The Role of Art in Developing and Evaluating Cognitive Skills

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Eleven graduate students who had registered for an elective course in art therapy worked under supervision with 11 unselected learning-impaired children. They used special art techniques designed to develop and evaluate ability to order, ' perceive, associate, and represent components. After 10 weekly one-hour art periods, the children showed significant gains in concepts of space, order, and class, as measured by pre- and post-tests designed for the study.

Special art procedures for both assessing and remediating cognitive deficits were developed at a school for children with language and hearing impairments and produced significant improvements in the children (Silver 1973, 1975). Now in this study, we ask whether such testing and teaching procedures would be useful with children who have an opposite constellation of skills - verbal strengths and visual-motor weaknesses and whether the procedures could be used effectively by teachers other than the one who developed them. The teachers who participated were graduate students in art education and worked individually with the children.

In the initial project, the question was whether art procedures could be substituted for the use of language in developing the three basic concepts of space, order, and class from which all branches of mathematics are said to derive (Piaget 1970, p.24). Experimental art classes 'were provided for 34 language-impaired children: Significant Improvement was found at the p <.01 level in ability to form groups, and at the p <.05 level in spatial concept (N = 16) while control group children showed no significant Improvement. ' A difference between groups was found at the p <.001 level in favor of the experimental group (N = 18) in 14 key items of the fall program posttest. The items included measures of ability to order sequentially, form groups, conserve, and predict spatial relationships.

SUBJECTS

The children who participated in the present study were not selected. Announcements were sent to newspapers and to members of the Westchester Association for Children with Learning Disabilities, stating that art classes were being offered these children at the College of New Rochelle. The first 15 children who applied were enrolled.

One child had been diagnosed as hyperkinetic. Another was severely disturbed and attended a day school in a psychiatric hospital. The others. attended private schools or special classes in public schools. All but two had disabilities of a visual-spatial-motor nature, and these two were eliminated from the statistical analysis (one was deaf and the other emotionally disturbed; both were able to perform the

tasks on pre- and post-tests). Also eliminated from the analysis was a child who withdrew from the program and a child whose teacher became ill and withdrew from the course. A total of 11 children were included in the study, seven boys and four girls ages 7 to 11.

The 11 graduate students who worked with them were not selected either. They had registered for an elective course in therapeutic techniques in art education in the MA program at the College of New Rochelle. Their skills and backgrounds were varied. Most had provisional certification to teach art. Of the remaining, some had not yet received provisional certification while others had permanent certification.

The classes were held on Saturday mornings, all participants working together in a large studio under the supervision of the course instructor who had developed the teaching and testing procedures. The children attended 10 one-hour classes. The graduate students attended three preliminary lectures. Thereafter, each week for half an hour before the children arrived, they prepared for the day's activities. They stayed for another half hour after the children left to organize their notes and evaluate results.

When the classes ended, six of the graduate students scored the 44 pre- and post-test drawings which were identified only by number and presented in random order. The results were analyzed for reliability and for changes in ability to group and to represent spatial concepts. Scores for ability to order were obtained from students who were tested individually. In addition, parents were asked for anonymous evaluations of the program.

TEACHING AND TESTING PROCEDURES

Task 1: Ability to form groups in drawing from imagination. The concept of a group or class of objects requires the ability to select components of the group, associate them with past experiences, and combine them into a form. These abilities are fundamental not only in mathematics but also in language in selecting and combining words to form sentences (Jakobson 1964, p. 25), and they seem fundamental as well in the nonverbal thinking used in drawing or painting pictures. The painter selects and combines pictorial components such as colors and shapes, and if his work is representational, he selects and combines subjects as well. He can also use them, intentionally or unintentionally, as symbols to represent a particular instance of a class *(this* man) or the class itself (Man). He can go beyond representation, using them to project ideas and feelings through distortions or omission, for example, or, by depicting action or interaction between them. In other words, a child can select, combine, associate, and represent as he draws, relating his subjects to one another, to himself, and to those who might look at his work.

During the first class, drawings on 3- by S-inch cards were spread out on two tables, 12 drawings of people on one table, 12 drawings of objects on the other. The children were asked to choose one or more cards from each table and draw a story-telling picture about them. They were also asked not to copy the cards but to draw their selections in their own individual ways. The cards were available in later classes if a child needed help in getting started, but as a rule, they readily chose subjects of their own.

