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AUTHOR Eylon, Bat-Sheva; And Others
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ABSTRACT

Reported are the main activities undertaken in Israel during 1984 as part of the implementation of the Agam Method of Visual Education for preschool children. When the program's curriculum units were translated from the French, a revised version of the Agam Program was developed which involved no major changes in program content. Program implementation, begun in December 1983, was continued during the 1983-85 school years at four preschools, and expanded to include implementation in a first grade class twice a week. During the year, teachers were trained and a video film presenting an overview of the program was produced for use in future teacher training sessions. Program implementation was evaluated by several means, including teacher questionnaires for each learning activity, discussions at periodical review meetings, teacher interviews, and classroom observations. Findings suggest that the program is suitable for 4- and 5-year-old children and for first graders, and that a considerable amount of teacher training is necessary for effective classroom implementation. Also reported are findings of two investigations of the Agam Program's cognitive outcomes, including effects on intelligence, creativity, and the visual skills of identification, memorization, and reproduction. Affective outcomes and other effects of the program are reported. Related materials, which are written mainly in Hebrew, are provided in the appendices, and include a questionnaire for the preschool teacher, a set of visual skills tests, the first year summary test, and a summary of cognitive research instruments. (RH)

# THE AGAM PROJECT

## A RESEARCH AND CURRICULUM DEVELOPMENT PROGRAM IN VISUAL EDUCATION



PROGRESS REPORT NO. 2
January – December 1984





THE WEIZMANN INSTITUTE OF SCIENCE
DEPARTMENT OF SCIENCE TEACHING • REHOVOT • ISRAEL

THE AGAM PROJECT: PROGRESS REPORT NO. 2

January - December 1984

SCIENTIFIC STAFF

Bat-Sheva Eylon (Director)

Adina Ben-Dov

Anat Ben-Zvi

Pnina Golan

Rina Hershkowitz

Micha Razel

Sherman Rosenfeld

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Mr. Walter Schoenfeld, Seattle, U.S.A.

Ormat Turbines Ltd., Yavne, Israel

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# EXECUTIVE SUMMARY

## 1. The Project's Approach.

This report covers part of the first stage (1983-1985) of a three-stage project. The goals of the first stage are (a) to prepare the units and supplementary aids of the Agam Program for implementation in Israel, (b) to learn about this program through its restricted implementation (in 4 pr..schools), (c) to prepare research tools to evaluate the potential of this non-standard curriculum, and (d) to prepare the project's second stage, assuming positive indications the from the first stage. In the positive indications from the first stage. In the second stage (1985-87) there will be a wider implementation (in about 20 preschools), which will necessitate an expansion of the project's teacher training, implementation, and evaluation. Again, assuming a favourable outcome of the second stage, in the third stage (1987-1989), the Agam Program will be disseminated on a much wider basis.

## 2. Description of the Project's Main Activities.

The activities have been carried out by academic staff specializing in areas of child development, curriculum development and implementation, science and mathematics education, and educational research, as well as senior preschool teachers and supervisors, active preschool teachers, and technical staff.

The main activities in the project are as follows:

2.1 Preparation of the Curriculum Materials.

Curriculum materials, consisting of 12 written units and their accompanying instructional aids, were prepared. As part of the translation of the units from the French, a revised version of the Agam Program, with changes in aspects of didactics, mathematics, and organization, has been developed. No major changes were made in the program's content, although we believe that the resulting version is clearer, more mathematically precise and better organized.

2.2 Implementation of the Program and Teacher Training

The implementation started in December, 1983, with 5 preschools, and continues during the 1984-5 school year, with 4 preschools (one of the participating preschools was absorbed into another preschool participating in the program). These preschools have the same 5-year olds who began with the Agam Program last year as 4-year olds. In addition, it was decided to experiment with the program in one first grade class twice a week during the 1984-5 school year.

Teachers who currently implement the Agam Program have been trained. A video film presenting an overview of the program has been produced and it may be used in future teacher-training sessions.

2.3 Evaluation of Implementation.

(a) Evaluation methods included teacher questionnaires for each activity, discussions at periodical review meetings, teacher interviews and staff observations of the program in action.

(b) The program seems to be suitable for 4- and 5-year old children, as well as for first graders. Preschool teachers ranked the activities at a very high level of interest, an appropriate level of difficulty and a relatively high level of assigned importance.

(c) The program seems to be compatible with the existing daily schedule and curriculum of the Israeli preschool. The rate of progress seems to be about one unit per school month (about 9 units per year).

(d) Teachers responded enthusiastically to the program. Specifically, they liked the detailed instructions and learning aids. They adapted to the nonverbal approach, although they found this somewhat difficult at first. They followed the guideline to emphasize detailed and precise work, and they found much value in this approach. The program's structured nature was well accepted by both teachers and students.

(e) A positive relationship was established between the preschool and the home, which enabled interested parents to make a modest contribution to their children's progress in the program.

(f) A significant amount of energy must be invested in teacher training for the Agam Program to work effectively in the classroom. The importance of such training cannot be underestimated.

## 2.4 Cognitive Outcomes.

The goals of the Agam Program include the development of visual skills, intelligence and creativity. The claim being tested is that the program enhances student development in each of these three areas. Therefore, tests were administered, and the results analyzed, with respect to the visual skills of identification, memorization and reproduction. Also, tests of intelligence and creativity were administered.

Preschool children from our sample of 5 matched pairs of preschools (divided into experimental and comparison groups) were given the appropriate tests.

This report summarizes the tests given until the end of the first year (units 1-4), as determined by the slowest preschool. The results are discussed in four parts, as reported below.

(a) A Detailed Analysis of One Unit, As an Example:

Analysis of the experimental and comparison groups on tests of the <u>Ornaments</u> unit demonstrates that students in the experimental group seem to have gained a higher level of visual sensitivity and discrimination ability. Also, they seem to have gained a superior mastery of the concept, as evidenced by the complexity of the ornaments they produced.

(b) A Summary of Results in Units 1-4:

The combined test results in units 1-4 demonstrate that children in the experimental group were superior to the comparison children in (1) their <u>visual identification skills</u>, as shown by their identification of significantly more instances of the relevant concept in their environment, (2) their <u>visual memorization skills</u>, as evidenced by a significant advantage in the memory cards tests, and (3) their <u>visual reproduction skills</u>, as shown by the fact that they performed better in some aspects of reproduction. In particular, the ability of synthesis was enhanced considerably.

(c) Results of the Summary Test:

A summary test, given to children in both groups at the end of the first year, was designed to test the same visual skills in a wider context. The results indicate a superiority of children in the experimental group on most test items. They also point to certain difficulties common to both groups, e.g., an overgeneralization of a "circle" to "a closed circular shape."

(d) Results on Creativity:

Although most results relating to creativity have not yet been analyzed, counts of free art pieces made by both groups of children show that the experimental children suffered no disadvantage from the program's structured approach. A sample of children's artistic work is given in Appendix H (separate volume).

## 2.5 Affective Outcomes

The Agam Program seems to engender a high level of enthusiasm and motivation, for teachers and students alike. The program's appeal seems to be based on a number of aspects: (a) the quality of the activities, (b) the program's structure, (c) the attractive materials, (d) the varied opportunities for success, (e) the social interaction of the participants, and (f) the connections of the program to the child's everyday life.

## 2.6 Other Contributions of the Agam Program.

The program seems to make contributions in areas other than those explicitly articulated by the program's author. For example, there is evidence that some children, with apparent learning deficiencies and/or weak verbal skills, can succeed in the program. This success can have quite positive effects on the children's self-image and general success in preschool. The program also seems to make contributions in the development of social skills and work habits, motor skills, language, mathematical concepts and problem-solving strategies.

3. Recommendations.

On the basis of the above remarks, we make the following recommendations:

(a) The project should be continued into its second stage, consisting of continued preparation of program materials, implementation, evaluation and research. However,the scope of the project should be limited to about 20 preschools, in order to continue with controlled studies of implementation and teacher preparation.

(b) The project should focus primarily on program development in the preschools, due to the stability of their organizational setting. However, the limited involvement with first graders should be continued, in order to compare the effects of the program for different age groups.

(c) With regard to the existing instructional materials, minimal changes should be made, to allow for another cycle of improvements with the existing units. These changes should include the use of nonexamples and modifications relating to perspective-drawing.

(d) The written program's present format should be maintained. More extensive written teacher guides should be prepared. These guides should contain a classification of the activities via level of recommendation, so teachers can skip relatively unimportant activities, when necessary; this practice will help teachers progress more rapidly, without affecting the program's quality, and may help teachers cover more than the projected 18 units (out of the 36 units included in the Agam Program) for the two-year period.

(e) The size, scope and cost of the instructional aids should be reduced. A classroom organizational system to facilitate better storage and use of these aids is needed.

(f) The development of additional units should be continued, until all the written units and their accompanying instructional aids have been prepared.

(g) A great deal of project investment must be made in the area of teacher training, both pre-service (Summer, 1985) and inservice (1985-7). This investment is necessary due to the program's novelty and to the fact that preschool teachers have difficulty in understanding many of the related concepts.

(h) Existing evaluation and research work should be continued and expanded as needed. Longitudinal studies should be undertaken to check for possible effects on children, after they have completed the program.

## INTRODUCTION

This report covers part of the first stage (1983-1985) of a three-stage project. The goals of the first stage are (a) to prepare the units and supplementary aids of the Agam Program for implementation, (b) to learn about this program through its restricted implementation (in 4 preschools), (c) to prepare research tools to evaluate the potential of this non-standard curriculum and (d) to prepare the project's second stage, assuming positive indications from the first stage. In the second stage (1985-87) there will be a wider implementation (in about 20 preschools), which will necessitate an expansion of the project's teacher training, implementation and evaluation. Again, assuming a favourable outcome of the second stage, in the third stage (1987-1989) the Agam Program will be disseminated on a much wider basis.

The present report describes the project's main activities during January to December, 1984. The report is a continuation of Progress Report No. 1 (Project Agam -- Report of the First Half Year: June -- December, 1983). It consists of four parts:

1. A brief description of the progress made since the last report and the main activities of the Agam Project staff.

2. A discussion of the research conducted and some

preliminary results.

3. Our recommendations.

4. Appendices, which consist of (a) tests and questionnaires created for the evaluation research and (b) examples of the work of children who participated in the Agam Program (contained in a separate volume).

# I. DESCRIPTION OF PROGRESS IN THE MAIN AREAS OF ACTIVITY

## 1. Curriculum Materials

Two additional units, Red and Yellow, of the 36 that form the Agam Program, were handed over to the staff by Yaacov Agam. This brings to a total of 26 the number of units held by the Agam Project at the Weizmann Institute of Science. Nine additional units have been translated from the original French into Hebrew since the first progress report (Table 1). These units have gone through a comprehensive process of editorial review by individuals specializing in fields such as curriculum development, psychology and early education, mathematics and science.

A limited edition of about 40 booklets has been prepared for each of these units. The copies used by the preschool teachers were colored by hand. The edition of Unit 14, Symmetry, is currently being completed.

Materials to accompany units 5 through 14, such as geometrical shapes, transparencies, rods etc. have been prepared.

The editorial process has resulted in mathematical and geometrical changes, didactic changes, changes in the description of the activities, goals and materials sections in each activity, changes in the visual materials (e.g., the illustrations or the memory cards) and changes in the introduction to each unit.

## Table 1

The Units in the Agam Method of Visual Education and their status in the procedure of evaluation and implementation

| The Unit | Given to Agam Project for Evaluation | Translated from French | Edited |
|---|---|---|---|
| 1. Circle | + | + | + |
| 2. Square | + | + | + |
| 3. Pattern | + | + | + |
| 4. Circle & Square | + | + | + |
| 5. Flash Identification | + | + | + |
| 6. Horizontal | + | + | + |
| 7. Vertical | + | + | + |
| 8. Horizontal & Vertical | + | + | + |
| 9. Oblique | + | + | + |
| 10. Horizontal, Vertical & Oblique | + | + | + |
| 11. Triangle | + | + | + |
| 12. Circle, Square & Triangle | + | + | + |
| 13. Variations of Forms | - | | |
| 14. Symmetry | + | + | + |
| 15. Curve | + | + | |
| 16. Large, Medium, Small | + | + | |
| 17. Angles | + | + | |
| 18. Dot | + | | |
| 19. Typical Forms | - | | |
| 20. Proportions | + | | |
| 21. Red | + | | |
| 22. Yellow | + | | |
| 23. Blue | + | | |
| 24. Secondary Colors | - | | |
| 25. White, Black & Gray | - | | |
| 26. Trajectory | + | | |
| 27. From Eye to Hand | + | + | + |
| 28. Numerical Intuition | + | | |
| 29. Composition | - | | |
| 30. First Dimension | - | | |
| 31. Second Dimension | - | | |
| 32. Third Dimension | - | | |
| 33. Fourth Dimension | + | | |
| 34. Letters | + | | |
| 35. Visual Grammar | - | | |
| 36. Creativity | - | | |

Apart from changes that result from the translation from French to Hebrew, no changes which have a cultural basis have been noted. This is compatible with Yaacov Agam's position that his method teaches a universal language.

It is our opinion that this first Israeli version of the Agam Program, prepared for the present implementation, needs to be revised once more, as a result of what is learned from its implementation.

## 2. Implementation in Preschools

Implementation of the Agam Program began during the 1983-84 school year, with groups of 4-year olds (3 preschools in Rehovot and 2 in Yavne), and continued in the 1984-5 school year, with the same children, now 5 years old. All of the children in one of the preschools in Rehovot were transferred at the beginning of 1984-85 to another preschool participating in the experimental implementation. Thus, this year we have 4 preschools participating in the Agam Program (2 in Rehovot and 2 in Yavne).

## 3. Implementation in the First Grade

Towards the end of the 1983-84 school year, a first-grade teacher, working voluntarily with the Agam Project tried the Ornaments unit in a first grade. The teacher taught groups of children out of the class, while the rest of the class worked on other material. The children's response was very positive. In the teacher's judgment, there is considerable challenge for first graders in the program.

Based on this initial success, it was decided to implement the program systematically in one first grade class, twice a week, during the 1984-85 school year. As before, the program is being implemented by a teacher, a member of the Agam Project, who is working with groups of children outside their regular classroom.

### 4. Research and Evaluation

Research continued along the lines described in Progress Report No. 1 (1984). A detailed description of this research and some preliminary results are given in the second part of this report.

### 5. Teacher Training

During the period covered by this report, training was given to the four teachers participating in the implementation experiment. At monthly meetings, teachers discussed their teaching experiences with the Agam Project staff. The contents, mathematical background and didactic issues relating to the next unit to be taught were also presented. Discussions were held on such topics as "Creativity and the Agam Program" and "The Role of Speech in the Teaching of the Agam Program." Also, teachers were observed in action by staff members, who later discussed relevant points with the teachers.

Work has started on a teacher's manual, which will contain didactic information based on the experience accumulated over the first two years of the Agam Program.

Staff of the Agam Project cooperated with the Israeli Movie Center in producing a film, which presents an overview of the Agam Program, using as illustration a sample of activities from the third unit, Ornaments. This is the second video film (the first was described in Project Agam - Report, 1984) produced as a possible aid in teacher training sessions, which are planned for the Summer of 1985.

## 6. Literature Search and Review

A systematic attempt is being made to review the current available literature pertinent to the Agam Program. A bibliography has been collected in the following major areas: (a) perception and cognition (e.g., cognitive styles, cognitive theories, problem solving and information processing); (b) artistic expression (e.g., art education, artistic skills and creativity in art); (c) mathematical and scientific concepts (e.g., the teaching of geometrical concepts and the develcpment of spatial orientation); (d) reading (technical reading and comprehension); (e) alternative and related curricula, in Israel and elsewhere; and (f) research methods and design (e.g., tests, evaluation of educational programs and the case study approach).

## 7. Staff

Since the last report the following have joined the staff of the Agam Project, each on a half-time basis.

- Anat Ben Zvi, a developmental and cognitive psychologist with 6 years experience as an educational psychologist involved in teacher training and counseling work in schools.
- Penina Golan, an educational psychologist with experience in implementation and evaluation of educational programs.
- Dr. Sherman Rosenfeld, a science educator with 13 years experience in the development, implementation and evaluation of science education programs in museums, zoos, schools and other settings.

# II. RESEARCH REPORTS

Research on the Agam Program has several goals:

(a) to evaluate the program's implementation;

(b) to assess the cognitive outcomes of the program, including the development of visual skills, intelligence and creativity;

(c) to assess the affective outcomes of the program, as related to both children and teachers; and

(d) to explore other possible contributions of the program which go beyond its professed aims.

This section describes work and results in each of these four areas.

## A. AN EVALUATION OF IMPLEMENTATION

The program was implemented in five preschools as described above. In the evaluation, questions of a fundamental nature were asked, such as: Is the program suitable for 4- and 5-year old preschool children? Is the program suitable for 6-year old first graders? What is a reasonable learning rate? Is the Israeli teacher able and willing to work with such a program? Can the program be adopted by the Israeli preschools with their particular curriculum and daily schedule? How much training and guidance does the teacher need in order to use the program effectively?

