# MATERIAL ORGANIZATION AND MODELING INFLUENCES ON CONCEPT LEARNING IN KINDERGARTNERS

by

Jeannette Rose Flom

---

A Thesis Submitted to the Faculty of the

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF ARTS

In the Graduate College

THE UNIVERSITY OF ARIZONA

1 9 7 7

## STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgment of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the copyright holder.

SIGNED: Jeannette R. Flom

## APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Thomas R. Kratochwill
T. R. KRATOCHWILL
Professor of Educational Psychology

3/25/87
Date

# ACKNOWLEDGMENTS

Considering the number of people to whom I owe thanks, this page seems certainly inadequate. I would like to take this opportunity, however, to thank those outstanding individuals who have given generously of their time and consideration throughout various phases of this thesis. My thanks to my committee members, Tom Kratochwill, Jack Bergan, and Glen Nicholson for their cooperation, comments, and suggestions in the initial and concluding phases of the experiment. I also wish to thank Gene Brody for his interest and assistance during the project. Special thanks to my advisor, Tom Kratochwill, for his time and efforts in the conceptualization of the experiment and timely suggestions and assistance throughout the completion of the project. My appreciation to Amphitheater School District and the several teachers, parents, and children whose cooperation was very much appreciated throughout the pilots and final running of the experiment. To Linda Anderson, my sincere thanks for her statistical wizardry in using the University of Arizona computerbanks (not to mention the mental anguish she saved me). Also, to the "other" experimenter, Marilyn Turner, my appreciation for her assistance in running subjects when time was certainly "of the essence." My thanks also to Irwin Pasternack for his artistic talent and generous time contribution in creating the experimeal pictorial stimuli used in the experiment and to Mrs. Thalia Fine for her constant support throughout the project. Last, but not least, I wish to thank my parents whose sincere interest in my progress has always been a motivation to me.

TABLE OF CONTENTS

LIST OF TABLES

## LIST OF ILLUSTRATIONS

## ABSTRACT


Ninety normal kindergarten children of mixed socio-economic status in Tucson, Arizona, were presented a concept sorting task under three conditions of modeling (modeling only, modeling plus naming, and modeling plus naming plus rule) and three levels of organization (full, partial, and random). Both error and time dependent variables were assessed on acquisition and transfer phases. Results indicated (1) a main effect for treatments on time measures, (2) a modeling x phases interaction, (3) a main effect between acquisition and generalization on errors, (4) a modeling x phase interaction on errors, (5) a phase x organization interaction, and (6) a negative correlation between the time and error variables in the generalization phase. The implications of information processing strategies in modeled displays are discussed which included among other aspects (1) partial support for the theory regarding the use of malorganization in concept formation, (2) evidence further supporting product deficiency theory concerning the existence of required skills in young children to categorize, (3) confirmation of superior benefit derived in concept acquisition when maximum informative modeling techniques are utilized, and (4) the implication of reflectivity versus impulsivity in concept generalization.

CHAPTER 1

# INTRODUCTION

Previous research in modeling, both alone and in conjunction with other variables, has been shown effective in teaching children from a wide range of age groups and socioeconomic-ethnic backgrounds a variety of linguistic and conceptual skills (Zimmerman and Rosenthal 1974). Additionally, question asking skills (Zimmerman and Pike 1972) as well as acquisition of complex relational rules (Zimmerman and Rosenthal 1972a, 1972b) and even rules for generating creative responses (Zimmerman and Dialessi (1973) have been modified or induced by observational learning procedures. Recently, an additional direction for further research has been initiated which investigates the relationship of observational learning phenomena to abstract learning generally so that an integration of learning principles and processes may be obtained.

Concurrently, two somewhat different views of observational learning are considered: the operant view and the social learning theory. Primarily, the operant view focuses on the development of an imitated action which transfers from reinforcement of a matched overt behavior of a model. Bandura's (1971) social learning aspect treats the model as a source of information from which the observer gains symbolic representations of the actions performed. Bandura's model explains novel acts performed by the observer as a derivation of conceptual properties without necessitating a direct view of the process and response operations performed; the operant model acknowledges novel responses as induced by the model's demonstration, but focuses on matching the observed behavior of a person or human surrogate.

Modeling research in concept attainment, as summarized by Zimmerman and Rosenthal (1974) has indicated that generalization can be established both immediately after training and also after long delays. Also demonstrated is the finding that observationally learned abstract paradigms are relatively independent of former stimuli and experimenters that have been utilized in original training. Additionally, verbal instructions, rule, and encoding parameters play important roles in observationally created acquisition, generalization, and retention of concepts. It is noted, however, that the literature has not produced consistent results with regard to the influence of a verbal rule accompanying modeled displays. Although substantial support evidences superior performance with modeling plus a rule formats (Rosenthal, Alford, and Rasp 1972; Forehand and Yoder 1973, 1974; Yoder and Forehand 1974) others have found that modeling plus a rule did not enhance performance over modeling alone on a conceptual task (Rosenthal et al. 1971, Rosenthal and Zimmerman 1972b). The current experiment will examine further the influence of the verbal rule accompanying the modeled display as compared with other modeled conditions.

Another aspect which will be examined in the current experiment is an issue concerning the mediational view of concept learning in young children. Moely et al. (1969) presents a theory in which there is reference to the question of "product deficiency." This term was initially employed by Flavell, Beach, and Chinsky (1966) who suggested that there is a stage in development during which a child tends not to utilize symbolic and conceptual skills spontaneously as a means of solving or coping with a task although the skills are obviously part of his cognitive repertoire. An opposing earlier mediational deficiency hypothesis by Reese (1962) asserts that should a young child in fact attempt to use specific skills necessary to conceptually group, he would tend not to assist or "mediate" task performance in the expected way.

Researchers within the cognitive social learning domain (Bandura 1971) have been interested in examining the influence of task organization in learning from observation. This is especially important in light of the fact that many conceptual abilities are acquired through the observation of a diverse array of models whose modeled displays are often very unorganized or inconsistent (Battig 1968, Rosenthal and Zimmerman 1973). Current research appears to support the view that learning is enhanced by a range of operations that are orderly versus random in presentation of information (Tulving 1962; Liebert and Allen 1967; Liebert, Hanratty, and Hill 1969; Liebert and Swenson 1971) which was first stated by Bourne (1966).

One of the objectives of the present study was to further examine the parameters which might influence the acquisition and generalization of conceptual information in organization. An important issue considered in the literature concerns the efficacy of transfer from acquisition influence. Martin et al. (1968) hypothesize that the more similar the training conditions with the naturalistic situation, the greater will be transfer after training. An opposed position is considered by Battig (1968) which was first concluded in paired-associate investigations; intratask interference represents an important source of intertask facilitation. His primary point was that heterogeneity, "noise," or malorganization in the training stimuli may, in some situations, require the learner to initiate finer discriminations in order to comprehend the problem; therefore, such interference may assist eventual transfer to new or related tasks. Battig's (1968) theory implies that better input organization may not necessarily enhance the transfer of concepts because the learner has not been prepared to deal with variabilities in format and sequence which must be overcome in generalizing a concept to modified stimulus arrangements. Previous researchers have suggested that task organization is an important parameter in such diverse subject populations as college students (Drew and Altman 1970), young children (Rosenthal and Zimmerman 1973, Zimmerman and Rosenthal 1974), as well as special education populations like the learning disabled (Freston and Drew 1974; Parker, Freston, and Drew 1975), and the mentally retarded (Gerjuoy and Spitz 1966; Simpson, King, and Drew 1970). Results of these studies have indicated diverse results between particular subjects' performance on organized versus unorganized material. A related purpose of the present experiment was to further clarify the status of how adjunct information contained within a modeled display influences acquisition and generalization under varying degrees of modeled task organization in young childrens' concept learning. Thus, children were presented with modeled displays which either provided no adjunct information; a naming response accompanied by the modeled display; or a modeled display, naming response, and a rule across varying degrees of task organization.

In summary, the purpose of this study was to (1) investigate the various aspects of the mediational view of concept learning in young children, (2) examine the influence of a modeled display accompanied by a verbal rule compared with other modeled treatments, (3) examine the influence of task organization in learning from assorted conditions of observation, and (4) to further examine the parameters which might influence the acquisition and generalization of conceptual information through observation.

## CHAPTER 2

## REVIEW OF THE LITERATURE

According to cognitive theorists (Bandura 1971), concept formation is basic to organizing new information and making use of current information. Concepts help the child make sense of the world by providing exclusive labels--single words that include many things within them. It has been suggested by cognitive learning theorists and research that children learn concepts by varied sensory experiences that are talked about. The learner must have exploratory, manipulative, and observational experiences with objects. Discussion about these experiences contributes to concept formation (Mann and Taylor 1973).

Since some concepts are never verbally defined in a person's repertoire, the best description may be what Bruner describes as a category. He portrays a category as a basket in which the individual puts those objects that belong together because of the attributes they share under a given system of classification. A category includes within it a range of discriminably different items which are treated as if they are the same (Bruner 1965).

## Theories Involving the Status of Conceptual Development in Children

In the concept learning research designed by Moely et al. (1969), there is reference to the question of "product deficiency" regarding mediation processes with conceptualization. This term was first used by Flavell et al. (1966) who suggested that there is a stage in development during which a child tends not to bring the use of symbolic and conceptual skills into play spontaneously as a means of coping with a task, even though they are clearly part of his cognitive repertoire. Moely et al.'s (1969) experiment tends to explore the concept of grouping or clustering items by conceptual category skill rather than earlier experiments that investigated rehearsal and verbal recall in serial presentation. In two particular conditions of her experiment, (1) the naming condition, which labeled each category and pointed out its members; and (2) the teaching condition in which clustering was taught, product deficiency was significantly displayed. Moely found that except when asked to do so by hints or instructions, the younger subjects tended not to rearrange the stimuli into spatial groups by class membership during study periods in which they were required to memorize; i.e., performance was lacking even though there was evidence of the ability to categorize. Moely also found that given such assistance, the resulting increase in study period manual clustering was accompanied by a decided increase in subsequent recall.

What are the factors responsible for spontaneous production and basic capacity in product deficiency? Moely et al. (1969) suggest two general factors which should be considered. The first has to do with the basic capacity itself. To what degree does the child "possess" the capacity in question? This would be directly related to the child's spontaneous use of the skill on appropriate occasions. A second factor that should be considered is the task situation. This includes the various features and forces in the problem setting which, in interaction with the first factor, may facilitate or impede the capacity to manifest production. Consideration of the two factors produced a developmental "time-table" interpretation of major findings in symbolic-conceptual production cited by Moely et al. (1969, p. 32):

> a) verbalizations of stimulus names during study periods (very frequent, even at the kindergarten level);
>
> b) verbal rehearsal of stimulus names during brief delay periods between stimuli offset and recall testing;
>
> c) self-testing (infrequent prior to Grade Three);
>
> d) manual clustering during study periods (infrequent prior to Grade Five).

Moely et al. suggest that the gap between a and d is best explained with reference to the first two factors. The ability of the basic capacity to name individual stimuli is surely better established in the five year old than the basic capacity to detect implicit similarities among sets of them. The second factor would seem to play an important role in accounting for the developmental ordering of productions a, b, and c. A study period indicating a pretest session would certainly stimulate a learning attempt.

An earlier mediational deficiency hypothesis (Reese 1962) asserts that should a young child in fact invoke and attempt to use specific skills necessary to conceptually group, he would tend not to assist or "mediate" task performance in the expected way. While Moely et al.'s (1969) research displays a definite gap between basic capacity and spontaneous production for younger subjects, there is no parallel gap between production and mediation. That is to say, in all age levels tested, an increase in pretest study clustering resulted in recall clustering which in turn led to an increase in item recall. Thus, once learned, the clustering skill was utilized successfully by the younger subjects in the process of categorizing. Where a mediational response is some verbal or nonverbal form of symbolic representational mnemonic activity and the mediated response is recall, a young child is far more likely to show a production deficiency than a mediational deficiency (Flavell et al. 1966; Corsini, Pick, and Flavell 1968; Moely et al. 1969). Other research may indicate, however, that a genuine mediational deficiency may occur when a very newly acquired symbolic operation is attained (Silverman and Craig 1967).

## Schematic Concept Formation

Aiken and Williams (1973) found that both fifth graders and adults were significantly more accurate than first and third graders in skills of schematic concept formation. Tasks of this type require the subject to distinguish between and group pictorial patterns presented. Psychophysical analysis indicated that age differences reflected differences in efficiency rather than in strategy; the two younger groups were merely slightly less proficient than the two older groups using the same physical pattern cues in the same manner. The task required the subjects to distinguish between patterns of two classes without either feedback or knowledge of the class prototype.