Remediation consisted of providing frequent opportunities to associate and reflect on components, to select and combine colors, shapes, and subject matter while drawing or painting from imagination. Emphasis was on content rather than form, meaningful pictures rather than abstract designs, exploratory learning rather than directive teaching, and eliciting responses rather than instructing. The children's first and last drawings from imagination were evaluated for ability to select, combine, represent, and express (see Table I).

Task 2: Ability to preceive and represent spatial relationships. The task on the pre- and post-tests designed to evaluate these abilities was to draw an arrangement of objects, as indicated in Table 11. The remediation tasks consisted of drawing similar objects placed in the center of the room and sketched from different points of view.

Task 3: Ability to order and conserve in manipulating objects, modeling clay, and painting. As indicated in Table III, the task on the pre- and post-tests was based on an experiment

TABLE l. Ability to associate and represent (form groups).

Materials: paper 8'/2 by 11, black felt-tipped pen, and Set A (drawings on 3x5" cards).

Procedure: Present the cards in a random arrangement so that all are visible at the same time. For individuals, spread out on a table; for groups, prop against a wall. Ask subject's) to draw a picture about one or more of the people or objects on the cards, the story-telling kind of picture, something happening, adding whatever is needed to make the drawing more interesting. Also, ask them not to copy the cards. "They are just here to help you get started. Draw in your own way. When you have finished, please turn your paper over and write your name and a title for your drawing."

Score each drawing on the basis of 1, 3, and 5 points, as indicated below. Score 2 or 4. if needed, to indicate an intermediate level.

This drawing suggests that the child has ability to:

A. Select at the level of:
   1. __ Perception 'subjects are not related but simply denoted, may be isolated or unrelated in size: no interactions.
   3. __ Function 'subjects are related concretely - what they do or what can be done to them).
   5. __ Connotation 'subjects are related abstractly - goes beyond denoted meaning, implies more than is visible; suggestive, indirected, possible rather than actual events).

B. Combine at the level of:
   1. __ Proximity, distance, enclosure (subjects float in space, drawing is fragmentary, uncoordinated).
   3. __ Base line 'bottom of paper may serve as base line).
   5. __ A unified whole 'attention given to whole paper, or background and subjects shown from a single point of view).

C. Represent at the level of:
   1. __ Imitation 'copies model or used stereotype such as stick figures; impersonal).
   3. __ Reconstruction -hanged model or stereotype, or used pictographs - arrows, dotted lines, cartoon devices).
   5. __ Transformation !highly personal, inventive, imaginative).

D. Express verbally at the level of:
   1. __ Description 'title simply describes what is visible).
   3. __ Amplification 'tine elaborates on what is visible).
   5. __ Transformation symbolic or abstract, presents thoughts or feelings not evident without verbal explanations.

E. Express nonverbally through visual art medium, at the level of:
   1. __ Commonplace form
   3. __ Moderate skill, care, exploration.
   5. __ Skill or sensitivity -o art values.

by Bruner and Kenny (1966. p. 156, 183) and on the classic Piagetian test of conserving liquid. Remediation consisted of modeling clay from imagination and following an experiment by Sonstroem for developing ability to conserve solids (Bruner 1966, p.20&. In addition, the mixing of poster paints on a caper palette with palette knife was introduced in the second art class. The children were encouraged to mix their own colors from an array of red, blue, yellow, black, and white, and' asked to mix a series of tints or shades.

In general, instruction was indirect in order to encourage spontaneity and exploratory learning. Although the ten sessions were structured, most tasks were open-ended to leave the children as free as possible to make decisions for themselves. When tasks could not be openended, they were limited to 5 or 10 minutes and followed by free-choice activities.

Other procedures were used which do not involve drawing and are not described here. They were games adapted from experiments by Piaget (1970, p. 29, 36, Piaget & Inhelder 1967, p. 379, 421), and used individually when they seemed appropriate.

TABLE II. Ability to perceive and represent.

Materials: paper 81/2, by 11, black pen, and Set B (3 cylinders differing in height, width, and color; a large pebble, and a cardboard base on which their outlines are traced in the positions shown below).

Procedure: Place the arrangement as shown against a well so that the back of the base plane touches the wall, and ask subject's) to sketch it from observation. To clarify the task, sketch the arrangement yourself very quickly, no more than 20 seconds, then put your sketch out of sight.

