

THE FUNCTIONS OF PICTURES AND REPETITION  
IN CHILDREN'S ORAL PROSE LEARNING

by

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## Abstract

The effects of using pictures and repetition to facilitate the oral prose learning of grade one children was investigated in a multi-variate factorial experiment. The purpose of the study was to determine whether pictures and repetition have hierarchically related or independent functions in aiding the recall of orally presented material. It was argued that interactions between pictures and repetition on paraphrased cued recall and free story recall would support the hypothesis that the two aids are hierarchically related, while main effects on the dependent measures would support the hypothesis that the two aids have independent functions in facilitating oral prose learning.

A main effect of pictures on paraphrased cued recall was found. No effects of pictures or repetition were found on serial order of recall or semantic free story recall. In one school only, there was a main effect of repetition on the length of utterances used when retelling the stories during free recall.

The results provide weak evidence supporting the hypothesis that pictures and repetition have independent functions in facilitating oral prose learning. Pictures facilitated the answering of paraphrased questions while repetition, when it had an effect, facilitated syntactic complexity. Theoretical, methodological and educational implications of the study were discussed.

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## Introduction

Since much of school learning involves remembering orally presented information, it is important to find effective ways of facilitating children's oral prose learning and to attempt to describe the underlying cognitive functions of such facilitation. The use of pictures and the use of repetition during oral presentation of information have both been shown to improve children's recall. Children who listen to passages accompanied by relevant pictures perform better on subsequent recall measures than children who listen to passages without pictures (see Levin & Lesgold, 1978; Levin, 1979 for reviews). Similarly, children who repeat or listen to repetitions of oral prose show greater recall than children who simply hear passages once (e.g. Levin, Bender & Lesgold, 1976; Petros & Hoving, 1980).

There are three possible ways that the functions of pictures and repetition can be related. First, these aids may have the same function. Second, pictures and repetition may serve hierarchically related functions. Third, the two kinds of instructional support may have independent functions in facilitating recall.

The first possibility has been suggested by Resnick (cited in Levin et al., 1976; Levin, 1979) and Brody and Legenza (1980). They have hypothesized that the reason pictures in prose are helpful is simply because pictures prompt children to rehearse the information just given.

Recent research examining this simple rehearsal hypothesis provides evidence that it is not sufficient to account for the effects of pictures and repetition on recall. While both aids help in comparison to control conditions on cued recall measures, pictures result in better performance than repetition (e.g. Levin, Bender & Lesgold, 1976; Ruch & Levin, 1977). This finding has been interpreted as indicating that the functions of pictures and repetition are hierarchically related. Ruch and Levin (1977) have suggested that pictures provide something more than a simple repetition of verbal information. Their hypothesis is based on Craik and Lockhart's (1972) depth-of-processing model of memory.

An alternative hypothesis is that pictures and repetition may have independent functions in facilitating oral prose learning. Possibly pictures provide something different than a repetition of the verbal information.

It is important both theoretically and practically to distinguish between these two hypotheses about how pictures and repetition function in facilitating oral prose learning. If the two aids are in fact hierarchically related then, theoretically, they can be considered to function at different levels of a single cognitive process as Ruch and Levin (1977) suggest. Educationally, a hierarchical relationship would imply that only the aid that is the most facilitative (pictures) need be provided to maximally facilitate oral prose learning. However, if the two aids have independent functions, then a single process explanation would not adequately describe the underlying functions of pictures and repetition. Instead, a model which



postulates more than one processing system may be better able to consider nominally different functions (e.g. Das, Kirby & Jarman, 1979; Paivio, 1971). From an educational point of view, independent functions would mean that when information is being presented orally, providing both pictures and repetition together should be more helpful than providing pictures alone.

In examining the results of research to date, it is not possible to distinguish between these two hypotheses because of two limitations. First, the only kind of task on which the effects of providing pictures or repetition have been compared is cued recall. While pictures have been found to be more effective than repetition on this particular type of task, there may be other tasks for which repetition is more effective than pictures. Second, while the effects of these two kinds of instructional support have been compared to each other, using them together in a combined instructional treatment has never been examined. Without looking at the effects of pictures and repetition combined it is impossible to determine whether the two aids have ordinally related functions with pictures providing something more than repetition, as Ruch and Levin (1977) suggest, or if pictures and repetition have nominally different functions in facilitating oral prose learning.

To differentiate between the two hypotheses, the effects of pictures and repetition were compared factorially on both a free recall task and a cued recall task. The two hypotheses led to different predictions about the patterns of recall that would occur. The hypothesis that the functions of pictures and repetition are hierarchically related led to the prediction that

since pictures provide something more than repetition, using the two aids together would be redundant. Therefore, an interaction between the two factors, such that the repetition effect would be subsumed under the picture effect was expected to occur. In other words, using pictures and repetition together should have the same effect as using pictures alone on both cued and free recall measures. In contrast, the hypothesis that the two aids have independent functions in facilitating oral prose learning led to the prediction that since pictures provide something different than repetition, using the two aids together would be additive rather than redundant. Therefore, instead of an interaction, main effects of pictures and main effects of repetition on both recall tasks were expected.

