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ABSTRACT

A study was conducted to test the hypothesis that Ss from disadvantaged homes have poorly developed "abstract" thinking skills and that their thought can be characterized as more "concrete" or relational. Four forms of a problem-solving inventory were developed which differed in mode of presentation. The original form consisted of real-life problem situations portrayed in cartoon form and shown to Ss as slides with an accompanying answer book and audio tape of item stems and directions. The additional forms were: (1) a picture-book form with drawings in the answer book and no slides; (2) a form in which pictures were described in a short paragraph and substituted for the pictures in the answer book; and (3) a form in which 3-D full-color models based on the drawings were used. Ss were 410 second and fourth graders from two schools enrolling a large proportion of disadvantaged and advantaged children, respectively. Ss were randomly assigned to the test forms. Analyses of variance were computed to determine the effects of socioeconomic status, grade, sex, and testing mode upon performance. No significant sex differences were found. Best performance from children, both second and fourth graders, disadvantaged and advantaged, was obtained on the middle forms of the test, not on the most abstract or most concrete forms. It is suggested that the lack of support of the hypothesis may have resulted from a lack of manipulative material on the concrete tests and too much irrelevant information in the test content. (KM)m

Problem Solving Ability of Disadvantaged Children Under Four Test Modes

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Objective

Considerable research has demonstrated differential school performance among children from different SES backgrounds (Deutsch, 1963; Coleman, 1966). The explanation for such differences is that differential styles of thinking and interacting with adults develop in lower as opposed to middle- or upper-class environments (Hess & Shipman, 1965; Havighurst, 1964; Deutsch, 1963; John & Goldstein, 1964). In particular, several authors (Ausubel, 1968; Blank & Solomon, 1968; Sigel & McBane, 1967) contend that Ss from disadvantaged homes have poorly developed "abstract" thinking skills, and that their thought can be characterized as more "concrete" or relational. As a result, the performance of disadvantaged Ss should be enhanced when more "real-life, concrete" aids are presented. The purpose of the present experiment was to test this hypothesis.

Method

Four forms of a problem solving inventory were developed which differed in terms of the mode of presentation of the items. The original form of the inventory consisted of real-life problem situations portrayed in black and white line drawings in cartoon form shown to Ss as slides (Feldhusen, Houtz, & Ringenbach, 1972) with an accompanying answer book and audio tape of item stems and directions. The three additional forms developed for the present study were: (1) a picture-book form in which the drawings were placed in the answer book and no slides were shown, (2) a form in which the pictures were described in a short paragraph and substituted for the pictures in the answer book, and (3) a form in which 3-D full-color models based on the cartoon drawings were used as the test stimuli. Thus, a continuum, as suggested by Hamreus (1966), of realism in visual learning aids, was created, from an "abstract" form (the paragraph form), through two in-

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termediate stages (the picture-book form, then the slide form), to a more "concrete, realistic" form (the 3-D models).

Data Source

The Ss for the present study were 410 second- and fourth-graders from two schools in Indianapolis, Indiana. School I enrolled a large proportion of children from "disadvantaged" homes. School II enrolled a large proportion of children from "advantaged" homes. Title I eligibility was used as the criterion for school selection. The Ss were randomly assigned to one of the four test forms. Each test was administered to Ss by a trained E. All directions, item descriptions, and item choices were presented via audio tape to minimize reading difficulties.

Results and Conclusions

ANOVA's were computed to determine the effects of SES level, grade, sex, and testing mode upon performance. The main effects of SES, grade, and test form were significant. Advantaged Ss outperformed disadvantaged Ss, and fourth-graders outperformed second-graders. No significant sex differences were obtained. Newman-Keuls post tests (Winer, 1971) revealed that the abstract test form resulted in significantly lower performance than any other form. Also, the 3-D form resulted in performance significantly below that on the picture-book form. To test the present experimental hypothesis specifically, simple main effects were calculated (Winer, 1971). Significant differences between SES levels on all but the slide form of the tests were obtained.