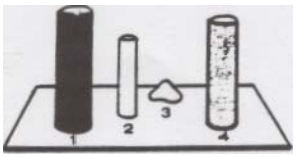
Score drawings on the basis of 0, 1, 3, and 5 points as indicated on the scoring form below.

Scoring Form

name age diagnosis date

A. Left-right relationships (horizontality, width):
1.__ only 2 adjoining objects are correctly placed.
3. __ 3 adjoining objects, or 2 pairs are correctly placed.
5.__ all adjoining objects are correctly placed.

B. Above-below relationships 'verticality, height):
1. the relative height of any 2 objects is correct.
3. the relative height of 3 objects is correct.
5. __ the relative height of all objects is correct.

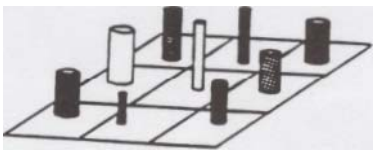


C. Front-back relationships 'perspective, depth)
1 . __ base plane is represented by a line enclosing the objects.
3. __ base plane is represented by base line or bottom of paper.
5. __ base plane is represented as a plane supporting objects which appear as seen from a single point of view. (score zero if base plane is not represented)

TABLE III. Instructions for administering test and evaluating ability to order a matrix.

Procedure: Present the cylinders arranged as follows:
1. Remove first 1 cylinder, then 2, then 3, and ask subject to replace them.
2. Scramble the cylinders and ask him to build "something like what was there before."
3. Scramble in the southwest corner of the grid 'the shortest, thinnest) in the southeast corner. Ask him to build something like what was there before, leaving the cylinder where it was placed by the examiner.

Scoring:
1.__Can replace cylinders.
3.__ Can reproduce matrix.
5.__Can transpose matrix.



*Based on a test by Kenny and Brunner 1966, p. 156.

TWO CASES IN POINT

Marjory. To illustrate, Figure 1 is the drawing made by Marjory*, age 12, when she was first asked to draw the arrangement of four objects on a table, as shown in Table 11. Figure 2 is her response to the same request in the last session.

Marjory was in a "mainstreaming" program for children with learning disabilities in a suburban public school. According to her teacher, she often failed to distinguish between the letters and spaces on a page. This perceptual difficulty is reflected in her first drawing where she gave the background more importance than the subjects. Furthermore, she drew only three of four objects and confused their colors and relationships in width, heighth, and death. Her first drawing received an average score of 3.66 points while her last drawing received a score of 5.16 points (see Table V).

Figure 3 is Marjory's response in the first session when she was asked to select one or more of the model subjects. She selected two cards, a snake and a bed, and after drawing Figure 3, explained that "The first picture shows the snake going to bed. The second shows it in bed and the third shows it going away from bed. That's all." This drawing received an average score of 2.-5 (see Table V). Figure 4 is her response to the same request in her last session when she chose a model banana and made up a story to explain her drawing as "a picture of a family at home. The man is eating some bananas. The girl is putting some in her lunchbox and the mother is coming down stairs in the morning with a baby." This drawing received an average score of 3.5 points, indicating gain in ability to group or associate.

Marjory was able to order sequentially with ease. This was tested by asking her to order a series of sticks from shortest :o longest and a series of colors from lightest ant to darkest shade, in addition to transposing the matrix as indicated in Table Ill.

Marjory was present at eight of the ten art periods. The graduate student who worked with her had provisional certification as an art teacher, and had been working for eight years in New York City Board of Education schools.

In response to the questionnaire, Marjory's parents wrote, "This was a very positive experience for [Marjory] ." They thought she had gained in all the specified areas but social development. They found her self-esteem much greater and volunteered that they had bought $30 worth of art materials so that she could continue to paint at home.

Donald. Figures 5 through 8 are the drawings made by Donald, age 9, with learning disabilities and socialization problems who prefers not to verbalize. According to his school report, "He seems very aware of his handicaps and though he has many skills, he refuses to use them in a group setting with his peers.... refuses to participate in almost all activities unless coaxed or given special reward." His performance on the WISC test showed large variations in individual tests (from 4 to 14 points) which suggests that he was not using his full potential.