### Literature Review

In this section the framework for the present experiment on the functions of pictures and repetition in oral prose learning will be developed. First, representative single and dual process models of cognition will be presented and compared. Second, these models will provide a context for reviewing research dealing with the functions of pictures and the functions of repetition in oral prose learning. Third, the use of paraphrased cued recall and free story recall as measures of oral prose learning will be discussed.

## Models of Cognitive Processing

While there are almost as many models of cognitive processing as there are theorizers, most can be sorted into two categories. Single process models propose that there is one hierarchically organized system and dual process models postulate two independent systems for processing information.

Two single process models are the depth-of-processing framework (Craik & Lockhart, 1972), and the stages of encoding approach (Anderson, 1972). In both models it is suggested that information is processed through a series of hierarchically arranged levels progressing from a surface level of sensory perception through a level of rote learning to deeper abstract and semantic levels. Retention is viewed to be a function of the level to which the information is processed.

Two examples of the dual process approach are Paivio's dual coding model (1971, 1975), and the simultaneous and successive processing model described by Das et al. (1975, 1979). Both models describe two separate but complementary cognitive processing systems. While there are differences in how the constructs are defined in each model, and although Kirby and Das (1976) have criticized Paivio's (1975) definitions and research methodology, Paivio (1976) has pointed out that the two approaches are very similar. Both distinguish between parallel or simultaneous processing and sequential or successive processing. The former refers to synthesizing information in a gestalt fashion, while the latter refers to processing information in temporal order. The dual process models are similar to the single process models in that they describe a

hierarchy of levels within each system. However, they are different from the single process models in that the systems themselves are seen to function independently of each other rather than being hierarchically related. An important aspect of this approach is that it is assumed that retention can be affected additively by the two systems.

The distinctions between the single process and dual process models which are of importance to the present study are in how the two approaches view the functions of verbal repetition and pictures in facilitating learning. In the single process models pictures and repetition are considered to be hierarchically related with pictures leading to deeper processing than repetition. Repetition is viewed as a rote process which is a less helpful way of facilitating learning than other more meaningful semantic coding strategies (e.g. Anderson, 1972) such as the provision of pictures. In the dual process models the two kinds of instructional support are seen to facilitate two different processing systems rather than different levels of the same system. In other words pictures and repetition are seen to aid learning in separate ways. Repetition, being verbal and sequential, probably mainly involves successive or sequential processing. Pictures, consisting of images which can be perceived in a gestalt manner, probably mainly involve simultaneous or parallel processing (e.g. Das et. al., 1979; Paivio, 1971).

The two approaches to cognitive processing have been compared in verbal learning research in which lists of discrete items are used. Which model is supported appears to depend on

the experimental paradigm used. The results of paired associate experiments tend to favor a single process model. This is because few differences between the provision of either pictorial or verbal elaborations have been found (see Pressley, 1977; Reese, 1977; Rohwer, 1973 for reviews) and because elaboration has been found to be a much more effective study activity than the generally detrimental strategy of repeating the two items to be learned. (e.g. Schnorr & Atkinson, 1969; Yarmey & Barker, 1971).

The results of other kinds of list learning studies have found evidence that can best be interpreted within a dual process framework. In contrast to paired associate findings it has consistently been demonstrated that repetition in fact aids free and serial recall (see Nelson, 1977; Ornstein & Naus, 1978 for reviews). There is also evidence that repetition facilitates recall independently of semantic elaborative strategies (Maki & Schuller, 1980).

The main difference between the paired associate and other list learning paradigms is in the type of task used to measure recall. Paired associate experiments use cued recall and other kinds of list learning studies use free and serial recall as well as cued recall. Since the results seem to vary according to which dependent variable is used, it seems important to use more than one task to measure recall when testing hypotheses about the effects of different kinds of instructional support on learning.

## Oral Prose Learning

Recently, verbal learning researchers have begun to investigate the effects and functions of pictures and repetition in learning from connected discourse. At first the aim was simply to demonstrate the positive effects of repetition (e.g. Ausubel & Yousef, 1965) and pictures (Lesgold, Levin, Shimron & Guttman, 1975; Levin, et al., 1976; Rohwer & Harris, 1975) as instructional aids. More recently, attempts have been made to describe the functions of these aids in prose recall (e.g. Brody & Legenza, 1981; Duchastel, 1980, Levin, 1979; Ruch & Levin, 1977).

Pictures. Accompanying orally presented information with relevant pictures has consistently been shown to improve children's learning as measured by cued recall (see Fleming, 1979; Levin, 1979; Levin & Lesgold, 1978; Pressley, 1977 for reviews). Significant positive effects have been found with children of various ages including students in kindergarten (Dunham & Levin, 1980; Guttman Levin & Pressley, 1977), first grade (Guttman et al., 1977; Lesgold, Levin, Shimron & Guttman, 1975; Levin, Bender & Lesgold, 1976), second grade (Purkel & Bornstein, 1979; Guttman et al., 1975), third grade (Ruch & Levin, 1977; Rustead & Coltheart, 1979), and fourth grade (Levin & Berry, 1980; Rohwer & Harris, 1975). The use of pictures has been found to facilitate the free story recall of grade two children when short stories are used but not when long stories are used (Lesgold et al., 1976).

