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Creativity and the Lowenfeld Mosaic Test with first, second and third grade children

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CREATIVITY AND THE LOWENFELD MOSAIC TEST WITH FIRST, SECOND AND THIRD GRADE CHILDREN

BY

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INTRODUCTION

The Lowenfeld Mosaic test developed in 1929 by Margaret Lowenfeld of England is "a test of performance in which the subject spontaneously creates a product" from colored plastic shapes (Lowenfeld, 1949). H. Dorken, who reviewed literature on the test in 1952 and 1956, described the Lowenfeld test as "purporting to show what a person can actually do. In some way it measures a person's ability to organize movable elements in his visual-motor-perceptual field in terms of a pattern or Gestalt."

The test has been used in studies of child development, industrial problems, intelligence, neurosis, mental disorders, and cultural differences. Variables which have been found in these studies to influence performance on the Lowenfeld Mosaic test are age, sex differences, IQ, psychopathologies, and cultural differences. The test, however, is assumed to be free from influence of the variable of creative manipulation of color and shape of the pieces. So far, no major study of the possible relationship of creativity to the test has been made.

Literature on the Test

Margaret Lowenfeld herself said in 1949 that "performance (on the test) is not affected by manipulative skill." In her book published in 1954, however, she said that originality, artistic interest and

ability are among the main aspects of personality which can be measured by the Lowenfeld Mosaic test. Joan Ames Chase, who used the test in a developmental study of 6, 7, and 8 year olds, assumes the Lowenfeld Mosaic test is "a test of performance little affected by manipulative skill." (Chase, 1957)

Only one study, that of Robert Walker in 1957, has made any attempt to investigate creativity as a variable of the test. His study of personality differences included creative and noncreative personalities among those he was investigating with the test. He found that children with creative personalities could be distinguished from those with noncreative personalities by the characteristics of their test performance.

Creative children produced large, creative, mosaic designs with a good relationship of the parts. Their designs were mostly representational rather than abstract, and usually pictured animals. Movement and activity were reflected in the designs. The subject's attitude toward the administrator and the test material was agreeable. Noncreative children could be distinguished by their production of slabs (meaningless piles of pieces), low output, impersonal and impoverished production, production of faces, and meaningless products. However, when judges were asked to match mosaic designs with the characteristics, they were unable to distinguish between the designs of creative and noncreative personalities.

Louise Bates Ames and Frances L. Ilg, who have made the greatest contribution to research on the Lowenfeld Mosaic test (1962), offer no original research on the relationship of creative ability to the

test. They merely quote the literature of Lowenfeld and Walker.

In view of the assumption, and the lack of evidence to support it, that there is no relationship between creative ability and performance on the Lowenfeld Mosaic test, it seems important that study should be devoted to the possibility of close correlation of the two. In addition, if the test should successfully distinguish between creative and noncreative persons, it would be a valuable aid to psychologists and educators who have been searching for measures of creativity since the early 1950's.

Literature on Creativity

In addition to literature on the Lowenfeld Mosaic test itself, writings concerning creativity and artistic and manipulative ability are of obvious relevance to this study.

Frank Barron of the University of California at Berkeley has used one of the most extensive batteries of tests in an investigation of creative artistic ability. The tests included construction of mosaics, completion of drawings, interpretation of inkblots, preferences for paintings and abstract line drawings, and making anagrams. He found that very creative artists and students could be distinguished from less creative ones by certain characteristics of their performance on the tests.

The very creative individuals produced complex and asymmetrical mosaics and drawings, that is, unbalanced in use of color and line. Their interpretations of inkblots took into account all of the details of the blots. They preferred abstract paintings, such as those of the impressionistic, cubistic and expressionistic schools. They rejected simple, symmetrical line drawings, and showed a preference for the

complex, asymmetrical and somewhat chaotic or disorganized line drawings. They gave significantly more original responses to anagrams than did less creative individuals.

In summary, the very creative individuals could be distinguished from the less creative ones by their preference for the complex and asymmetrical, insistence upon complete, synthesizing responses, and original responses. (Barron, 1958)

Edward M. Burchard (1952) and Griffith O. Freed (1961) reviewed a number of studies of artistic creativity that had used the Rorshach inkblot test. The studies indicated that creative persons could be distinguished from noncreative ones by certain characteristics of their responses to the blots.

Creative subjects gave significantly more whole, inclusive responses. They indicated more human and animal movement, and gave a greater number of original responses than noncreative subjects.

Both P. Photak (1960) and Trude Schmidl-Waehner (1942) found that creative individuals drew and painted figures in motion, whereas noncreative individuals drew and painted stationary figures. In addition, Schmidl-Waehner (1942) found that creative individuals drew and painted asymmetrically and complexly colored pictures.

W.R. Ashby and M. Bassett (1949) have demonstrated that persons with creative artistic ability prefer a wider range of colors in their paintings than noncreative persons.

William L. Brittain (1952) has found that facility with block design and three-dimensional paper construction is correlated with high creative ability.

Hypotheses

Based on findings of the Walker study of the Lowenfeld Mosaic test (1957) and the above mentioned studies of creativity, the following hypotheses may be made. Creative children will make original or novel designs and show complex use of color and shape. Their designs will be more asymmetrical in shape and placement and contain a greater number of pieces than the designs of noncreative children. They will make representational rather than abstract designs, and their human and animal figures will show motion.

METHOD

Subjects and Sampling Method

The relationship between performance on the Lowenfeld Mosaic test and creativity was studied by comparing the designs made by two groups of subjects who resembled each other in age and sex, but who showed differences in creative ability.

The subjects were 120 white boys and girls from the first, second and third grades of three schools in the City of Richmond Public School System. Sixty of the children, 20 from each grade, were judged as creative in the manipulation of arts and handicraft materials. The other 60 were judged as noncreative. The creative and noncreative groups were divided equally according to sex at each grade level.

Selection of children for both groups was made on the basis of teacher judgments. Teachers of each of the classes were given descriptions of characteristics and abilities that creative and noncreative children display in their arts and crafts work. (See Appendix A.) They were asked to pick the boys and girls in their rooms whose characteristics were most like those described.

Descriptions of the characteristics and abilities of creative

children were essentially the same as those of Viktor Lowenfeld (1958) and J.P. Guilford (Leanne G. Rivlin, 1959). Those of non-creative children were essentially original with the investigator. They were intended to contrast sharply with those of creative children. They were undoubtedly suggested to some extent by the literature the investigator read in connection with this study.

Because only one teacher judged each child it was impossible to establish the reliability of teacher selections. Many teachers did comment, however, that the task and descriptions were meaningful to them and that they had no difficulty in making their choices. Most previous studies of creativity used teacher judgement as the most feasible method of selecting creative and noncreative subjects.

Test Materials and Administration

The test materials included a Lowenfeld Mosaic test kit and tray. The test kit consists of 456 flat plastic pieces in five shapes and six colors. The shapes are square, diamond, and scalene, large and small triangles. The colors are red, green, yellow, blue, black and white. The tray measurers 10½ inches by 12 3/8 inches and has a raised wooden rim on all four sides.

For ease in recording and scoring the child's approach to the test, characteristics of his mosaic design, and his attitude during and at the conclusion of the test, the investigator adapted a checklist record form from Chase, 1957. (See Appendix B.) Each design was recorded by making a tracing on onion skin paper. Each piece was marked according to color.

Procedure

Each child was administered the test individually. He was seated before a table with the tray placed directly in front of him. The box containing the mosaic pieces was to his left.

The examiner opened the box and instructed the child, "Here is a box of pieces of different colors and shapes. I want you to make something with them on the tray. You can make anything you like. But first, I am going to show you all the colors and shapes."

At that point, the examiner demonstrated one piece of each kind -- large triangle, small triangle, scalene, diamond, and square, in that order -- and pointed out all of the colors. With the pieces replaced in the box, the examiner instructed the child, "You may start now. Make anything you want to on the tray." If any child hesitated, the examiner asked, "Which piece are you going to start with?"

Any child who asked what the examiner was writing (during checking of items on the record forms), was told, "I'm just writing down which pieces you use."