Drummond and Tanner (1973) studied results of data when prototype information was made available. This included the strategies children would use when given several options concerning prototype information, whether information requests would differ from age to age, and whether developmental differences in classification accuracy would remain when prototype information was available. Results of their experimentation suggested that with increasing experience in classification, children become increasingly confident in their ability to classify. Classification was significantly more accurate for the fifth graders in comparison to the second grade subjects. Furthermore, girls appeared to be more accurate than boys in the first block of trials. The results implied that developmental differences in accuracy on schematic concept formation tasks are largely unaffected by the availability of the class prototypes for assistance in classification. One of the most surprising findings of the Drummond and Tanner (1973) study was how infrequently children at either age level made use of the prototype information. It would seem that age differences in schematic concept formation are due more to differences in the efficiency with which the information is used in classification than to differences in strategy of the selection of information to be used. This particular study's results indicated that this was the case for both information concerning the classes into which patterns were sorted as well as information involving the physical characteristics of the patterns classified.

## Multi-Sensory Conceptual Learning

Mann and Taylor (1973) investigated the effects of multi-sensory learning which consisted of combining the related media of a concept with verbal interaction. The purpose of their study was to determine the effectiveness of multi-sensory learning systems in teaching basic concepts to two and five year old children. Concepts taught included nineteen categories derived from elements of basic design of art involving color, line, form, space, and texture. The experimental group was taught by the multi-sensory method in which prototype structures were used as instructional tools (which are chosen to stimulate various sensory modalities of the individual subject), that supported concepts to be taught. The control environment was a traditional kindergarten classroom. Results showed no significant differences between groups. Both treatment conditions were capable, however, of significantly increasing the concept formation of children. A second part of the study utilized language within the multi-sensory experimental design environment by labeling stimuli which included films, slides, tapes, music, toys, etc. as the child interacted with them. Implied in this system is the feedback model (an adult) which ascertains that a concept has been formed. The control group received typical day-care environment where there was little child-adult verbal exchange. Results indicated a significant difference in favor of the language variable. The findings support the notion that language development and concept formation are interdependent processes. Mann and Taylor (1973, p. 42) also suggest the following resulting from their investigations:

> a) Perhaps there is a limit to the amount of stimulation from the environment a child needs to develop concepts. The fact that a highly stimulating physical environment versus a traditional

kindergarten classroom did not significantly affect the concept learning of the children supports this assumption.

b) It is evident that language interaction with an adult plays a direct role in the learning of concepts that can be communicated to others. This corrective feedback technique of verbal reinforcement, extension, and elaboration seems to be effective in developing verbal labels for expression of conceptual understanding. Although the child can develop his own labels for concepts, unless they are communicable to others, they are relatively useless.

Mann and Taylor (1973) feel that Piaget's developmental periods of preconceptual thought (ages two to four) and intuitive thought (ages four to seven) have been largely ignored. Considering the data and aforementioned findings, it is in this stage of the child's development that he is using his sensory systems as models for perceptions to develop the conceptual understandings of his environment. Mann and Taylor suggest that more concentration on a child's motor, visual, perceptual, language, cognitive, and social development using content related concepts would be more relevant to his development so as to integrate the senses in learning. Instead of accelerating the curriculum of inappropriate developmental tasks (as reading), it may prove more effective for children to be developing and broadening classification categories of concepts.

## The Influence of Modeling on Concept Formation

Currently, researchers in the operant tradition and Bandura's (1971) current social learning approach hold two somewhat different views of observational learning phenomena. These alternative positions are complementary and not incompatible, however they do differ in emphasis and certain underlying assumptions. In essence, the operant view has been concerned with the development of imitative actions from which a skill of generalized imitation develops through reinforcing for matching the overt behavior of the model. Supporters of this model acknowledge that relatively novel acts can be induced from a model's demonstration, but they focus primarily on matching the observed behavior of a person or such human surrogates as puppets. Bandura treats the modeling condition as a source of information from which an observer acquires primarily symbolic representations of the actions performed. An informational, social learning interpretation implies that when instances produced by modeling are displayed an observer may be able to derive and match their conceptual properties without directly witnessing the process and response operations through which the resulting products were created.

Bandura (1969) suggests internal representations of stimulus displays are of two kinds, verbal and imaginal. By providing a high verbal code, covert verbal coding should be facilitated. This covert coding should supplement the sensorily-conditioned imaginal representations and thus enhance performance.

Considerable research has now indicated that much of the traditional operant view of modeling makes up only a part of what can be legitimately termed imitation learning. Other factors which can affect such imitative learning include the type of modeled display, properties of the tasks on which the model and observer perform, and many other variables (Rosenthal, Zimmerman, and Durning 1970; Zimmerman and Rosenthal 1974).

Modeling of language rules have demonstrated learning in diverse populations; this has included passive and prepositional sentence construction (Odom, Liebert, and Hill 1968); sentence pattern (Carroll, Rosenthal, and Brysh 1972; Rosenthal and Whitebrook 1970); complex sentences using the past perfect tense (Rosenthal and Carroll 1972, Harris and Hassemer 1972); singular and plural morphemes (Guess et al. 1968); complete sentences (Wheeler and Sulzer 1970); past and present progressive verb tenses (Shumaker and Sherman 1970); and past, present, and future verb tense rules (Clark, Sherman, and Kelley 1971). In summary, a variety of studies of modeling procedures, both alone and in combination with other variables, were found effective in teaching children of diverse populations to respond according to generalized linguistic rules. Modification of language usage has been demonstrable with normal children when no reinforcement was given to either the child or the model.

Investigations concerning concept acquisition and generalization on various other tasks and skills demonstrate interesting findings. An early study by Rosenthal et al. (1970) utilized four different informational conditions to modify the criteria governing question development by Mexican-American sixth graders. The informational conditions included (1) nominal or physical stimulus aspects, (2) functional uses of the stimuli, (3) causal relationships among the stimuli, and (4) value judgments. Praise and reinforcement were not utilized. Each condition was shown to significantly increase question production congruent with the criterion category used by the model and then generalized to new target stimuli.

A subsequent study by Rosenthal and Zimmerman (1972a) investigated observational learning of value judgment questions by young subjects. Four direction conditions included (1) implicit instructions, (2) explicit instructions, (3) pattern instructions alerting the child to look for a rule in the model's response, and (4) mapping instructions which provided the rule guiding the model's behavior. Responses indicated that informative directives enhanced performance more than implicit instructions especially for the mapping group. However, the differences were not maintained on the generalization task. Results suggested that instruction concerning what to observe appears to influence an observer's acquisition more directly than his transfer of the rule.

Another experiment by Rosenthal et al. (1970) found that observation of a model demonstrating a simple equivalence concept led young children to adopt the rule governing marble placements and transfer of the rule to unique stimuli arrangements. An interesting result indicated that verbal rule cues accompanying modeling did not lead to better acquisition than silent modeling, but verbal cues improved transfer for kindergartners though not for younger children. Rosenthal and Kellogg (1973) in a sequel using severely retarded adolescents and young adults found that observation of a live model produced substantially better performance than did presenting equivalent information verbally. Currently, other contradictory information from various studies appear to cloud a consistent response indication of the modeled display accompanied by the verbal rule. Although substantial support evidences superior performance with modeling plus rule formats (Rosenthal et al. 1972; Forehand and Yoder 1973, 1974; Yoder and Forehand 1974), others note inferior performance compared with modeling alone on a conceptual task (Rosenthal et al. 1971, Rosenthal and Zimmerman 1972b).

Rosenthal et al. (1972) were among the first to study the effects of coding and verbalization upon observational learning, generalization, and retention of a novel clustering concept. Treatment groups included silent modeling, modeling with a low informational code or with a high informational code plus a statement of the rule governing the concept. Concept acquisition and generalization were found and were partially retained at retesting after several weeks delay. The strength of concept attainment and generalization were related to the saliency of the information coded by the model. This evidenced the first demonstration of acquisition, generalization, and retention of a complex concept previously unavailable to the children in the experiment. Experimental treatments in immediate imitation and the high verbal code plus rule performed best; low information group performed worst and the remaining groups were intermediate. A similar pattern was found in immediate generalization. Poor performance of the low code group appeared to confirm other research (Blanchard 1970) showing that verbal cues can have harmful effects as compared with just observing the model (Flanders 1968). Consistently poor mastering by low informational code subjects indicated that the codes themselves and not just attentional constraints imposed by verbalizing models influenced the results. Retention data showed similarly that the low code and silent modeling groups performed poorly. Also, the high code, no rule group appeared to retain well. Rule summary, however, appeared to create both facilitating retention effects for former controls and interference, particularly during delayed generalization, for the high code plus rule group.

Zimmerman and Rosenthal (1972a) further studied the roles of verbalization and modeling using clocklike stimuli in acquisition. Results again suggested that modeling when accompanied by a verbalized rule produced the highest level of acquisition and generalization. Simple observation and rule provision produced significant results when compared to the control group. Retention was maintained over time. Also, significant transfer to new items was found despite lengthy delays which confirmed that observationally induced concepts, even when unsupported by verbal rule provision can be retained over extended time intervals.

Zimmerman and Rosenthal (1974) further investigated the effectiveness of observational learning procedures in teaching a different type of conceptual rule involving the concept of "same-different." Attention was also focused at teaching verbal reasoning skills as well as nonverbal judgment responses to determine the relationship between these measures and how this relationship influences acquisition, transfer, and retention. Zimmerman and Rosenthal also investigated the relative effectiveness of given corrective feedback in teaching three and four year olds (which involved, of course, limited language skills). The results of this study provided the first evidence of the effects of a model's demonstration in creating conceptual rule generalization and retention in very young children. Modeling as well as verbal description was effective in promoting generalization and retention on both the judgments and reasons measures of conceptual response. Age was found to be generally concordant with Bandura's (1969) suggestion that verbal means of coding and storing become more dominant as age advances.

These experiments, when taken together, demonstrate the utility of modeling for establishing conceptual behavior. It has been demonstrated that such concepts can be generalized both immediately after training and after long delays; that observationally instated abstract paradigms are relatively independent of the particular stimuli and experimenters involved in the original training; and that verbal instructions, rule, and encoding parameters play important roles in observationally developed acquisition, generalization, and retention of concepts.

## The Influence of Organization on Concept Formation

Researchers within cognitive social learning domain (Bandura 1971) have been interested in examining the influence of organization in learning from observation. This is especially important in light of the fact that social learning theorists have argued (Bandura 1969) that many conceptual abilities are acquired through the observation of a diverse array of models whose modeled displays are often very unorganized or inconsistent. Also relevant to this topic is important work by Underwood (1964) on organization as a central factor in memory. His theory suggests that a superordinate organizing function facilitates recall through categorization of concepts. Subjects would then tend to cluster conceptually related material in recall. Work in this area initially studied input organization from an associative clustering approach (Gallagher 1969). Criticism of this approach regarding methodological problems (Gallagher 1969, Simpson et al. 1970) has indicated that cognitive organization is most appropriately investigated as the experimental variable in the form of input organization. Previous research results using this approach have indicated that task organization is an important parameter in diverse subject populations.

Gerjuoy and Spitz (1966) and Simpson et al. (1970) compared retarded and nonretarded subjects' performance as a function of external material organization. Results indicated that external material organization facilitated retardates' performance, but had no effect on non-retardates. After investigation, data gave strong indications of non-retardate performance being masked by ceiling effects.

Another study using children with chronological ages of seven to seventeen with learning disabilities investigated verbal performance on a word study list (Freston and Drew 1974). Results of this study indicated a lack of differences between subjects' performance on organized versus unorganized material. Freston and Drew concluded that the data represented a behavioral outcome for the population studied. Another hypothesis related to this result was a possible lack of sensitivity to the conceptual framework used to organize the material. Recall performance varied solely as a function of material difficulty. Parker et al. (1975) initiated a follow-up study on Freston and Drew (1974) in which both learning disabled and normal children, ages eight to eleven, were compared as a function of input organization. Results indicated that the hypothesis that learning disabled children could not take advantage of externally organized materials was supported whereas normal children's performance was influenced by both material organization and level of difficulty.

In research designed by Drew and Altman (1970), the effects of input organization and material difficulty on free recall were investigated on a normal college student population. Although various categories of words were used as stimulus materials containing both common and rare words, no main effect was produced. Organized lists significantly facilitated more correct responses than unorganized lists.

The absence of an interaction between the main effect variables of word difficulty and organization level indicated that external organization influenced subjects' performance on both levels of difficulty to the same relative degree. This finding suggests that recall of very rare words comprising the very difficult lists places the same relative demand on the ability to produce implicit associative responses in recall of the very easy words in the quite easy lists.

Promotion of transfer and retention effects have been investigated yielding two major opposed positions. Liebert and his colleagues studying observational learning have found better performance when the model's display followed a systematic rule-congruent format (Liebert and Allen 1967), better adherence to a reward criterion with greater rule structure (Liebert et al. 1969), and better recall when a model chose pictures to accord with a common stimulus attribute than when no underlying rubric governed her choices (Liebert and Swenson 1971); however, no tests of concept generalization were made in Liebert's studies.