Repetition. The effects of repetition on learning from prose have received limited interest in comparison to the large literature available on the effects of repetition and rehearsal

on learning paired associates and serial lists. This may be because much of the research with meaningful material is educationally oriented. It seems that educators have accepted the assumed connection between repetition and rote learning (e.g. Anderson, 1972) and so there is more interest in other kinds of learning strategies. However, the few studies that have been done demonstrate that repetition does facilitate prose learning.

Significant positive effects of both overt and covert repetition on both cued and free recall have been found with adults (e.g. Ausubel & Yousef, 1965; DiVesta & Grey, 1972; King & Cotton, 1969). Overt repetition has also been found to facilitate the free recall of grade two children (Petros & Hoving, 1980). While covert rehearsal instructions have not been found to affect the recall of kindergarten children on either cued recall (Dunham & Levin, 1980) or free recall (Travis & White, 1979), Dunham and Levin (1980) found that overt repetition facilitated cued recall in this age group.

Pictures Versus Repetition. The literature reviewed to this point has simply demonstrated that both pictures and repetition facilitate oral prose recall. Attempts to describe the functions of the two aids by specifically comparing their effects will now be discussed.

Levin et al. (1976) found that while both aids helped grade one children's recall in comparison to a control group on verbatim cued recall, pictures were more facilitative than repetition. Ruch and Levin (1977) found that, for grade three children, pictures and repetition both facilitated the answering

of verbatim cued recall questions, but only pictures facilitated paraphrased cued recall. In a study with mentally retarded children Bender and Levin (1978) found that pictures facilitated the answering of both verbatim and paraphrased questions while repetition was not significantly better than control conditions on either measure. Dunham and Levin (1979) reported that pictures and repetition were equally more effective than imagery instructions, covert rehearsal instructions or control instructions on the verbatim cued recall of kindergarten children. Silvern (1980) found no significant differences between a picture condition, a repetition condition, and a control condition on a verbatim cued recall measure in a study with kindergarten children.

The different patterns of performance found by Bender and Levin (1976), Levin et al. (1976), and Ruch and Levin (1977) when comparing pictures to repetition indicate that a "simple rehearsal" hypothesis is not sufficient to account for the effects of pictures on prose. Instead Ruch and Levin (1977) proposed that pictures and repetition are hierarchically related with pictures providing something more than repetition. They argued that rehearsal is helpful in that it provides more exposure to the surface characteristics of the passage, resulting in better phonological-acoustic encoding. However, pictures are even more helpful because they provide an organizational context in which the information can be more deeply processed. More recently Levin (1979) proposed that pictures have several functions including: reiteration, representation, organization, interpretation, and transformation



of information. Within this list the reiteration (or repetition) function of pictures is viewed as being less useful than the other functions mentioned. Levin (1979) asserts that none of these functions are unique to pictures but instead are considered to be general strategies for improving children's prose learning. These general strategies are also considered to subsume verbal activities such as repetition, question answering and paraphrasing. In essence, Levin's (1979) taxonomy is a single process approach in which pictures are seen to provide something more than, rather than something different from repetition.

An alternate hypothesis explaining these findings is that the different patterns of performance found between pictures and repetition on cued recall occur because the two instructional aids serve independent rather than hierarchically related functions in facilitating oral prose learning. Possibly repetition is not simply less facilitative than pictures but is actually facilitative in some different but equally important ways.

These hypotheses are both plausible explanations of how pictures and repetition function in facilitating oral prose learning because both can account for the findings of research to date. To discriminate between the two hypotheses, research examining the effects of pictures and repetition used both alone and in combination on retrieval tasks other than cued recall is needed.

## Recall Measures

There are two common methods of measuring prose recall but they are seldom both used in the same study. With very few exceptions (e.g. Lesgold, DeGood & Levin, 1977; Rohwer & Harris, 1975) the tendency has been to use either cued recall (e.g. Lesgold, Levin, Shimron & Guttman, 1975; Silvern, 1980), or free story recall (e.g. Cummins & Mulcahy, 1979; Mandler & Johnson, 1977; Petros & Hoving, 1980; Travis & White, 1979). In cued recall the subject is asked verbatim (verbatim cued recall) or paraphrased (paraphrased cued recall) questions about the previously presented material. In free story recall the subject is instructed to recall everything s/he can about the previously presented material.

Previous studies comparing the effects of pictures to repetition in aiding oral prose learning have only used cued recall as a dependent variable (e.g. Bender & Levin, 1978; Dunham & Levin, 1980; Levin, Bender & Lesgold, 1976; Ruch & Levin, 1977). (In fact, Levin et al. (1976) attempted to elicit free recall as well as cued recall from the children in their study but because a floor effect was produced only the cued recall results were analyzed.) Researchers have found differences in recall patterns when comparing the effects of pictures and repetition on cued recall measures (e.g. Ruch & Levin, 1977). Differences in recall patterns were also expected to occur when pictures and repetition were compared on free story recall.

The two recall measures that were used in this study are paraphrased cued recall and free story recall. Paraphrased cued recall consists of questions which are related to the originally

presented material in meaning but unrelated with respect to the actual words used. Although the questions convey the meaning of the sentences in the study material, they do not have any substantive words in common. Instead they consist of lexical (or paradigmatic) associations (Anderson, 1972). This task was chosen rather than verbatim cued recall, in which the questions asked use the same words as were used in the study material, partly in an attempt to make the task more difficult and so avoid a possible ceiling effect, and partly because researchers favoring single process frameworks and researchers favoring dual process models have different perspectives on the demands of paradigmatic tasks as discussed below. In short, it was felt to be a more difficult and theoretically more interesting task than verbatim cued recall.