In order to maintain uniform conditions and to allow for testing a large number of children in a relatively short period of time, a time limit of fifteen minutes was set on each child's manipulation of the test pieces. Any child who had not finished his design at the end of fifteen minutes was stopped and asked, "Tell me what you made."

After completion of the test, the examiner made a tracing of the design and replaced the pieces in the box before the next subject came into the testing room.

RESULTS

After all 120 Mosaic designs had been collected and the accompanying record forms completely filled out, the designs were sorted into one of two groups according to the teacher's ratings of the children as creative and noncreative. Each item of the record forms was then tabulated for each group. The method of chi square was used to analyze the differences between major categories on the Record Form for the groups. Since the data permitted, t-tests were used to determine whether differences between number of pieces used and time to complete the design were significant for the two groups.

The overall results indicated there were few statistically significant differences between the scores of the two groups. Only three of the chi squares computed on the 18 design characteristics were significant at the .05 level of confidence. The three significant differences were obtained on coherency (organization), recognizability of name given to the design, and on whether the design was named or unnamed. (See Table I.) Creative children made significantly fewer incoherent (disorganized) designs than noncreative children did. The designs of creative children were named more often

and the names were more often appropriate.

Out of the t-tests computed on time and number of pieces used, one was significant at the .05 level. Noncreative children spent significantly more time on their designs than creative children did. In addition, there were wide variations in the amount of time each individual noncreative child spent on a design.

None of the hypotheses made by the examiner was upheld. These were that creative children would make original designs, show complex use of color and shape, make more asymmetrically shaped and placed designs, make designs containing a greater number of pieces, make representational rather than abstract designs and that their human and animal figures would show motion.

However, there were certain statistically nonsignificant trends. Creative children tended to make more original designs. They tended to make more complex use of color that added to the geometrical structure of their designs or formed bold contrasts. Both creative and noncreative children made the same number of symmetrical designs. Noncreative children tended to make more gestalt (overall, tray filling) designs than did creative children. Both groups of children placed an equal number of designs in the center of the tray. However, creative children more often tended to place their designs asymmetrically than did noncreative children. (See Table I.)

Creative children, contrary to expectation, did not tend to use as many pieces in their designs as noncreative children did. The mean and standard deviation for the creative group were smaller

than for the noncreative group. This indicates that the creative group tended to use fewer pieces and that there was less variation in the number of pieces used within the group. (See Table III.)

Creative children's designs tended to show human and animal movement more often than did the designs of noncreative children. (See Table I.)

In addition, creative children tended to show more form emphasis, more emphasis on combinations of form and color or form, color and space, use of more different kinds of pieces and colors, and made more nonfundamental and multiple designs (scenes). They also tended to make more successful designs than noncreative children did.

TABLE I

Analysis of Major Design Characteristics

Characteristics	Groups		d.f.	x^2
	Creative	Noncreative		
Creation of Design				
Continuous process	46	14	1	.12
Noncontinuous process	41	19	1	.38
Final Design				
Single design	29	31	1	.13
Multiple design	33	27	1	.14
Fundamental Pattern				
Fundamental	28	24	1	.15
Nonfundamental	32	36	1	.12
Placement on Tray				
Centered	1	1	3	0.00
Off center	23	14	3	1.10
Sloped	1	8	3	2.72
Rim or corner	35	37	3	.03
Symmetry of Design				
Symmetrical	16	16	2	0.00
Asymmetrical	39	28	2	.90
Gestalt	5	16	2	2.88
Design Emphasis				
Form	52	42	2	.53
Other	4	3	2	.07
None	4	15	2	3.19
Type of Design				
Abstract, planned	8	6	4	.14
Abstract, unplanned	8	20	4	2.51
Representational	44	32	4	1.00
Mixed	0	2	4	.95
Process				
Slab building	5	4	3	.06
Abstract gestalt building	5	15	3	2.50
Form interest	48	37	3	.71
Other	2	4	3	.33

TABLE I (Continued)

Characteristics	Groups Creative	Noncreative	d.f.	χ^2
Number of Colors Used				
One	0	1	5	.50
Two	3	5	5	.25
Three	4	6	5	.20
Four	10	5	5	.83
Five	15	10	5	.28
Six	30	33	5	.07
Use of Color				
Reinforcing structure	22	16	3	.47
Adding to structure	13	5	3	3.13
Bold contrasts	17	22	3	2.21
Indiscriminate	8	9	3	.03
Number of Kinds of Pieces Used				
One	6	9	4	.03
Two	4	10	4	1.29
Three	12	14	4	.08
Four	9	7	4	.13
Five	27	20	4	.53
Success or Lack of Success				
Successful	47	29	2	2.21
Partial success	5	19	2	.40
Unsuccessful	8	12	2	4.08
Design Level				
Simple	16	41	3	5.48
Complex	13	7	3	.90
Bizarre	4	7	3	.41
Original or clever	27	5	3	7.51
Coherency				
Coherent	54	39	1	1.21
Incoherent	6	21	1	4.17*
Animal or Human Movement				
Movement	7	1	1	2.25
No movement	55	59	1	.16
Superimposed Pieces				
Superimposed pieces	8	10	1	.11
No superimposed pieces	52	50	1	.02

*Significant at .05 level

TABLE I (Continued)

Characteristics	Groups		d.f.	x^2
	Creative	Noncreative		
Pieces Stood on End				
Pieces stood on end	0	2	1	1.00
No pieces stood on end	60	58	1	.02
Naming of Design				
Design named	55	44	1	6.11*
Design unnamed	5	16	1	2.88
Recognizability of Name in Design				
Name recognizable	49	27	1	3.18
Name unrecognizable	11	33	1	5.50*

*Significant at .05 level

TABLE II

Time Spent on the Design

	$\bar{X}$	σ	d.f.	t
Creative Children	9.583	5.196	59	4.078*
Noncreative Children	11.100	12.247	59	

*Significant at .05 level

TABLE III

Number of Pieces Used

	$\bar{X}$	σ	d.f.	t
Creative Children	31.317	17.692	59	1.025
Noncreative Children	35.667	25.646	59	

DISCUSSION

The performance of artistically creative and noncreative first, second and third grade children on the Lowenfeld Mosaic test shows statistically significant differences on four characteristics. Creative children spend less time on their designs, the fit of the pieces in their designs shows more planning, the design has meaning to the child since he names it, and the name is appropriate and recognizable.

In contrast, although noncreative children spend more time on their designs, the designs are usually more poorly planned. They often use more pieces, with some noncreative children using more than 100 pieces to make an unpatterned abstract design. Many of them will work on a design until the examiner calls time. The designs of noncreative children are often meaningless to the child, and are either unnamed or inappropriately named.

Walker, in his 1957 study, reports similar findings. He found that the designs of creative children could be distinguished from those of noncreative children by their "planfulness," that is, by the overall relationship of the parts, and by the appropriateness of the name given the design. He described noncreative children as

using more pieces, spending more time, and expending patient effort in creating a meaningless product.

The present study indicates that there are differences in the way creative and noncreative children approach and carry out solutions to problems. Creative children tend to show economy of effort in solving problems. They tend to find workable solutions quickly and not to waste time with irrelevant experimentation. They are able to carry out their solutions successfully. There are some indications that creative children of all ages tend to be more advanced than noncreative children in finding and carrying out solutions to problems. (See Appendix E.)

In general, age-grade trends for this study agree with studies of age differences by Stewart and Leland, 1955; Reiman, 1950; Chase, 1957; Ames and Ilg, 1962, and Walker's study, 1957, using first, second and fifth grade children. Children of all three age-grade levels tended to make a greater number of representational rather than abstract designs. The majority of the designs were coherent or organized and were successful at all three age-grade levels. In addition, representational designs, coherency and successfulness become increasingly evident with age. Older children tended to use a greater variety of colors and shapes and their designs tended to be more complex. (See Appendix D.)

Ames and Ilg, 1962, reported that children used more pieces and spent more time on their designs as they grew older. This study, however, revealed that children in the first grade used the most pieces and spent the most time on the designs. Children of the

second and third grades used fewer pieces and spent less time on the designs. Second and third graders used approximately the same number of pieces and spent about the same amount of time on the designs. (See Appendix D.)