## 1. Implementation Procedure

The implementation consisted of a two-stage trial. Each unit was first tried by the supervising preschool teacher on the Project staff. This teacher visited one of the experimental preschools several times a week to work with the children on the Agam Program. Following these visits, she gave preliminary guidance to the other preschool teachers, who then tried the unit in their classes. The supervising teacher worked with all the four-year olds in 1983-84. In 1984-85 she tried the program on 8 of the 36 5-year olds. The other 5-year olds in that class received instruction in the Agam Program from their regular teacher.

The pilot implementation in the first grade was performed by a first-grade teacher on the project's staff. This teacher visited the school twice a week and worked with small groups of children in the hall outside the children's classroom.

## 2. Evaluation Methods

Each booklet consisted of about forty activities. The teachers were given questionnaires (see Appendix A) to be completed at the end of each activity. They were asked to indicate difficulties they had with the activity or with the accompanying learning aids. The teachers were also requested to supply information about the suitability of the activity for the children, and to rank each activity for importance, difficulty and interest on a 3-point scale.

Review meetings for the staff and the teachers were held at regular intervals. At these meetings, the teachers were given an additional opportunity to report and discuss problems they encountered. The teachers' comments in these meetings were recorded. Staff members also observed the preschool teachers and children in action, while the program was being implemented.

### 3. <u>Results</u>

The results of the implementation study were generally positive, as detailed below.

(a) <u>Age suitability of the program</u>. The children seem to be fascinated with the program and the activities seem to be of an adequate level of difficulty. Also, the children develop new skills introduced by the program, as evidenced by their excellent test results (see Section B on "Cognitive Outcomes").

Figures 1-4 present teachers' perceptions of the importance, difficulty and interest of the activities in each of the first four booklets. These results indicate a very high level of interest, an appropriate level of difficulty and a relatively high level of assigned importance.

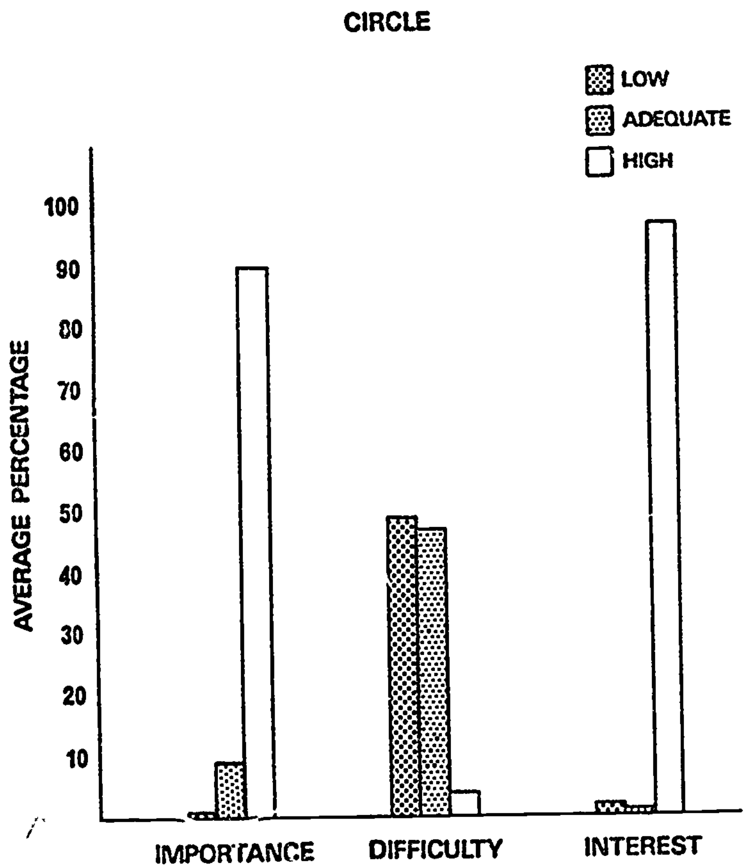



Figure 1. Unit 1 -- Circle: Importance, Difficulty and Interest as Perceived by Teachers. Percentages indicate, for each aspect, averages across all activities (48) and all teachers (4)

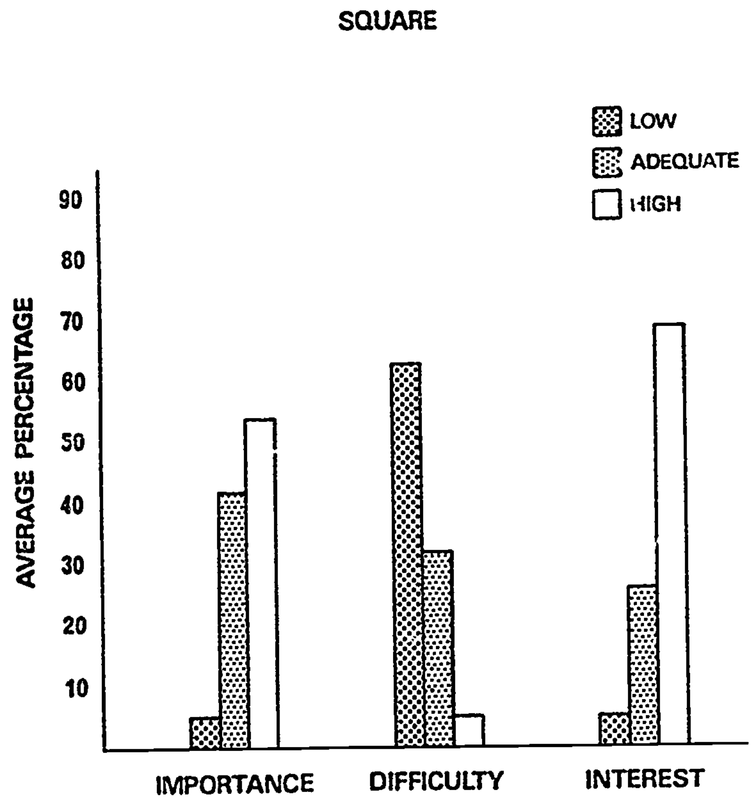



Figure 2. Unit 2 -- Square: Importance, Difficulty and Interest as Perceived by Teachers. Percentages indicate, for each aspect, averages across all activities (38) and all teachers (4).

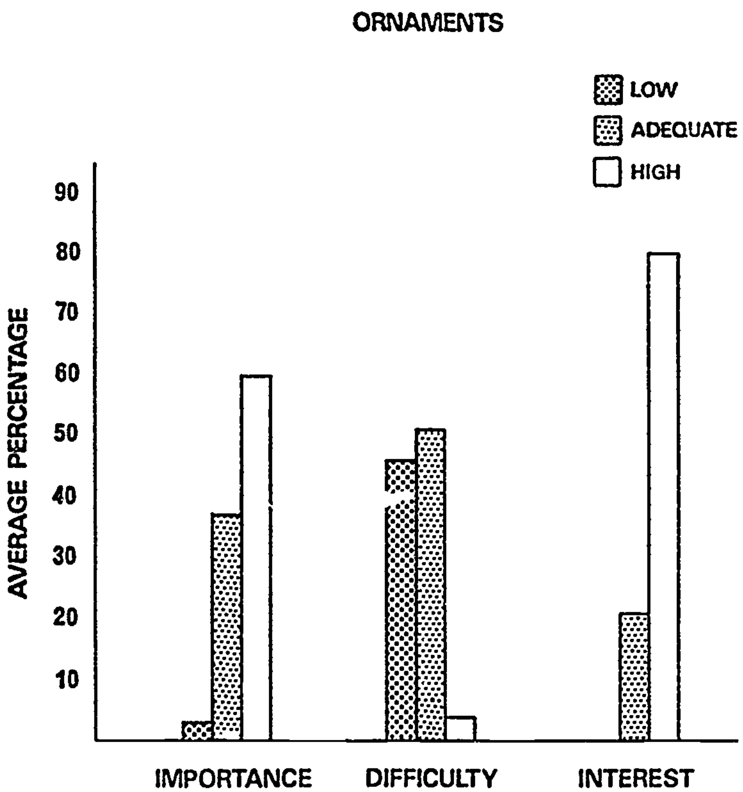



Figure 3. Unit 3 -- Ornaments: Importance, Difficulty and Interest as Perceived by Teachers. Percentages indicate, for each aspect, averages across all activities (42) and all teachers (4).

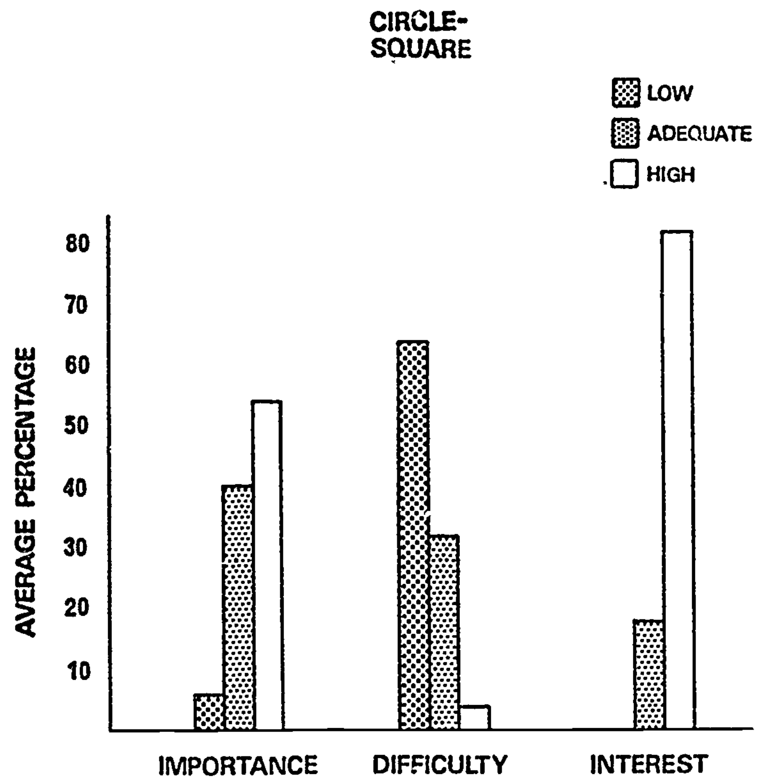



Figure 4. Unit 4 -- Circle-Square: Importance, Difficulty and Interest as Perceived by Teachers. Percentages indicate, for each aspect, averages across all activities (39) and all teachers (4).

Because of the small sample size, short observation time, and lack of test results, a more tentative answer must be given to the question of the applicability of the Agam Program for the 6-year old first graders. However, though the answer is more tentative, it is no less positive. First graders seem to enjoy the program as much as the younger children. In addition, compared with the younger children, they seem to be able to spend a greater time on individual activities and have greater persistence in striving for perfection in their performance. For these reasons, the teacher found it necessary to modify some of the activities. Thus, while Agam's approach seems applicable to first graders, the specific program needs to be further adapted for such use.

It should be noted that the above-mentioned differences are to be expected, due to the older age of the first-grade children, and do not disprove the hypothesis that the impact of the Agam Program is more profound at earlier ages.

(b) Rate of progress. We noted in our first progress report that, as the result of our experience with the first two units, the rate of progress was one unit per two months in the preschools. However, as noted at the time, we expected the learning rate to increase, as teachers and children gained experience with the program. Indeed, this seems to have happened. Children were working on the 9th or 10th unit at the end of December 1984, indicating a rate of progress closer to one unit per month. In other words, we expect that a two-year program will consist of about 18 out of the present 36 units. The implications of this fact are discussed in the recommendations.

(c) Willingness of the Israeli preschool teacher to work with the program. The preschool teachers that participated in the program did so enthusiastically. They found the experience rewarding, especially as they realised the considerable advance in the children's visual skills.

(d) Compatability of the program and the existing curriculum of the Israeli preschool. It seems that the Agam Program can be incorporated successfully into the daily schedule of the Israeli preschool. In most preschools, the daily schedule includes a period during the early part of the morning customarily devoted to creative activities of children, and two daily sessions for more structured activities. Typically, in the Agam Program, teachers instruct small groups of about 5 children each. Each group receives 15-20 minutes of training per daily session. This instruction takes place during the daily recess period, from 11:30 a.m. to 12:30 p.m., so that there is no interruption in the daily schedule. In addition, many Agam activities involving free creativity are introduced to the whole class in the early part of the morning, during the period customarily devoted to creative activities. Other activities, especially those involving the presentation of new ideas, are sometimes taught to the whole class during one of the two daily sessions held by the preschool teacher with her class. Thus, the Agam Program is easily integrated into the existing daily routine. For various reasons, the teacher is unable to spend time on the program each school day; on the average, the program is implemented 4 days per week.

Did the Agam Program come at the expense of other important learning activities, usually given at the preschools? The preschool recess period is usually a time for small-group activities devoted to other subjects (primarily math and language). In general, the teachers stated that the other subjects did not suffer. As one teacher put it, "The children receive the important things in any event through the activities of the Agam Program." Another teacher agreed. "The kids got a lot of math and language enrichment within the framework of the Agam Program." One teacher disagreed. "I think the program was given at the expense of our language program".

(e) Teachers' reactions to learning materials (booklets and aids). The teachers responded enthusiastically to the detailed instructions for each activity and agreed that these instructions made their work much easier. "I enjoyed the fact that each topic in the Agam Program was treated in such an organized and comprehensive manner," commented one teacher. The teachers made every effort to follow these detailed instructions to the letter, to insure that the experiment would be as reliable as possible.

All the teachers agreed that the learning aids (transparencies, shapes made out of wood and felt, flash cards, etc.) are an integral part of the program. "These materials made our work so much easier," explained one teacher, "but it would have been a problem if I had to provide them myself." Likewise, the children were enthusiastic about the materials. "The children were fascinated by the size and by the colors of the shapes," said one teacher. Another teacher added:

> The children were very pleased with the materials... and there were shouts of excitement each time we brought out the big circle or the colored sticks. We usually do not have such a wide variety of materials in the preschools. This is one of the things which stimulated the children to participate in the activities. Much of the program's attraction is due to these materials.

(f) Teachers' reactions to teaching methods. A unique feature of the Agam Program is its nonverbal approach. It turns out that the teachers found the nonverbal approach difficult at first, while the children found it quite natural. However, after some experience, the teachers said they felt more comfortable in presenting various shapes, patterns and activities with minimal verbal explanation. It should be noted that, although the use of explanations and verbal definitions is limited, the appropriate terms for the concepts (e.g., "horizontal," "symmetrical axis") are introduced and used habitually.

Another important feature is the program's emphasis on detailed and precise work. The teachers followed this guideline, particularly in the identification and memory activities, but they made allowances for ability differences between children, as illustrated by the following comments of four teachers:

> I tend to demand completeness, but when a child tries hard and still has great difficulty completing an excercise, I accept uncompleted work. But not with the identification activities, only with the reproduction activities. I demand more from children who have a greater ability to do this work. In general, I don't demand completeness from every child. I feel that if I did and if I put them under a lot of pressure, they would stop working and would feel frustrated.

> I felt that I couldn't make the same demands of certain children, because of their particular ability or their emotional level. I wanted all the kids to love the program and to have the motivation to participate in it, so I wasn't able to make the same demands of these certain children.But this year (as opposed to last year), they are making demands on themselves to be exact and to do detailed work. For example, when they see a table leg which isn't exactly vertical, they reach the conclusion themselves that it isn't vertical, and they correct their work accordingly.

> I tried very hard to be consistent, but when I saw that a particular child was unable, I concluded he was simply unable. Usually I demanded exactness and all the children understand very well the concept "this is not exact." But when a child has to draw, this is difficult. Still, when a child has to show me a circle in the picture, or a square, here there are no compromises. A square has to be a square and not a rectangle, and a circle has to be a circle, and not an ellipse.

> Yes, I demand exactness, and this practice proved itself with time. At the beginning, I wasn't very firm about it, but later I learned that when you aren't consistent, things go downhill. When I started to demand exactness, the kids learned that this was important, and they demanded exactness in their own work and were more critical. In this work, it's important to know what is the starting point of each child. This is the personal relationship. But as far as exactness in identifying objects or shapes, all the children are in the same boat. Their ability to critique their own work is very high. They also can critique the work of others and this, too, is learning.

A third program attribute is its structured nature. There is strong evidence that both the teachers and children were enthusiastic about this feature. More details are given in the section on affective results.

(g) Relationship of parents to the program. A positive relationship was established between the preschool and the home, which enabled interested parents to make a modest but limited contribution to their children's progress in the program.

At the start of the year, before the program was implemented in the preschools, each teacher gave the parents · short description of the program and presented the booklets and the related materials. The parents' reactions were very positive. One teacher said:

> Mothers told me that their children would point out that the tiles in the bathroom were square and the mothers would reinforce this observation. I think this mutual reinforcement -- from parents as well as from teachers -- strengthens what is learned in the program.

