DOCUMENT RESUME

ED 098 538 CS 001 478

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TITLE The Distinction Between Perceiving and Memorizing in Elementary School Children.
PUB DATE Apr 74
NOTE 13p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, Illinois, April 1974)

EDRS PRICE MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS *Cognitive Processes; *Educational Research; Elementary Grades; *Learning; Learning Modalities; *Memorizing; *Perception; Recall (Psychological); Retention

ABSTRACT

Thirty-two children each in grades 1-5 participated in an experiment designed to replicate and extend a study by Flavell and associates (1966) which hypothesized that "memorizing and perceiving are functionally undifferentiated for the young child, with deliberate memorization only gradually emerging as a separate and distinctive form of cognitive encounter with external data." Children at all ages showed this differentiation by studying differently and recalling more items when instructed to "remember" a list of pictures than when instructed to "look" at a list. The failure to find age trends in differential responding contradicted findings in the earlier study and was explained in terms of slight differences in experimental procedures. (Author)

Article to ~~appear in~~ be read at AERA APRIL 1974 ~~1974 issue of Child Development~~ 15.C.6

The Distinction Between Perceiving and Memorizing in Elementary School Children

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The Distinction Between Perceiving

and Memorizing in Elementary School Children

It has been shown in recent research that as children develop they become increasingly planful and strategic in their approach to the task of remembering (Flavell, 1970; 1971; Meacham, 1972). In a recent study by Appel, Cooper, Knight, McCarrell, Yussen, & Flavell (1972), one aspect of this development was examined--namely, the child's response to the explicit instruction to remember a set of items. The writers argued that preschool children do not deliberately try to study or memorize items and that their response when directed to remember is much like their response when directly simply to look at or perceptually examine items. In contrast, the writers argued that older children understand the implications of the direction to remember, responding in a more strategic, study-oriented fashion with the to-be-remembered items than they would following the direction to simply look at or examine such items.

Appel et al., (1972) carried out two experiments to test their hypothesis.

> The experiments were designed to be essentially replications of one another in all important respects save one. In both experiments, children of the same three age groups were individually tested for recall twice (thus, a within-Ss design), once following instructions to memorize a set of items for future recall, and once following instructions merely to look at a similar set of items carefully, with no hint that a recall test would ensue. In both experiments analyses were made of Ss' level of recall, recall clustering, and any prerecall, study-period behavior suggestive of active attempts to memorize (e.g., verbal rehearsal), in order to compare, at each age level, the effects of the two types of instructions on these measures. While the period of stimulus presentation was also of roughly the same duration in the two experiments, the conditions of stimulus presentation were markedly different. In experiment 1, S had simultaneous access to all items (pictures of objects) for a study period of 1.5 minutes, during which he was free to inspect and manipulate them as he chose. In experiment 2, on the other hand, the same items were slide-projected one at a time on a screen, each item being exposed once briefly (0.5 second), with a 7-second pause between successive exposure. (PP. 1366-1367)

The subjects in each experiment were preschoolers, first graders, and fifth graders. Each experiment produced similar developmental trends. Preschoolers showed the same level of recall, recall clustering, and various study behaviors under the two instructional sets--look and remember. Fifth graders recalled more, clustered more, and evidenced greater study behavior following instructions to remember than following instructions to look at the pictures.

The results substantially supported the hypothesis of the investigators and the phenomenon is worthy of further exploration. The purpose of the present investigation is to examine the course of this developmental differentiation in the elementary school years. The main prediction is that children's approach to the task of remembering is clearly differentiated from the task of looking at items throughout the range of elementary grades bracketed in the earlier study. Although it has been shown that children have a differentiated sense of the meaning of remembering beyond the first grade, the current study will provide evidence bearing on the form and time of onset of any changes in memory differentiation that might be occurring between first and fifth grade, particularly in the realm of study behaviors. An additional feature of the current study was a slight modification of one of the earlier experimental tasks, in order to account for a discrepancy in the results obtained for first graders in the Appel et al. experiments.

Method

Subjects. The Ss were 160 lower middle and middle class children from two elementary schools in the Madison area. There were 32 Ss at each of the grade levels from 1 to 5, 16 of each sex, with respective mean ages of 7.3, 8.5, 9.2, 10.2, and 11.3 years.

Design. All Ss were given the same recall task following two different study instructions, look and memory. In the look condition, Ss were asked to look at an array of pictures. In the memory condition, they were asked to remember the names of the pictures. Two different stimulus lists were employed for each S, one in each

condition. At each age level the factors of order of condition, list, and sex were counterbalanced. Two experimenters were used--a male and a female graduate student. Each one tested half of the children with the experimenter factor counterbalanced across the other between subject variables.

Stimuli and Apparatus. The stimuli were the same set of pictures used in the Appel et al. study. They were individual 2 7/8 x 3 1/2 inch black and white drawings of common objects, colored with paints and mounted on equal sized pieces of cardboard. Each stimulus list consisted of 15 pictures, three in each of five categories. Three additional colored pictures accompanied each list and were used for a practice recall test. Children at each grade saw all the pictures in each list.