While both paraphrased cued recall and free story recall tasks have been used to measure learning from oral prose, they are very different kinds of procedures. Paraphrased cued recall is a lexical paradigmatic task while free story recall is a sequential task which has syntactic, and serial ordering as well as lexical demands. Single process and dual process theorists have different views on the demands of paraphrased cued recall and free story recall. According to at least one single process theorist (Anderson, 1972), paraphrased cued recall requires deeper processing than free recall because the former can only be successfully completed if the stimulus material was comprehended, while it is possible that the latter could be successfully completed through rote memory strategies. There is, however, no evidence supporting this suggestion. In fact, free

story recall is actually a more difficult task than cued recall, especially for young children (A. Brown, 1975) because the subject is required to produce sentences and organize recall without cues. While Levin et al. (1976) question the validity of using free story recall to measure young children's oral prose learning, other researchers have found that although free recall is difficult, most young children are able to perform this task adequately enough to measure differences in performance between subjects (e.g. Mandler & Johnson, 1977; Stein & Glenn, 1977; Travis & White, 1979).

According to the dual process models, lexical, paradigmatic tasks mainly involve parallel or simultaneous processing while syntactic, sequential tasks mainly involve sequential or successive processing (Paivio, 1971, 1975; Das et al., 1979). Several studies provide empirical support for this suggestion. Cummins (1978) and Jarman (1980) have found that lexical and paradigmatic tasks are correlated with a simultaneous factor. Cummins (1978), Cummins and Mulcahy (1979) and Jarman (1980) have found that syntactical tasks are related to successive processing.

### Summary

In summary, there are two plausible hypotheses about how pictures and repetition function to facilitate oral prose learning. The hypothesis proposed by Ruch and Levin (1977), which is based on Craik and Lockhart's (1972) single process model of memory, suggests that pictures and repetition serve hierarchically related functions. This implies that any effect

repetition has on oral prose learning is encompassed in the more facilitative functions of pictures. The alternative hypothesis, which is based on dual process models of cognitive processing, (e.g. Das et al., 1979; Paivio, 1971) proposes that the functions of pictures and repetition are independent from each other and therefore facilitate oral prose learning in different ways.

In research examining ways of facilitating oral prose learning, both pictures and repetition have been found to be useful instructional aids. In studies which have compared the effects of the two aids on cued recall, the provision of pictures has been found to be a more effective form of instructional support than the provision of repetition. This has been interpreted within a single, continuous process framework as indicating that pictures provide something more than repetition. However, an alternative hypothesis is that pictures may provide something different than repetition. If so a dual process framework would provide a better interpretation than can be described within a single process model..

The two hypotheses lead to different predictions about the effects on cued and free recall of using pictures, repetition, or a combination of the two aids when presenting oral information to children. If the functions of pictures and repetition are hierarchically related then picture by repetition interactions would be predicted on both paraphrased cued recall and free recall measures. According to this first hypothesis, any repetition effects found would be smaller than any pictorial effects because pictures are more facilitative than repetition. Further, using the two aids together would not be expected to be

any more effective than using pictures alone. For these reasons, interactions such that the repetition effects form part of the more powerful picture effects are predicted by this hypothesis. If, however, pictures and repetition have independent functions then using pictures and repetition would be expected to result in separate additive main effects. The use of pictures would be expected to mainly facilitate the lexical aspects of recall such as those tapped by paraphrased cued recall and the semantic information recalled in free recall. The use of repetition would be expected to mainly affect serial order and syntactic complexity in free recall. Further, if pictures and repetition make independent contributions to oral prose learning, then using both aids together would be expected to be more effective than using either aid alone. Thus main effects and no interactions are predicted by this hypothesis. The purpose of the present study was to determine which of these two hypotheses is the most useful way to describe the functions of pictures and repetition in facilitating oral prose learning.

### Method

#### Subjects

The study was conducted with 32 grade one children from a school in a small town on Vancouver Island, B.C. (School 1), and replicated with 32 grade one children from a school in a rural community on Vancouver Island, B. C. (School 2). In School 1 there were several grade one children who spoke English as a

second language, and several native Indian children. The children who spoke English as a second language were excluded from the study. The native Indian children were included. This age group was chosen because young children do not spontaneously use imagery or covert repetition to facilitate prose learning (e.g. Dunham & Levin, 1980), and so it seemed possible to measure the effects of experimentally manipulating pictures and repetition with assurance that the results would not be confounded with subject generated covert strategies. The children were randomly assigned to the experimental conditions.

### Design and Materials

Factors. Pictures and repetition were orthogonal factors in a completely randomized multi-variate design. There were two levels of pictures: a) no pictures provided, b) pictures provided, and two levels of repetition: a) no repetition provided, b) repetition provided. The four resulting instructional conditions were 1) no pictures, no repetition control, 2) repetition provided, 3) pictures provided, 4) pictures and repetition combined. Since initial analyses indicated the school populations were different, the effects of these instructional treatments were examined separately within each school.