The teachers did not give the children excercises to take home, since they believed that the parents might make excessive demands on their children. On the other hand, the teachers encouraged the children to bring from home those materials in which the different shapes appeared. This atmosphere of co-operation between preschool and home is expressed in the comments of the teachers:

> I told the parents about the program and asked them to co-operate with us, and that if their children asked for something specific, to give it to them. I asked that they be open and willing to help us integrate the home with our work in the preschool.

> Here and there, when parents and their children went on an outing, the children would see an ornament or the combination of a square and a circle, and they would point it out to their parents.

> Most of the parents are so happy with the program that they take the initiative to tell us when they see their kids do or say something unusual, which relates to the program. For example, one parent told me that during mealtime, his child noticed the circular shape of an egg yolk. Another time, his child measured everything in the house with a water level (note: the program used water levels to measure horizontal lines).

> There were parents who came to the preschool just to watch. The program simply interested them and they wanted to see what we were doing.

(h) Amount of required training and guidance. We found that teachers who were not observed regularly, at least at the beginning stages, might use incorrect teaching methods, e.g., drowning the children's visual experiences with excessive verbal explanations.

It is our impression that the implementation stage has been wanting with respect to teacher training. It seems that time must be set aside, before actual teaching of the program starts, for teachers to address, in a systematic way, such issues as the importance of the visual mode of thinking and ways of developing it. Teachers must be trained in teaching the Agam Program (perhaps to their fellow teachers) in situations where immediate feedback is possible (e.g., through micro-teaching). Teachers should perhaps be trained themselves in the Agam Program, so that they can experience the change in sensitivity their pupils will experience. A first-trial run of this type of teacher training is planned to be held in the Summer of 1985 for the teachers who will participate in the second experimental implementation of the Agam Program.

## B. COGNITIVE OUTCOMES

### 1. Background

(a) Goals. The following are three central goals of the Agam Program (Agam et al., 1983):

i) the development of visual skills in the perceptual, memory and reproductive domains,

ii) the improvement of intelligence, and

iii) the cultivation of creativity.

The units have been designed to foster the development of these goals. As an example, we describe the content and structure of Ornaments, the third unit in the program.

(b) Description of the Unit, "Ornaments." An ornament is a periodic series of visual elements. It is introduced to the children in the third unit after they have learned about circles and squares.

The first activities deal with identification. The children are shown periodic series of geometrical shapes starting with circles of a given size and color. The series gradually increase in complexity to include circles of different sizes and colors, then squares, then squares and circles, etc. The empty interval between elements is also introduced as an important variable. Once the concept has been mastered via the use of geometrical shapes, the children are encouraged to look for ornaments in their classroom.

The second section of the unit deals with <u>memorization</u>. Here, the aim is to practice the skill of storing visual information in memory and to exercise the ability to recall various ornaments.

The last part is <u>reproduction</u> in which children learn to produce ornaments. They start by reproducing an ornament presented by the teacher and continue by designing creatively their own ornaments using a variety of materials. This part culminates with the section <u>reproduction from memory</u> - in which children are shown ornaments for very brief periods of time and have to reproduce them from memory. The didactic structure of the unit <u>Ornaments</u> exemplifies a general approach which is realized in each unit.

In every unit, the use of words during the process of instruction is minimal. The aim is to allow children to experience the concepts that are taught in a direct visual manner, rather than conceptualize them through verbal definitions. Various means are used to enhance the internalization of the concepts: the body, group activities and the auditory mode. For example, children are given an auditory code for a circle and a square and are asked to create a visual ornament by following an auditory dictation. Exactness and self-checking are encouraged. The complexity of motor skills required is gradually increased in a way that allows each child to express his creative ability.

## 2. Methods and Analyses

(a) The Sample. An experimental versus comparison group design formed the basis for the research. The comparison group consisted of children who were not trained in the Agam Program. The comparison group was obtained by selecting five comparison preschools that were matched pairwise with the five experimental preschools on three criteria (see Table 2):

i) They were located in the same neighborhood. The average distance between the pairs of preschools was about 150 m. Since all the preschools in our study were public (or "municipal"), and since the assignment of children within a given neighborhood to a municipal preschool is random, this method of matching should result in samples of children randomly drawn from the same population.

ii) The preschools within each pair belonged to the same main grouping in the Israeli educational system: state, or state religious.

iii) The preschools contained both 4- and 5-year olds. However, this was not true in all preschools. During the 1983-84 school year, one class had only 4-year olds and another had 3- and 4-year olds (see Table 2).

## Table 2

Number of Children and their Ages in the Experimental and Control Classes

| | No. of nursery school | Location | Sector | Name of teacher | Number of children in class | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1983 - 84 | | | | 1984 - 85 | | |
| | | | | | Total | 3-year-olds | 4-year-olds | 5-year-olds | Total | 4-year-olds | 5-year-olds |
| Experimental preschools | 1 | Rehovot | Religious | Nechama | 32 | - | 12 | 20 | 26 | 12 | 14 |
| | 2 | Rehovot | State | Hanna | 21 | - | 21 | - | 28 | 7 | 21 |
| | 3 | Yavne | Religious | Georgette | 33 | - | 19 | 14 | 36 | - | 36 |
| | 4 | Yavne | State | Shula | 33 | - | 23 | 10 | 29 | 10 | 19 |
| | 5 | Rehovot | State | Dina | 24 | - | 8 | 16 | - | - | - |
| | | | | Total | 143 | | 83 | 60 | 119 | 29 | 90 |
| Control preschools | 6 | Rehovot | Religious | Rachel | 35 | - | 15 | 20 | 29 | 12 | 17 |
| | 7 | Rehovot | State | Shemira | 27 | - | 9 | 18 | 34 | 13 | 21 |
| | 8 | Yavne | Religious | Ricki | 35 | - | 5 | 30 | 36 | 12 | 24 |
| | 9 | Yavne | State | Ruthi/ Edna[a] | 25 | 15 | 10 | - | 35 | - | 35 |
| | 10 | Rehovot | State | Devora | 24 | - | 10 | 14 | - | - | - |
| | | | | Total | 146 | 15 | 49 | 82 | 134 | 37 | 97 |
| Experimental first grade | 1 | Rehovot | State | | | | | | 29 | | |
| Control first grade | 2 | Rehovot | State | | | | | | 29 | | |

[a] Ruthi's preschool in 1983-84 was replaced by Edna's in 1984-85.

(b) Tests of visual skills and their administrtation. Tests were created to measure the effects of the Agam Program on visual identification, memory and reproduction as they relate to the contents of each unit. The tests for the first 4 units, Circle, Square, Ornaments and Circle & Square, are given as Appendices B, C, D and E respectively. These tests contain a sample of the tasks included in each booklet. In general, they require the child to identify, remember and reproduce a circle or square, a combination of circles and squares, or a repetitive pattern of circles and squares, remember such a stimulus and reproduce it. The tests were given to the experimental group before (pretest) and after (posttest) the teaching of each unit. Some of the children in the comparison group received the test only once, when the corresponding experimental preschools completed the appropriate unit. Since the posttests include activities that are part of the Agam Program, the tests administered to the same-age comparisons could be expected to have a small but cumulative effect on performance. For that reason, the 4-year old comparison group was divided randomly into two halves, equal in intelligence as based on the results of Raven's Coloured Progressive Matrices (1965). One half received the same posttest as the experimental group. The other half received only one summary test at the end of the year.

The first year summary test with its two parts is given in Appendix F. About half the items in each part were based on activities similar to those in which the children received training. The other half consisted of items that tested different measures of transfer, such as identification and reproduction of letters, or memory for pictured objects presented disjointly in an array or as an integral part of a more complex drawing.

Each test was administered to groups of four children. Every child sat by himself/herself next to a table on which the test and all the necessary equipment (e.g., shapes, colors, etc.) were placed. The examiner stood in front of the children and another adult (usually the teacher) was there to help with the test administration. Before the test, different routines such as how to answer a given question were explained. When the tested concept, such as the concept of an "ornament," was unfamiliar, it was introduced briefly to the children.

(c) Tests of intelligence. To test the effects of the Agam Program on intelligence, three intelligence tests were administered: The Coloured Progressive Matrices (Raven, 1965), a nonverbal intelligence test, the Goodenough-Harris Drawing Test (Harris, 1963) and the WPPSI (Lieblich, 1979). The first test is a nonverbal individual test that requires the finding of a missing patch in a graphic design or matrix. Though visual in nature, it is a general intelligence test since it tests a general reasoning ability. The second test is a group test that requires the child to draw (with a pencil) a full picture of a man and/or a woman. Goodenough and Harris have developed a scoring method for these pictures that yields an intelligence score. The third test is an individual intelligence test containing five verbal and five nonverbal subtests covering a wide variety of skills. The experimental and comparison group were given the Progressive Matrices and the Draw-a-Man and -Woman tests, when the experimental children started to work with the Agam Program. They received the Draw-a-Man test and two items AB 4 and B 4 from the Progressive Matrices again at the end of the 1983-84 school year.

The administration of Raven's Coloured Progressive Matrices to a single child takes only about ten minutes, compared to the 75 minutes required to give a complete WPPSI. The WPPSI was given to all the experimental children. But because of the time needed to administer this test, only a sample of 5 children from each comparison age group -- 4- or 5-year olds -- in each preschool was given the WPPSI. We plan to administer the WPPSI at the end of the present school year 1984-85 to the same children to whom it was administered two years earlier.

It is expected that the experimental children will improve more than the comparisons from the first testing to the second. It is also expected that the effect of the Agam Program on the Draw-a-Man test, Raven's matrices and the nonverbal half of WPPSI will be more pronounced than on the verbal subtest of the WPPSI.

The WPPSI intelligence test may be used to yield two intelligence scores, a verbal IQ and a nonverbal IQ. These scores allow us to distinguish between children who are more verbal and those who are more nonverbally inclined. Hence we can test whether the Agam Program affects these two types of persons differentially.

(d) Measures of creativity. The children's creativity could be evaluated by looking at their free artistic work. The Israeli preschool's work day includes a daily hour of creative activity. In most cases the children express themselves in one of three media: drawing with crayons, painting with water colors or making collages. The productions of every child during one week were collected twice. At the end of each week, one random sample piece from each artistic medium -- crayon, water color or collage -- was selected from the child's portfolio. This sample will form the basis for a future analysis of the development of undirected artistic expression as affected by the Agam Program.

In addition, the total number of each child's weekly productions in each of the three artistic categories was recorded. The count was made for all experimental and comparison 4- and 5-year olds.

All the children in the experimental and comparison classes were asked at the end of the first year to make a crayon drawing of a child who is doing something which he likes to do. These drawings will be analyzed to yield another measure of the visual artistic creativity of the children.

The first year summary test included one item that required the children to transform each of 15 squares into a picture and to make as many different pictures as possible. Similar to the Torrance Tests of Creative Thinking (1974), this item can be scored to yield different indices of creativity, such as flexibility, fluency and originality. It is our plan to administer Torrance's Figural Test of Creative Thinking at the end of the 1984-85 school year.

Another measure of some aspects of the creative process may be obtained by looking at the results of the Draw-a-Man test. The test is usually considered to provide a measure of intelligence. However, the task measures creativity too, in the sense that it estimates the richness of visual information accumulated by the child about the subjects of his drawings, and his ability to represent on paper the visual imagery stored in his memory.

An additional test consisted of asking the children to draw a "model", i.e., the adult who administered the test. This test was administered together with the Draw-a-Man test at the beginning of the implementation of the Agam Program. Though model drawing is not part of the Goodenough-Harris test, it can be scored using the scoring guide for this test. The model drawing task reflects the ability of the child to express on paper what he sees, while the draw-a-man and -woman tasks assess the child's ability to produce on paper his internal imagination and the richness and accessibility of his visual memory.

The cognitive research instruments are summarized in a table in Appendix G.

(e) Analysis and presentation of results. The following sections summarize the cognitive achievements of the first year. Our research has resulted in a large amount of data. For the purpose of this report, only part of this data is presented. In order to provide the reader with a sense of the "whole picture" the results are described in four parts. The first describes in detail the results of one unit; this part illustrates how each unit was assessed. The second part overviews results of the first four units. The third part describes the summary test which was given at the end of the first year and some of its results, and the fourth part deals with creative outcomes.

Following the structure of each unit, the tests included tasks probing the visual skills of identification, memory and reproduction. The various skills were tested in a variety of conditions requiring different levels of motor skills. Accordingly, we discuss separately the results for each skill. We then compare the respective achievements in the experimental and comparison groups. The comparison is based on those children who took both this test and the Raven's Progressive Matrices intelligence test. Since the experimental and comparison groups did not have identical intelligence distribution, an analysis of covariance was carried out for the various variables, and corrected means were computed. In the following tables and graphs, these corrected means are reported. Each table includes also a column which reports the level of statistical significance for the difference between the performance of the groups (after the effect of IQ has been taken into account). Since many measurements were taken on each child, the significance levels reported in this column do not provide an appropriate measure of statistical significance. However, they provide information about the size of the difference between the two groups, taking into account the variability within the groups. The final report will include summary analyses, providing an appraisal of the size and meaning of differences between the experimental and comparison groups.

### 3. Results of the Unit, "Ornaments"

(a) Identification. This skill was probed by a debugging task (test item no. 6). Four different series of geometrical shapes were drawn in the test booklet. The children were told that some of these series are ornaments while others contain an error and need to be corrected. They were then asked to identify the series that contained an error and to mark the place that needed to be corrected. Of the four, one series was an ornament (henceforth referred to as an <u>example</u>) and three series were not (thus referred to as <u>nonexamples</u>). For instance, one of the series was the following.

Figure 5

Table 3 describes the results on this task.

<u>Table 3</u>

Percentage of Correct Identification for Example and Nonexample Ornaments.

| | Experimental Group (N= 55) | Comparison Group (N= 16) | p |
|---|---|---|---|
| example | 81.9* | 68.5 | N.S. |
| nonexample (average) | 59.6 | 20.2 | .0002 |
| Average | 70.7 | 44.3 | .0004 |

* All Percentages are corrected for intelligence effects.

Both in the identification of the example (correct ornament) as being correct and the nonexample as being incorrect, the success rate was higher in the experimental group than in the comparison group. It should be noted that, in the case of the nonexample, it was required of the children also to point out <u>where</u> the ornament needed to be corrected. When a less strict criterion was used, judging the children's ability merely to identify the nonexamples as such, about 80% of the children in the experimental group could do so vs. 50% in the comparison group. A comparison of the experimental group in the pretest and posttest of the same task shows an improvement of about 30% for both the example and the nonexamples.

(b) Identification: from concept to object. Each child was asked to identify in the classroom as many ornaments as he/she could (test item no. 9). The experimenter wrote down all the child's answers, whether they were examples of ornaments or not. Table 4 presents results for both types of answer. It also includes the maximum number of correct ornaments found in each group.

Table 4

Average Number of Objects Correctly and Incorrectly Identified as Ornaments.

| | Experimental Group (N= 55) | Comparison Group (N= 16) | p |
|---|---|---|---|
| Correct | 7.8* | 2.0 | .0005 |
| Incorrect | 0.9 | 0.6 | N.S. |
| Maximum Correct | 29 | 7 | |

* All numbers are corrected for intelligence effects.

The results indicate a considerable difference between the groups in the correct identification of ornaments, but there is no difference in the number of false identifications. This suggests that children in the experimental group did not overgeneralize the concept. It is also remarkable that there was a child in the experimental group who could identify as many as 29(!) different ornaments in his natural environment. There was considerable improvement from pretest to posttest for the experimental children, the number of correct answers increasing on the average by about 200%. These results are in line with the conclusion that the Agam Program was successful in "educating the eye," thus enabling the children to see more in their environment.

(c) <u>Memorization</u> (test items numbers 4 and 5). A memory card (size 28 x 22 cm) with an ornament, as in Figure 6, was shown briefly. Each child had to identify the same ornament in the test booklet out of the nine alternatives depicted in Figure 7.