Procedure. The subject was seated at a table and the experimenter sat to his right side where he could inconspicuously observe the subject's mouth movements, visual gaze, and manipulation of stimuli.

In both tasks, E told the child that he would see a number of pictures spread in a circle and that S was to look at all the pictures. To demonstrate the meaning of the instructions, E briefly showed the child each of the practice pictures, with a mini version of the appropriate instruction (look or memory) prior to each task.

In the look condition the child was told to look at all the pictures on the table in order to ensure that they were "clear and easy to see," since the pictures would be used in a later game. In the memory condition, S was told to do whatever he could to remember the pictures and that, afterwards, he would be asked to tell E all the picture names.

The pictures were arranged in a circle in a fixed order with consecutive pictures being in different semantic categories. After each practice trial was given, the S was told that the E had some work to do that would take a couple of minutes. The study period in both conditions lasted 90 seconds. E recorded S's behaviors (the work he had to do) on a rating sheet by checking whether a behavior occurred in each 15 second interval. The same behaviors examined in the Appel et al. study

were included on the rating sheet. The behaviors and operational definitions are: sequential naming--looking at the pictures and naming two or more of them sequentially; sequential pointing--pointing to two or more pictures sequentially; rehearsal--naming pictures while not looking at them, or indicating some degree of self-testing through lip movements, head movements, or facial expressions; categorization--rearranging pictures in a new configuration that included at least two groups of two common category members or one group in which all three are common category members.

At the end of each study condition the pictures were hidden and the subject was asked to name all the pictures he could remember.

Two reliability measures were obtained for study behaviors. The inter-experimenter reliability ranged from .88 to 1.00 for the four behaviors. The reliability between experimenter and outside observer ranged from .80 to .95 for the behaviors.

Results

For both recall and recall clustering, complex analyses of variance were computed involving the 5 independent between subject variables, Grade (5), Order of Instructions (2), List order (2), Experimenter (2), and Sex of the Subject (2), and the repeated measure, Experimental Condition (2).

In the case of the binary (presence-absence) study-behavior data, within grade (and within-S) between-condition comparisons were made by means of the McNemar test for correlated proportions, and within-condition between-age comparisons, by means of the ordinary X^2 test. Point biserial correlations involving some of these data were also computed.

Recall. The mean number of items recalled for children at each grade are shown in Table 1. The 6-way analysis of variance revealed, as predicted, a significant experimental condition effect, $F\ (1,80) = 90.67$, $p < .001$.

Insert Table 1 about here

More items were recalled in the memory task than in the look task. The interaction between age and experimental condition did not approach significance. Follow-up comparisons for simple effects revealed that the condition difference was signifi-

cant for all grades (F (4,80) = 10.57, $p < .001$, smallest F value). The order of presenting the experimental conditions modified the effectiveness of them, as seen in two significant interactions, task order x experimental condition, F (4,80) = 4.32, $p < .05$, and age x task order x experimental condition, F (4,80) = 2.52, $p < .05$.

Main effects were associated with age, F (4,80) = 11.74, $p < .01$ and experimenter, F (1,80) = 8.34, $p < .01$. There was a linear increase in recall with age and the male experimenter produced a greater level of recall in children than the female experimenter. The experimenter effect was qualified by significant interactions involving age and sex of the subject: age x experimenter, F (4,80) = 4.74, $p < .01$, experimenter x sex of the subject F (1.80) = 4.21, $p < .05$, age x experimenter x sex of the subject F (4,80) = 3.0, $p < .05$.

One additional 2-way interaction was significant, list order x experimental condition, F (1,80) = 7.07, $p < .01$.

Clustering in recall. Clustering was assessed by means of the Robinson (1966) index used in the Appel et al. study:

$$ICI = \frac{r}{c\ (w_c - 1)},$$

where r is the number of clustered pairs (category repetitions) in recall, c is the number of categories represented in recall, and W_c is the number of items per category in the stimulus list.

The mean clustering indices for children at each grade are shown in Table 1. The 6-way analysis of variance revealed, as predicted, a significant experimental condition effect, F (1,80) = 4.58, $p < .05$. The clustering index was higher in the memory condition than in the look condition. The interaction between age and experimental condition did not approach significance. Followup tests revealed that the condition difference was significant or near significant only for the fifth graders, F (4,80) = 5.82, $p < .10$. As with item recall, there were significant main effects for age, F (4,80) = 3.80, $p < .01$ and experimenter, F (1,80) = 4.05, $p < .05$. The age effect was produced by a linear increase in level of clustering with an increase in age, while the experimenter effect was produced by a higher level of clustering in sub-

jects tested by the male experimenter than in subjects tested by the female experimenter.

The experimental condition effect was qualified by several interactions: task order x experimental condition, F (1,80) = 7.30, $p < .01$, and list order x experimental condition, F (1,80) = 4.09, $p < .05$.