The aforementioned research leads to the view that learning is enhanced by a range of operations that are orderly (versus random) in presentation of information. This view concurs with Bourne (1966) who initially derived this viewpoint from his studies of programmed instruction. He implied that stronger acquisition of training stimuli should sponsor greater generalization to modified instances. An experiment by Zimmerman and Bell (1972) further supported this viewpoint. A clock-spool conjunction task was compared when a systematic pattern did (categorical) or did not (associative) occur between dial positions and the correct numbers and colors of spools chosen. They found that children who observed the abstract rule relationship displayed better generalization and retention than those for whom the clock-spool conjunctions were random and discrete. A related position regarding transfer by Martin et al. (1968) suggests that the more similar training conditions and the realities of variability in naturalistic situations, the greater will be the transfer after training.

Battig (1968) presents the opposed position based on paired-association studies; his main point was that heterogeneity, "noise," or malorganization in training stimuli may require that the learner make more accurate discriminations to better grasp the concepts being presented. The more attention drawn to the concepts being presented would then assist eventual transfer to new or related tasks; intratask interference represents an important source of intertask facilitation. That is, better input organization may not be necessarily enhancing to the transfer of concepts because the learner has not been prepared to deal with variabilities in format and sequence which must be overcome in generalizing a concept to modified stimulus arrangements.

Rosenthal and Zimmerman (1973) were the first to investigate the effects of an organization combined with modeling, versus guided practice acquisition to transfer task in third and fourth graders. The design utilized a dial-reading concept in which three levels of organization were presented in each of four different training conditions. Results demonstrated that full stimulus organization created substantially stronger acquisition but no better transfer; also, all organization levels performed comparably in generalization. The authors concluded that this result may concur with Battig's theory. A related point was made by Rosenthal et al. (1972) that, from intervention of symbolic mediation, immediate learning may sometimes not prove a good predictor of later generalization or recall.

It should be noted at this point that no implication from opposing positions indicates that the degree of input organization is a negligible factor in information processing, or that well organized formats typically hamper transfer. A more interesting view noted by Rosenthal and Zimmerman (1973) may be the consideration that, for given concepts and populations of learners, there may be some useful range of "noise" or intratask interference, above and below which transfer is suboptimal. A non-monotonic relationship between input organization and abstract behavior is thus implied. Further research in this area is certainly desirable.

## CHAPTER 3

## EXPERIMENTAL METHOD, RESULTS, AND DISCUSSION

### Method

#### Subjects

Ninety normal kindergarten children of mixed neighborhoods of socioeconomic status from three Amphitheater District schools in Tucson, Arizona, served as subjects. There were 45 boys and 45 girls who ranged in age from 4 years 8 months to 7 years 0 months with a mean age of 5 years 10 months.

#### Materials

An acquisition and transfer concept learning task was developed by forming 12 lists of six items each with various conceptual categories (i.e., 36 total stimulus cards). For example, the concept "transportation" contained six common pictures of modes of transportation (i.e., car, bus, airplane, bicycle, boat, and train). Six different lists were used for the acquisition and transfer tasks. Each item in each list was easily identifiable and mounted on 4 x 6 inch index cards for ease of presentation. (Pictorial stimuli can be referred to in Appendix B).

Procedure

Each child was tested individually in a room removed from peers by one of two female experimenters who presented both the acquisition and transfer tasks.

The main analysis involved a 3 (modeling, modeling plus labeling verbally, and modeling plus labeling verbally plus a verbal rule) x 3 (level of stimulus organization) x 2 (dependent measures of time and number incorrect), with five boys and five girls in all combinations of modeling and stimulus organization.

Subjects were randomly assigned to conditions and experimenters. First the Experimenter said: "We're going to play a game of putting pictures into piles. I'm going to see how quickly you can put these cards into the six piles that make the most sense to you. First it's my turn. Watch carefully while I put the cards into the six piles that make the most sense to me."

Concept Sorting

1. Modeling--Subjects in this condition viewed a model sort the items into six categories. No verbalizations accompanied the modeled presentation.
2. Modeling plus naming--Subjects in this condition viewed a model sort the items into six categories. Additionally the Experimenter named each item as it was being sorted (i.e., "This is a bus").

3. Modeling plus naming plus rule--Subjects in this condition viewed a model sort the items into six categories. Additionally, the Experimenter named each item as it was being sorted and provided a verbal rule regarding the category (i.e., "This is a bus and belongs here because we can travel in it").

Levels of Organization

1. High organization--In the high organization condition, all items belonging to a certain category were sorted sequentially. Upon completion of a category, the next category was sorted until all were completed.
2. Partial organization--In partial organization condition, the Experimenter sorted only one item from each category sequentially, always sorting the cards in the same order until all six categories were completed.
3. Random organization--In the random organization condition, the Experimenter randomly sorted items from all six categories until each item from the list was completed.

Both the high and partial organization levels were presented in prearranged order of stimuli (i.e., all cards in both levels were presented in the same order to each Subject).

All sorted items were arranged into piles in front of the Subject. As each card was sorted, it was placed immediately on top of the preceding card in the particular category. Immediately following the Experimenter's modeling phase, the Subject was handed the same cards in random order and was told: "Now it's your turn; you can start now. I'll tell you when to stop." A stopwatch was started when the child handled the first card. No feedback regarding responses was provided. Queries from the child were answered with "Do the best you can" or "Keep going, you're doing fine." The child was told to stop if he had not completed the task within four minutes. The total number of items incorrectly sorted in the six categories and the total time needed to complete the task were recorded.

Scoring Responses

After the task was completed, or the four minute time limit was terminated, the child was asked to hand each of his card piles to the Experimenter one by one. Only the first six card piles handed to the Experimenter were recorded. The top card of each pile was used to indicate in which category the child scored. Although repeated categories were not scored again, they were considered one of the six card piles counted in the recording format. If the child had not completed the task within the four minute time limit and had sorted less than six different card piles, the remaining pile of unsorted cards counted as one of the six card piles with the same considerations as other sorted card piles.

Transfer Phase

Immediately following the recording scheme of the acquisition task, the Subject was provided with materials (i.e., 36 cards) to sort into six new categories. Stimuli were arranged in random order. The task was identical to the acquisition phase, except the Subject was told: "Now we're going to play the same game with new pictures. You can start now. I'll tell you when to stop." The stopwatch was started when the child handled the first card.

After the recording procedure for the transfer phase was completed, the child was thanked and escorted back to his classroom.

## Results

An analysis of sex and experimenter effects suggested no differences between conditions; these variables are ignored in subsequent analysis.

The main analysis involved a 3 (organization) x 3 (modeling treatment) x 2 (phase) repeated measures analysis of variance (Kirk 1968). (The analysis of variance tables can be found in Appendix A.) On the time dependent measure, a significant main effect was found for the modeling treatment, $F(2,80) = 4.88$, $p. < .01$. Tukey post hoc tests revealed that children in the modeling plus naming plus rule condition used more time to task completion than either the modeling only and modeling plus naming conditions (both p's $< .01$) in the acquisition phase as indicated by Table 1. Further, a modeling x phases interaction, $F(2,80) = 4.88$, $p < .01$, was detected which qualified the main effect for modeling. Post hoc tests indicated ($p < .01$) that subjects in the modeling and modeling plus naming treatments took less time to task completion than the modeling plus naming plus rule condition (see Table 2 and Figure 1) within the acquisition phase. Within the generalization phase, the modeling only as well as the modeling plus naming condition also took less time to solution than the modeling plus naming plus rule condition. One other interesting result was demonstrated between the acquisition and transfer phase of the modeling plus naming plus rule condition; this was the only condition in which the transfer phase took more time to task completion than the acquisition phase ($p < .01$). Except for those results as noted above, the time variable did not produce any other significant effects.

The main analysis on the number incorrect variable suggested that subjects performed better during the acquisition than in the generalization phase, $F(1,80) = 6.96$, $p < .01$ (see Table 3). The data also indicated that subjects

Table 1. Means and Standard Deviations for Main Modeling Effect on Time Variable

| Modeling | Modeling plus Naming | Modeling plus Naming plus Rule |
|---|---|---|
| 132.6 | 134.7 | 168.0 |
| 41.3 | 49.6 | 49.5 |

Table 2. Means and Standard Deviations for Modeling x Phase Interaction on Time Variable

| | Modeling | Modeling plus Naming | Modeling plus Naming plus Rule |
|---|---|---|---|
| Acquisition | 145.5 | 144.8 | 152.6 |
| | 44.0 | 53.1 | 52.4 |
| Generalization | 119.6 | 124.7 | 183.4 |
| | 38.4 | 46.1 | 46.5 |

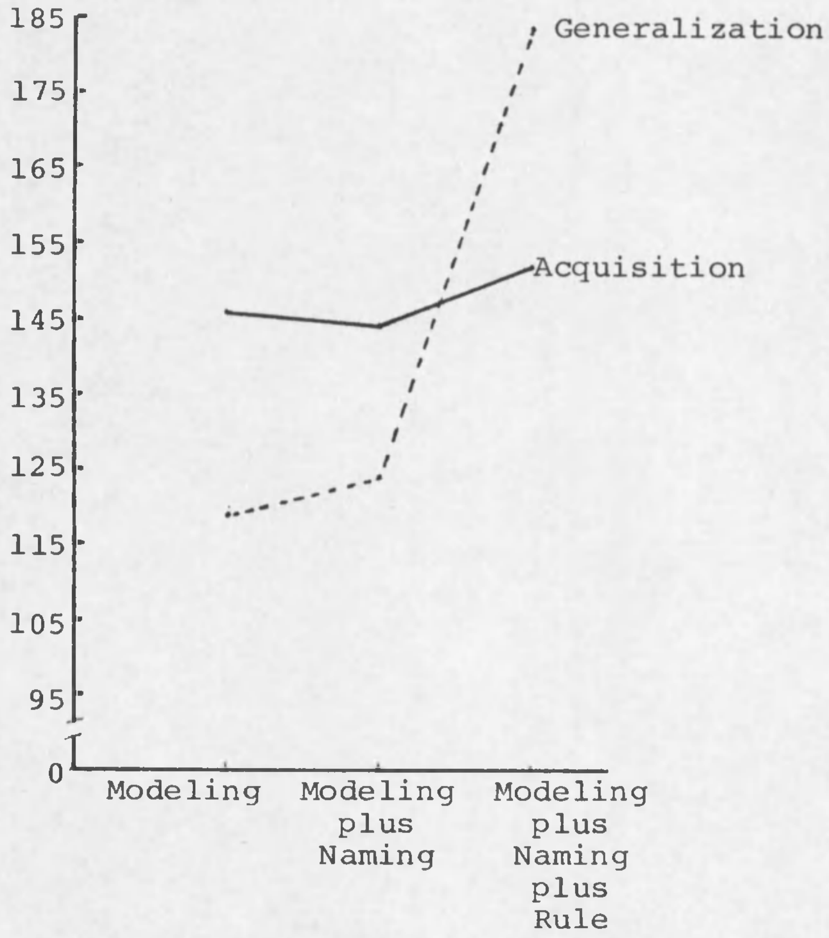



Figure 1. Modeling x Phase Interaction on Time Variable

Table 3. Means and Standard Deviations for Main Phase Effect on Number Incorrect Variable

| Acquisition | Generalization |
|---|---|
| 15.5 | 20.1 |
| 7.6 | 7.9 |

performed differently in acquisition depending on which modeling treatment they received ($p < .01$). Post hoc tests revealed that subjects in the modeling plus naming plus rule conditions made fewer errors than subjects in the modeling only and modeling plus naming conditions in both the acquisition and generalization phases, $F(2,80) = 4.88$, both p's $< .01$ (see Table 4 and Figure 2). Finally, subjects in the modeling plus naming plus rule condition made fewer errors in the acquisition phase than the generalization phase ($p < .01$) which indicates that even more instruction is needed to facilitate generalization. A phases x organization interaction was detected, $F(1,80) = 6.96$, $p < .01$. Post hoc tests revealed that subjects receiving the random organization condition in the acquisition phase committed fewer errors than subjects in the full organization and partial organization conditions (both p's $< .01$) as shown in Table 5 and Figure 3. Although there were no significant differences between any of the transfer phases, subjects who received random organization in the acquisition phase made fewer errors than subjects in the same condition in the generalization phase ($p < .01$).