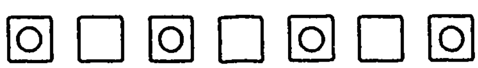
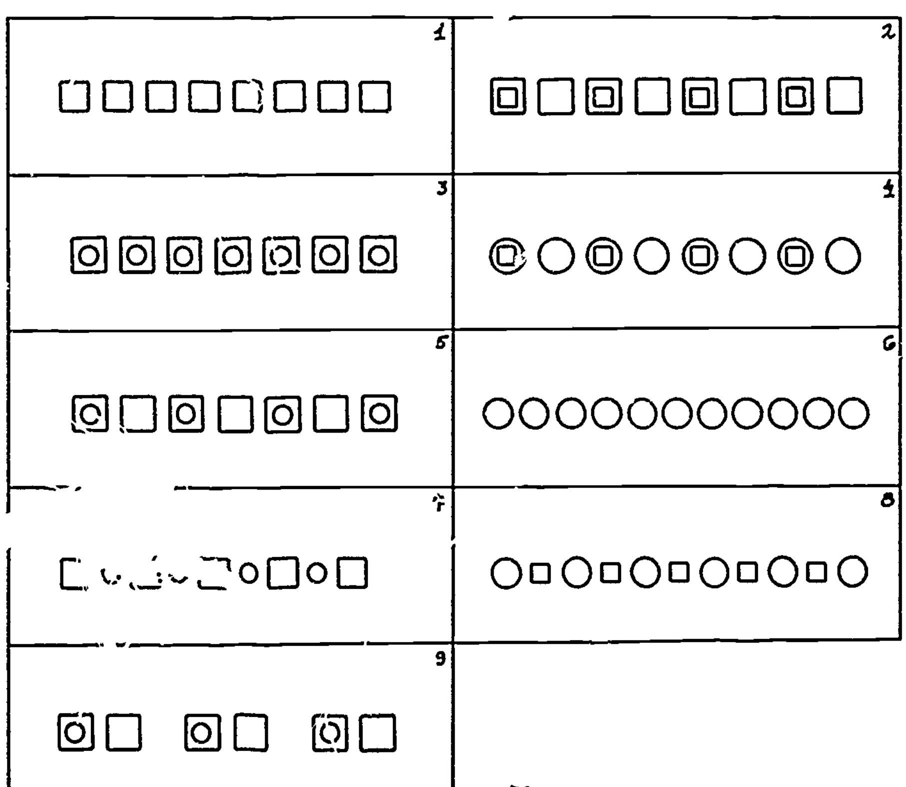
Figure 6 

Figure 7 

This task was given twice, each time with a different stimulus and different response alternatives. As can be seen from Table 5, the experimental group outperformed the comparison group.

Table 5

Percentage of Ornament Recognition.

| | Experimental Group (N= 55) | Comparison Group (N= 16) | p |
|---|---|---|---|
| Test item no. 4 | 32.6* | 19.0 | N.S. |
| Test item no. 5 | 49.0 | 25.2 | 0.005 |
| Average | 40.8 | 22.1 | 0.005 |

* All percentages are corrected for intelligence.

(d) Reproduction. This skill was tested by several tasks requiring different levels of motor dexterity. In one task (test item no. 7), the children had to draw the continuation of four different ornaments. One such ornament is given in Figure 8.

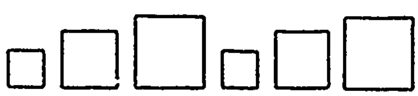


Figure 8

The average score for correct performance on the four tasks was 85.8% in the experimental group and 68.3% in the comparison group (significance for difference between groups with IQ serving as covariate $p < 0.03$).

In another task (test item no. 2), the children were given four small circles and four large circles, and the same number of small and large squares. They were asked to create an ornament. There were no differences between the groups in the performance on this task, about 80% of the children, in both groups, were able to create an ornament of some kind.

In another task (test item no. 1), the children were given pencils and were asked to draw any ornament they wished. The results, given in Table 6, indicate that about 90% of the children in both the experimental and comparison groups knew the concept of an ornament and were able to produce one.

Table 6

Characteristics of Ornaments Drawn by Children.

| | Experimental Group (N= 55) | Comparison Group (N= 16) | p |
|---|---|---|---|
| Any ornament | 89%* | 88% | N.S. |
| Complex ornament | 82% | 56% | 0.02 |
| Average no. of elements in unit | 2.4 | 1.6 | 0.003 |
| Average no. of shapes in element | 1.9 | 1.6 | 0.002 |

* All numbers are corrected for intelligence.

However, the ornaments drawn by the children in the comparison group were much simpler than those drawn by the children in the experimental group. To gauge the level of complexity of the ornaments drawn by the children, the following analysis was performed. Suppose that a child drew the ornament given in Figure 9.

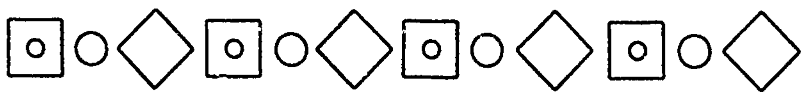


Figure 9

This ornament can be decomposed into *units*. Each unit includes three *elements* (a circle within a square, a circle and a square), and one of the elements includes two shapes (circle within a square). This ornament would be labelled as being *complex* since its unit includes at least two elements. The results presented in Table 6 suggest that children in the experimental group reached a higher level of ability to conceptualize and create ornaments.

(e) *Reproduction from memory*. This skill was probed by two tasks. In one task (test item no. 3), a simple ornament consisting of alternating blue and yellow squares was shown briefly and the children had to reproduce it with elements given beforehand. In another task (test item no. 8), the children had to draw the ornament given in Figure 10, which was also shown very briefly.

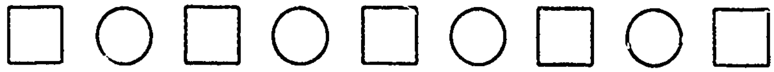


Figure 10

In both cases, there was no significant difference between the groups.

To summarize, the cognitive results from the unit, Ornaments, are encouraging. The visual skills of children in the experimental group seem to have improved considerably relative to those of the comparison group. In particular, children improved their skills of identification, memorization and reproduction:

i) Identification: Children in the experimental group seem to have gained a high level of visual sensitivity and discrimination ability with regard to the concept of ornaments. This is evidenced in their success in debugging errors in an incorrect series and in detecting ornaments in their environment..

ii) Memorization: Children in the experimental group better memorized the presented ornaments.

iii) Reproduction: Children in the experimental group increased their mastery of the concept of ornament as evidenced in the complexity level of the ornaments they produced.

## 4. Overview of the Results in Units 1-4

This section summarizes briefly the results of the various skills across the four units. The complete tests are enclosed in Appendices B-E. Because of space limitations, not all tasks will be discussed.

(a) Identification. In each of the four tests, children were asked to identify examples of the relevant concept in their environment (e.g., for Unit 4 - an object which is a combination of a circle and a square). Figure 11 shows the average number of correct examples after IQ has been taken into account (corrected means) and Figure 12 shows the same for incorrect examples.

An analysis of covariance was performed on the average number of examples (across the four units) with IQ (as measured by the Raven test) serving as a covariate. The test yielded a highly significant difference ($p < 0.00005$). On the other hand, there were no differences between the groups in the number of incorrect answers. These results indicate that children in the experimental group became more observant and sensitive to the visual aspects of their environment. However, they did not overgeneralise the concepts more than children in the comparison group. The following are a few examples of items given by the children: Circle - telephone dial, head of nail, shoelace holes, drum, clock, lights of a traffic light, circular table, dish, button, round table cloth.

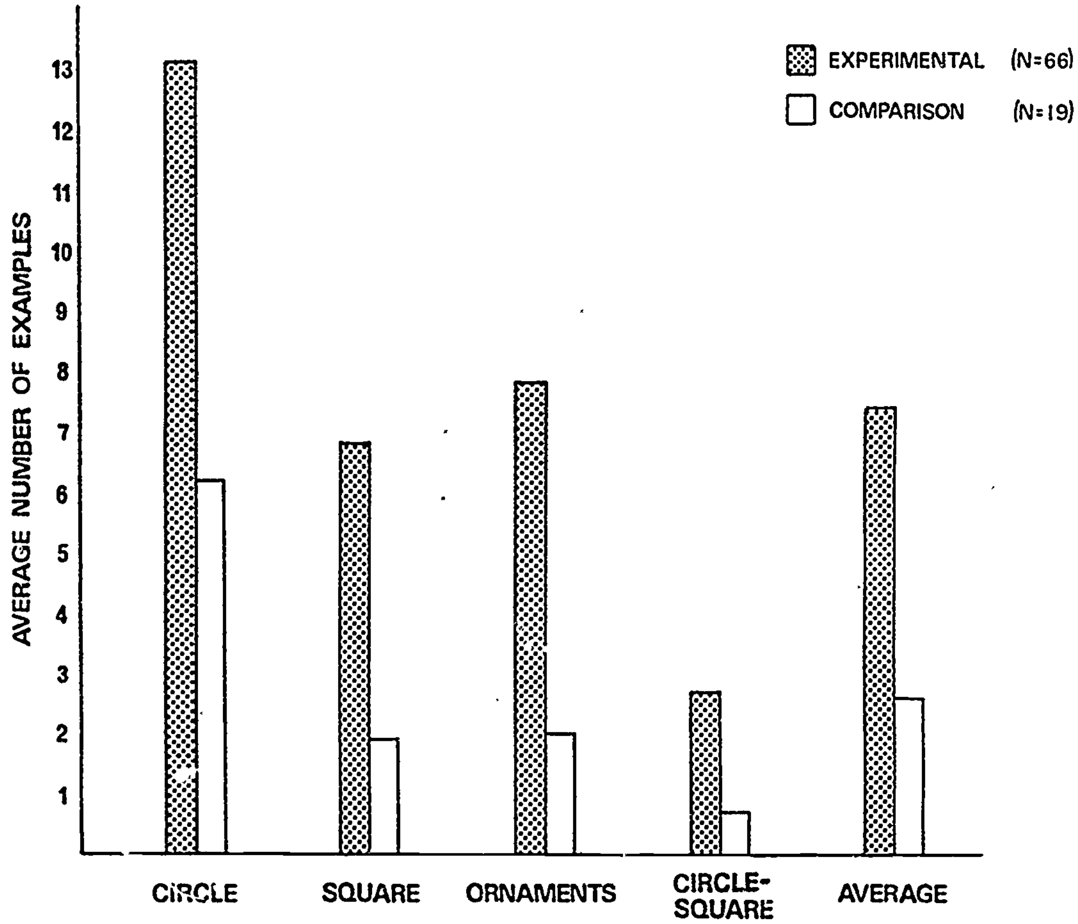



Figure 11. Average Number of Correct Examples (Corrected for Intelligence) Given by Children in the Experimental and Comparison Groups in Each Unit.

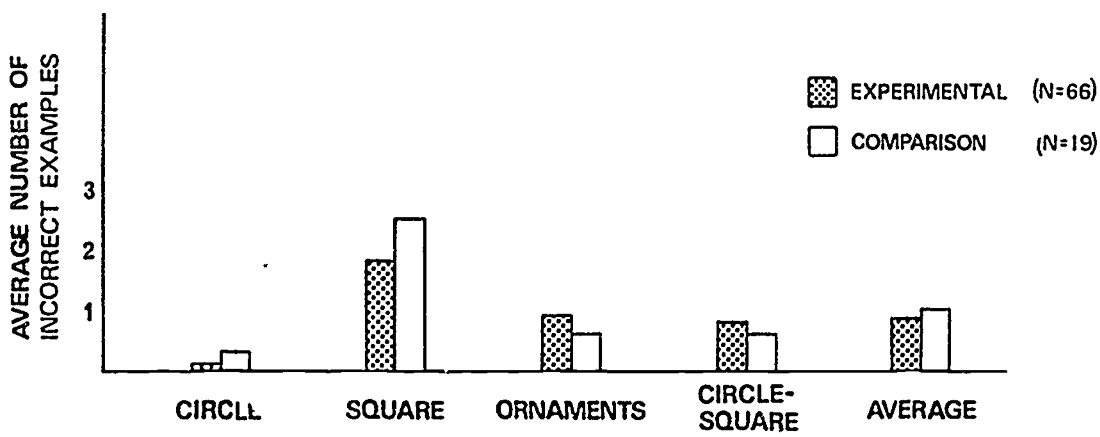



Figure 12. Average Number of Incorrect Examples (Corrected for Intelligence) Given by Children in the Experimental and Comparison Groups in Each Unit.

Square - pillow, window, front doors of a closet, picture, frame of television, mirror, lamp shade, book, bottom of a chair's leg, empty space between rungs of ladder, floor tiles, electric socket.

Ornament - row of children's cubicles in preschool class, letters in some children's names (e.g. LiLi), television dials, shoelace holes with laces, nails in children's chart, pattern on socks, floor tiles, preschool windows, perforated holes in computer paper, abacus, steel bars on windows.

Circle and Square - round table with square tablecloth, square room's ceiling with circular lamp, basketball net and backboard, square telephone and its circular dial, plastic container for eggs, traffic light, kitchen tile with a hole in it for the faucet, circular lip of pasta drainer (with net of squares), car headlight inside square frame, a record and its record-jacket.

(b) Memorization. In every test, (except for Unit 1) children were shown briefly one or more "memory card". They had to identify the appropriate item out of nine drawings in their test booklets. Figure 13 presents the percentages of correct answers in the experimental and comparison groups after IQ was taken into account. If there was more than one task of this type for a given test, an average success rate was computed. The difference in average score (across units) is significant at a level of 0.01 (analysis of covariance with IQ as a covariate).

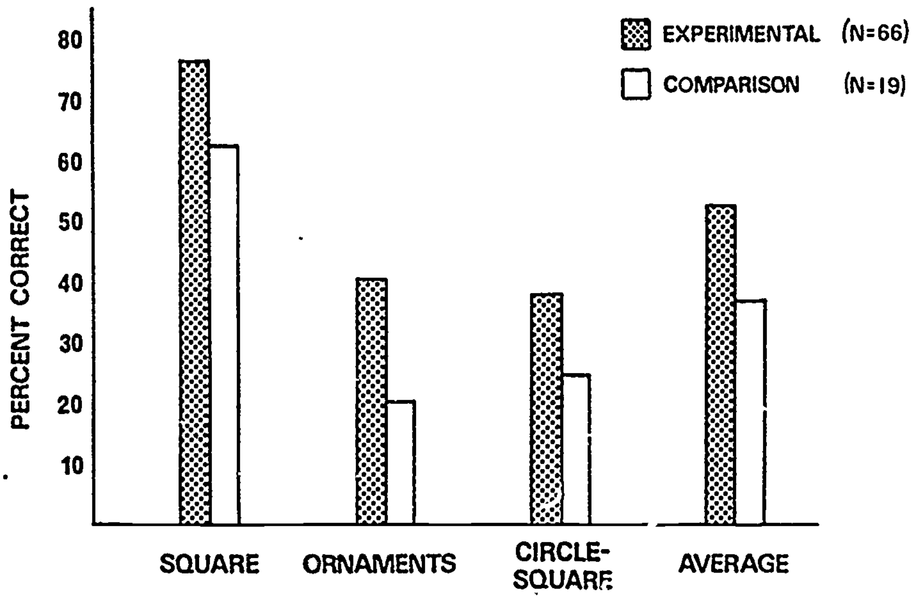



Figure 13. Mean Percentage (Corrected for Intelligence) for Identification of Memory Cards in Each Unit.

(c) Reproduction. The reproduction tasks in the various visual tests can be categorized into : (1) reproduction in presence of stimulus - tasks where the stimuli were present while the child reproduced them, for example, a copying task. (2) reproduction from memory - tasks where the stimuli were absent during the reproduction. As an illustration, we describe the three reproduction tasks given in the unit, Square (see Figure 14). The tasks were: (i) Reproduction with Stimulus (RS); various combinations of shapes were presented on the left side of a page. The children were asked to copy them on the right side. (ii) Reproduction from Memory by drawing (RM); the experimenter showed briefly a card with a combination of shapes and the children had to draw from memory what they saw. (iii) Reproduction from Memory with Transparencies (RMT); in this task, the experimenter briefly showed a card with a stimulus. The children reproduced it from memory with transparencies.