Stories. Two narrative passages of ten sentences each which were developed by Guttman (Guttman, 1975) were presented on tape by a female speaker at the rate of one sentence per ten seconds. There was a ten second pause following each sentence. During this pause the appropriate instructional treatment was

administered. Control subjects received an unfilled pause. Repetition subjects listened to a repetition of the previous sentence. Picture subjects viewed a picture of the previous sentence. Subjects in the combined instructional condition viewed a picture and listened to a repetition of the previous sentence. The pictures used were colored line drawings which were also developed by Guttman (1975). There are ten pictures for each story with one picture corresponding to each sentence. Each child heard both stories. The order of story presentation was counterbalanced across subjects.

Recall Measures. There were two methods used to measure learning: paraphrased cued recall and free story recall. The paraphrased cued recall task consisted of two sets of ten questions developed by Ruch and Levin (1977) in accordance with Anderson's (1972) rules for constructing paraphrase questions. There was one set of questions for each story. Each question asked for information presented in one of the sentences. Questions were asked in the same temporal order as the sentences had been presented in the story.

The free story recall task was a variation of the procedure developed by Travis and White (1979) in which subjects are asked to tell everything they can remember about the story. Travis and White's (1979) procedure was varied by using a puppet as a prop because Bullock (Note 1) suggests using a puppet or a doll who is absent during story presentation in order to encourage more complete recall in young children. The children in the present study were asked to tell the story they had just heard to a puppet who had been "asleep" in an attempt to encourage detailed



recall rather than just a summary of the story (see Appendix A).

Each child received both recall measures, one measure for each story. The order of measurement was counterbalanced across subjects.

### Procedure

Children were tested individually in a small room at their school. Children were given identical instructions except that repetition subjects were told they would hear each sentence twice, and picture subjects were asked to pay attention to the pictures that went with the story. Following instructions, a one-sentence practice "story" and recall task were presented in the manner appropriate to the condition the child was in. Then the first story was presented. After the child heard the first story, either free story recall or paraphrased cued recall was measured. Next, a second one-sentence "story" and appropriate recall task were presented for practice. Then the child listened to the second story. Following this story the second recall task was administered. The entire procedure took twenty minutes per child (see Appendix B). Free story recall was tape recorded and later transcribed for scoring. Two children who were unable to do the practice recall tasks (one child from each school) and two children who were interrupted during free story recall (one child from each school) were replaced by other subjects.

## Results

Four dependent variables were used in the multi-variate analysis. The paraphrased cued recall task yielded one measure and the free recall task yielded three measures. Their names and the order in which they were entered into the analysis were: paraphrased cued recall, semantic recall (Information Unit Score), syntactic complexity (Mean Length of Utterance), and serial order of recall. The effects of pictures and repetition on these dependent variables were analyzed within each school using the Roy-Bargman Step-down F test (Bock, 1975).

Inter-rater reliability for the above scoring procedures was calculated by giving scoring directions to a second judge and having him score a random sample of ten protocols. Inter-rater reliabilities were all above .94 (see Appendix C).

### Paraphrased Cued Recall

The procedure used by Ruch and Levin (1977) was employed in the present study to score paraphrased cued recall.<sup>2</sup> Each question was worth one point. Each answer was scored as correct (1) partially correct (.5), or incorrect (0).

The mean paraphrased cued recall scores are presented in Table 1. A main effect of pictures on paraphrased cued recall was found in School 1 (univariate  $F(1,56)=5.90$ ,  $p=0.018$ ; Step-down  $F=5.12$ ,  $p=0.028$ ). In this school, children who viewed pictures while listening to stories answered significantly more questions correctly than children who did not view pictures. Although this effect did not reach significance in School 2 at

Table 1  
Paraphrased Cued Recall:  
Mean Number of Correct Answers  
as a Function of Instructional Condition

CONDITION	School 1			School 2		
	No Pic.	Picture	Mean	No Pic.	Picture	Mean
No Repet.	4.19	6.81	5.50	6.00	6.88	6.43
Repetition	5.88	6.88	6.38	6.13	7.94	7.03
Mean	5.03	6.84	5.94	6.06	7.40	6.73

the 0.05 level it approached significance (Univariate  $F(1,56)=3.29$ ,  $p=0.075$ ; Step-down  $F=3.34$ ,  $p=0.070$ ) and the means were in the expected direction.

### Semantic Recall

A simplified version of the informational units procedure developed by Stein & Glenn (1975) was used to measure the amount of information recalled.<sup>3</sup> The stories were divided into information units containing one verb each. Each unit roughly corresponds to a proposition, or a simple sentence. Initial inter-rater agreement about how the stories should be divided was 85%. All differences were resolved by discussion between the two judges. The children's protocols were examined for the presence or absence of these information units. Each information unit was scored as correct (1), if the child had recalled the verb and at least one noun. If the child recalled only the verb, or only the nominal information, then the unit was scored as partially correct (.5). If no information from that unit was

recalled, it was scored as absent (0).