To further investigate the effect of the dependent variables, Pearson correlation coefficients were computed for the time and number incorrect in both phases of the experiment. Although no results were significant in the acquisition phase of the experiment, results indicated a

Table 4. Means and Standard Deviations for Modeling x Phase Interaction on Number Incorrect Variable

| | Modeling | Modeling plus Naming | Modeling plus Naming plus Rule |
|---|---|---|---|
| Acquisition | 22.7 | 19.6 | 4.1 |
| | 6.0 | 10.5 | 6.4 |
| Generalization | 21.7 | 21.3 | 17.3 |
| | 8.1 | 7.5 | 8.1 |

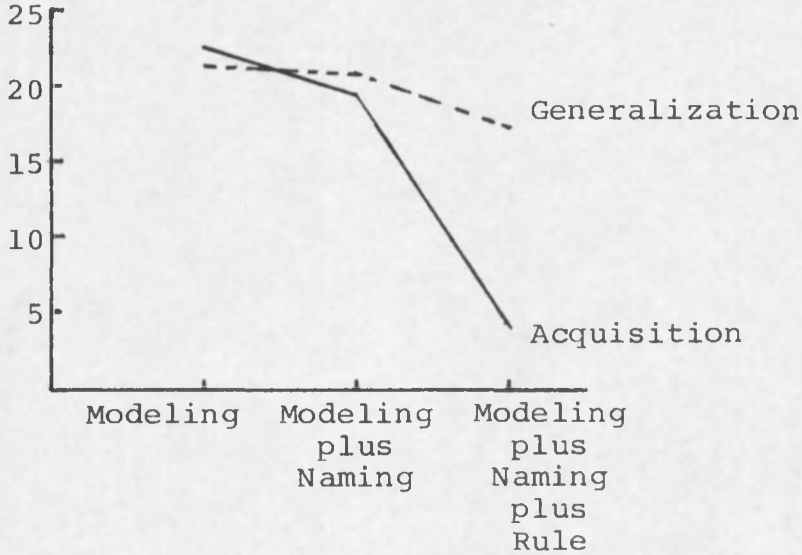



Figure 2. Modeling x Phase Interaction on Number Incorrect Variable

Table 5. Means and Standard Deviations for Organization x Phase Interaction on Number Incorrect Variable

| | Full | Partial | Random |
|---|---|---|---|
| Acquisition | 17.7 | 17.3 | 11.6 |
| | 7.4 | 8.4 | 7.0 |
| Generalization | 21.3 | 19.8 | 19.2 |
| | 6.5 | 9.5 | 7.7 |

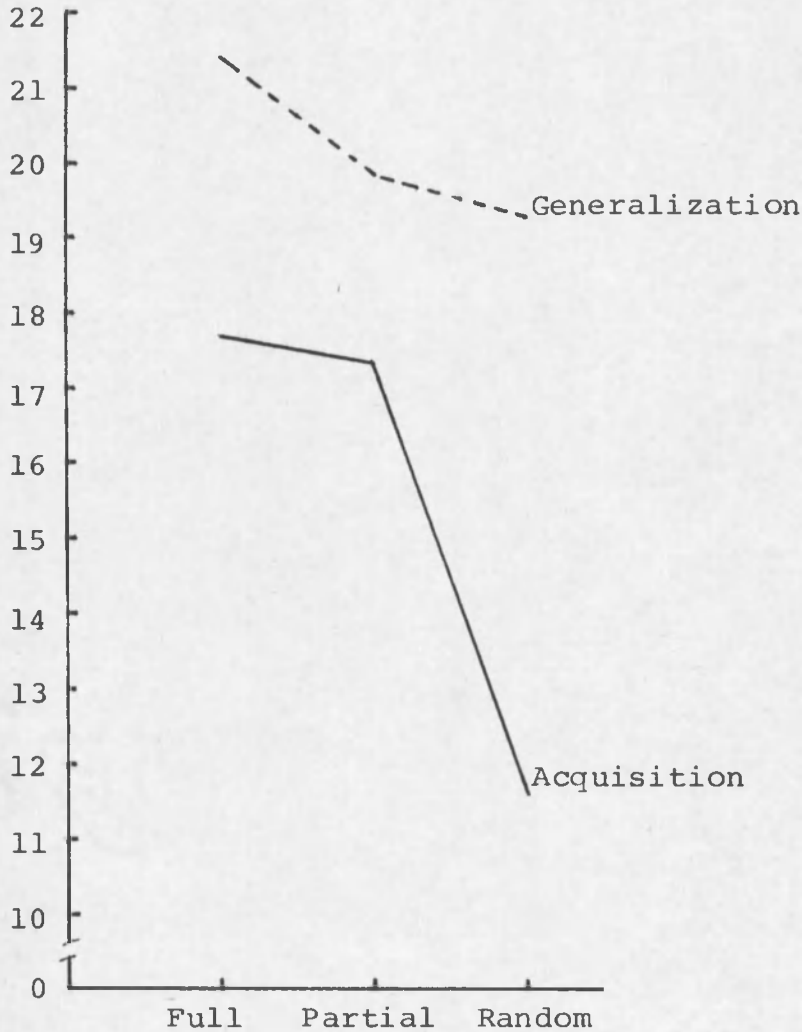



Figure 3. Organization x Phase Interaction on Number Incorrect Variable

negative correlation in the generalization phase suggesting that as more time was spent on task, subjects tended to make fewer errors ($r = -.60$, $p < .03$).

## Discussion

The results of this study have several implications for educational practice as well as direction for further research along these theoretical lines. First, the results suggest that in attempts to teach novel concepts to young children through observation, it is important to provide as much information as possible. This was reflected in the finding that children in the modeling plus naming plus rule condition demonstrated superior performance relative to the other two modeling conditions which is also consistent with much research in the observational learning domain (Zimmerman and Rosenthal 1974), although others have found inconsistent results using the verbal rule with modeling format (Rosenthal et al. 1971, Rosenthal and Zimmerman 1972b). Two other findings seem especially salient: Young children who received the modeling plus naming plus rule condition took more time to solve the tasks while they also made fewer errors in both the acquisition as well as the generalization phase. The increase in time appears to indicate an increase in mediational activity which facilitated learning. A significant factor, however, is noted that the number incorrect in the generalization phase of the modeling plus naming plus rule condition did not display a significant number incorrect when compared to the other modeling conditions. This may occur with Moely et al.'s (1969) product deficiency theory which states that there is a stage in development during which a child tends not to bring the use of symbolic and conceptual skills into play spontaneously as a means of solving a task, even though they are clearly part of his cognitive repertoire. Another related point may be indicated by noted similar results in a study by Rosenthal et al. (1972): immediate learning may sometimes not prove a good predictor of later generalization or recall.

Another related finding correlating the time and number incorrect in the generalization phase of the experiment also indicates that fewer errors are produced when more time is spent on task. This implies that there is a relationship between the amount of information which children process from a modeled display and the time they need to effectively solve a conceptual problem and subsequent use of this information. It is interesting to note at this point the effect of "interference" upon children's performance in conceptual attainment. A study by Rosenbaum (1967) which indicates that verbal labeling by another child assisted learners' recall and self-produced labels did not may be generalized in this instance to underlying rules in concept attainment; while the model's rules may have assisted the child in the acquisition phase of the experiment, the necessary transfer to a novel underlying rule may have interfered with performance in the generalization phase of the experiment.

The surprisingly superior performance of subjects who received the random organization level lend credibility to the notion that some degree of disorganization can facilitate performance on conceptual learning tasks when children are instructed through observation (Rosenthal and Zimmerman 1973). This theory was initially contended by Battig (1968) who stated that some static or "noise" (malorganization) in the training stimuli would cause the learner to attend more closely and make finer discriminations for better recall performance. Again, increased achievement in the random organization condition was evident only in the acquisition phase of the experiment. The author believes that the scoring procedure utilized in the experiment may have influenced the organization conditions. Although scoring may have been accurate up to a point, scoring may not have been totally descriptive of the subjects' performance. It is believed that a more accurate description of the subjects' performance would have been more complete if a point system had been utilized; this may have enabled a more comprehensive picture of responses in the various organization levels.

In summary, the results of this study demonstrate that young children achieve better concept attainment when given maximum information about the underlying concept describing the expected performance. A related finding indicated that the young children who received maximum information also took more time to solve the tasks while also making fewer errors in both the acquisition and generalization phases. Interestingly, results indicated that across all conditions in the generalization phase, fewer errors occurred when more time was spent on task. In regard to the lack of significant differences between the levels of organization within the experiment, the author believes that a more descriptive scoring procedure may have indicated more significant results. In addition, the finding that superior performance was achieved by those subjects receiving the random organization condition in the acquisition phase lend support to Battig's (1968) theory that some malorganization may lead to better concept attainment.