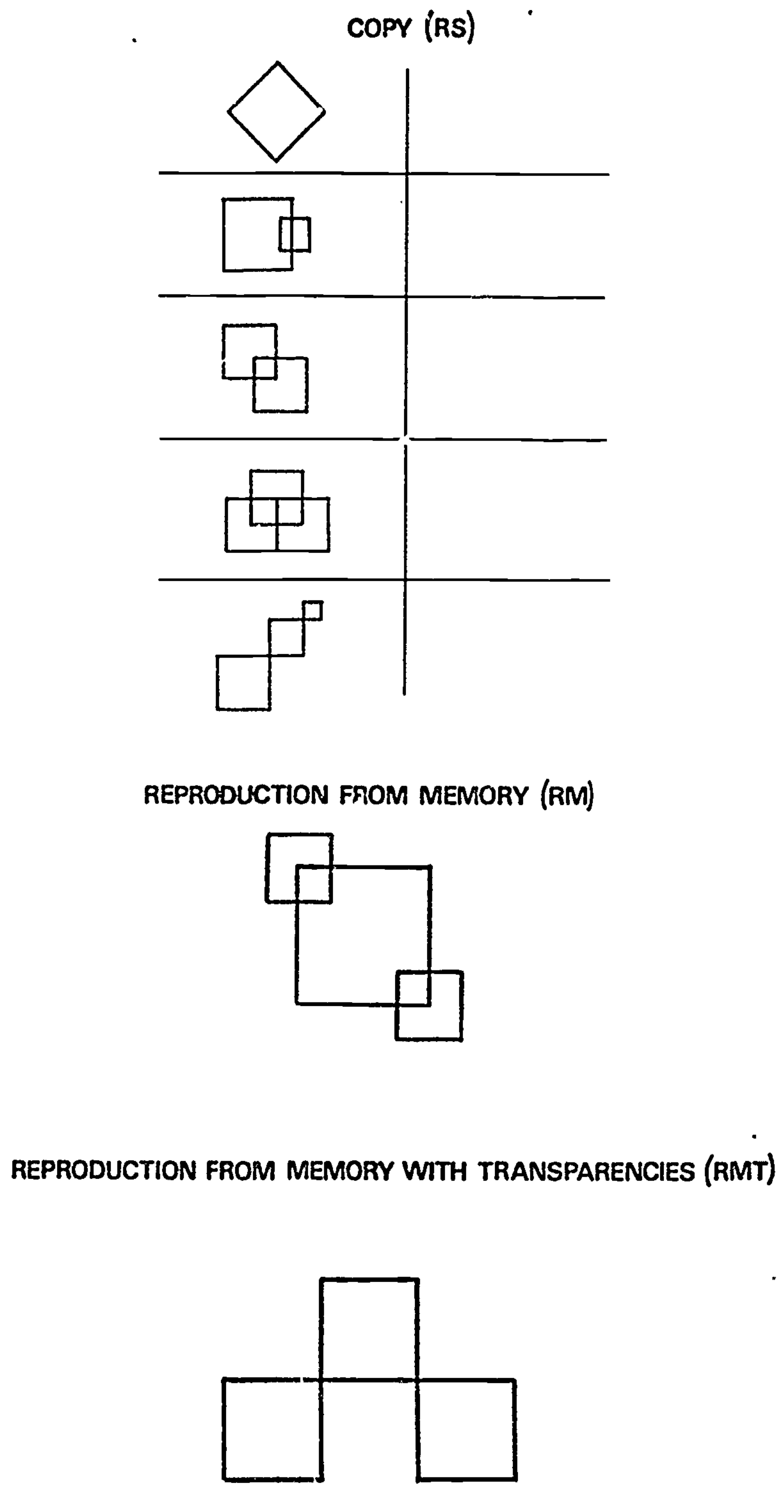

COPY (RS)
REPRODUCTION FROM MEMORY (RM)
REPRODUCTION FROM MEMORY WITH TRANSPARENCIES (RMT)

Figure 14

Four aspects were considered in the analysis of children's reproductions: (1) synthesis - whether the child drew only the components of the drawing separately (analysis only) or considered also their relative position (analysis and synthesis), (2) spatial relations, (3) number of shapes and (4) relative size of shape. Four scores were computed for each drawing, evaluating performance on each of these aspects. These scores were then computed into an average (reproduction) score. If there was more than one task of a given type, as in the case of the copying task in the unit, Square (6 drawings), an average of the reproduction scores was computed.

Thus, three average scores were computed from the various reproduction scores in units 1-4: one for all tasks of copying (RS), one for all tasks of reproduction from memory by drawing (RM) and one for all tasks of reproduction from memory with transparencies (RMT). These average scores were subjected to analysis of covariance with IQ (as measured by the Raven Matrix test) serving as a covariate. Figure 15 presents the corrected average scores for the various reproduction tasks in the experimental and comparison groups. The analysis of covariance resulted in a statistically significant difference only in the case of reproduction from memory with transparencies ($p < 0.001$).

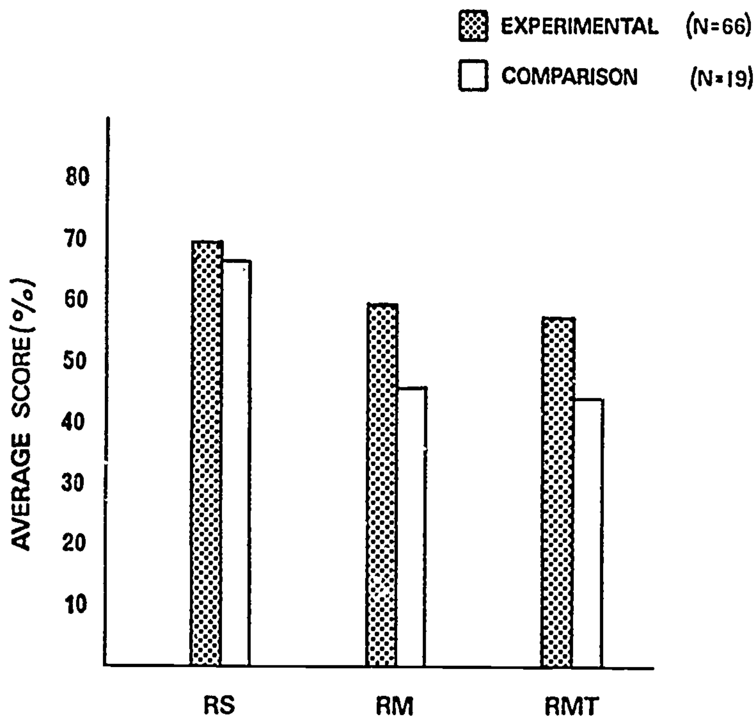



Figure 15. Average Scores (Corrected for Intelligence) for Reproduction Tasks in Units 1-4. RS = copying tasks; RM = reproduction from memory by drawing; RMT = reproduction from memory with transparencies.

It is of interest to examine more closely the four aspects described above for tasks where differences were observed. As an illustration, Figure 16 presents the corrected average score' for reproduction from memory with transparencies for the unit, Square. When the above-mentioned aspects for the other tasks are examined, it turns out that, in general, there was a difference between the groups in the ability of children to synthesize. This result is consistent with the program's emphasis on combinations of shapes.

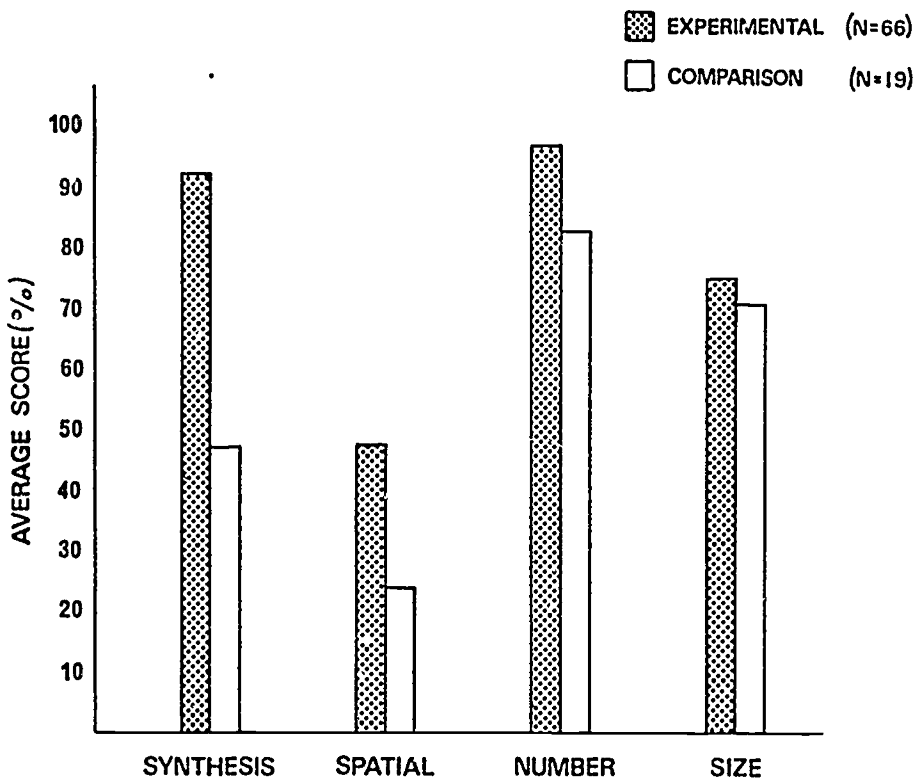



Figure 16. Average Scores (Corrected for Intelligence) for Reproduction from Memory with Transparencies in the Unit, Square. The four measures are described in the text.

To summarize, the results of units 1-4 indicate a considerable improvement of children in the experimental group in skills of identification and memorization, and a moderate improvement in the skill of reproduction. In particular, the ability of synthesis was advanced considerably.

## 5. Results of Summary Test - First Year

At the end of the first school year (after about 7 months of working with the program), all the children in the experimental and comparison groups were given a summary test. The test included items which were not specific to a given unit. It was designed to test the same visual skills assessed in the unit related tests, but in a wider context. The complete test is given in Appendix F. Because of its length, it was administered in two parts. The procedure was similar to that described at the beginning of this section.

(a) Identification. The children were presented the combination of shapes shown in Figure 17.

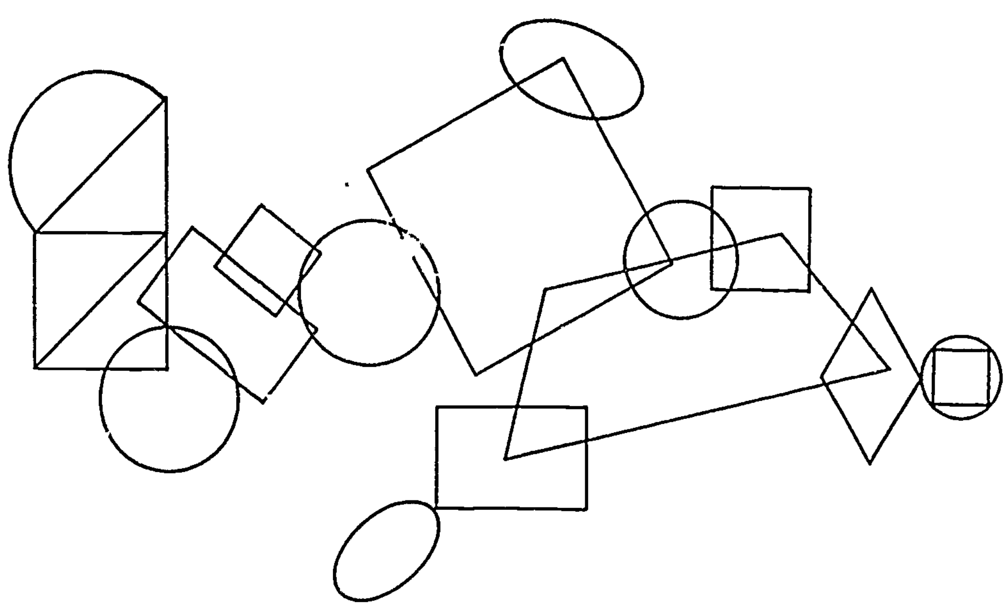


Figure 17

The children were asked first to identify all the circles by tracing their circumference in red, and then to identify the squares similarly in blue. Table 7 presents the corrected mean percentages for the experimental and comparison groups. The percentages are separated for the correct identification of examples and nonexamples.

Table 7

Mean Percentages for Correct Identification of Circles and Squares in a Complex Drawing of Geometrical Shapes

| | Experimental Group (N= 134) | Comparison Group (N= 108) | p |
|---|---|---|---|
| Circle examples | 94.2* | 93.4 | N.S. |
| Circle nonexamples | 50.9 | 60.5 | N.S. |
| Square examples | 77.1 | 62.0 | 0.001 |
| Square nonexamples | 79.9 | 79.0 | N.S. |
| Average for examples | 85.7 | 77.7 | 0.01 |
| Average for nonexamples | 65.4 | 70.7 | N.S. |

* All numbers are corrected for intelligence.

The children who were trained in the Agam Program were systematically superior to the comparison children in the identification skill. However, about 50% of children in both groups marked all the round shapes as circles. This suggests that at this age children tend to overgeneralize from a "circle" to a "closed round shape." In its present form, the program does not seem to succeed in fostering this discrimination. This is not surprising, since there are no activities with round nonexamples of circles. Since such a discrimination is desirable, such activities are recommended. On the other hand, there was a considerable difference between the groups in the identification of correct squares but there was no significant difference in false identifications. This finding further indicates that there was no overgeneralization of this concept in the experimental group.

(b) Memorization. In the visual tests for the units, the stimuli in the memorization tasks involved only combinations of geometrical shapes. The summary test included also memorization tasks, where the stimuli were pictures of objects. Each picture was shown by the experimenter briefly. The children were then given a set of items and were asked to mark the ones that were present in the picture. The two tasks of this type are shown in Figure 18.

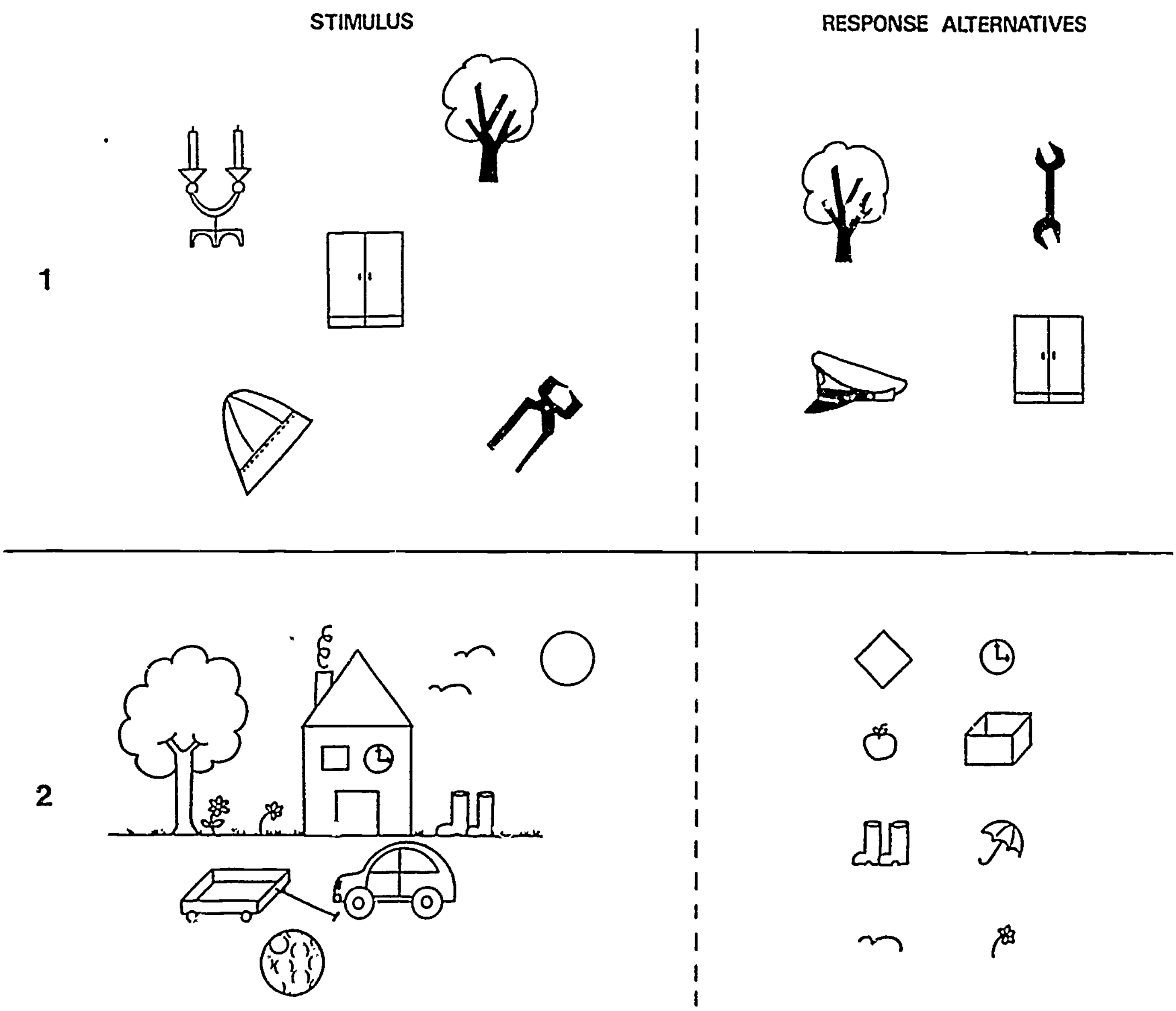



Figure 18

Table 8 presents the results of this task in terms of percentages for correct identification of objects that had been part of the picture (stimuli) and those that had not (distractors) and were left correctly unmarked. The results indicate a superiority of the children trained in the Agam Program over the comparison children. These findings suggest that the effects of training in this method are not restricted only to the materials used by the program since both tasks involved stimuli representing everyday objects. Thus the visually educated children seem to see more in their environment and remember it better.

Table 8

Mean Percentages of Correct Identification of Objects in Drawings

| | Experimental Group (N= 134) | Comparison Group (N= 108) | p |
|---|---|---|---|
| Average for stimuli | 74.7 | 63.4 | 0.03 |
| Average for distractors | 41.9 | 47.4 | N.S. |

* All numbers are corrected for intelligence.

Another task of memorization (task no. 10) involved the identification of a memory card which consisted of a combination of circles and squares. The experimental group outperformed the comparison group (an average of 56.3% vs. 38.7% after IQ has been taken into account, $p < 0.06$).

(c) Intelligence. Two items from the Raven Intelligence Test (tasks no. 5 and 6) were included in the summary test. After the effect of IQ as measured in the beginning of the year, no differences were detected between the groups on these items (average success of about 33%).