Unlike the Ames and Ilg study, children in this study tended to place few designs symmetrically on the tray. The majority of children either placed the designs asymmetrically or along the rim and corners of the tray. (See Appendix D.)

As in the study by Ames and Ilg, little animal and human movement was shown in the designs of the children in this study. (See Appendix D.) (There was, however, a larger percentage of animal and human movement in this study. This finding is most likely due to the influence of creativity.)

There appeared to be little if any age-grade differences between the creative and noncreative groups. Children of the same age-grade level tended to make similar designs, regardless of whether they were in the creative or noncreative group. (See Appendix E.)

This study revealed little or no differences between the sexes on the characteristics of the designs. This agrees with the studies of Stewart and Leland, 1952; Walker, 1957; Reiman, 1950, and Kerr, 1939, which showed few if any clear-cut sex differences. However, it disagrees with the study by Ames and Ilg, 1962. They reported striking sex differences on the design characteristics of form level, color use, successfulness, symmetry of design, and abstractness or representationalism. This study did reveal, however, that

boys used more pieces and spent more time on the designs than girls did. (See Appendix F.)

A suggestion for further study of creativity and the Lowenfeld Mosaic test lies in the area of socio-economic differences. Children from two of the schools included in the study were from low to lower middle socio-economic areas while children from the other school were from an upper middle to upper socio-economic area. There seemed to be noticeable differences between the performance of the creative children of the two areas. Creative children from the upper area seemed to make a greater number of unnamed and inappropriately named designs, as did the noncreative children from the lower areas. Perhaps one reason for this difference lies in the different orientations of the schools. It may be that schools in the upper socio-economic areas are more academically oriented, to the exclusion of artistic creativity, than are schools in the lower areas. Another cause may be that children from the lower socio-economic areas, who have less money to spend on toys, develop imagination and inventiveness for turning ordinary objects into toys. This would be reflected in their manipulation of the test pieces.

The major fault of the Lowenfeld Mosaic test lies in its scoring system. (Wideman, 1955, and Ames and Ilg, 1962.) The scoring system allows one to categorize rather than measure design characteristics. It provides one with frequency counts rather than scale scores. Perhaps such counting is not sensitive enough to detect some of the characteristics of the design that are related to creativity.

In conclusion, although the test would not be very reliable in indicating artistic creativity, it might be investigated as a clinical technique. Many of the variations within the two groups of subjects were no doubt due to individual differences. Children of the same age, sex and group often performed quite differently on the test. Some made scattered, unnamed designs of ninety or a hundred pieces; others made planned, named designs of two to nine pieces. Some made abstract designs and others made representational ones. Some children made animals and people while others made inanimate things.

While the test may not be truly quantitative, norms might be established for it as for the Holtzman Inkblots Test or ratios and popular responses might be determined as with the Rorshach. If this is done, the Lowenfeld Mosaic test might serve as a valid measure of personality differences or disorders.

SUMMARY

One hundred twenty boys and girls from public schools were used in a study of artistic creativity and the Lowenfeld Mosaic test. Of these first, second and third grade children, 60 were judged by their teachers as creative and 60 as noncreative.

The test was individually administered to each child. The results of the test were then analyzed by use of chi squares and t-tests to determine the differences between the two groups on certain design characteristics.

The conclusions were the following: (1) creative children made more coherent or organized designs, (2) the designs of creative children were more often named, (3) the names given to the designs of creative children were more often appropriate, and (4) creative children spent less time on their designs than the noncreative children did.

Creative children show economy of effort in their method of approach and in their solutions to the mosaic task.

Age and grade trends in this study are consistent with previous findings.

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APPENDIX A

Criteria for Judging Creative and Noncreative Children

For this study we need two groups of children, those who are creative in drawing, painting and making things and those who are not creative in these activities.

A creative child, for the purpose of this study, may be thought of as one exhibiting the following characteristics and abilities in his art and handicraft work:

1. He is sensitive to the possibilities and the limitations of the medium and materials with which he is working and makes effective use of both.

2. He produces a large number of effective ideas for the use of the medium and materials.

3. He is able to adapt his ideas and the medium he is using to the task at hand.

4. He has the ability to produce original products.

5. He has the ability to use familiar objects or materials in new ways.

6. He is able to plan a design and logically follow through on his plan.

7. He can relate isolated design elements to each other to form designs and make products.

8. He is able to integrate the various parts of a design to each other in a meaningful manner.

The creative child, then, exhibits in his arts and crafts work

the characteristics of sensitivity, insight, productivity, flexibility and originality as well as the ability to redefine, analyze, synthesize and unify.

For the purpose of this study, a noncreative child displays the following characteristics in his art and handicraft work:

1. Lack of awareness of the possibilities and/or limitations of the medium and materials with which he is working.

2. Poverty of ideas - inability to come up with a number of ideas for the use of his materials.

3. Inability to adapt or adjust his ideas and the medium he is using to the task at hand.

4. Conventional and unimaginative production.

5. Conventional and stereotyped use of familiar objects and/or materials.

6. Inability to plan and carry out a logical, systematic process in creating a product.

7. Inability to relate parts of a design to each other in an over-all effective design.

8. Production of meaningless, incoherent products.

Think carefully of each child in your class and identify those you can as creative or noncreative according to the above criteria. If you are uncertain about any child do not place him in either group. The accuracy with which you classify the children will determine the success of this research.

Thank you for your cooperation and time.

APPENDIX B

Record Form
(Adapted from Chase, 1957)

Name_____ Grade_____
Sex_____Designation_____ Time to complete design_____

I Attitude toward test.
- __A. Interested
- __B. Grudging
- __C. Suspicious
- __D. Frightened, shy
- __E. Indifferent
- __F. Other_____

II Creation of design
- __A. Continuous process
- __B. Other designs attempted
  - 1. Other designs different from final in
    - __a. type
    - __b. form
    - __c. color
    - __d. position
  - 2. Other designs different from each other in
    - __a. type
    - __b. form
    - __c. color
    - __d. position

III Final design
- __A. Single pattern
- __B. More than one pattern
  - __1. With separate parts
  - __2. Composing a whole

IV Single pattern
- __A. Compact
- __B. Spaced
- __C. Intermediate

V More than one pattern
- __A. Number of patterns
- __B. Same type
- __C. Different types

VI Fundamental pattern
- __A. One fundamental pattern
- __B. Several fundamental patterns
  - __1. Without elaboration
  - __2. With elaboration
- __C. Which fundamental pattern used_____

VII Placement on tray
- __A. Centered
- __B. Off center
- __C. Sloped
- __D. Attached to rim or corner
  Describe_____

VIII Symmetry of design
- __A. Symmetrical
- __B. Asymmetrical
- __C. Gestalt

IX Design emphasis
- __A. Color
- __B. Form
- __C. Space
- __D. Other_____

X Type of design
- __A. Abstract
- __B. Representational
- __C. Mixed
- __D. Other_____

XI Process
- __A. Slab building
- __B. Abstract gestalt building
- __C. Random
- __D. Color interest
- __E. Form interest
- __F. Other

XII Color
- __A. One_____
- __B. Several_____
- __C. Reinforcing structure
- __D. Forming pattern adding to geometrical structure
- __E. Forming bold contrasts
- __F. Used indiscriminately

XIII Pieces
- __A. Number_____
- __B. Kind and number of each
  - __1. Square_____
  - __2. Diamond_____
  - __3. Large triangle_____
  - __4. Small triangle_____
  - __5. Scalene_____

XIV Content of design
- __A. Human
- __B. Human detail
- __C. Animal
- __D. Animal detail
- __E. Nature
- __F. Other_____

XV Success or lack of success in creating design
- __A. Successful
- __B. Unsuccessful
- __C. Partial success

XVI Design level
- __A. Simple
- __B. Complex
- __C. Original or clever
- __D. Bizarre

XVII Is any part of design incoherent in structure_____
_____

XVIII Does design represent movement or action_____

XIX Are any pieces superimposed____ Number_____

XX Is an attempt made to stand any piece on end____Describe_____
_____

XXI Naming of design
- __A. Before start
- __B. During construction
- __C. After completion
- __D. In answer to a question

XXII Is name recognizable in design
_____

XXIII Attitude toward finished design
- __A. Satisfied
- __B. Dissatisfied
- __C. Indifferent
- __D. Other

APPENDIX C

Definition of Terms

Abstract gestalt building - pieces are laid down in an abstract design with the apparent goal of completely filling the tray.