## APPENDIX A

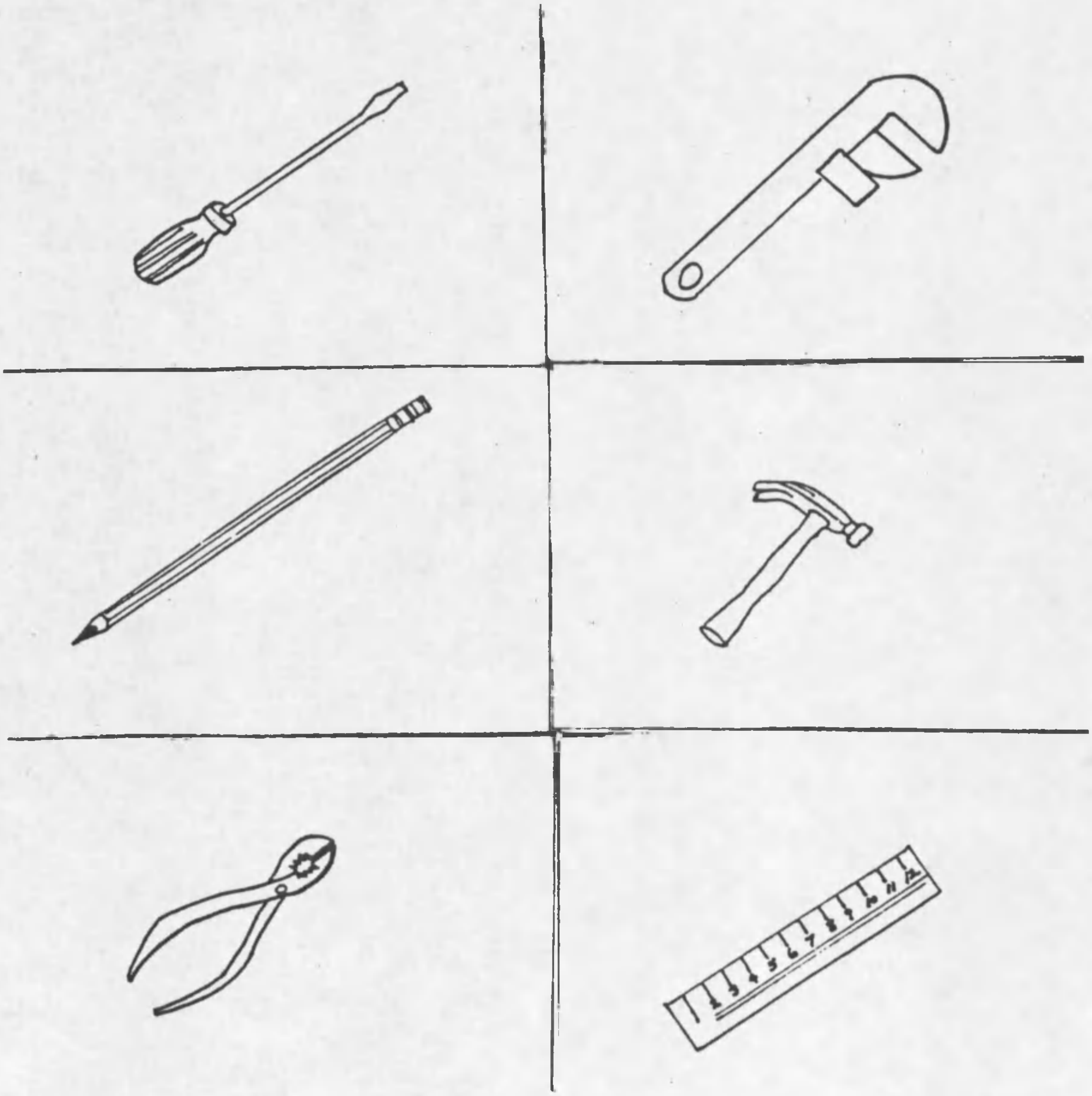
### ANALYSIS OF VARIANCE TABLE

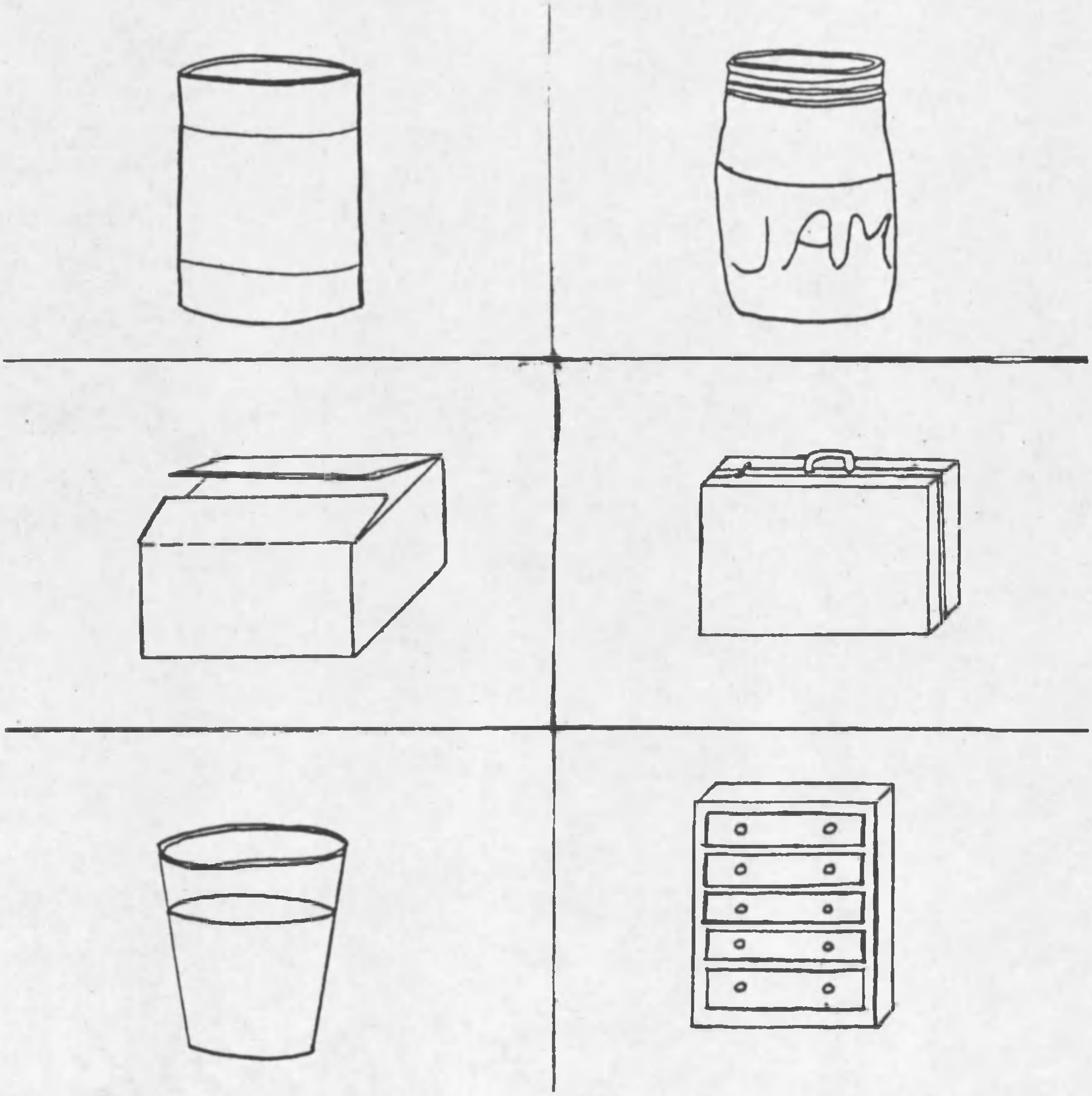
| Source* | df | SS | MS | F |
|---|---|---|---|---|
| T | 1 | 1383.338889 | 1383.338889 | 1.380 |
| S | 4 | 12503.144444 | 3125.786111 | <1 |
| X | 1 | 3050.450000 | 3050.450000 | <1 |
| O | 2 | 1248.577778 | 624.288889 | <1 |
| M | 2 | 45920.344444 | 22960.172222 | 6.519 |
| TS | 4 | 2401.411111 | 600.352778 | <1 |
| TX | 1 | 572.450000 | 572.450000 | <1 |
| TO | 2 | 6106.977778 | 3053.488889 | 3.048 |
| XO | 2 | 19205.200000 | 9602.600000 | 2.726 |
| TM | 2 | 28927.544444 | 14463.772222 | 14.480 |
| XM | 2 | 9719.633333 | 4859.816667 | 1.308 |
| OM | 4 | 5795.288889 | 1448.822222 | <1 |
| TSX | 4 | 6686.855556 | 1671.713889 | 1.669 |
| TSO | 8 | 3508.522222 | 438.565278 | <1 |
| TXO | 2 | 314.533333 | 157.266667 | <1 |
| TXM | 2 | 1662.700000 | 831.350000 | <1 |
| TOM | 4 | 5749.088889 | 1437.272222 | 1.435 |
| XOM | 4 | 13491.266667 | 3372.816667 | <1 |

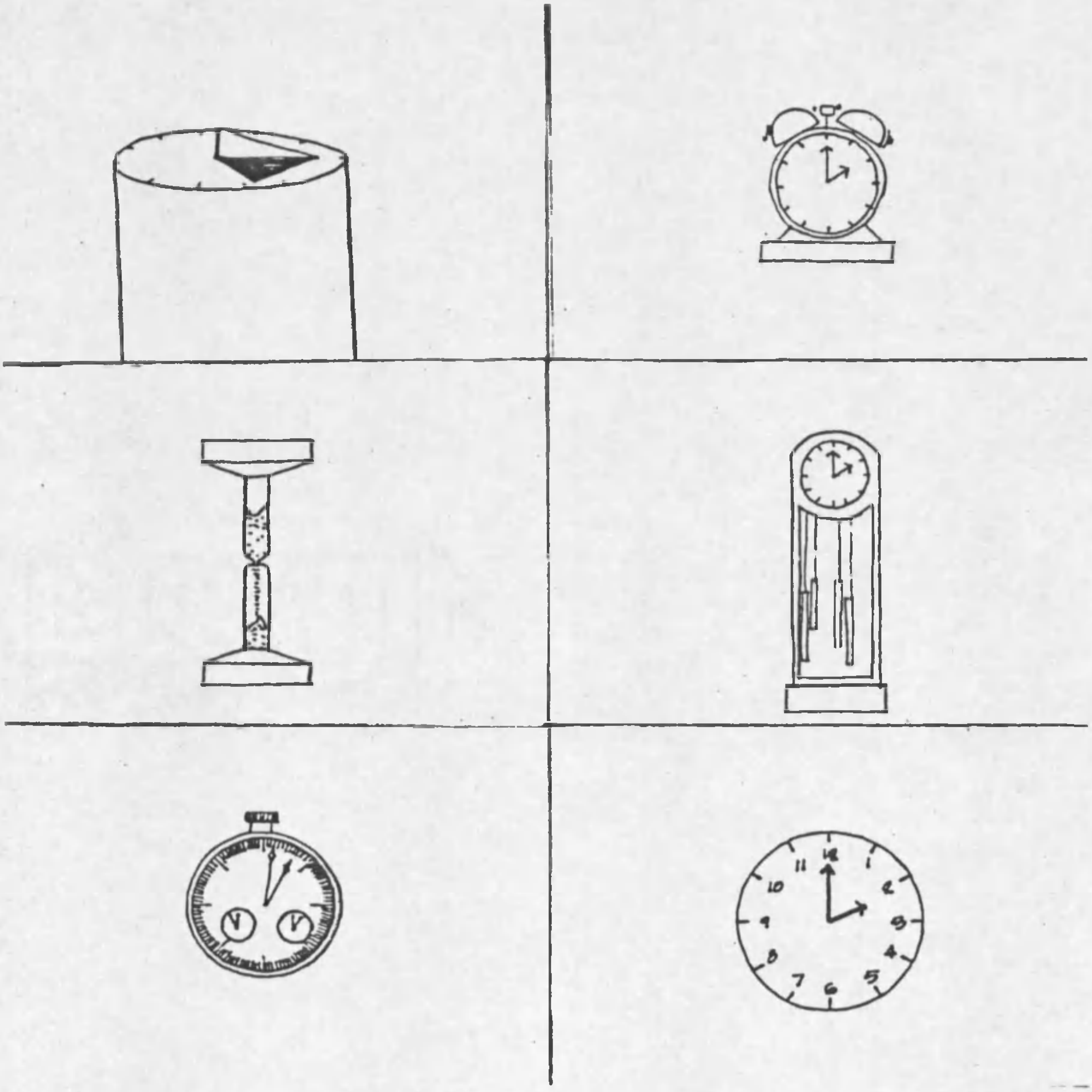
*T = Task (acquisition, transfer).
X = Sex of subject (female, male).
O = Organization of items (full, partial, random).
M = Modelling (silent, naming, naming and rule).

