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Enhancing the Incidental Learning of EMR Children

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Type I incidental learning of mentally retarded children was investigated. Four orienting-instruction conditions and two tasks (two and three dimensions) were used. One orienting-instruction condition was found to be superior for enhancing incidental learning. This task-specific strategy continued to produce the best incidental learning during a 24-hour follow-up session. The results were discussed in terms of recent memory models. Directions for future research were delineated.

Experimental research relating to various psychological features of mental retardation has grown substantially since the early 1950s (Brooks & Baumeister, 1977). Incidental learning, as a topic of study, represents one small area of this larger body of research. Type I incidental learning (Postman, 1964) refers to the situation in which subjects are exposed to stimulus materials without instructions to learn. Following exposure, the subjects' retention of the materials is unexpectedly tested, with the amount of incidental learning determined by the specific test chosen.

Recent innovations in conceptualizing human memory (Craik & Lockhart, 1972; Jenkins, 1974) have attracted researchers working with nonretarded populations (Hyde & Jenkins, 1973; Walsh & Jenkins, 1973) to the area of Type I incidental learning (Murphy & Brown, 1975). Craik and Lockhart (1972) viewed the Type I paradigm as providing "a relatively pure measure of the memorial consequences of different processing activities" (p. 677). The new memory models emphasize the importance of inducing appropriate task activities to facilitate retention. For example,

in their theory Craik and Lockhart (1972) stated that the strength and durability of memory is a "positive function of the depth to which the stimulus has been analyzed" (p. 671). Consequently, stimuli processed at a deep semantic level will result in a more persistent memory trace than will stimuli processed superficially (e.g., analyzing only the physical features of a given stimulus).

The Type I paradigm has been used to investigate the relationship between depth of information processing and subsequent retention. In studies with nonretarded children (Geis & Hall, 1976; Murphy & Brown, 1975), researchers have found that providing children with instructions that induce semantic processing of materials results in task retention equivalent to providing task-specific strategies (e.g., taxonomic clustering) or instructions to memorize the task and superior to giving instructions designed to result in only superficial processing (e.g., physical dimensions) of the learning materials.

Unfortunately, the recent work on incidental learning with nonretarded subjects has not been extended to the retarded population. In a review of the literature, Hardman and Drew (1975) stated that "this particular area of learning, as it relates to mental retardation, has been grossly neglected by researchers" (p. 3). Type I studies with retarded children (Fox & Rotatori, in press; Mintzes, 1971; Singer, 1964) have been comparative and limited to examination of the incidental-learning

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characteristics of the retarded population. Generally, these investigators have found that the retarded children do learn incidentally and that providing specifically detailed task instructions appears to be a critical dimension of this learning.

In the present study, Craik and Lockhart's (1972) information-processing model was extended to a retarded population using the framework provided by Murphy and Brown (1975). More specifically, the relationship between the depth of information processing, ranging from superficial to semantic, and subsequent retention was examined. Three different orienting-instruction conditions and one control condition were used to induce different levels of cognitive processing. Postman (1964) cautioned that any conclusions about incidental learning are specific to the method of measurement (i.e., the task); therefore, in the present study we used two- and three-dimensional tasks to assess their relative influence on the incidental learning of educable mentally retarded (EMR) children. Finally, the long-term retention of materials once learned has been the focus of several researchers working with retarded persons (see review by Belmont, 1966). Consequently, the present study included a 24-hour retention condition to determine the task and strategy that lead to the best long-term retention of the incidental-learning material.

Method

Subjects and Experimental Design

Subjects were 112 EMR children (44 females, 68 males) drawn from special education classrooms in Madison, Wisconsin, and the immediate surrounding area. These children ranged in chronological age (CA) from 81 to 167 months, had IQs from 44 to 86, and were free from gross motor central nervous system pathology. Four orienting-instruction conditions and two experimental tasks were used, resulting in eight groups. A randomized blocks design (Edwards, 1965) was employed to establish the eight groups with the IQ score as the blocked variable. Subjects' CAs and IQs, by groups, are shown in Table 1.

TABLE 1
MEANS AND SDs OF SUBJECTS' CAs AND IQs

Group ^a	IQ		CA (in months)	
	Mean	SD	Mean	SD
1	69.07	9.75	123.50	21.83
2	68.85	9.73	124.21	28.87
3	68.92	10.31	128.85	23.33
4	67.35	10.56	126.28	18.31
5	67.85	10.03	125.35	23.98
6	69.57	9.42	129.00	23.55
7	68.35	10.86	122.42	26.43
8	68.64	9.90	125.42	26.54

^a N = 14 in each group.