Figure 5 is his response in the first session to Task 1. He chose a model mouse and scribbled over his drawing. Figure 6 is his response in the last session (he attended nine) to the same task, when he chose a model lamp and explained his drawing as a picture about his grandmother whom he visits every Sunday. He drew her at a stove making hamburgers for him, then added the path with a car driving on it and a house at the end of the path. His scores in ability to form groups improved from 1 to 2.50 points. In spatial orientation, his score in drawing from observing four objects on a table improved from .91 to 5 (see Figures 7 & 8). In ability to order a matrix, his score improved from 3 to 6 points. The graduate student who worked with him had received provisional certification to teach just as the art program began.

RESULTS

The reliability of judges' ratings of the test results was determined by using an analysis of variance to estimate reliability of measurements as described by Winer (1962, p. 128). The obtained reliability quotient was based upon the scoring of tests by six judges. Separate analyses were performed for scores both on the tests of the ability to form groups and on the tests of spatial orientation.

**Names of the children have been changed to protect their identities.*

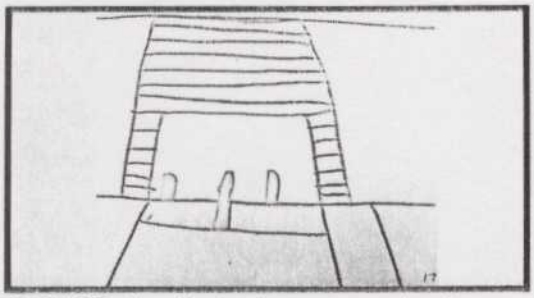


FIGURE 1. Marjory's pretest drawing on Task 2.

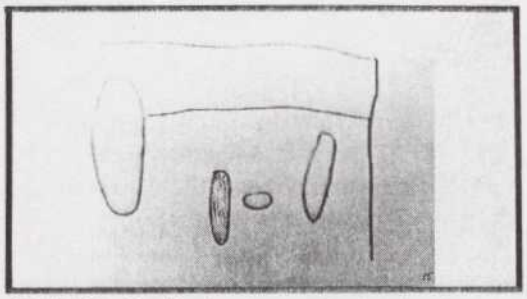


FIGURE 2. Marjory's posttest drawing on Task 2.

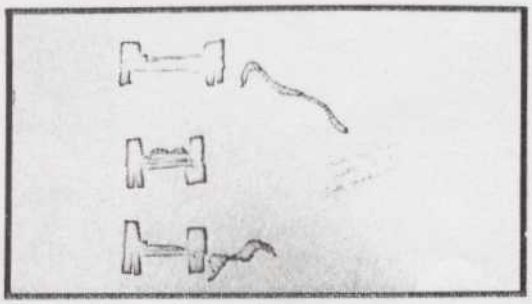


FIGURE 3. Marjory's pretest drawing on Task 1.

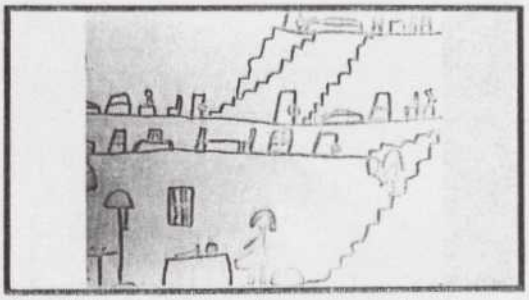


FIGURE 4. Marjory's posttest drawing on Task 1.

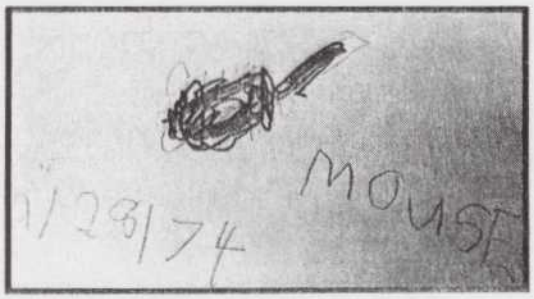


FIGURE 5. Donald's pretest drawing on Task 1.

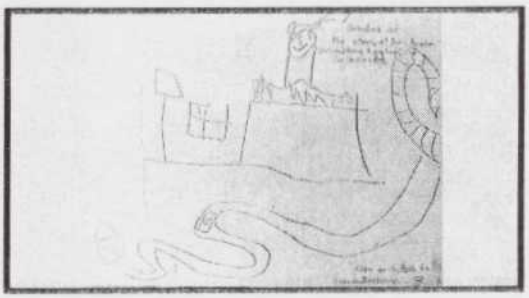


FIGURE 6. Donald's posttest drawing on Task 1.