(d) Additional analyses. Some of the tasks (e.g., reproduction) were not analyzed yet and will be reported later. Further analyses of the program's effect on children of different levels of IQ is being performed. These analyses will shed light on the effect of the program on children of different ability levels. In particular, analyses with respect to the verbal and nonverbal components of IQ will be carried out.

## 6. Results on Creativity

Most indices collected to shed light on the Agam Program's effect on creativity have not been analyzed yet. One measure which has been analyzed superficially (i.e., without making the usual statistical analyses) is the count of free art pieces made with crayons, water colors or collages that were produced by the children during two one-week periods. The results were that the experimental children produced an average 1 03 pieces of free art per day per child compared with 0.97 in the comparison group. The results show clearly that the experimental children suffered no disadvantage. These data therefore seem to reassure us that the training of visual skills in the perceptual and reproductive domains, which is included in the Agam Program, does not suppress the child's free artistic creativity.

The average number of art pieces produced by the five-year-olds was 0.9 and .79 in the experimental and comparison classes. The comparison of these two means is not of interest since both five-year-old groups were not trained in the Agam Method. But it is worth while noting that they are lower than the averages for the four-year-olds, in line with the claim that the urge for free creative expression declines with age.

A sample of children's artistic work is given in Appendix H (separate volume).

## D. AFFECTIVE OUTCOMES

The observations made by the preschoool teachers and the staff indicated repeatedly that the program stimulated a high level of enthusiasm and motivation. This was true for all the units of the Agam Program and for the various parts of each unit. The positive reception of the program by the children further increased the favorable attitude of the teachers toward the program.

The general impression of the staff was that the teachers and the children freely invested a great deal of energy and time in the program. When children entered the preschool, they would often ask when they would be able to participate in the Agam Program activities. Children would leave their morning snack, in order to join an activity group and not miss their allotted Agam activity time. When they were called by the teacher to work on the activities, the children appeared very happy and eager to participate. When these activities were concluded, the children often expressed disappointment and asked to remain for additional activities. They reacted positively even for activities which make considerable demands on them (e.g., visual memorization and graphic reproduction).

We asked teachers to comment on the motivational aspect of the program. The following quotations are typical responses:

> When people ask me -- "Well, does the program work or doesn't it? Is it good or not?" -- I answer that I don't know. But I tell them one thing, that the program is fun, that the children love it, and that that's already an important accomplishment. When I see that the kids want to participate in the activities, when they tell me how sorry they are that the activities are over, and when the children sit in the preschool in the morning and work on all sorts of activities derived from the Agam Program (and they love to do these things) and when they invent by themselves new ideas that go beyond what is provided by the program, this is great!

> They loved the program a lot. All you had to do was say "Agam"..... (here the teacher paused and smiled). It was like that the entire year. I noticed that each child's motivation decreased in the area where he was weak. Like the boy who was strong from an intellectual point of view but weaker in his fine motoric abilities, well, the moment he had only intellectual activities (e.g., identification of memory cards) he worked with much more enthusiasm, as compared with activities involving fine-motor work (e.g., graphic reproduction).

We asked teachers if some children refused to participate in the program or had negative reactions towards it. One teacher responded that there were individuals who refused to participate but that these children had general learning problems and refused to participate in all preschool activities, not only in the Agam Program. Otherwise, teachers responded as follows:

> In principle, there was never an instance where a child refused to participate.

> I don't recall a single instance, but I think that in one case a group of children successfully encouraged a reluctant boy to participate. They told him: "Come on, it's worth it!"

Detailed records were written by all the teachers on each activity they presented. These records provided information on how interesting the activities were for the children. With the exception of two activities that seemed to lie above the ability level of the children, all of the activities tested in the program were reported to be very interesting to the children.

In light of these positive responses, the research staff held a special session with the experimental preschool teachers in an attempt to characterize the factors which contributed to the program's appeal. The following aspects were identified in the discussion:

(a) The quality of the activities. Each booklet of the program contains a rich variety of ideas and activities. In every new booklet the children are still surprised by novel activities and, therefore, their curiosity is maintained throughout the program.

(b) The program's structure. In the field of art education, many advocate a complete lack of adult interference and direction (e.g., Bland, 1960; Hoover, 1961; and Kellog and O'Dell, 1967). Nonetheless, we found that the general structure of the Agam Program, as well as the individual structure of each booklet, make it easier for teachers to present the material and to deal with this material in a systematic and in-depth fashion. The children seem to enjoy this structured approach, which seems to make it easier for them to absorb new knowledge and to be aware of their progress in the program.

The teachers noted the following change in the children's attitude in regards with the memory activities that appear regularly in every booklet. At the beginning of the program, the children asked for "easy" cards, but after several months they demanded work with "difficult" cards. It seems that since the children encountered the memory activities in a structured and systematic manner, they were able to develop their memory skills and to be aware of their progress. As a result, the children are looking for visual challenges and feel confident that they can deal with these challenges, because they have developed the necessary skills.

The fact that the children are aware of the program's structure is illustrated in the following incident, as related by a teacher.

> When we completed the booklet on oblique lines (Unit 9), Noah asked: "And what will be the next unit?" I answered: "What do you think?" Noah thought for a moment and said: "I think it will be a booklet about horizontal, vertical and oblique lines." "How do you know?" I asked. Noah responded: "Because once we learned about the circle and then we learned about the square and next we had the booklet on the circle and the square."

(c) The program's attractive materials. Each unit utilizes a variety of program aids. The use of these materials strengthens the children's identification and reproduction of specific shapes and patterns. The materials, which come in different sizes, colors and textures, seem to heighten the children's interest in the program.

(d) The varied opportunities for success. The program provides a variety of ways for children to succeed, based on their own strengths and skills. As one teacher put it:

> This quality of the program allows us to give children reinforcements naturally, every step along the way. I think this adds a great deal to the children's self-confidence, and this self-confidence expresses itself in all the other areas of their work, not just in the Agam Program.

(e) The social interaction of the participants. The program's activities are designed for small groups of children. The resulting interaction and mutual stimulation helps children learn from each other and enhance their enjoyment of the program.

(f) The connections of the program to the child's everyday life. The visual world occupies a vital and central place in a child's everyday life. By providing children with tools to manipulate and use a visual language,the program seems to enhance the children's understanding of their visual world.

## E. OTHER CONTRIBUTIONS OF THE AGAM PROGRAM

This section reports our findings regarding program effects other than those relating to the cognitive and affective outcomes reported above. We first discuss the program's contributions to different children and next consider the program's contributions to the learning of different subject matter in the preschools.

### 1. Contribution to Children with Apparent Learning Deficiencies

> Many more children were able to find their strengths in the Agam Program than in other preschool activities, most of which are verbal. There were children who had great difficulty expressing themselves verbally and who were very quiet and passive most of the time. These same children actively participated a great deal more during the Agam activities. I think this is because those children had the opportunity to express themselves and to create things without needing to use words. I was very excited to discover that these children had skills that, perhaps otherwise, I never would have noticed.

The teacher quoted above could have pointed to the example of Esther, who, at the beginning of last year, exhibited an extremely poor level of fine-motor co-ordination (note: the names of the children mentioned in this report have been changed, to protect their privacy). Esther demonstrated a very low level of self-confidence, as expressed by her tendency to seclude herself from others and to refuse to participate in large group activities. She exhibited inappropriate and childish behaviors. Sometimes, when she found it hard to adjust, she burst out crying.

Her self-imposed isolation was an escape from dealing with others, especially in a verbal manner. Based on this background, Esther's teacher had low expectations of her.

The Agam Program made it possible for Esther's teacher to discover Esther's skills and potential in other areas and -- as a result -- to modify her own impression of Esther. During one of our meetings with this teacher, she said: "If only because of its effect on Esther, the Agam Program was worthy of implementation in my preschool."

The Agam Program gave Esther the opportunity to successfully engage in nonverbal activities within a small-group context. For example, she was able to construct various objects and shapes without the need to use words. As a result, she loved the Agam Program a great deal. She would often leave the playground in the middle of a game in order to enter the classroom on time so she could participate in an activity from the program. She did this without any fear whatsoever, in sharp contrast with the other preschool activities. Esther ell in each of the three major types of activities in the Agam Program: identification, reproduction and memory. Her fine-motor skills improved, her drawings became more sophisticated, and her ability to concentrate and work with persistence increased. The self-confidence she gained from the Agam Program became visible in other areas of her work. In addition, Esther's relationships with the other children and adults in the preschool improved as well.

One of the great strengths of the Agam Program is that it provides a framework for expression, for each child, according to his or her own skills. Each child can succeed at the "identification" activities. Children who find the "reproduction" activities difficult (via drawing) can successfully create the same shapes or patterns with various aids (e.g., transparancies, wood shapes) or with the use of their own bodies. The teacher can adapt the "memory" activities to suit the ability level of each child, by manipulating the different parameters of the memory cards (e.g., duration of presentation, complexity of the graphic, and number of memory cards presented for recall). Thus, the three major types of activities which compose the Agam Project can be tailor-made for each participating child.

The following example describes one participating child whose maturity and skills were quite weak. This child -- we will call him Aaron -- succeeded particularly well in one area of the Agam Program, and this success had a significant effect on his overall behavior and personality.

At the beginning of the year, Aaron was quite an immature child who lacked perserverence and the ability to concentrate. There were severe doubts that he would be able to function adequately in first grade. Aaron's teacher told his mother about these worries and his mother began teaching him at home. But this added only more pressure, and Aaron became even more frustrated, with a low self-image. He became disruptive in class and seemed to enter a vicious cycle of negative behavior.

At first, it was difficult for Aaron to sit quietly and follow instructions even in the Agam Program activities. During these activities, he would often run outside of the classroom. His poor graphic abilities seemed to amplify his overall lack of success. However, the teacher noticed that Aaron had a relatively good visual memory, and she focused her efforts on developing this ability. Aaron received much reinforcement for his good visual memory, as expressed in the Agam Program activities, and this pleased him very much. Eventually, this process had a positive influence on his overall motivation and desire to succeed, his graphic ability, his perserverence and his ability to concentrate.

The teacher called these developments to the attention of his mother, who confessed that she had been continually criticizing her son for his poor behavior and abilities. She felt that this criticism gave him feelings of inferiority and a lack of confidence, but she had not known what else to do. As a result of her son's successes in the Agam Program, the mother could now join the teacher in reinforcing Aaron's accomplishments. In effect, the negative cycle of behavior was now replaced by a positive cycle of behavior.

Our observations in the comparison preschools also point to the value of visual education to different children. We have found that certain children, who otherwise perform oorly in the conventional word-oriented subjects, have excellent skills in the visual domains. As in the cases of Esther and Aaron, these children could see themselves as capable, successful, and even better-than-average in a program of visual education. Moreover, their teachers and parents could reinforce their visual skills, thereby inducing positive cycles of behavior.

The following story of a child from one of the comparison preschools illustrates this point. When we administered the test on the concept of "horizontal" to the comparison preschools, one of the tasks given to each child was to identify objects or shapes in the preschool that contain a horizontal line. It is important to note that since these children had not received the Agam Program, the test-giver briefly demonstrated the meaning of a horizontal line. We assume that this was the first time the children heard of this concept.

One of the children, Udi, was outstanding in his fine discrimination and systematic performance of this task. He identified 16 objects without error. The test-giver, who had administered this task in a number of preschools, was impressed by Udi's performance and his original answers. For example, among his answers Udi included the horizontal steps of a toy tractor, the upper horizontal line of a drum, the upper horizontal line of a cylinder, and the horizontal line of a three-dimensional triangle.

After the test, in light of Udi's unusual performance, the test-giver took an interest in Udi, asked the teacher about him, and discovered that he was considered a very problematical child. "This is a child who receives special tutoring and who has severe problems of fine-motor co-ordination and concentration," explained his teacher. When the test-giver told the teacher about Udi's performance on the test, and the teacher reacted in amazement. Likewise, Udi's special tutor received the news with great enthusiasm.

Perhaps the discovery of Udi's strong visual skill can now be used to direct future work with Udi, in order to modify his overt behavior and perceived image in the preschool. And perhaps there are many other children like Udi, who are characterized as as problematic, but whose strong visual abilities go unnoticed and undeveloped.

## 2. The Development of Social Skills and Good Work Habits

"From the social point of view, the children had more contact with each other," commented one teacher. "Since they worked together in small groups, they had more opportunity to develop courtesy and tolerance for each other." This tolerance was demonstrated during the drawing activities, when the children refrained from criticizing each others' work, and during the memory activities, when each child had to wait patiently until his or her turn came to identify the flash cards. "When you see a four-year old child letting another child have his turn, you know it requires a great deal more than from an older child," said another teacher.

Good work habits were also developed through the program. The structured nature of the program and its daily presentation helped develop persistence and concentration in the children. In addition, the program required that the children listen to and follow instructions, and that they work quite independently. The children learned to follow directions from different people (e.g., different test-givers) and not solely from the teacher.

## 3. The Development of Motor Skills

The program made it possible for children to improve their fine-motor co-ordination. "David at first didn't know how to hold a pencil in his hand," one teacher told us. "I never would have worked with him on his fine-motor skills were it not for the Agam Program. To the program's credit, I did work with David. Now he can hold his pencil steadily and can draw with exactitude."

The program's activities also helped children develop their eye-hand co-ordination. In addition, the activities helped children develop their body awareness and sense of balance (e.g., when each child had to illustrate certain shapes and lines with parts of their body, and when each child had to illustrate an oblique line with his or her entire body).

## 4. The Development of Language

There is no inherent reason why verbal language cannot be developed in a program designed to develop visual language skills. In the Agam Program, a complementary relationship seems to exist between these two areas. The program enriches the children's vocabularly with such novel concepts as "flash" identification, integration (e.g., integration of circle, square and triangle), ornaments, horizontal, vertical, oblique, equilateral triangle, etc. These concepts are internalized verbally and nonverbally by the children, who use them in many different ways.

The development of the visual language prepares the children for the written language, i.e., reading and writing, since the development of observation abilities is basic to the development of these two areas. For example, according to a teacher of first graders, the program helped the children develop their visual discrimination and reading skills, after only 3 months of activities.

The excercises in graphic reproduction and in the development of symbolic language (e.g., the reproduction of shapes made by one's arms, by drawing lines on paper) seem to increase the children's readiness for writing. As one teacher said:

> The moment I see a specific program present something to a child, and the child internalizes it, and afterwards he sees that the "nun" and the "taf" (two Hebrew letters: נ and ת ) are made up of combinations of vertical and horizontal lines, I say that's great! This is when we've reached our goal, when the child knows how to transfer what he has learned to new situations. This is what's so beautiful about the Agam Program. There are many examples of this. I don't know if the children would have reached this (level of transfer) without the program.

Of course, a more thorough and systematic study is needed to reach well-founded conclusions about the program's effects on reading and writing. Such research should involve follow-up studies of the children in the experimental and comparison groups, after the children leave preschool.

## 5. The Development of Mathematical Concepts

The Agam Program presents children with a sound and intuitive basis for the formal understanding of geometry. The subject of geometry is important for two main reasons: (1) geometrical concepts are of widespread importance in many areas in daily living, and (2) the study of geometry is important in mathematics education, since the topic is an excellent example of a system of mathematical deduction. Regarding this latter point, it is generally well-accepted that without an intuitive understanding of geometrical shapes, children find it very difficult to learn deductive geometry In the United States, for example, where until recently the practice was to teach the subject as a one-year course in junior high school without prior preparation, student achievement was very low. In contrast, in the U.S.S.R., where geometrical concepts are presented at an intuitive level much earlier, student achievement in geometry is much higher. In Israel, intuitive treatment of some geometrical concepts is given to elementary school students. However, the Agam Program raises the possibility of beginning such training earlier, in a more systematic and in-depth manner than presently available for preschoolers.

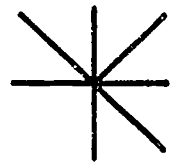
## 6. The Development of Problem-Solving Strategies

The reproduction activities, a principal component of every booklet, seem to develop analytic and synthetic abilities in addition to the graphic skills.

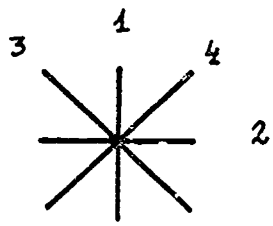
In these activities, children reproduce from memory or copy models consisting of combinations of basic shapes. In order to successfully perform the reproduction activities, children learn how to mentally break down visual shapes into their component parts (analysis) and to mentally and graphically reconstruct these visual shapes from the necessary elements (synthesis).

The following example, observed and reported by one of the staff members, illustrates the development of these abilities.

At the beginning of the year, when Meir had to copy cards from unit 5, he needed to look at the picture many times in each stage of copying. This procedure resulted in relatively poor reproductions. The observer's impression was that Meir had difficulties in analysing the picture's components on the basis of its basic shapes (circle, square) and therefore he was unable to correctly reproduce the picture and the relations between its elements. She noticed a marked improvement in Meir's performance. The task given to the children was to reproduce from memory the following flash card (number 25):



Meir reproduced this picture as follows:




(the numbers represent the order of reproduction).