Animal detail - a part of an animal; for example, a head, a tail, etc.

Asymmetrical design - an unbalanced pattern.

Bizarre design - a poor original design; individual treatment of a design with poorly handled complexity of form.

Color forming bold contrasts - color is used deliberately to form bold contrasts.

Color forming pattern adding to geometrical structure - color is used deliberately to form a pattern or patterns which add to the geometrical structure of an abstract design.

Color reinforcing structure - color is used deliberately to carry out the forms of a representational design.

Color used indiscriminately - color is used without apparent regard for its appropriateness or aesthetic value.

Compact pattern - pieces within the design are closely fitted together.

Complex design - a design consisting of a number of pieces with adequate and successful or partially successful but not original handling of form.

Continuous process - the subject works on only one design without attempting others.

Designs of different types - patterns within the design are both representational and abstract.

Designs of the same type - patterns within the design are either all representational or all abstract.

Fundamental pattern - the simplest design that can be made with each of the mosaic shapes; all pieces of a design are the same shape.

Gestalt - an overall abstract design in which the whole tray is almost or completely covered.

Human detail - a part of the human body; for example, a face, a hand, etc.

Incoherent - disorganized.

Intermediate design - a design in which some pieces are closely fitted together and others are loosely scattered.

Movement or action - animal or human movement very obviously implied, such as position of limbs implying running or walking, or explicitly stated by the subject.

Nature - grass, trees, mountains, etc.

Original or clever design - individual treatment of a design with successfully handled complexity of form.

Partially successful design - the subject was able to make a design but was unable to name it, or subject was unable to complete a design.

Planned abstract design - a nonrepresentational design with definite and deliberate patterning.

Random process - putting the pieces together haphazardly.

Recognizability of name - name given to the design by the subject

is apparent in the design.

Representational design - a design consisting of one or more objects or a scene.

Simple design - a design with only a simple level of patterning; single or small designs of four to five pieces.

Slab building - pieces are placed closely or loosely in juxtaposition to each other without forming an overall symmetrical pattern.

Spaced design - pieces within the design are loosely fitted together.

Successful design - the subject was able to make a design and name it.

Superimposed pieces - pieces that are placed on top of other pieces.

Symmetrical design - a balanced pattern.

Unplanned abstract design - a nonrepresentational design without pattern; the design shows only chance, if any, repetition of elements.

Unsuccessful design - the subject was unable to make and name a design.

APPENDIX D

Table I

Summary of Age-Grade Scores on the Design Characteristics

Characteristics	Grade		
	First	Second	Third
Creation of the Design			
Continuous process	26	31	30
Noncontinuous process	14	9	10
Final Design			
Single design	23	20	19
Multiple design	17	20	21
Fundamental Pattern			
Fundamental	19	19	14
Nonfundamental	21	21	26
Placement on Tray			
Centered	1	0	1
Off-center	7	14	16
Sloped	3	4	2
Rim or corner	29	22	21
Symmetry of Design			
Symmetrical	7	9	16
Asymmetrical	20	26	21
Gestalt	13	5	3
Design Emphasis			
Form	29	31	34
Other	3	2	2
None	8	7	4
Type of Design			
Abstract, planned	6	3	5
Abstract, unplanned	15	9	4
Representational	18	28	30
Mixed	1	0	1
Process			
Slab-building	2	4	3
Abstract gestalt building	13	5	2
Form interest	24	29	32
Other	1	2	1

Characteristics	Grade First	Second	Third
Number Colors Used			
One	1	0	0
Two	4	3	1
Three	4	2	4
Four	2	5	8
Five	5	12	18
Six	8	6	21
Use of Color			
Reinforcing structure	7	14	17
Adding to structure	5	3	8
Bold contrasts	18	19	12
Indiscriminate	10	4	3
Number of Kinds of Pieces Used			
One	8	4	5
Two	9	3	2
Three	6	10	10
Four	5	6	5
Five	12	17	18
Success - Lack of Success			
Successful	22	24	30
Partial success	8	6	6
Unsuccessful	10	10	4
Design Level			
Simple	23	19	15
Complex	9	2	9
Bizarre	3	6	2
Original or clever	5	13	14
Coherency			
Coherent	28	29	36
Incoherent	12	11	4
Animal or Human Movement			
Movement	0	3	5
No movement	40	37	35
Superimposed Pieces			
Superimposed pieces	9	6	3
No superimposed pieces	31	34	37
Pieces Stood on End			
Pieces stood on end	0	1	1
No pieces stood on end	40	39	39

Characteristics	Grade		
	First	Second	Third
Naming of Design			
Design named	31	33	35
Design unnamed	9	7	5
Recognizability of the Name			
Name recognizable	23	24	29
Name unrecognizable	17	16	11

Table II

Time Spent on the Design

Grade	Mean	Median
First	7.68	15
Second	6.60	11
Third	6.40	10.5

Table III

Number of Pieces Used

Grade	Mean	Median
First	27.60	36
Second	20.05	24.5
Third	19.35	25.5

APPENDIX E

Summary of Age-Grade and Group Scores on the Design Characteristics

Characteristics	Group-Grade Scores					
	Creative Group			Noncreative Group		
	First	Second	Third	First	Second	Third
Creation of Design						
Continuous process	13	16	17	13	15	13
Noncontinuous process	7	4	3	7	5	7
Final Design						
Single	10	9	10	13	11	9
Multiple	10	10	10	7	9	11
Fundamental Pattern						
Fundamental	10	10	8	9	9	6
Nonfundamental	10	10	12	11	11	14
Placement on Tray						
Centered	1	0	0	0	0	1
Off-center	3	9	11	4	5	5
Sloped	0	1	0	3	3	2
Rim or corner	16	10	9	13	12	12
Symmetry of Design						
Symmetrical	4	3	9	3	6	9
Asymmetrical	12	16	11	8	10	4
Gestalt	4	1	0	9	10	3
Form Emphasis						
Abstract, planned	5	1	2	1	2	3
Abstract, unplanned	4	3	1	11	6	3
Representational	11	16	17	7	12	13
Mixed	0	0	0	1	0	1
Process						
Slab building	1	3	1	1	1	2
Abstract gestalt building	5	0	0	8	5	2
Form interest	14	17	17	10	12	15
Other	0	0	2	1	2	1

Characteristics	Group-Grade Scores					
	Creative Group			Noncreative Group		
	First	Second	Third	First	Second	Third
Number of Colors Used						
One	0	0	0	1	0	0
Two	2	1	0	2	2	1
Three	1	1	2	3	1	2
Four	1	3	6	1	2	2
Five	4	6	3	1	6	3
Six	12	9	9	12	9	12
Use of Color						
Reinforcing structure	5	8	9	2	6	8
Adding to structure	4	1	8	1	2	0
Bold contrasts	7	8	2	11	11	10
Indiscriminate	4	3	1	6	1	2
Number of Kinds of Pieces Used						
One	5	2	1	3	2	4
Two	4	0	0	5	3	2
Three	3	4	5	3	6	5
Four	4	3	2	1	3	3
Five	4	11	12	8	6	6
Success - Lack of Success						
Successful	14	16	17	8	8	13
Partial Success	6	1	1	2	5	5
Unsuccessful	0	3	2	10	7	2
Design Level						
Simple	7	7	2	16	12	13
Complex	7	1	5	2	1	4
Bizarre	2	1	1	1	5	1
Original or clever	4	11	12	1	2	2
Coherency						
Coherent	16	18	20	12	11	16
Incoherent	4	2	0	8	9	4
Animal or Human Movement						
Movement	0	3	4	0	0	1
No movement	20	17	16	20	20	19
Superimposed Pieces						
Superimposed pieces	2	3	3	7	3	0
No superimposed pieces	18	17	17	13	17	20
Pieces Stood on End						
Pieces stood on end	0	0	0	0	1	1
No pieces stood on end	20	20	20	20	19	19