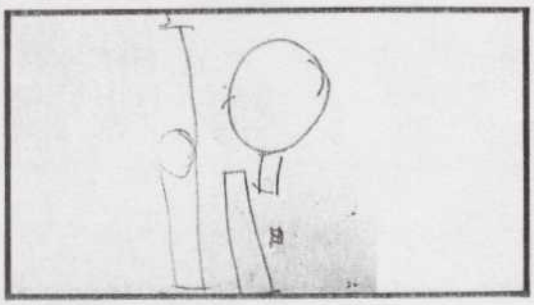


FIGURE 7. Donald's pretest drawing on Task 2.

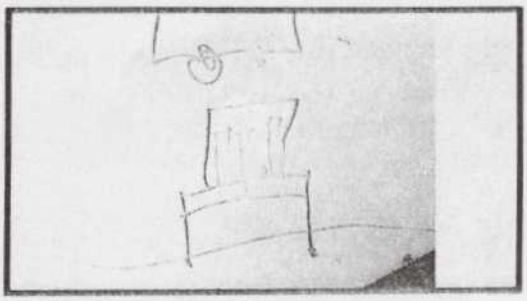


FIGURE 8. Donald's posttest drawing on Task 2.

For the ability to form groups, the obtained reliability coefficient was .852. The reliability coefficient for spatial orientation was .944. The obtained coefficients reveal that the six judges, based upon their training, had a similar frame of reference and displayed a high degree of agreement in scoring the tests.

The effectiveness of the training program was evaluated by using a t test (N = 11) for correlated means to determine the significance of differences in mean pre- and post-test scores. Separate analyses were performed for scores on the tests of the three separate areas of cognition - the ability to form groups (select and combine), spatial orientation, and the ability to order a matrix.

All the obtained t values were statistically significant. The improvement in the ability to form groups (t = 4.79) and in ordering a matrix (t = 6.54) was significant at the .01 level. The improvement in spatial orientation was significant at the .05 level (t = 2.42). The impaired children who engaged in the therapeutic art program, therefore, improved significantly in the three areas of cognitive development that were the focus of the study.

Of the 15 parents, 14 returned the questionnaires. In response to the question, "Did your child enjoy coming to the class?" 12 checked the highest rating, and 13 indicated that they would like to be informed about future classes. These results are indicated in Table V.

SUMMARY

The statistical analyses and the questionnaire responses support the hypothesis that children with learning disabilities would show improvement in the three areas of cognitive development under consideration when taught by graduate students trained in using the art procedures developed in the project for children with communication disorders.

TABLE / V. Questionnaire sent to parents of 15 children who attended art classes (with total of responses indicated).

Dear Parent:

Now that our experimental art class is coming to an end, we would like to know if it was worthwhile for the children who participated. It would be most helpful in planning future classes if you would answer the following questions with checkmarks in the appropriate boxes.

1. Was the art class beneficial for your child in:

	Not at all	Very little	Sometimes	Much	Very much
Visual-motor development			3	1	2
Cognitive development			3	1	2
Artistic development		1	2	1	3
Emotional development			2	1	5
Social development	1		1	2	2
Other _____					

2. Did your child enjoy coming to the class? 1 | 1 | 12

3. Would you like to be informed about future classes? 13 yes | 1 no

There are no plans for continuing the class next term. Arrangements made directly with student teachers for continuing, would not be under the auspices of the College of New Rochelle, and accordingly the College would have no responsibility for supervision.

COMMENTS:

TABLE V: Results of art program for children with learning disabilities taught by graduate students at College of New Rochelle, fall 1974.