According to the order of Meir's reproduction, the observer presumed that Meir analyzed the picture according to its basic lines -- horizontal, vertical, and diagonal (subsequently, he synthesized the elements in their correct relative position). These modes of processing allowed Meir to remember the picture and to reproduce it. When the teacher presented the picture a second time, Meir noticed immediately his mistake and corrected his drawing. The observer assumed that Meir's ability to analyze and to synthesize helped him in this task.

In connection with the strategies relating to visual memory Haith (1971) makes the following observations:

> Preschool children are fairly rapid and efficient information processors and are capable of taking in relatively large amounts of information ... The 5-year old fares beautifully when one stimulus is presented or even if many stimuli are presented and the strategy for dealing with these stimuli ... is imposed soon enough. <u>But leave him to his own devices or delay the instruction long enough so that he has to devise his own strategy for dealing with the information, and he has trouble .... We do not know how such strategies for visual encoding or for visual rehearsal might be taught</u>. (emphasis added)

Brown (1973) agrees that younger children have strategies for problem solving. She notes that "reconstruction of order is within the problem solving capacity" of these children, but that they have a "general passivity in problem-solving situations."

It seems that program provides children with tools and helps them to develop strategies to process visual information, at least within the program's context.

Interesting questions arise: To what extent have the children internalized these strategies? Do they use these strategies in other contexts involving visual elements? In the long run, will they use these problem-solving strategies in other fields? We hope to address these questions in the course of the Agam Project.

## III. RECOMMENDATIONS

On the basis of the above remarks, we make the following recommendations:

(a) The project should be continued into its second stage, consisting of continued preparation of program materials, implementation, evaluation and research. However, the scope of the project should be limited to about 20 preschools, in order to continue with controlled studies of implementation and teacher preparation.

(b) The project should focus primarily on program development in the preschools, due to the stability of their organizational setting. However, the limited involvement with first graders should be continued, in order to compare the effects of the program for different age groups.

(c) With regard to the existing instructional materials, minimal changes should be made, to allow for another cycle of improvements with the existing units. These changes should include the use of nonexamples and modifications relating to perspective-drawing.

(d) The written program's present format should be maintained. More extensive written teacher guides should be prepared. These guides should contain a classification of the activities via level of recommendation, so teachers can skip relatively unimportant activities, when necessary; this practice will help teachers progress more rapidly, without affecting the program's quality, and may help teachers cover more than the projected 18 units (out of the 36 units in the Agam Program) for the two-year period.

(e) The size, scope and cost of the instructional aids should be reduced. A classroom organizational system to facilitate better storage and use of these aids is needed.

(f) The development of additional units should be continued, until all the written units and their accompanying instructional aids have been prepared.

(g) A great deal of project investment must be made in the area of teacher training, both pre-service (Summer, 1985) and inservice (1985-7). This investment is necessary due to the program's novelty and to the fact that preschool teachers have difficulty in understanding many of the related concepts.

(h) Existing evaluation and research work should be continued and expanded as needed. Longitudinal studies should be undertaken to check for possible effects on children, after they have completed the program.

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# IV. APPENDICES

A. Questionnaire for Preschool Teacher (to be filled after the completion of each activity)

B. Visual Skills Test for Unit 1 (Circle)

C. Visual Skills Test for Unit 2 (Square)

D. Visual Skills Test for Unit 3 (Ornaments)

E. Visual Skills Test for Unit 4 (Circle & Square)

F. First Year Summary Test

G. Summary of Cognitive Research Instruments

H. Samples of Children's Work (separate volume)

A copy of Appendix H was not received by ERIC.

A. Questionnaire for Preschool Teacher (to be filled after the completion of each activity)

תאריך:

פעילות ____________

זמן פעילות לכל קבוצה: ____________________

מספר הילדים שהשתתפו בפעילות: ____________________

שמות ילדים שלא שיתפו פעולה: ____________________

הערכת קושי הפעילות: קל / מתאים / קשה

קשיים בהבנת ההוראות: ____________________

קשיים בביצוע: ____________________

קשיים אחרים: ____________________

תגובת הילדים: התענינות / חוסר התענינות פרט: ____________________

____________________

ריכוז / חוסר ריכוז סיבות: ____________________

____________________

הערכת הציוד: (כמות, גודל, מקום איחסון, בעיות מרחב וכו')

מתאים / מתאים באופן חלקי / לא מתאים

הערות: ____________________

____________________

____________________

פעילויות נוספות שבוצעו באותו יום: ____________________

חשיבות הפעילות לדעתך: חשוב מאוד / חשוב / לא הכרחי / מיותר לחלוטין

____________________

הערות כלליות: (למשל: הרחבות, תגובות ילדים, תופעות מיוחדות בפעילות הילדים וכו')

____________________

____________________

____________________

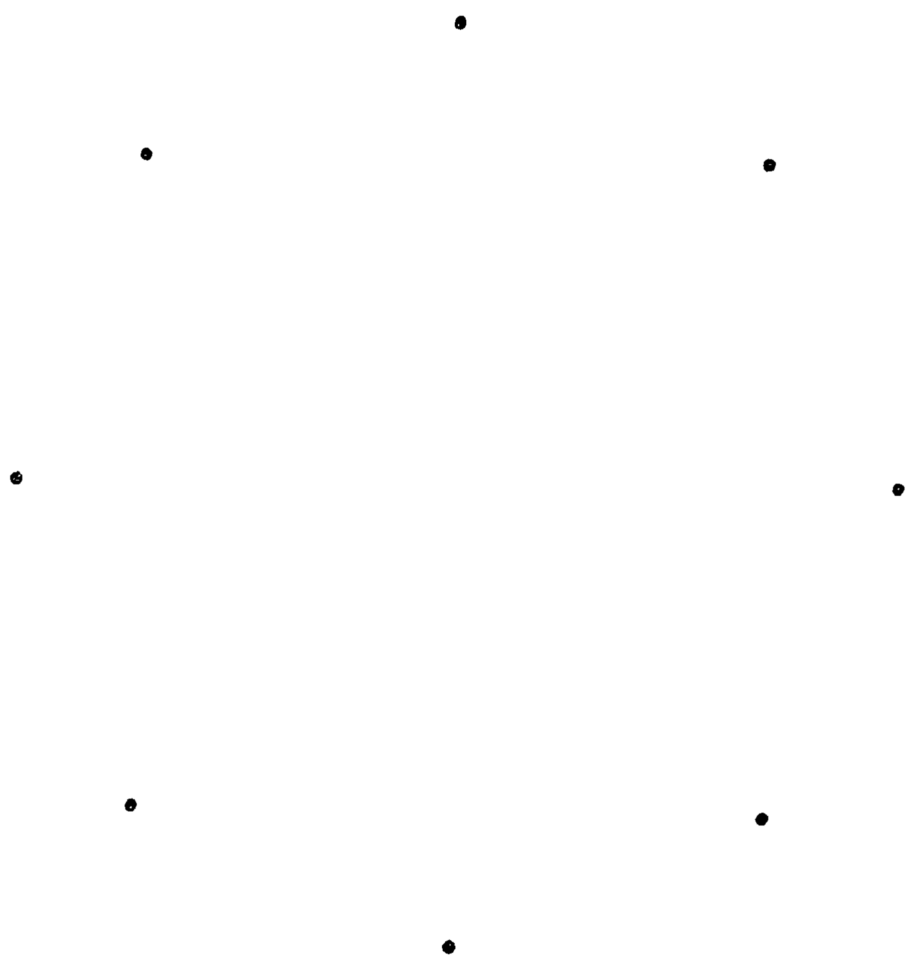
## B. Visual Skills Test for Unit 1 (<u>Circle</u>)

### שאלון לחוברת מס' 1 - עיגול

שם הילד: ____________ תאריך: ____________

שם הגננת: ____________ מבחן: ____________

1) צייר עיגול.



פעילות 2

צייר שילוב מס' 29 (מהזיכרון).

פעילות 3

1) כחול גדול ____________________

2) אדום גדול + אדום קטן ____________________

3) אדום גדול + כחול קטן ____________________

4) אדום גדול + כחול גדול + צהוב קטן ____________________

---

פעילות 4

נקוב בשמות עצמים בצורת עיגול:

| | | |
|---|---|---|
| ________ | ________ | ________ |
| ________ | ________ | ________ |
| ________ | ________ | ________ |
| ________ | ________ | ________ |
| ________ | ________ | ________ |
| ________ | ________ | ________ |
| ________ | ________ | ________ |

---

פעילות 5

שחזר דגם משקפים.

# C. Visual Skills Test for Unit 2 (Square)

שם הילד:________________ תאריך:__________

שם הגננת:_______________ מבחן:__________

---

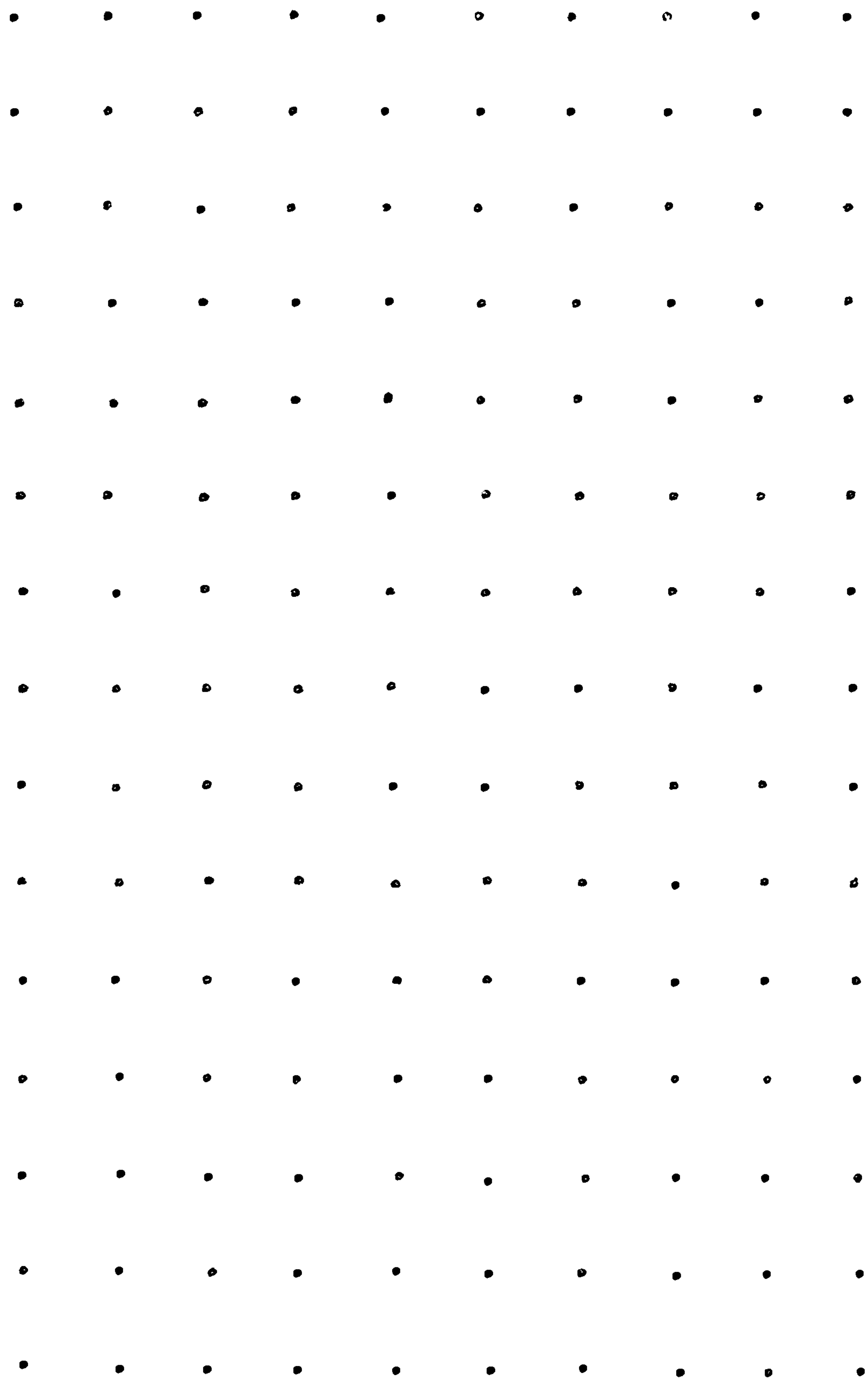
צייר ריבוע

עשה ריבוע

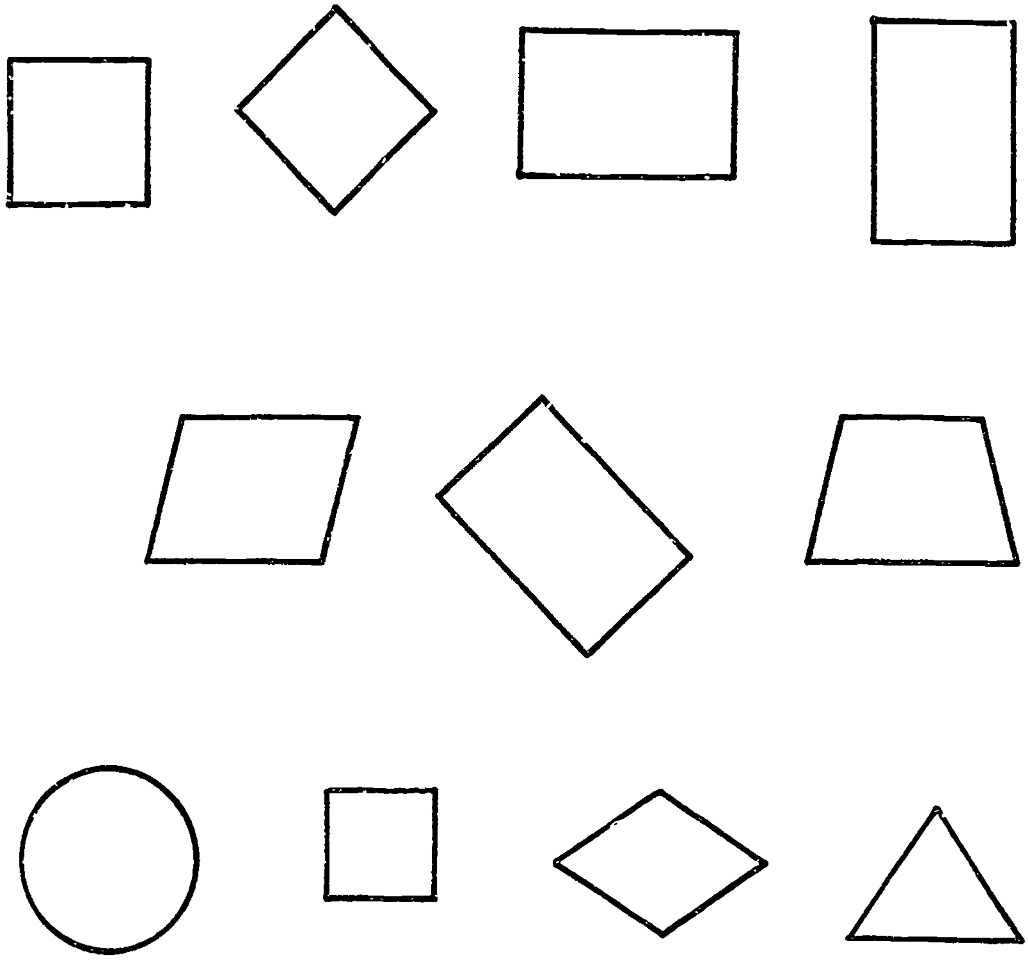
(תני ארבע רצועות בשלושה גדלים שונים)