Characteristics	Group-Grade Scores					
	Creative Group			Noncreative Group		
	First	Second	Third	First	Second	Third
Naming of Design						
Design named	16	19	20	15	14	15
Design unnamed	4	1	0	5	6	5
Recognizability of name						
Name recognizable	14	16	19	9	8	10
Name unrecognizable	6	4	1	11	12	10

APPENDIX F

Table I

Summary of Scores on the Design Characteristics According to Sex

Characteristics	Scores According to Sex	
	Boys	Girls
Creation of Design		
Continuous process	40	47
Noncontinuous process	20	13
Final Design		
Single design	35	27
Multiple design	25	33
Fundamental Pattern		
Fundamental	31	21
Nonfundamental	29	39
Placement on Tray		
Centered	2	0
Off-center	19	18
Sloped	4	5
Rim or corner	35	37
Symmetry of Design		
Symmetrical	15	7
Asymmetrical	32	35
Gestalt	11	8
Design Emphasis		
Form	45	49
Other	4	2
None	11	9
Type of Design		
Abstract, planned	8	6
Abstract, unplanned	13	15
Representational	37	39
Mixed	2	20
Process		
Slab building	6	2
Abstract gestalt building	11	11
Form interest	14	17
Other	0	0

Characteristics	Scores According to Sex	
	Boys	Girls
Number of Colores Used		
One	0	1
Two	3	5
Three	8	2
Four	5	10
Five	14	9
Six	30	20
Use of Color		
Reinforcing structure	16	22
Adding to structure	5	11
Bold contrasts	32	17
Indiscriminate	7	10
Number of Kinds of Pieces Used		
One	10	7
Two	6	8
Three	14	12
Four	7	9
Five	23	24
Success - Lack of Success		
Successful	37	39
Partial Success	12	8
Unsuccessful	11	13
Design Level		
Simple	24	33
Complex	11	9
Bizarre	5	6
Original or clever	20	12
Coherency		
Coherent	47	46
Incoherent	13	14
Animal or Human Movement		
Movement	5	3
No movement	55	57
Superimposed Pieces		
Superimposed pieces	8	12
No superimposed pieces	52	48
Pieces Stood on End		
Pieces stood on end	2	0
No pieces stood on end	58	60

Characteristics	Scores According to Sex	
	Boys	Girls
Naming of Design		
Design named	49	50
Design unnamed	11	10
Recognizability of the name		
Name recognizable	41	35
Name unrecognizable	19	25

Table II

Time Spent on the Design

Sex	Mean	Median
Boys	10.5	5.5
Girls	10.4	13.0

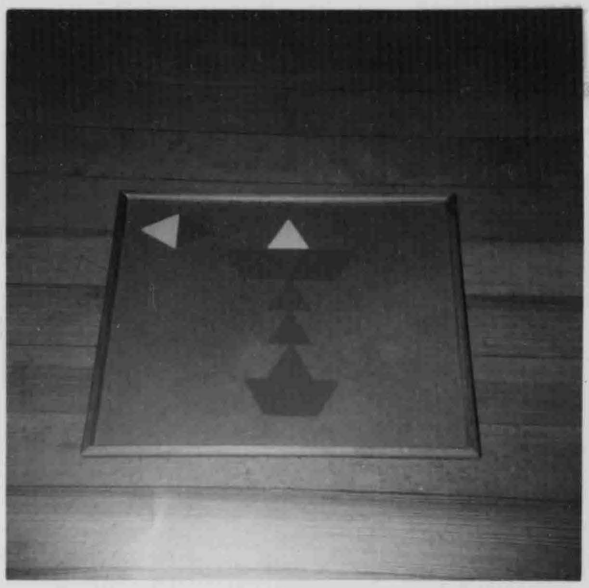
Table III

Number of Pieces Used

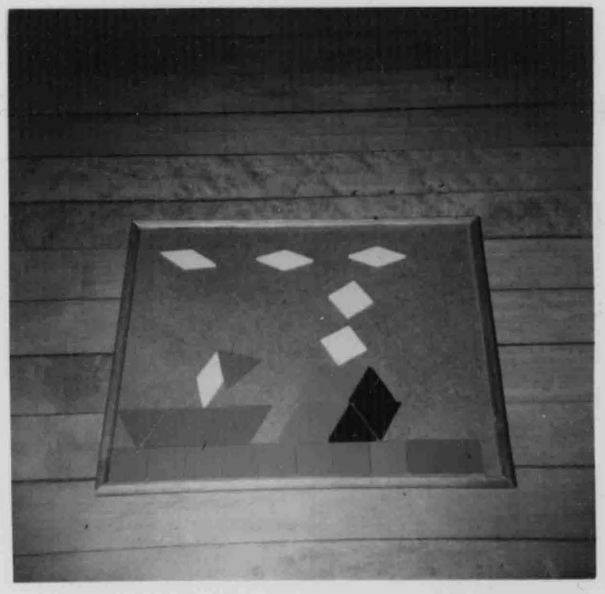
Sex	Mean	Median
Boys	36.55	30.5
Girls	30.60	25.0

ILLUSTRATIONS

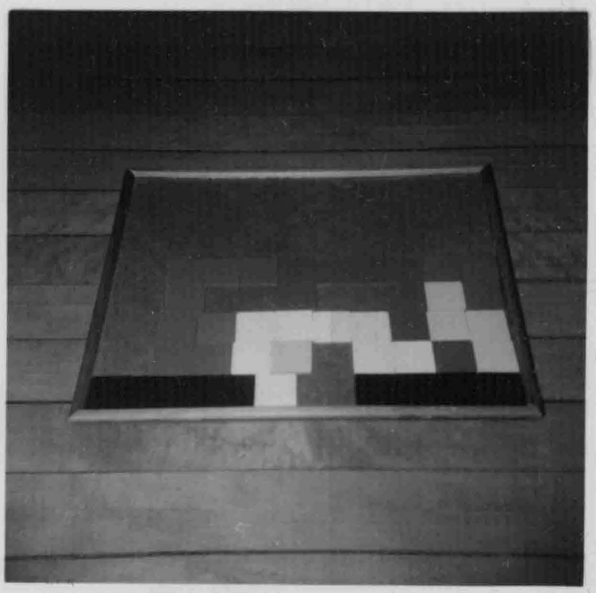
Designs by Creative Children of the First Grade



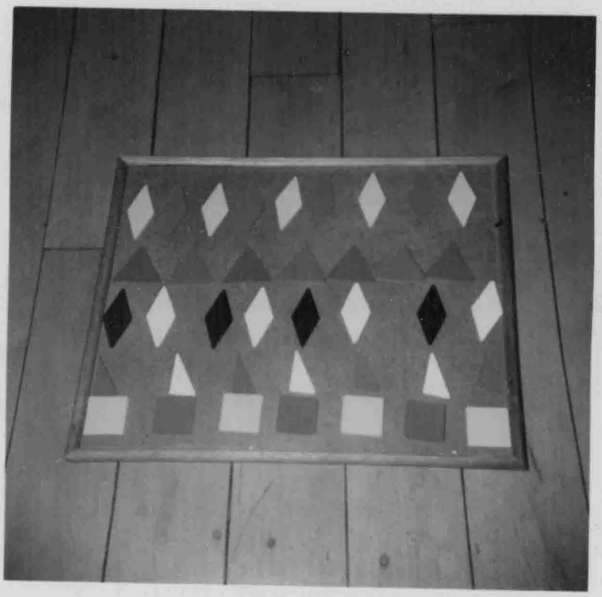
Girl. A lamp with rays of light coming from it.



Boy. Sailboat on the water with clouds, an island and a smoking volcano.

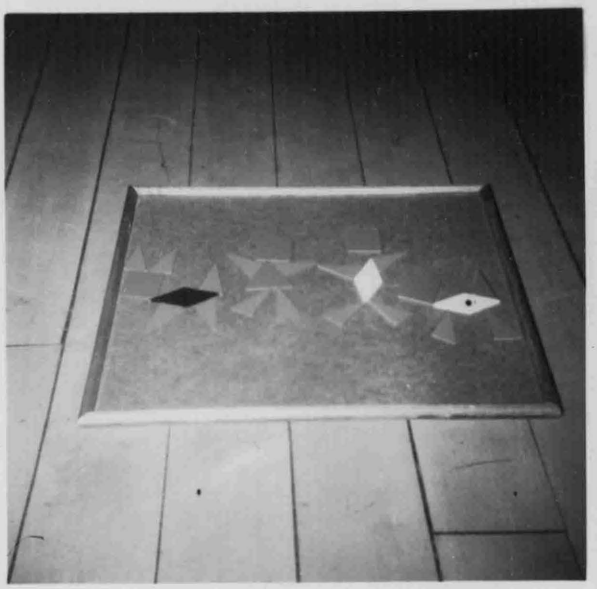


Boy. A school.