All of the remaining interactions which were significant involved : age x experimenter, F (4,80) = 4.20, $p < .01$, age x task order x list order, F (4,80) = 3.94, $p < .01$, age x task order x sex of subject, F (4,80) = 2.54, $p < .05$, and age x list order x sex of subject, F (4,80) = 2.96, $p < .05$.

Study behaviors. The percentage of Ss at each grade level exhibiting one or more instances of each type of study behavior is shown in table 2. The McNemar test and the binomial test (used when expected cell frequencies were less than 5) indicated that all but the fifth grade children engaged in sequential naming significantly more in the memory condition than they did in the look condition, with X^2 (1) = 9.60, $p < .01$; and N = 9, x = 1, $p < .02$ being the least significant effects for the respective tests. Only the third grade children engaged in sequential pointing significantly more in the memory condition than in the look condition, X^2 (1) = 9.09, $p < .01$. Second and third graders rehearsed significantly more in the memory than in the look condition, N = 6, x = 0, $p < .02$, for each comparison, and the differential rehearsal of the fifth graders, approached significance, N = 7, x = 1, $p < .07$.

None of the comparisons involving categorization yielded significant results, but the differential categorization of first, N = 9, x = 2, $p < .09$, fourth, N = 7, x = 1, $p < .07$, and fifth graders, N = 9, x = 2, $p < .09$, each approached significance.

Point biserial correlations between study behaviors and amount of recall and between study behaviors and clustering were computed separately for each behavior in which 25% or more of the Ss displayed the behavior. The only significant correlations which were found repeatedly involved the same single study behavior--categorization. In a number of statistical tests for different grades categorization was positively correlated with level of clustering and recall.

None of the analyses for age trends in the study behaviors were significant.

Discussion

The recall data provided strong evidence that the elementary school children remembered more following explicit instructions to remember than following instructions simply to look. There was no overall age increase in the differential effectiveness of the instructions. This may be interpreted as a partial failure to replicate the earlier experiment in the Appel et al. study in which the first graders did not show an instruction effect.

The clustering data also provided strong support for the predicted instruction effect, but failed to reveal an age x instruction effect. In contrast to recall, however, the fifth graders were the only group to show a significant difference in clustering between memory and look conditions, as measured by followup tests. Perhaps this reflects a greater dependence on and salience of category cues for the oldest children.

The study-period data essentially confirm the fact that children behaved differently following the different instructions. No simple age trends appeared in the differential use of particular study strategies or in the use of study strategies following one of the instructions. Significant positive correlations suggest that categorization may have facilitated recall and clustering among a number of the elementary groups which is in basic agreement with the findings in the Appel et al. study. Unlike the earlier finding of a positive correlation between sequential naming and recall, however, no significant relation between sequential naming and recall was observed in the present experiment.

In contrast to the earlier investigation, fewer of the children in the current study sequentially named, fewer of the oldest children rehearsed, and many more of the first graders categorized stimuli.

The current experiment produced recall effects for first graders which are discrepant with the effects observed in experiment 1 of the earlier investigation. In the current study, first graders recalled more items in the memory condition than in the look condition, whereas in the earlier experiment, there was no instruction effect. Appel et al. accounted for a similar discrepancy in their own experiments 1

and 2 by referring to the different task requirements of remembering an array of pictures simultaneously available for lengthy, personal study (experiment 1) and remembering a series of individual, quickly flashed pictures which are not available for personal study (experiment 2). Given the present results, however, it appears that the important determinant of the discrepancy within the Appel et al. study was the presence of an intricate foil procedure used in the look task of their experiment 1 and its absence in the look task of their experiment 2. Told that they would have to identify 'incomplete' drawings of pictures in the look task, perhaps the first graders studied the pictures more intensely than if their task had been only to determine the clarity of the pictures as in experiment 2 and the present experiment. For first graders, perhaps intense looking and visual inspection are the critical study behaviors which enhance their recall in a memory as compared to a look task.

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Table 1

Mean Number of Items Recalled and Clustering Indices by Experimental Condition and Grade of the Subjects

Condition		Grades 1	2	3	4	5
Look:						
	item recall	5.25	6.22	6.72	7.28	7.88
	clustering	.13	.22	.23	.21	.24
Memory:						
	item recall	7.13	8.38	9.47	9.41	11.28
	clustering	.16	.21	.28	.22	.38

Table 2

Percentage of Ss Showing Various Study-Period Behaviors

Behavior		Grade 1	2	3	4	5
Sequential naming:						
	Look	3	9	3	3	9
	Memory	25	59	44	31	22
Sequential pointing:						
	Look	16	16	9	9	6
	Memory	19	19	44	16	13
Rehearsal:						
	Look	3	3	3	3	3
	Memory	3	22	22	13	19
Categorization:						
	Look	19	9	25	13	16
	Memory	34	6	22	28	31

FOOTNOTES

This research was supported by a grant from the Graduate School of the University of Wisconsin. The authors are grateful to the administrators and teachers in the Madison area school that made this study possible through their cooperation and assistance in obtaining subjects.

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