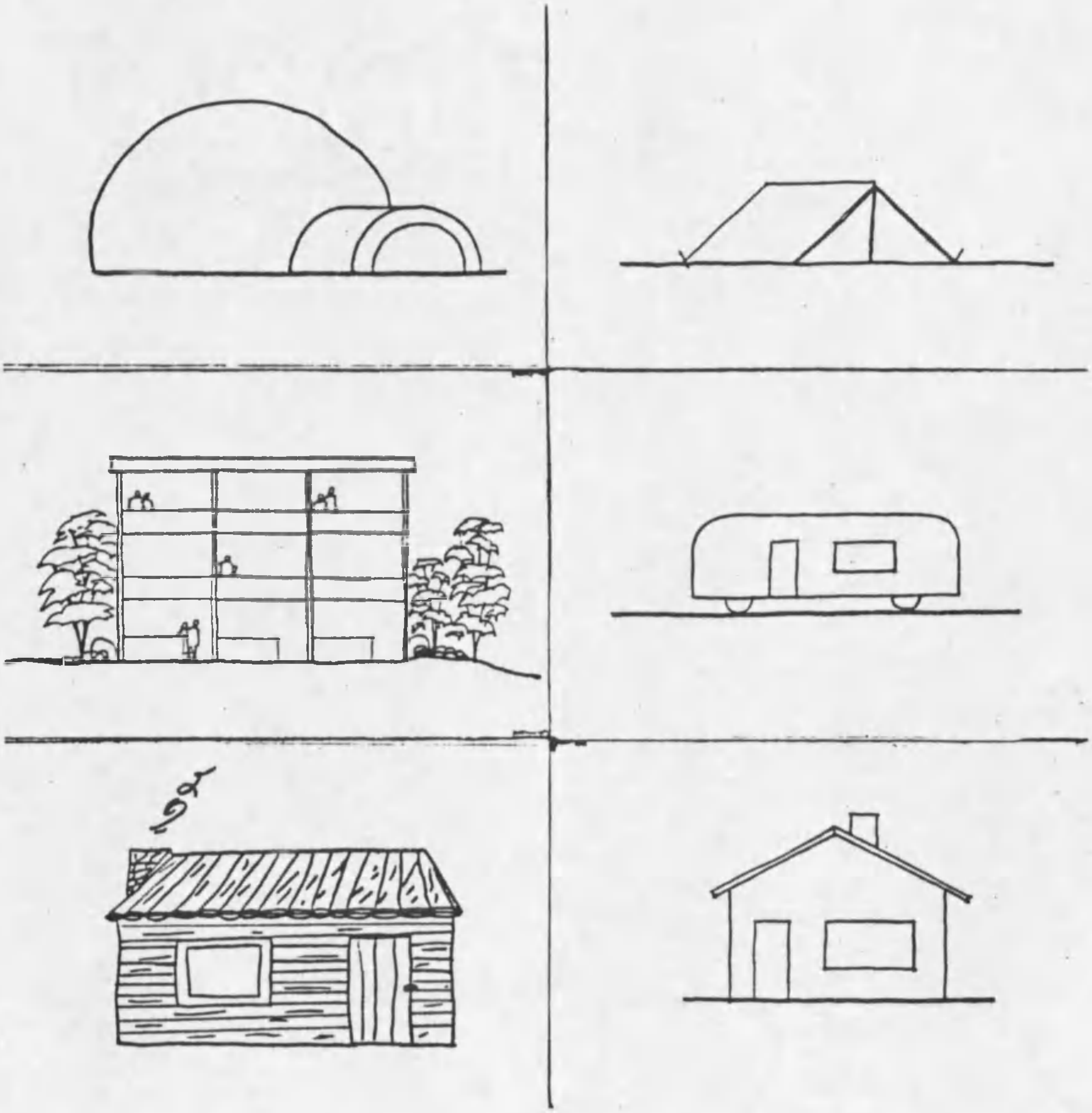
## APPENDIX B

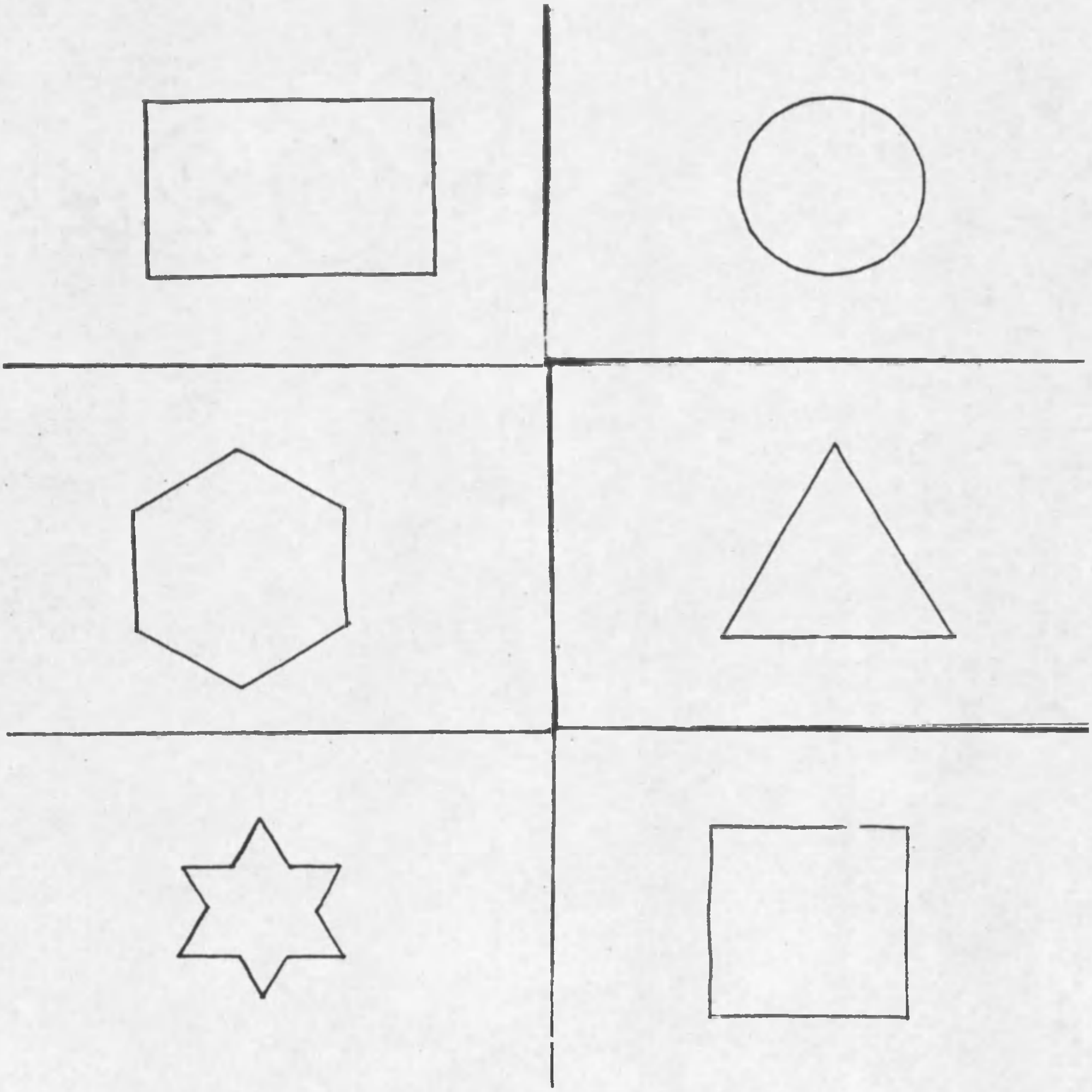
## CATEGORIES OF EXPERIMENTAL STIMULI

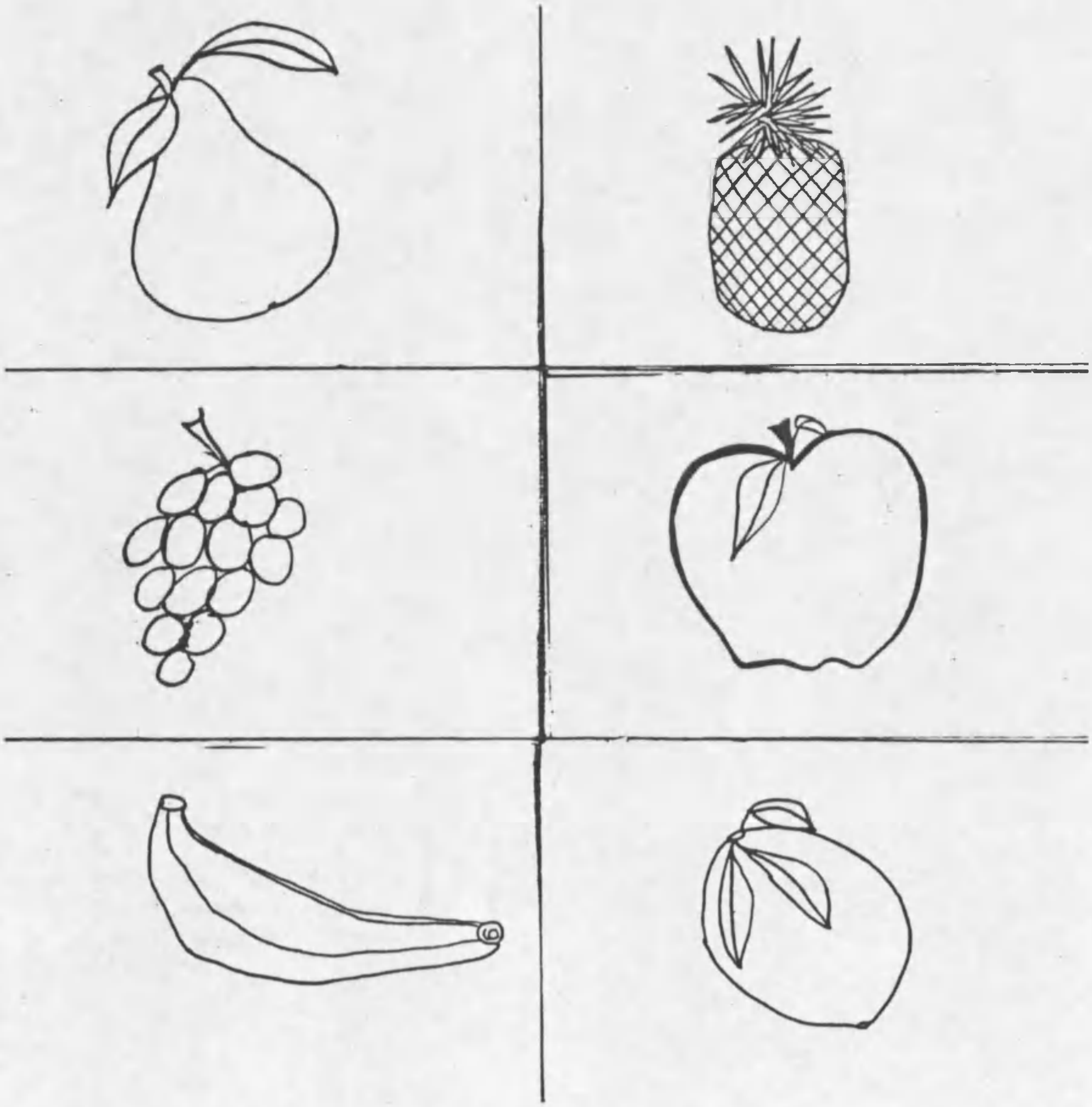


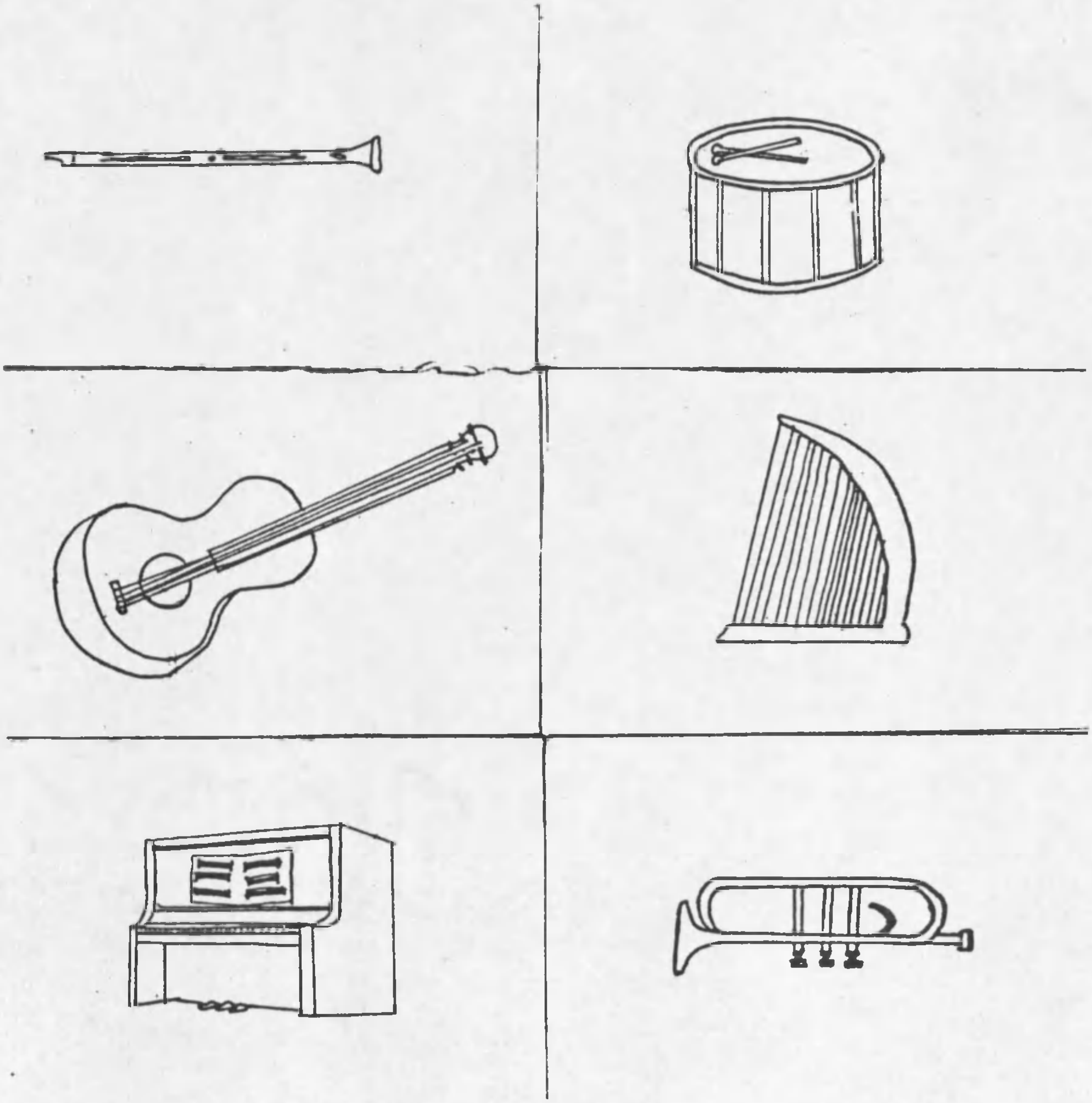

JAM

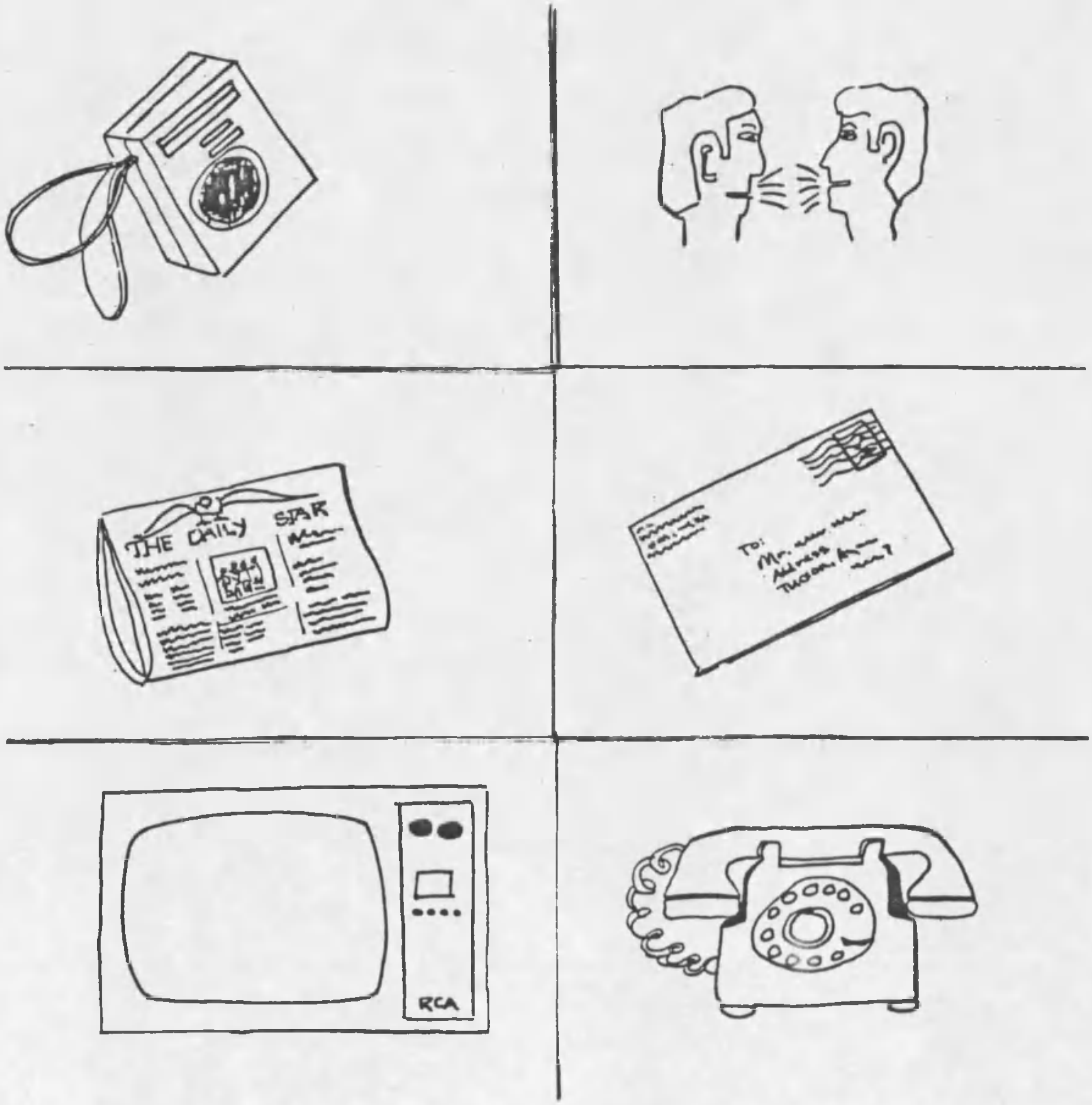


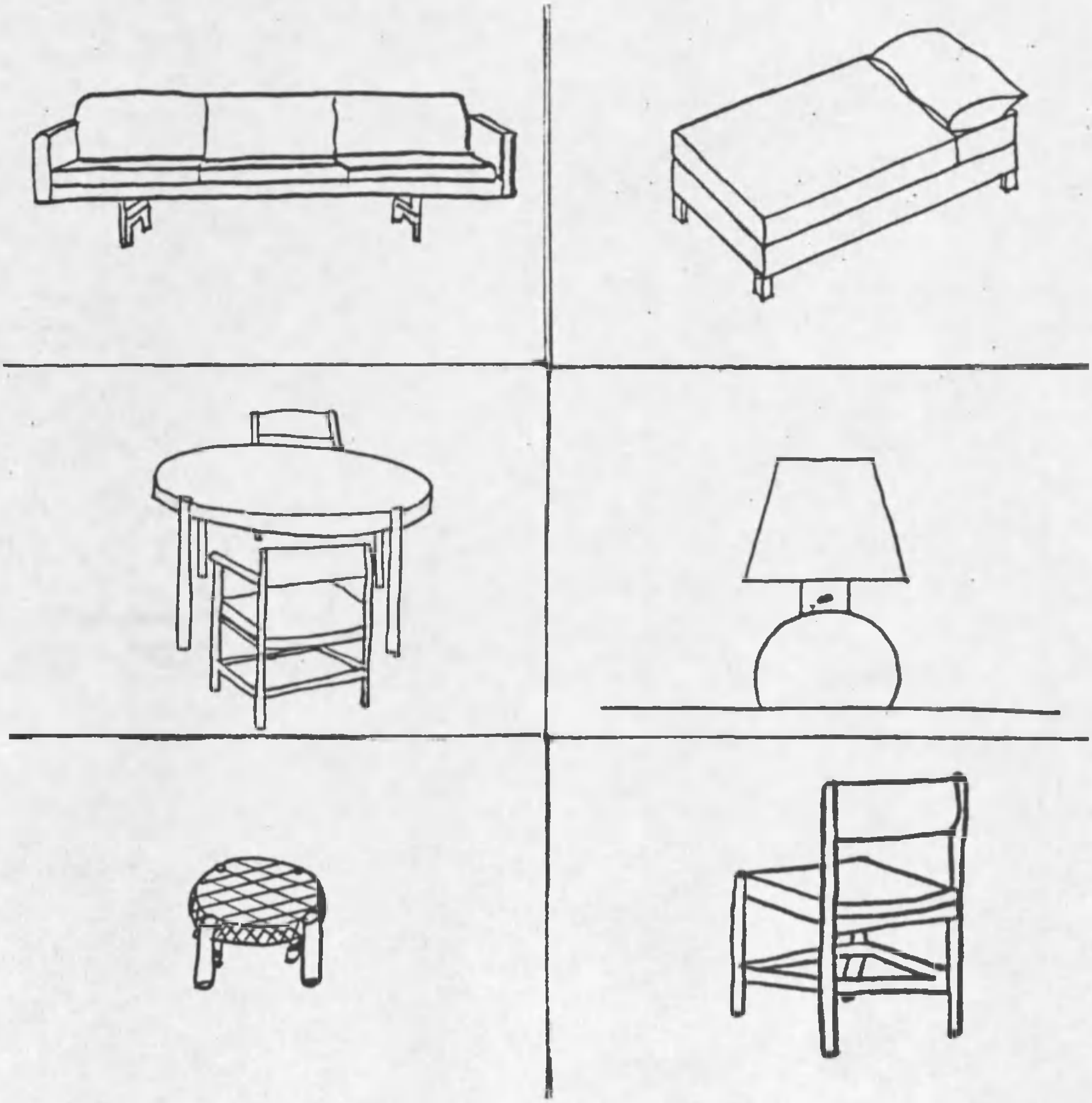


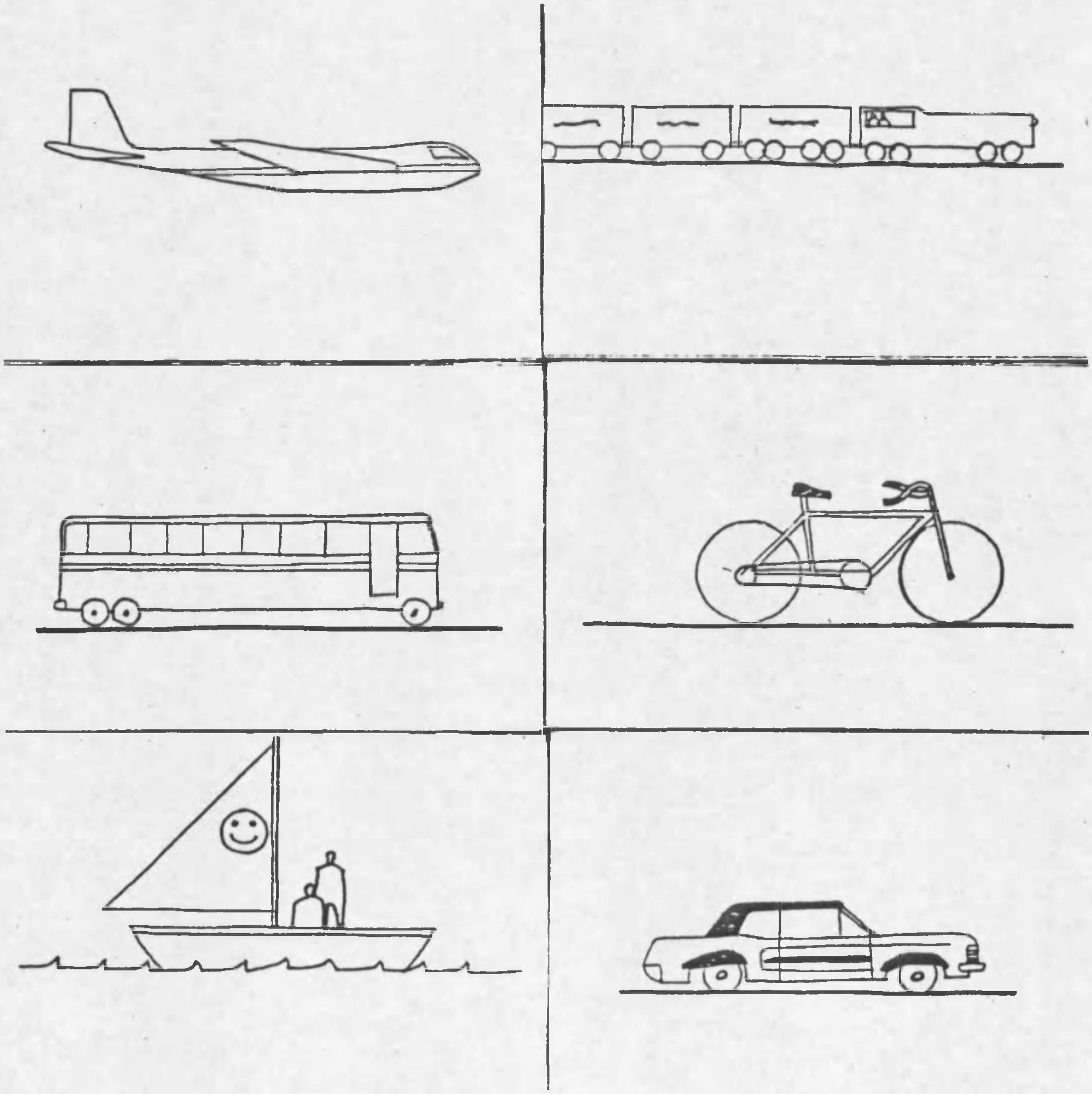


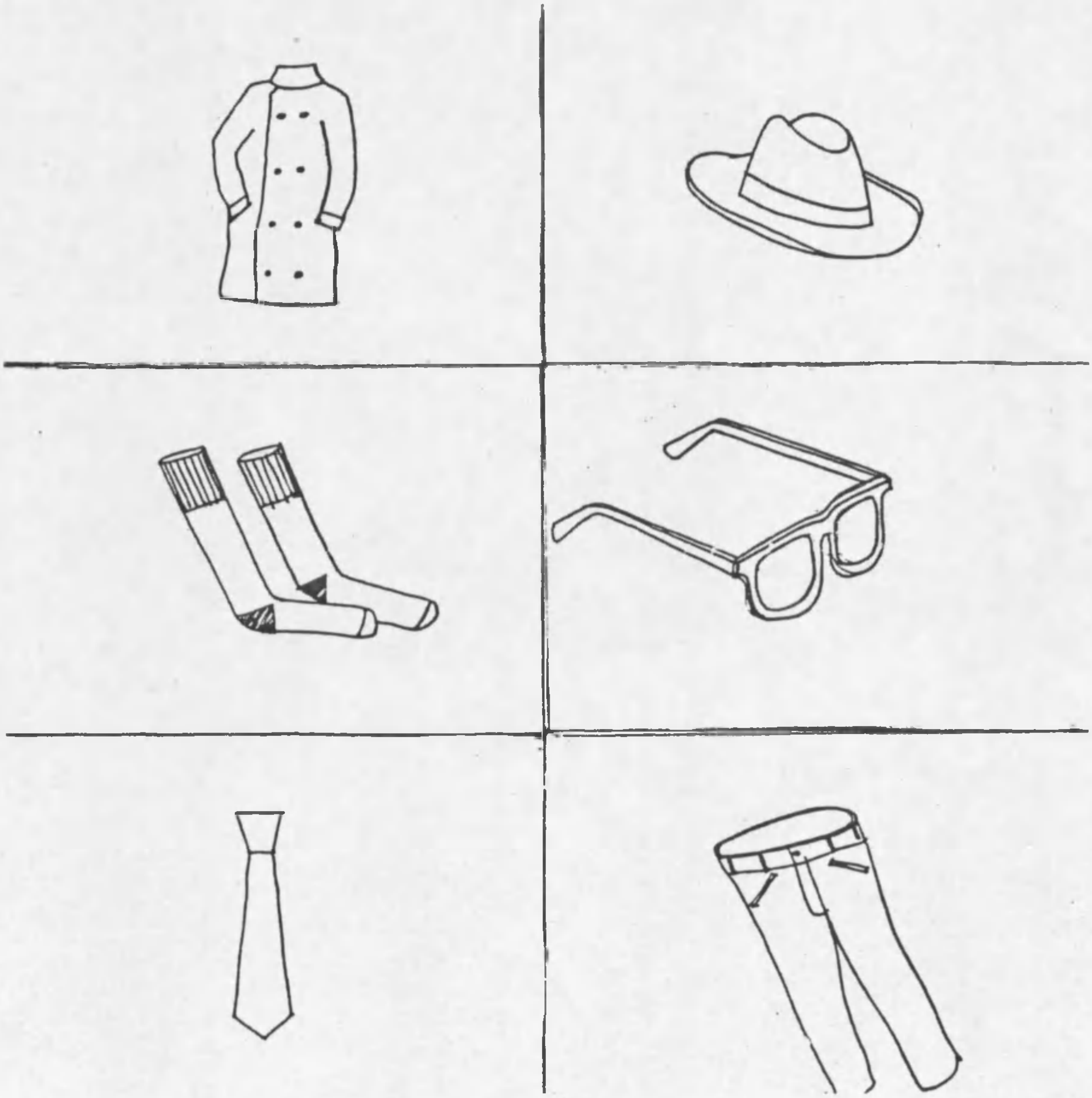


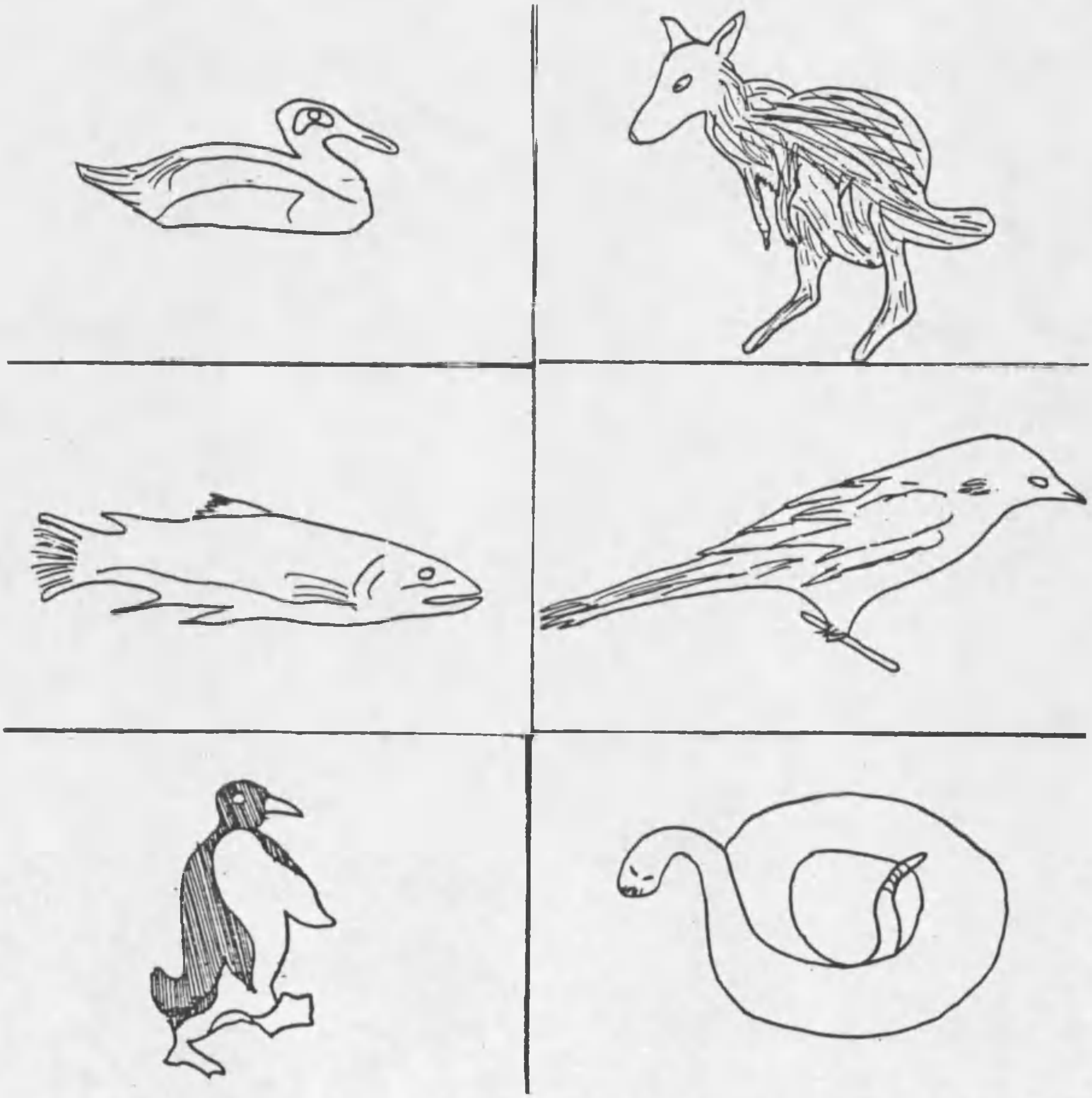



THE DAILY STAR
To:
RCA









Aiken, L. S., and T. M. Williams. A developmental study of schematic concept formation. *Developmental* Psychology, 1973, 8, 162-167.
Aiken, L. S., and T. M. Williams. A developmental study of schematic concept formation. *Developmental Psychology*, 1973, 8, 162-167.
Bandura, A. *Principles of behavior modification*. New York: Holt, Rinehart & Winston, 1969.

Bandura, A. *Social learning theory*. New York: General Learning Press, 1971.

Battig, W. F. Paired-associate learning. In T. R. Dixon and D. L. Horton (Eds.), *Verbal behavior and general behavior theory*. Englewood Cliffs, N. J.: Prentice-Hall, 1968, 149-171.

Blanchard, E. B. Relative contributions of modeling informational influences and physical contact in extinction of phobic behavior. *Journal of Abnormal Psychology*, 1970, 76, 55-61.

Bourne, L. E. *Human conceptual behavior*. Boston: Allyn & Bacon, 1966.

Bruner, J. S. The growth of the mind. *American Psychologist*, 1965, 20, 1007-1917.

Carroll, W. R., T. L. Rosenthal, and C. G. Brysh. Social transmission of grammatical parameters. *Journal of Educational Psychology*, 1972, 63, 589-596.

Clark, H. B., J. A. Sherman, and K. Kelley. Use of modeling and reinforcement to train generative sentence usage. Paper presented at the meeting of the American Psychological Association, Washington, D. C., September 1971.

Corsini, D. A., A. D. Pick, and J. H. Flavell. Production deficiency of nonverbal mediators in young children. *Child Development*, 1968, 39, 53-58.

Drew, C. J., and R. Altman. Effects of input organization and material difficulty on free recall. *Psychological Reports*, 1970, 27, 335-337.

Drummond, T. B., and M. W. Tanner. Children's use of prototypes in pattern classification. Child Development, 1973, 44, 686-688.

Flanders, J. P. A review of research on imitative behavior. Psychological Bulletin, 1968, 69, 316-337.

Flavell, J. H., D. H. Beach, and J. M. Chinsky. Spontaneous verbal rehearsal in memory task as a function of age. Child Development, 1966, 37, 283-299.

Forehand, R., and P. Yoder. The effects of modeling and verbal cues on learning of retardates. Journal of Clinical Psychology, 1973, 29, 183-186.

Forehand, R., and P. Yoder. Acquisition and transfer of conceptual learning by normals and retardates: The effects of modeling, verbal cues and reinforcement. Behavior Research and Therapy, 1974, 42, 199-204.

Freston, C., and C. J. Drew. Verbal performance of learning disabled children as a function of input organization. Journal of Learning Disabilities, 1974, 7, 34-38.

Gallagher, J. R. A comparison of retarded and normals on subjective organization in short-term memory. American Journal of Mental Deficiency, 1969, 73, 661-665.