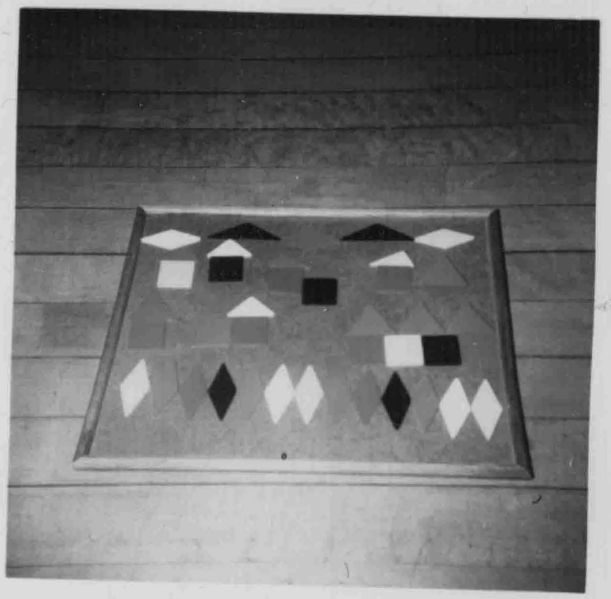


Boy. A decoration.

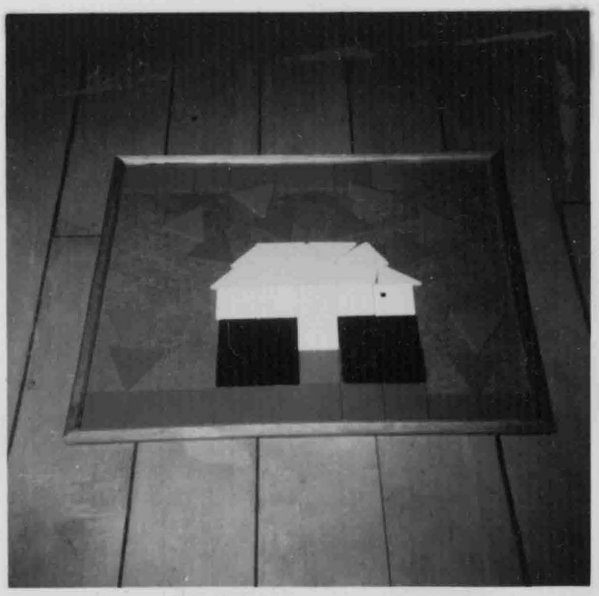
Designs by Creative Children of the Second Grade



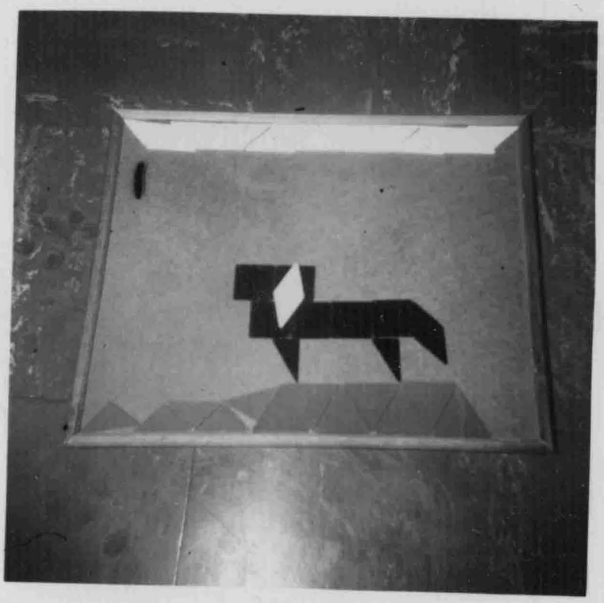
Boy. A boy, a girl, a cat and a dog.



Girl. Schools with houses around them and a fence.

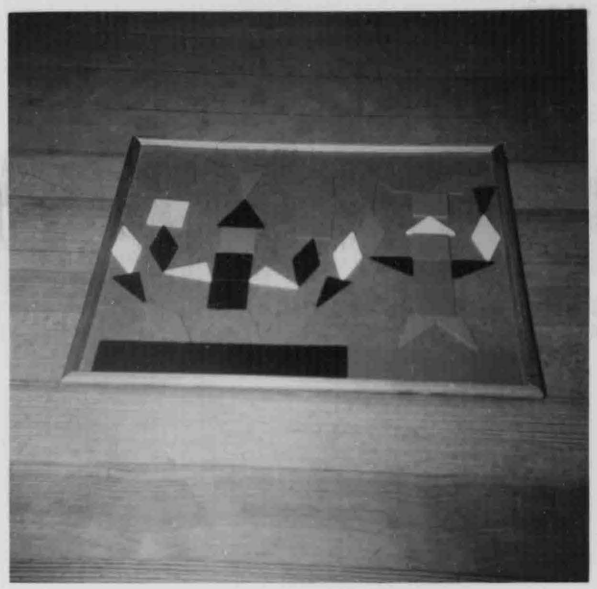


Boy. The little flower house.

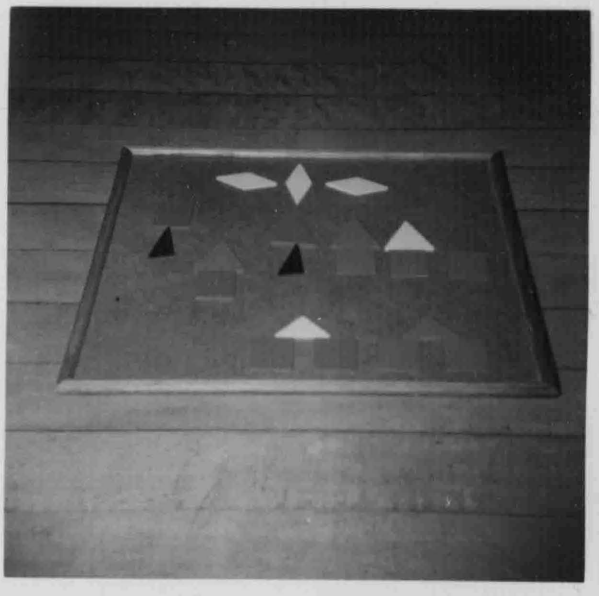


Girl. Grass, water and a dog.

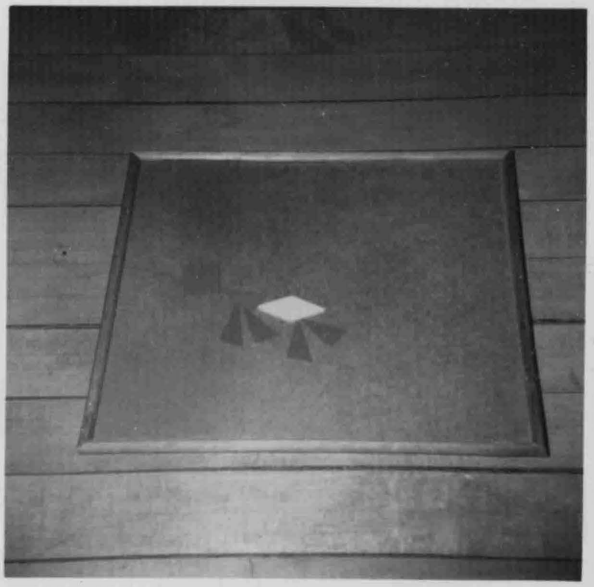
Designs by Creative Children of the Third Grade



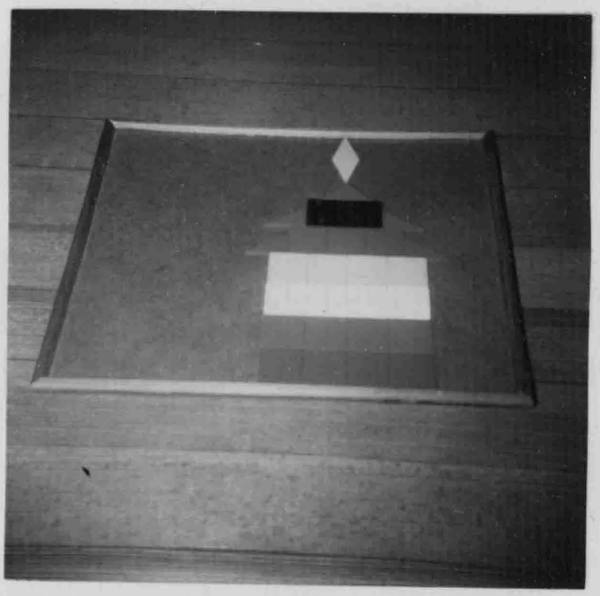
Girl. Two clowns balancing things.