Task Materials

Two sets of stimuli were employed. The first set, comprising Task 1, included 16 three-dimensional objects ranging in size from 8 to 12 cm. The criteria for selection were (a) that the objects would be familiar to school-aged children, (b) that they represent real-life objects, appropriately colored; and (c) that objects were such that the question "is this object good or bad?" would be reasonable. Additionally, the 16 objects represented four categories with four objects in each: insects: spider, butterfly, grasshopper, beetle; animals: bear, elephant, giraffe, ape; fruit: apple, pear, grapes, lemon; and people: Indian, policeman, witch, baby. The second set of stimuli, Task 2, consisted of 16 colored photographs, approximately 8 cm × 10 cm in size, of the objects used in Task 1.

Procedure

The subjects were seen individually in a quiet room in the child's school. Each child was exposed to one set of stimuli (pictures or objects) and one set of orienting instructions. The stimuli for each child were prearranged before the child entered the testing room. Task 1 was placed in a 4 × 4 pattern with each object covered by a small individual box, which hid it from the subject's view. Task 2 was also prearranged in a 4 × 4 pattern, face-downward.

Each of the eight experimental conditions included the following format: (a) subjects were required to either remove the boxes

from the objects or to turn the pictures face-upward; (b) subjects verbally labeled each task item; (c) subjects were given specific instructions to orient them to the task materials (orienting instructions); and (d) subjects engaged for 2 minutes in activities, introduced by the orienting instructions, with the task materials (orienting activity). The orienting instructions and activities varied across conditions and are discussed later.

Subjects in the control group were instructed to engage with the experimenter for 2 minutes in activities related to only the color of the materials (e.g., Tell the experimenter one color from each item; put all the red items together.). This group was also told that they would be tested immediately following the orienting activity to see if they remembered the task items. The instructions for subjects in the color group were exactly the same as those for the control group, except that the memory component was deleted. The purpose of instructions to both the control and color groups was to induce superficial processing of the stimuli. Consequently, the subject's attention was directed to only the physical features of the stimuli (i.e., color). In the categorize group the subjects were instructed to put all the insects, fruits, animals, and people together in spatially separate groups. After the groups were assembled, the children were asked to name the task items in each category. The categorize condition was designed to provide the subjects with the optimal strategy (i.e., taxonomic clustering) for enhancing their recall of the stimuli. In the meaning group the subjects were instructed to place each item in one of three groups: good, bad, or in-between. The terms *good* and *bad* were used instead of Murphy and Brown's (1975) *nice* and *nasty* distinction. These alternative terms were judged to be more familiar to the EMR subjects and, thus, more likely to facilitate meaningful placement of the task items in one of the three groups. After the groups were assembled, the subjects were asked to explain why they had placed the task items in the various categories. The meaning condition was designed to elicit continued semantic processing of the task items along

dimensions different from those present in the categorize condition. Consequently, repetitive naming of items within the meaning categories was not included in order to prevent simple memorization practice of the task items.

After the subjects completed the 2-minute orienting activity, the task items were removed from their vision. They were then asked to recall as many items as possible. After approximately 24 hours, each child was seen again by the same experimenter in the same testing room. The child was asked to recall as many task items as possible.

Results

A one-way analysis of variance was used to establish the equivalence of the eight experimental groups on IQ, the blocked variable. No significant differences were found. A second analysis was conducted to determine if any CA differences existed between groups. Again no significant differences were found.

The dependent variables used were the number of task items recalled and the degree of clustering as measured by Roenker, Thompson, and Brown's (1971) Adjusted Ratio of Clustering (ARC):

$$ARC = \frac{R - E(R)}{\text{Max } R - E(R)}$$

where R = total number of observed category repetitions, $\text{Max } R$ = maximum number of category repetitions, and $E(R)$ = expected or chance number of category repetitions.

The mean number of task items recalled and the degree of clustering on the first and second day of testing are presented in Table 2. On Day 1 of testing, a two-way analysis of variance indicated that the orienting-instructions alone produced a significant difference between experimental groups ($F = 5.66, 3/104 df, p < .003$) on the number of recalled task items. Duncan's (1955) multiple range post-hoc test revealed that the categorize condition produced significantly better item recall than did the control,

TABLE 2
MEAN NUMBER OF TASK ITEMS RECALLED AND DEGREE OF CLUSTERING SCORES FOR THE
EXPERIMENTAL CONDITIONS

Instructions and dimensions	Day 1		Day 2	
	Mean items recalled	Degree of clustering	Mean items recalled	Degree of clustering
Orienting instructions				
Control	9.07	-.04	6.82	.36
Color	8.14	.08	6.25	.31
Categorize	11.42	.65	9.36	.55
Meaning	8.89	.11	6.82	.19
Task dimensions				
Pictures	9.19	.23	6.82	.34
Objects	9.57	.17	7.80	.37

color, and meaning conditions, which did not differ from each other. Similar findings were produced on Day 2 of testing. A two-way analysis of variance revealed that the orienting-instructions alone produced a significant difference between groups on number of task items recalled ($F = 6.37$, $3/104$ *df*, $p < .001$). The post-hoc test revealed that the color, control, and meaning conditions did not differ from each other; however, each of these conditions differed significantly from the categorize condition on number of task items recalled ($p = .05$).