Gerjuoy, I. R., and H. H. Spitz. Associative clustering in free recall: Intellectual and developmental variables. American Journal of Mental Deficiency, 1966, 70, 918-927.

Guess, D., W. Sailor, G. Rutherford, and D. M. Baer. An experimental analysis of linguistic development: The productive use of the plural morpheme. Journal of Applied Behavioral Analysis, 1968, 1, 297-306.

Harris, M. B., and W. G. Hassemer. Some factors affecting the complexity of children's sentences: The effects of modeling, age, sex and bilingualism. Journal of Experimental Child Psychology, 1972, 13, 447-455.

Kirk, R. E. Experimental design: Procedures for the behavioral sciences. Belmont, California: Brooks-Cole, 1968.

Liebert, R. M., and M. K. Allen. Effects of rule structure and reward magnitude on the acquisition and adoption of self-reward criteria. Psychological Reports, 1967, 21, 445-452.

Liebert, R. M., M. Hanratty, and J. H. Hill. Effects of role structure and training method on the adoption of a self-imposed standard. Child Development, 1969, 40, 93-101.

Liebert, R. M., and S. A. Swenson. Association and abstraction as mechanisms of imitative learning. Developmental Psychology, 1971, 4, 289-294.

Mann, M., and A. Taylor. The effect of multi-sensory learning systems on the concept formation of young children. Journal of Research and Development in Education, 1973, 6, 35-43.

Martin, M., R. Burkholder, T. L. Rosenthal, R. G. Tharp, and G. L. Thorne. Programming behavior change and reintegration into school milieux of extreme adolescent deviates. Behaviour Research and Therapy, 1968, 6, 35-43.

Moely, B. E., F. A. Olson, T. G. Hawles, and J. H. Flavell. Production deficiency in young children's clustered recall. Developmental Psychology, 1969, 1, 26-34.

Odom, R. D., R. M. Liebert, and J. H. Hill. The effects of modeling cues, reward and attentional set on the production of grammatical and ungrammatical syntactic construction. Journal of Experimental Child Psychology, 1968, 6, 131-140.

Parker, T. B., C. W. Freston, and C. J. Drew. Comparison of verbal performance of normal and learning disabled children as a function of input organization. Journal of Learning Disabilities, 1975, 8, 53-60.

Reese, H. W. Verbal mediation as a function of age level. Psychological Bulletin, 1962, 59, 502-509.

Rosenbaum, M. E. The effect of verbalization of correct responses by performers and observers on retention. Child Development, 1967, 38, 615-623.

Rosenthal, T. L., G. S. Alford, and L. M. Rasp. Concept attainment, generalization and retention through observation and verbal coding. Journal of Experimental Child Psychology, 1972, 13, 183-194.

Rosenthal, T. L., and W. R. Carroll. Factors in vicarious modification of complex grammatical parameters. Journal of Educational Psychology, 1972, 63, 174-178.

Rosenthal, T. L., and J. S. Kellogg. Demonstration versus instructions in concept attainment by mental retardates. Behavior Research and Therapy, 1973, 11, 299-302.

Rosenthal, T. L., W. B. Moore, H. Dorfman, and B. Nelson. Vicarious acquisition of a simple concept with experimenter as model. Behavior Research and Therapy, 1971, 9, 219-227.