In addition, test form made no difference at all among the non-disadvantaged fourth-graders. The non-disadvantaged second-graders on the picture-book form significantly outperformed those on each of the other forms. For both the disadvantaged second- and fourth-graders, the slide form or the picture-book form resulted in significantly better performance than the stories-form.

To summarize, best performance from children, both second- and fourth-graders, disadvantaged and nondisadvantaged, was obtained on the "middle" forms of the problem-solving test, not on the most "abstract" or most "concrete" forms. Several possible explanations exist for the lack of support for our major hypothesis. While our test forms may indeed have approximated a continuum of realism, we may not at all have represented a "concrete" dimension. Both Bruner (1966) and Piaget (Flavell, 1963) maintain the importance of active manipulations on the part of the child to establish significant enactive or sensory-

motor representations of thought. On the other hand, the experiments of Dwyer (1967, 1970) indicate that visual aids of intermediate detail result in highest performance. If one considers the dependence of the problem solving inventory upon visual images from which Ss must make abstract generalizations, then the concrete and abstract test forms may present too many irrelevant or too few relevant cues, respectively, for efficient performance from Ss. The color and "3-D ness" used in the model form may have increased student motivation at the non-disadvantaged, second-grade level, but the extra information, not crucial to the nature of the problem, itself, may have confused or misled all other students. On the other hand, the slide and picture-book forms may have "magnified" and made more salient the fewer, relevant bits of information crucial to the problem and reduced memory requirements, especially in the case of non-disadvantaged second-graders.

In conclusion, the nature of the tasks involved in making use of images on our problem-solving inventory remains crucial. More concrete aids may be useful only to the extent that the nature of the learning task involved is also concrete.

References

Ausubel, D. P. Educational psychology: A cognitive view. New York: Holt, Rinehart, & Winston, 1968.

Blank, M., & Solomon, F. A tutorial language program to develop abstract thinking in socially disadvantaged preschool children. Child Development, 1968, 39, 379-89.

Bruner, J. Toward a Theory of instruction. N.Y.: Norton, 1966.

Coleman, J. S. Equality of educational opportunity. Wasnington, D.C.: U.S. Government Printing Office, 1966.

Deutsch, M. P. The disadvantaged child and the learning process. In A. H. Passow (Ed.), Education in depressed areas. New York: Teachers College, Columbia University, 1963, 163-179.

Dwyer, F. W. Adapting visual illustrations for effective learning. Harvard Educational Review, 1967, 37, 250-263.

Dwyer, F. W. Exploratory studies of the effectiveness of visual illustrations. Audiovisual Communication Review, 1970, 18, 235-46.

Feldhusen, J. F., Houtz, J. C., & Ringenbach, S. Development of the Purdue Elementary Problem Solving Inventory. Psychological Reports, 1972, 31, 891-901.

Flavell, J. H. The developmental psychology of Jean Piaget. New York: Van Nostrand Reinhold Co., 1963.

Hamreus, D. G. Instructional systems development. In J. Crawford (ed.), CORD National Research Training Manual (Second Edition). Eugene, Oregon: Oregon State System of Higher Education, 1969, III-1 - III-29.

Havighurst, R. J. Who are socially disadvantaged? Journal of Negro Education, 1964, 33, 210-217.

Hess, R. C., & Shipman, V. C. Early experience and the socialization of cognitive modes in children. Child Development, 1965, 36, 869-886.

John, V. P., & Goldstein, L. S. The social context of language acquisition. Merrill-Palmer Quarterly, 1964, 10, 265-276.

Sigel, I. E., & McDane, B. Cognitive competence and level of symbolization among five-year-old children. In J. Hellmuth (Ed.) The disadvantaged child. Seattle: Special Child Publications, 1967, 433-453.

Winer, B. J. Statistical principals in experimental design. (Second Edition). New York: McGraw-Hill, 1971.