Boy. A town.

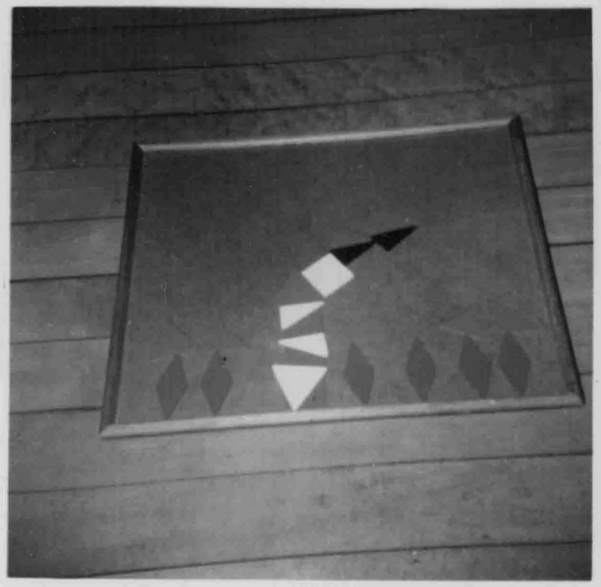


Girl. A cat.

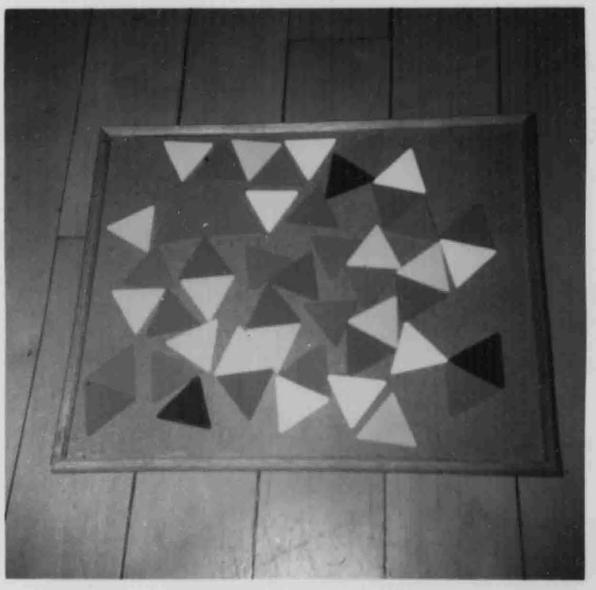


Boy. A design.

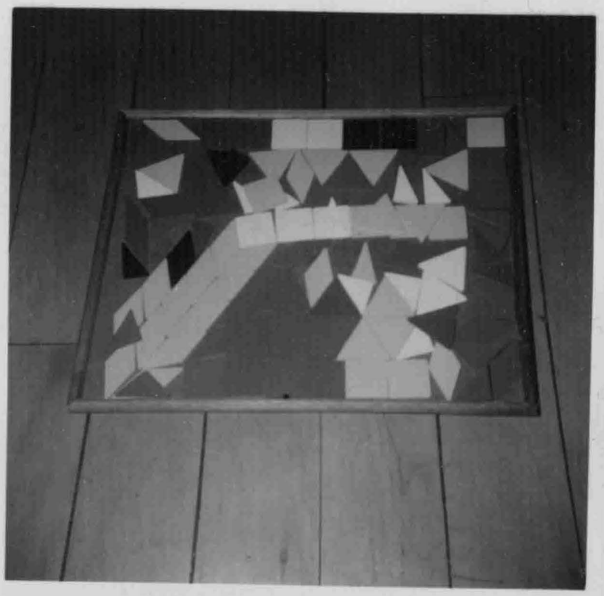
Designs by Noncreative Children of the First Grade



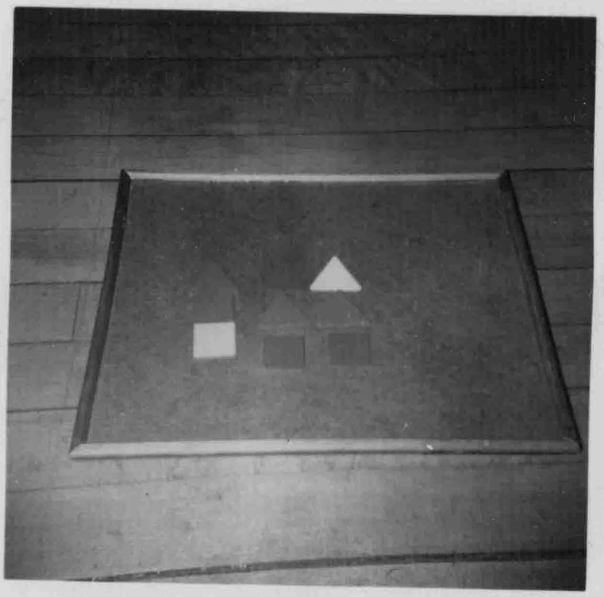
Girl. A house with flowers.



Boy. A design.

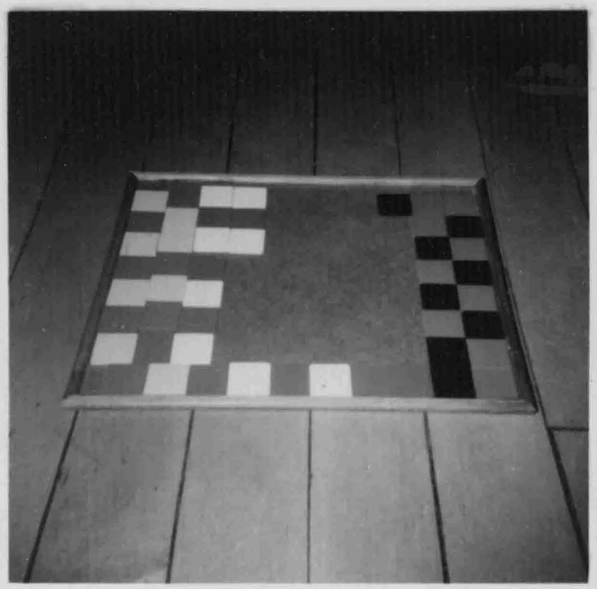


Girl. A building with construction equipment in it.

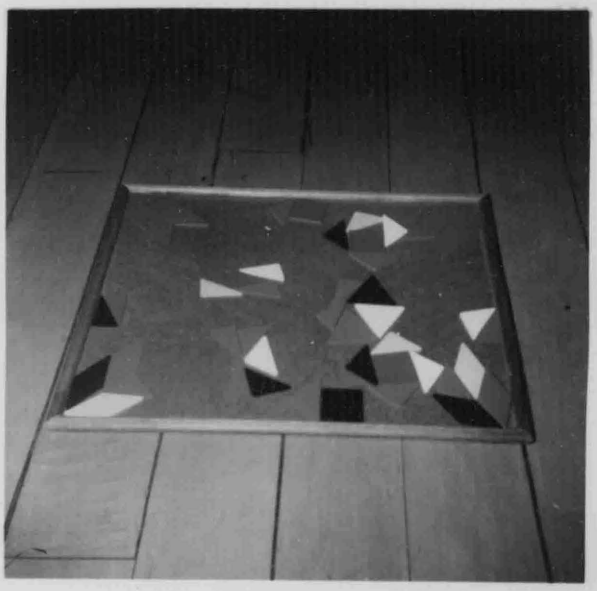


Girl. Hats, a little castle and two books.