Rosenthal, T. L., and J. S. Whitebrook. Incentives versus instruction in transmitting grammatical parameters with experimenter as model. Behaviour Research and Therapy, 1970, 8, 189-196.

Rosenthal, T. L., and B. J. Zimmerman. Instructional specificity and outcome expectation in observationally-induced question formulation. Journal of Educational Psychology, 1972a, 63, 500-504.

Rosenthal, T. L., and B. J. Zimmerman. Modeling by exemplification and instruction in training conservation. Developmental Psychology, 1972b, 6, 392-401.

Rosenthal, T. L., and B. J. Zimmerman. Organization, observation and guided practice in concept attainment and generalization. Child Development, 1973, 44, 606-613.

Rosenthal, T. L., B. J. Zimmerman, and K. Durning. Observationally induced changes in children's interrogative classes. Journal of Personality and Social Psychology, 1970, 16, 681-688.

Shumaker, J., and J. A. Sherman. Training generative verb usage by imitation and reinforcement procedures. Journal of Applied Behavior Analysis, 1970, 3, 273-287.

Silverman, I. W., and J. G. Craig. The roles of encoding practice and enforced decoding in verbal mediation: A developmental study. Paper presented at the meeting of the Society for Research in Child Development, New York, March, 1967.

Simpson, R. L., J. D. King, and C. J. Drew. Free recall by retarded and non-retarded subjects as a function of input organization. Psychonomic Science, 1970, 19, 334.

Tulving, E. Subjective organization in free recall of "unrelated" words. Psychological Review, 1962, 69, 344-354.

Underwood, B. J. The representativeness of rote verbal learning. In A. W. Melton (Ed.), Categories of human learning. New York: Academic Press, 1964.

Wheeler, A. J., and B. Sulzer. Operant training and generalization of a verbal response form in a speech-deficient child. Journal of Applied Behavior Analysis, 1970, 3, 139-147.

Yoder, P., and R. Forehand. The effects of modeling and verbal cues upon concept acquisition of normal and retarded children. American Journal of Mental Deficiencies, 1974, 78, 566-570.

Zimmerman, B. J., and J. A. Bell. Observer verbalization and abstraction in vicarious rule learning, generalization, and retention. Developmental Psychology, 1972, 7, 227-231.

Zimmerman, B. J., and F. Dialessi. Modeling influences on children's oddity performance. Psychonomic Science, 1973, 20, 94-95.

Zimmerman, B. J., and E. O. Pike. Effects of modeling and reinforcement on the acquisition and generalization of question-asking behavior. Child Development, 1972, 43, 892-907.

Zimmerman, B. J., and T. L. Rosenthal. Concept attainment, transfer, and retention through observation and rule provision. Journal of Experimental Child Psychology, 1972a, 14, 139-150.

Zimmerman, B. J., and T. L. Rosenthal. Observation, repetition and ethnic background in concept attainment and generalization. Child Development, 1972b, 43, 605-613.

Zimmerman, B. J., and T. L. Rosenthal. Observational learning of rule governed behavior by children. Psychological Bulletin, 1974, 81, 29-42.