			Ability to Form Groups*			Spatial Orientation +			Ability to Order a Matrix**		
Child	age	sex	Pro	Post	Change	Pre	Post	Change	Pre	Post	Change
Da	7	F	1.16	2.66	+1.50	2.16	2.16	0	1	5	+4
Ro	11'/2	M	1.50	3.33	+1.83	2.91	7.33	+4.42	5		
Donald	9	M	1.00	2.50	+1.50	0.91	5.00	+4.09	3	5	+2
Ra	9	M	1.16	1.83	+0.67	2.08	1.25	˙0.83	5		
Ca	11	M	1.66	1.16	˙0.50	0.75	1.58	+0.83	5		
Mario	7	M	1.08	3.41	+2.33	0.00	1.66	+1.66	1	3	+2
Me	7%	F	2.91	2.41	- .50	4.50	2.16	˙2.34	5		
Ca	7	F	1.83	1.16	- .67	0.83	2.58	+1.75	2	3	+1
Marjory	11'/2	F	2.75	3.50	+ .75	3.66	5.16	+1.50	5		
Pa	8'/2	M	2.58	2.83	+ .25	3.58	2.50	˙1.08	4	5	+1
To	8	M	3.00	2.00	˙1.00	2.16	2.58	+ .40	2	3	+1

**Average scores of two tests scored on the bases of 1 to 5 points with 5 = highest score. As measured by test of ability to form groups (select and combine), improvement was significant at the .01 level (t= 4.79).*

+ As measured by test of spatial orientation (left-right, above-below, front-back), improvement was significant at the .05 level (t = 2.42).

***As measured by test of ability to order the matrix, improvement was significant at the .01 level (t = 6.54)*

The success of this training program reveals that art techniques can be used to assist learning disabled children in expressing concepts nonverbally through visual-motor channels in spite of impaired functioning in this area. Through the use of cognitively oriented experiences with drawing, modeling, and painting, learning disabled children were able to develop the skills needed to bring order to their perceptually disoriented world. The variety of media provided tactile and kinesthetic feedback while the nature of the art activities provided practice in the cognitive visual skills of analysis, integration, and synthesis. The instructional activities were conducted in a success oriented, nonthreatening atmosphere in conjunction with enjoyable art activities far removed from those specifically academic tasks that to many learning disabled children simply mean failure. As a result of these factors, the children made significant progress in the cognitive skills that were the focus of the study.

The present study revealed that visual-motor weaknesses can be attacked successfully through the use of art experiences. Since the tested abilities, forming groups, perceiving and representing spatial relationships, ordering and conserving, are also fundamental in the development of language as well as mathematics and reading ability, future investigations into the effect upon these more complex behaviors might also be fruitful.

An attempt is currently being made to verify the results of this investigation. We hope these follow-up studies will provide additional evidence regarding the effectiveness of cognitive art instruction with learning disabled children. - *Graduate School, Department of Art, College of New Rochelle, New Rochelle, New York 10801.*

ACKNOWLEGMENT

We would like to thank the six graduate students who scored the drawings for this study: Laura D'Amico, Jo-ann O'Brien, Martha Geller. Judy Itzler, Mary Simons, and Phyllis Wohlberg. In addition, we feel credit is due to Mary Lou Impellizeri who worked with Marjory and Phyllis Wohlberg who worked with Donald.

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Postscript

After this article was published, I found that Tables II and III had been altered in such a way that their meanings had changed. In Table II, the cylinders had been redrawn changing their heighth, width, and relationships in depth. In Table III, the cylinders were placed at random on the grid, instead of becoming progressively taller and wider. The *Journal* corrected the errors in the next issue.

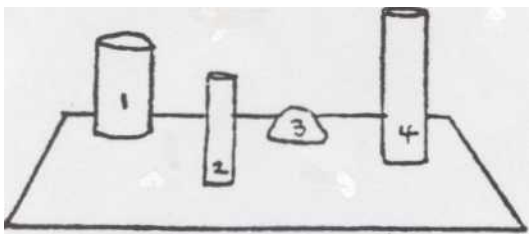

Table II

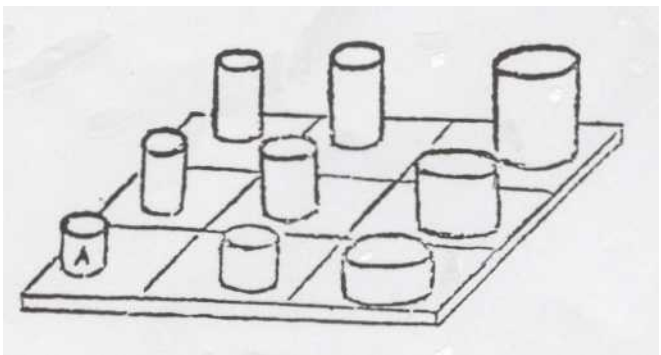

Table III