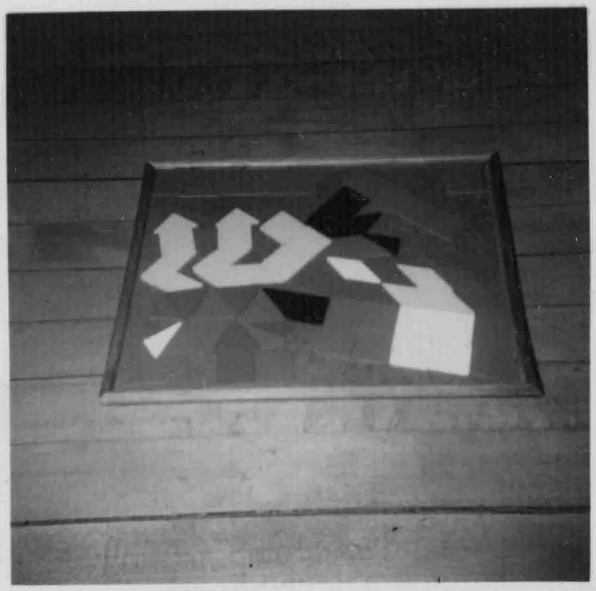
Designs by Noncreative Children of the Second Grade



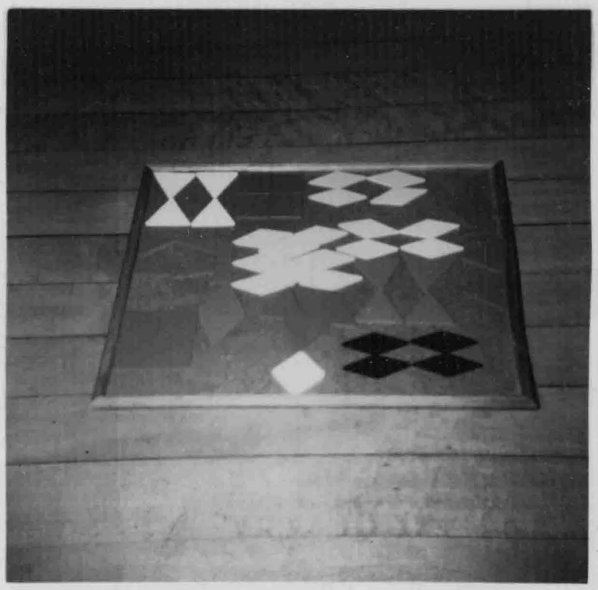
Boy. Unnamed design.



Girl. Unnamed design.

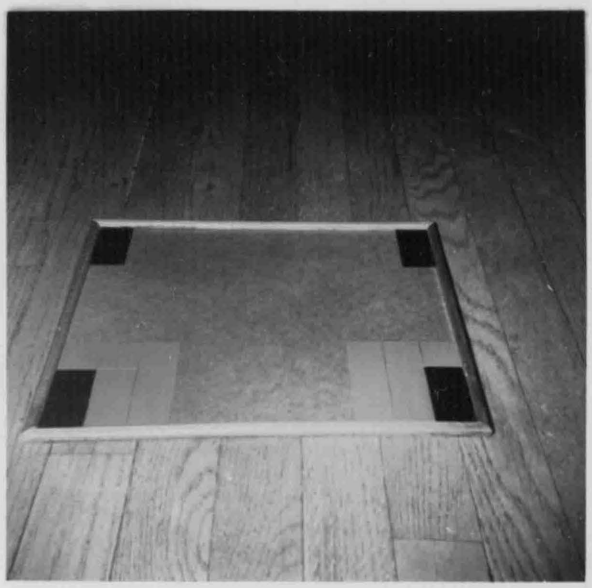


Girl. Unnamed design.

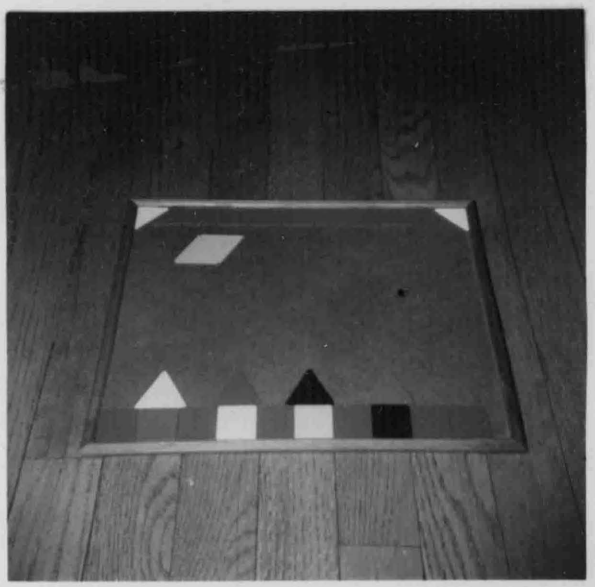


Boy. Designs.

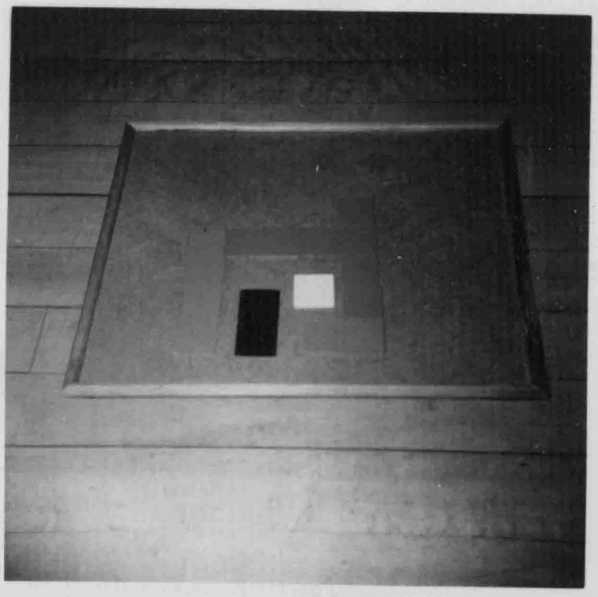
Designs by Noncreative Children of the Third Grade



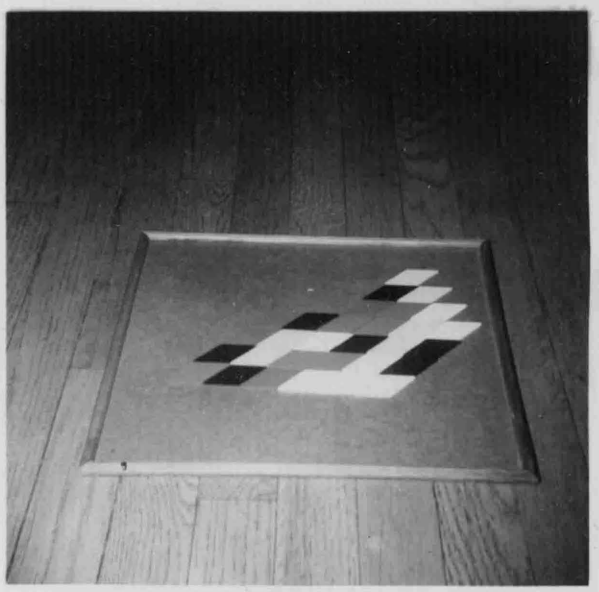
Boy. Unnamed design.



Boy. Houses, sky, sun and clouds.



Girl. A house.



Boy. Unnamed design.

VITA

Shelby Hargrave Cook was born in Surry County, Virginia, on March 19, 1940. In February, 1962, she received her B.A. in psychology from Evangel College, Springfield, Missouri. In September, 1963, she entered the University of Richmond Graduate School. She held a Williams Scholarship there during the school year of 1962-63. From spring of 1963 until winter of 1964, she worked as a remedial reading instructor for the psychology department. In December, 1963, she was married to Stephen Cook.