The table of means for semantic recall is presented in Table 2. The distribution of scores on this measure was fairly

Table 2  
Semantic Recall:  
Mean Number of Information Units Recalled  
as a Function of Instructional Condition

CONDITION	School 1			School 2		
	No Pic.	Picture	Mean	No Pic.	Picture	Mean
No Repet.	7.94	10.63	9.28	6.06	7.62	6.84
Repetition	8.13	7.88	8.00	10.31	8.56	9.44
Mean	8.03	9.25	8.64	8.19	8.09	8.14

flat with a wide standard deviation (3.93). The mean was 8.39, with a range from 2/26 to 17/26. No significant effects or interactions between kind of instructional support were found on this measure. However, in school 2, the difference between children who had repetition and children who did not have repetition approached significance. In this school children who had repetition tended to score higher on the total information recalled than children who did not hear the sentences repeated (Univariate and Step-down  $F(1,56)=3.54$ ,  $p=0.065$ ).

### Syntactic Recall

Since utterance length is highly correlated with syntactic complexity (e.g. R.Brown,1973) mean length of utterance (MLU) was used as an index of syntactic complexity. The procedure followed was the system used by Tyack and Gottsleben (1974) to

obtain the mean number of words recalled per utterance when scoring language samples. The total number of words was divided by the total number of utterances.

The mean MLU scores are presented in Table 3. A main effect

Table 3  
Mean Length of Utterance:  
Mean MLU as a Function of Instructional Condition

CONDITION	School 1			School 2		
	No Pic.	Picture	Mean	No Pic.	Picture	Mean
No Repet.	7.51	6.85	7.18	5.30	6.11	5.70
Repetition	7.24	7.30	7.27	8.07	8.35	8.21
Mean	7.38	7.07	7.23	6.69	7.23	6.96

of repetition was found in School 2 (Univariate  $F(1,56)=9.01$ ,  $p=0.004$ ; Step-down  $F=7.51$ ,  $p=.008$ ). This effect was not replicated in School 1 (Univariate  $F(1,56)=0.011$ ,  $p=0.92$ ; Step-down  $F(1,56)=0.03$ ,  $p=0.86$ ). No main effect of pictures and no significant interaction between pictures and repetition was found in either school.

#### Serial Order of Recall

In measuring recall, the order in which the information is recalled indicates the ability of the subjects to remember the temporal order in which the story was told. It was important to develop a procedure in which serial order of recall was not confounded with amount recalled. Lee (Note 2) recommended a scoring procedure in which the total number of information units

that were recalled or partly recalled by a subject was used to calculate the highest serial order score possible for that individual. For example, if a subject recalled five information units, his/her highest possible serial order score would be  $4 + 3 + 2 + 1 = 10$ . If a subject recalled ten information units, his/her highest possible serial order score would be  $9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 45$ . Next the actual order in which the subject recalled each unit was compared to the order in which the sentences had originally been presented. For example, a child who recalled three information units would score 3/3 if the units were recalled in the order 1-2-3. S/he would score 2/3 if the units were recalled in the order 1-3-2, or 2-1-3. S/he would score 1/3 if the units were recalled in the order 3-1-2 or 2-3-1. S/he would score 0/3 if the units were recalled in the

Table 4  
Serial Order of Recall:  
Mean Scores as a Function of Instructional Condition

	School 1			School 2		
CONDITION	No Pic.	Picture	Mean	No Pic.	Picture	Mean
No Repet.	0.84	0.68	0.76	0.61	0.73	0.67
Repetition	0.81	0.70	0.76	0.77	0.73	0.75
Mean	0.82	0.69	0.76	0.69	0.74	0.71

order 3-2-1. In this way serial order scores were generated for all subjects. The scores were then converted to percentages and transformed with an arcsine transformation (Kirk, 1968) so that they could be compared with the other subjects.

The cell means obtained on serial order of recall are

presented in Table 4. The distribution of scores on this measure was extremely varied (Standard Deviation=.27;Range=.03-1.00). No significant effects or interactions were found.

### Discussion

The results will be discussed in terms of theoretical implications, methodological limitations and educational implications.

#### Theoretical Implications

The main purpose of this study was to determine whether the functions of pictures and repetition in facilitating oral prose learning are hierarchically or independently related. The hypothesis that the functions of the two aids are hierarchically related led to the prediction that interactions between pictures and repetition on both cued and free story recall would occur. The hypothesis that pictures and repetition have independent functions led to the prediction that main effects of pictures and main effects of repetition would occur on both measures.

No interactions between instructional treatments were found on any of the four dependent variables which were analyzed. A main effect of pictures on paraphrased cued recall was found in one school and a main effect of repetition on MLU was found in the other school, but none of these effects held up across schools. The main effect of pictures in School 1 merits serious consideration since this effect did approach significance in School 2 and in fact it appears that a ceiling effect occurred in

this school on the paraphrased cued recall task. Therefore it can be cautiously concluded that the provision of pictures did facilitate performance on paraphrased cued recall while the provision of repetition had no effect.

Unfortunately, this finding in itself does not enable one to distinguish between the two hypotheses. Since repetition had no effect at all on this measure it is impossible to meaningfully say whether pictures provided something more than or something different from repetition.