On Day 1 of testing, a two-way analysis of variance of the second dependent variable, degree of clustering, revealed findings similar to those for the first dependent variable. The orienting instructions produced a significant difference between the experimental groups ($F = 9.35$, $3/104$ *df*, $p < .001$). The post-hoc test again found that the control, color, and meaning conditions did not differ from each other, and each produced significantly less clustering than did the categorize condition. On Day 2 of testing, an interaction between the orienting instructions and task dimensions produced the only significant difference between the experimental groups on the clustering measure ($F = 3.21$, $3/104$ *df*, $p < .05$). The post-hoc test revealed that the Task 2 (objects) group given categorize instructions showed significantly greater clustering than did the Task 2 groups given control, color, and meaning instructions and the Task 1 (pictures) groups given categorize and meaning instructions. The Task 1 groups given control and color instructions did not differ

from the Task 2 group given categorize instructions. Neither the orienting instructions nor the task dimensions reached significance for the clustering measure on Day 2 of testing. Thus, no main effects were found for the second dependent variable on Day 2 of testing.

Reliability

Tasks 1 and 2 were developed specifically for the present research project. The internal consistency of the task items was computed using Chronbach's (1951) coefficient alpha. Coefficient alpha represents the mean of all possible split-half reliability coefficients. On the first day of testing, the alpha was .70 for the task items; on the second day of testing the coefficient alpha was .82 for the experimental task.

Discussion

The results of the present study indicate that orienting instructions differentially influence the incidental memory of EMR children. The most appropriate learning strategy for the present experimental tasks, taxonomic categorizing, produced significantly better and more durable incidental memory than did orienting instructions designed to: (a) activate sets to remember the materials and (b) induce only semantic processing of the materials without the aid of categorization. This finding does not concur with similar research conducted with nonretarded children (Murphy & Brown, 1975) and adults (Jenkins, 1973), in which

the investigators consistently reported a retention equivalence for material processed semantically alone and semantically using categorization, and when the subject was provided instructions to remember the stimuli.

A number of factors relevant to the retarded population may have contributed to the disparate findings of the present study. First, instructions to memorize the task items in the control condition did not appear to elicit rehearsal strategies by the EMR subjects. Thus, the finding that categorizing instructions defined the superior rehearsal strategy for the experimental task supports Brown's (1974) contention that EMR children need to be provided with task-specific rehearsal strategies to maximize their learning. Second, the orienting instructions for the meaning condition, designed to produce only semantic processing of the materials without categorization, may have been too difficult for the EMR subjects to comprehend. One experimenter reported that even after repeated examples, the younger EMR subjects consistently had trouble understanding the orienting instructions, as evidenced by their inaccurate sorting of the task items (e.g., placing the black witch in the good category) and their confusing explanation of item placement (e.g., a butterfly is good because it is good). This difficulty was not reported by Murphy and Brown (1975), who used the nice and nasty distinction with nonretarded children as young as 3.67 years. Considering the relatively large CA range of the subjects in this study, potential developmental differences in semantic-processing ability were not detected. With the exception of the clustering measure on the second day of testing, findings in the present research indicate that task dimensions (two vs. three) do not influence the incidental learning of the EMR children. In studies with nonretarded children, investigators have consistently reported more rapid learning when objects rather than pattern stimuli were used (Etaugh & Van Sickle, 1971; Falk, 1968); however, the tasks used in the present study contained very attractive and highly familiar items. Additionally, the orienting instructions relied on recognition of familiar

task materials rather than on learning potentially new or unfamiliar materials. The attractive and familiar quality of the pictures used may have compensated for the one less dimension present in the pictures. In the present research we also found a moderately high reliability measure for the experimental task. This consideration has not been included in other incidental-learning research with mentally retarded persons.

The present study generated two directions for future research: (a) the developmental aspects of semantic processing of learning material (Craik & Lockhart, 1972) needs to be explored in retarded children, and (b) the role of task dimensions in acquiring new information about unfamiliar tasks requires investigation.

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