In relating this result to Ruch and Levin's (1977) findings about the effects of pictures and repetition on the paraphrased cued recall of grade three children it is apparent that this study has replicated their results with a younger group of children. Ruch and Levin (1977) found that children who received repetition did no better than the control group on paraphrased cued recall while children who viewed pictures did significantly better than both groups. The cued recall task that was facilitated by both repetition and pictures was verbatim cued recall. Since both instructional treatments have been found to affect recall on this measure this would have been a better task to use in attempting to determine whether pictures and repetition are hierarchically or independently related. In future research verbatim cued recall should be included as a dependent measure while attempts are made to make the task difficult enough that a ceiling effect does not occur.

At present the main effect of pictures without a repetition effect or a interaction can be adequately explained by either a single process or a dual process model. The single process



explanation for this effect is that the recall task involves deep processing. Since pictures facilitate performance on this recall task, this indicates that pictures lead to deep processing. The dual process explanation is that the paraphrased cued recall task involves simultaneous processing. Since pictures facilitate performance on this measure, this indicates that pictures facilitate simultaneous processing. Thus, while this result replicates previous research, it does not enable any distinction to be made between the two hypotheses.

Although the results on paraphrased cued recall in themselves do not enable any conclusions to be drawn about the two hypotheses, if considered in conjunction with the free story recall results some tentative possibilities can be presented. These conclusions are tentative because there were few significant free story recall results. Pictures had no effect on any of the free story recall measures and there is only weak evidence that repetition facilitated performance on this task. In School 2 children who received repetition tended to score better on semantic recall than children who did not receive repetition. However, since this effect did not reach significance at the 0.05 level and since it was not replicated in school 1, this finding only indicates a need for further research perhaps with a more sensitive measure. The only other significant finding was a main effect of repetition on the MLU of children in School 2. In this school, children in the repetition conditions used longer and presumably more complex utterances while recalling the stories than children in the other conditions. That there was a main effect of repetition on

mean length of utterance in one school provides some indication that the repetition may facilitate the syntactic aspects of oral prose learning. However, since the effect did not hold up across schools, it would appear that either there are differences between the populations of school 1 and school 2 that have not been accounted for, or the significant effect of repetition found in School 2 occurred by chance. Again, this indicates that more research is needed in order to examine the repetition effect more fully.

Keeping in mind that the evidence is weak, it appears that when repetition has an effect it is to facilitate syntactic complexity. This finding, along with the finding that pictures facilitate the answering of paraphrase questions, provides some indication that pictures and repetition have independent rather than hierarchically related functions. Pictures appear to facilitate semantic encoding of oral prose while repetition may facilitate syntactic encoding. This argument is consistent with evidence from dual process research which indicates that paradigmatic aspects of language and syntactic aspects of language different kinds of processing. This argument could perhaps be countered by attempting to order syntactic and semantic processing in a single process of progressively deeper levels of encoding. However, as both syntax and semantics are integral and important aspects of language (e.g. Bloom & Lahey, 1978; Dale, 1972), and as an ordinal ordering of structural and semantic processing has yet to be developed (Nelson, 1977) it seems more valid to describe semantics and syntax as nominally rather than hierarchically different.

To be more consistent with a dual process model, repetition should have facilitated performance on other sequential aspects of story recall such as serial order, and pictures should have facilitated performance on semantic recall. However, there was no evidence for this in the present study.

Thus, the suggestion that repetition may facilitate the syntactic processing combined with the finding that pictures facilitate performance on paraphrased cued recall, provides only tentative support for the hypothesis that pictures and repetition have independent rather than hierarchically related functions in facilitating oral prose learning.

#### Methodological Limitations

The study was limited by the dependent measures used. The skewed distribution of scores on paraphrased cued recall indicates that there was a ceiling effect on this measure and the non-significant results on free story recall indicates that this measure is not sensitive to picture and repetition treatment effects. The ceiling effect on paraphrased cued recall may account for the non-significant effect of pictures on cued recall in School 2. Perhaps a significant difference would have occurred if the task had been more difficult. In previous research using these stories, both stories were presented before recall was measured (e.g. Levin et al., 1976; Ruch & Levin, 1977). In the present study, recall was measured after each story both so that each subject could be tested on both cued and free recall, and so that a floor effect on free recall, as was found by Levin et al. (1976), would be avoided. Since free

recall is a more difficult task than cued recall it is difficult to find stimulus materials that will result in an appropriate range of scores on both measures. Perhaps using a longer story, rather than two completely different stories, before measuring recall might produce a desirable range of scores on both cued recall and free recall. Further, instead of free recall, the use of open ended questions might be more sensitive to instructional treatment effects and yet still involve different task demands than verbatim or paraphrased cued recall.

### Educational Implications

The main educational question asked in this study was: To facilitate oral prose recall, should both pictures and repetition be used when presenting oral information or would the provision of pictures alone provide the same amount of instructional support? It appears that while using pictures and repetition in combination does not result in an additive effect on any one measure, the children in the combined treatment condition both answered more questions than the children who did not view pictures, and used longer utterances in free story recall than the children who did not receive repetition. This leads to a tentative recommendation that both pictures and repetition be used when presenting oral information to young children. However, to provide a more definite answer to this question more research is needed.

Although individual differences were not the focus of this study, one of the more interesting findings was that there was a wide range of scores on both semantic and serial order of recall

in the free story recall task. These differences were not related to the factors of pictures and repetition. Further, the low correlation between ability to recall information and ability to recall the information in correct serial order indicates that separate skills are involved on these two aspects of the same task (see Appendix C). Research is needed to determine both why some young children have these skills and some do not, and what the educational implications of having or not having these skills are. Clearly, the ability to recall both the content and the order of orally presented information is important for such school related tasks as direction following, oral expression, and arguing logically. Further, it is very possible that the skills involved in oral story narration are pre-cursors to the skills involved in written expression and reading comprehension. Thus, even on the two dependent variables in which no treatment effects were found, there are results which generate questions deserving further study.

## Footnotes

<sup>1</sup> In reviewing this literature only studies in which the children listened to orally presented material or read aloud will be cited. Studies of the effects of pictures on reading (e.g. Samuels, 1970) are beyond the scope of this study because new variables such as word decoding skills must be considered in discussing that area of research.

<sup>2</sup> Because of the possibility that a ceiling effect would occur using this scoring system, a strict scoring procedure was also employed. In this procedure, each question was worth two points. Answers were given a score of (2) if the essential information and at least one correct descriptive adjective were present, a score of (1) if the essential information was present and a score of (.5) if part of the essential information was present. The distribution of scores was the same using either the liberal or the strict scoring system for paraphrased cued recall, and the correlation between the two methods was very high (Pearson  $r = .95$ ,  $p .0001$ ). Also, initial analyses yielded identical results. This implied that both methods were measuring essentially the same thing. Only the liberal scoring method was included in the analysis since it is the scoring procedure that has been used in previous analyses.

<sup>3</sup> Rubin's (1978) word unit analysis procedure was also used and compared to the above procedure for ease of use and reliability. The high correlation between both procedures for scoring semantic recall and identical initial analyses indicated that even though the size of the units of analysis are different, they are providing the same information. This indicates that when total amount of content recalled is the question of interest, both procedures are valid ways of obtaining that information. The informational units procedure was chosen as the final method to include in the multi-variate analysis because this is the unit size most commonly considered in scoring free recall (e.g. (Mandler & Johnson, 1977; Lesgold, et al., 1977)).

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## Appendix A

## Free Story Recall Instructions

Examiner : "Now I'm going to wake up Mr. Puppet, who has been asleep, so that you can tell him everything you remember about the story you just heard."

"Mr Puppet, wake up. This is (Child's Name) and s/he is going to tell you a story s/he just heard".

Mr. Puppet : "A story! I love stories. I hope it's going to be a long one".

Examiner : O.K. go ahead and tell Mr. Puppet everything you can remember about the story you just heard".

(When the student stops pause for twenty seconds).

Examiner : "Now I want you to tell Mr. Puppet anything else you can remember about the story".

(When the student stops, pause for twenty seconds).

"Now I'll give you one more minute to think about the story to see if there is anything else you can remember to tell Mr. Puppet".

(After forty seconds or after the student has stopped for twenty seconds)

Mr. Puppet : "What else can you remember to tell me about the story?"

(After the student stops wait for twenty seconds).

Mr. Puppet : Thank you very much, that was a great story.

## Appendix B

### Instructions to Subjects

"I want to find out how much kids your age can remember about stories they hear. First I will turn the tape recorder on. Then you will listen to a story. To help you remember it I want you to:

Control: "Listen to each sentence very carefully. Be sure to pay attention to the story."

Repetition: "Listen carefully to each sentence two times. Be sure to pay attention to the story."

Pictures: "Listen to each sentence very carefully. Be sure to pay attention to the pictures that go with the story".

Pictures plus Repetition: "Listen carefully to each sentence two times. Be sure to pay attention to the pictures that go with the story".

After you hear the story I will find out how much you can remember. Let's practice with a very short story first".

(Practice story 1) "The happy rabbit chewed on a blue pencil."

(Practice Cued Recall Task) "What did the bunny eat?".

or

(Practice Free Recall Task) Tell me everything you can remember about the story you just heard"..... "Very good. You remembered everything". or "Very good but you could have also said..... Now tell me everything you can remember about the story".

"Now that you understand what to do I want you to listen to a longer story".

(First story, followed by the appropriate recall task.)

"Now you will listen to another story. But first let's practice again so that you know what to do.

(Practice Story 2) "The scared duck looked back at the speeding car".

(Practice Cued Recall) "What did the bird see?".

or

(Practice Free Recall: Same as above).

"Now that you understand what to do I want you to listen to another long story".

(Second story, followed by the appropriate recall task).

## Appendix C

## CORRELATIONS OF DEPENDENT VARIABLES

## Inter-rater Reliability

Dependent Variable	Pearson r
Paraphrased Cued Recall	.99
Total Information Units	.97
Total Word Units	.97
Mean Length of Utterance (MLU)	.98
Serial Order	.94

## Inter-Correlation Matrix of Dependent Variables

Variable:	1	2	3	4	5	6
Paraphrased Cued Recall						
1) Liberal	1.00					
2) Strict	.94	1.00				
Free Story Recall						
3) Total Inf. Units	.32	.19	1.00			
4) Total Word Units	.30	.17	.95	1.00		
5) MLU	.13	.08	.16	.23	1.00	
6) Serial Order	.02	.11	.16	.16	.01	1.00