זהה מתוך הזיכרון

(שני ריבועים:גדול כחול - קטן צהוב)______________________________

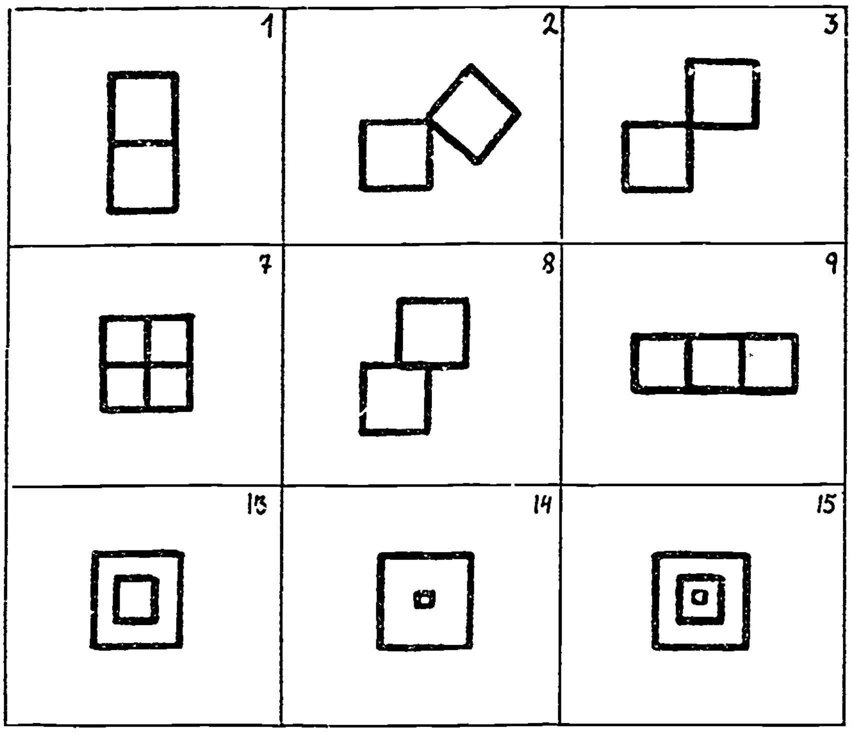


## זהה ריבוע

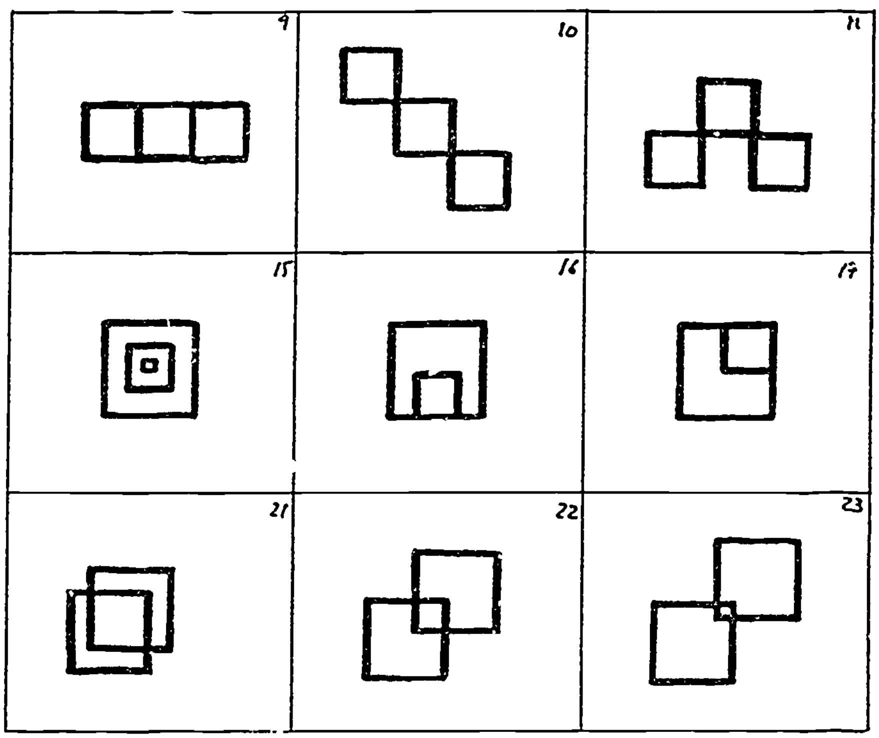


נקוב בשמות עצמים בצורת ריבוע

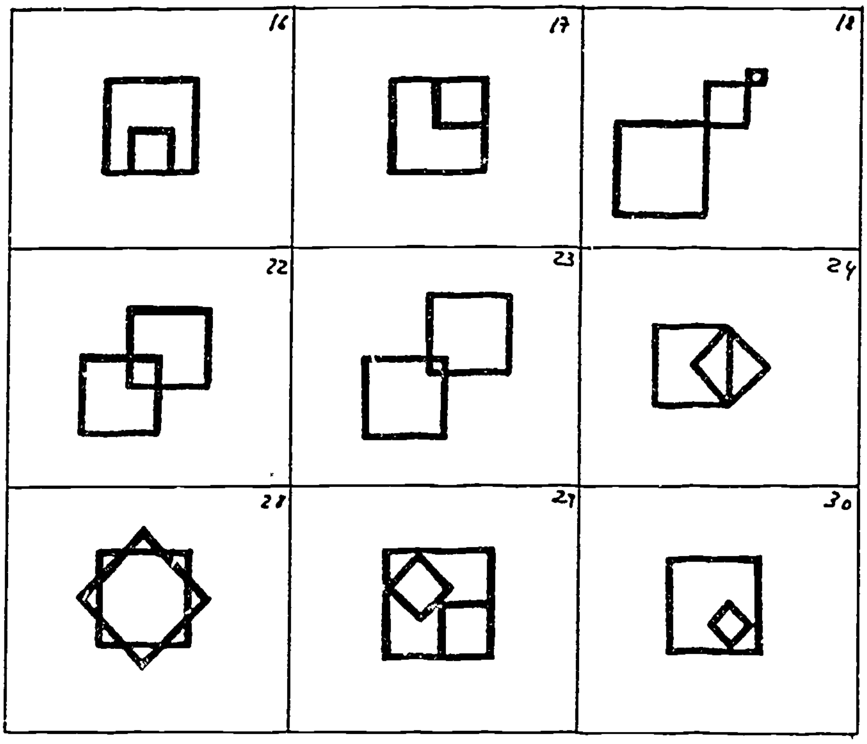
סמן ב-x כרטיס מתאים (8)



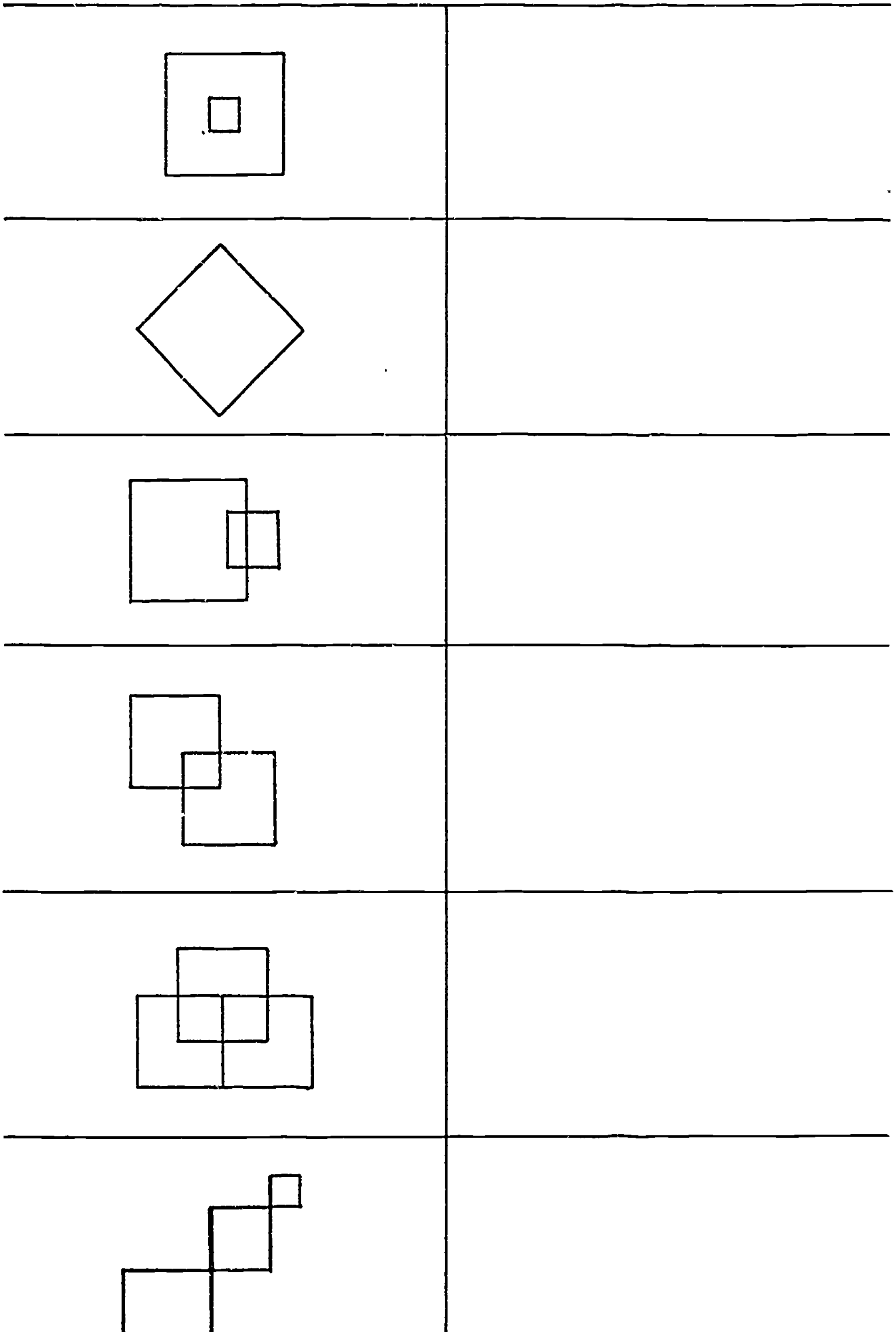
סמן ב-x כרטיס מתאים (22)



סמן ב-x כרטיס מתאים (24)



העתק



## D. Visual Skills Test for Unit 3 (Ornaments)

### שאלון - עיטורים

שם הילד:____________ תאריך:_________

שם הגננת:____________ מבחן:_________

---

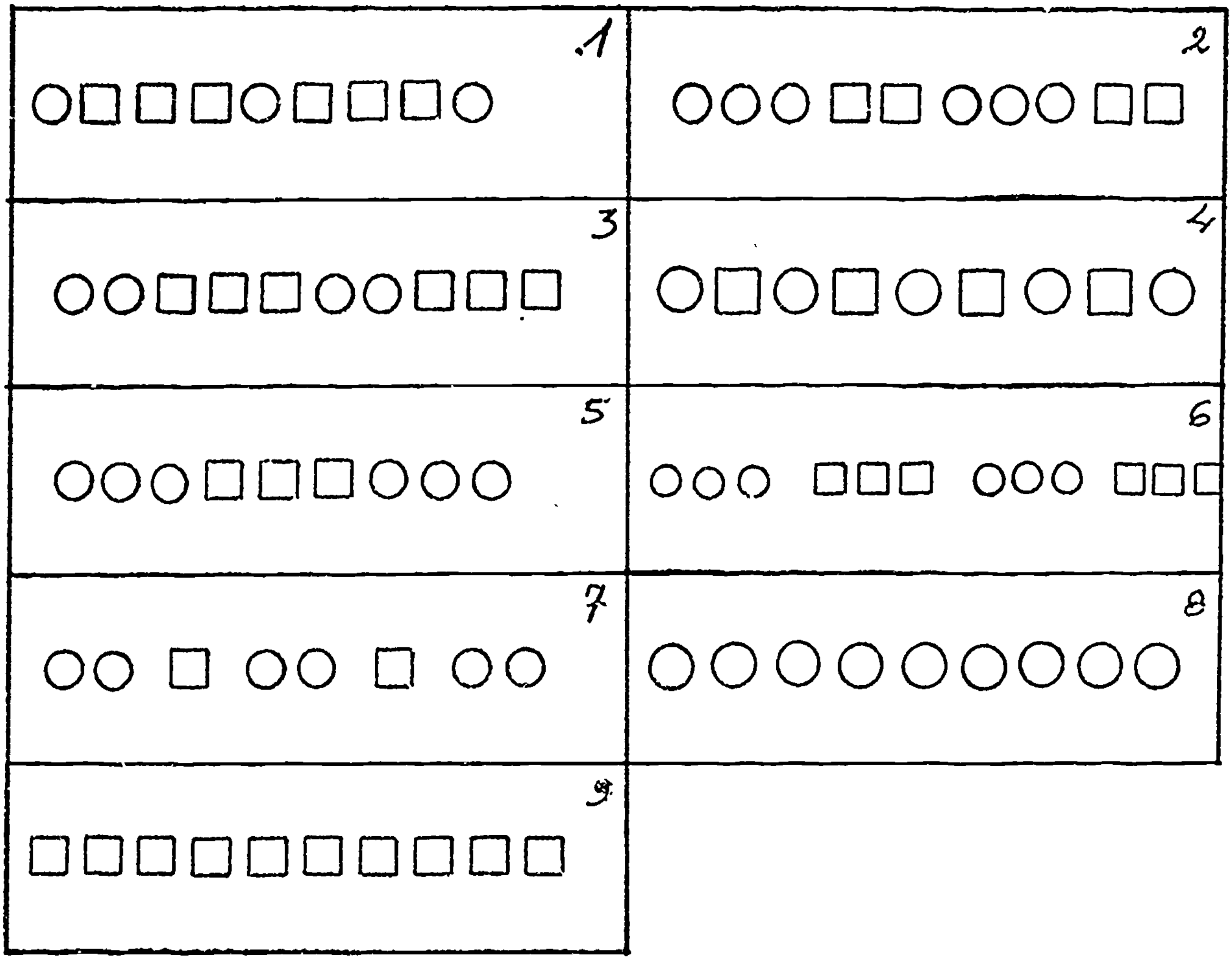
1. צייר עיטור (מחרוזת)

2. עשה עיטור (מחרוזת)

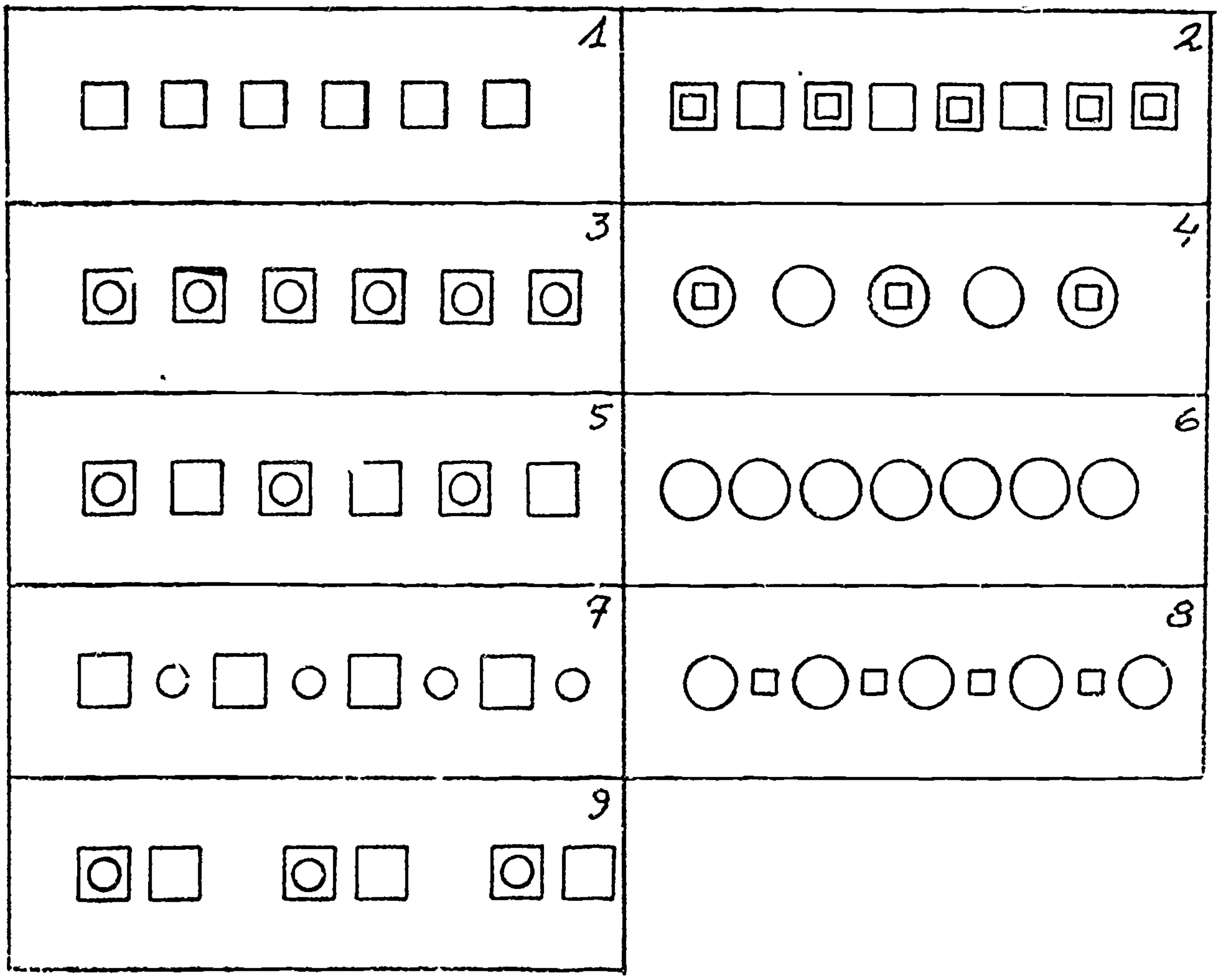
(4 עיגולים קטנים, 4 עיגולים גדולים, 4 ריבועים קטנים, 4 ריבועים גדולים
כל קבוצה צבע אחיד)

3. שחזר מתוך הזיכרון
(ריבועים כחול-צהוב במחזור)

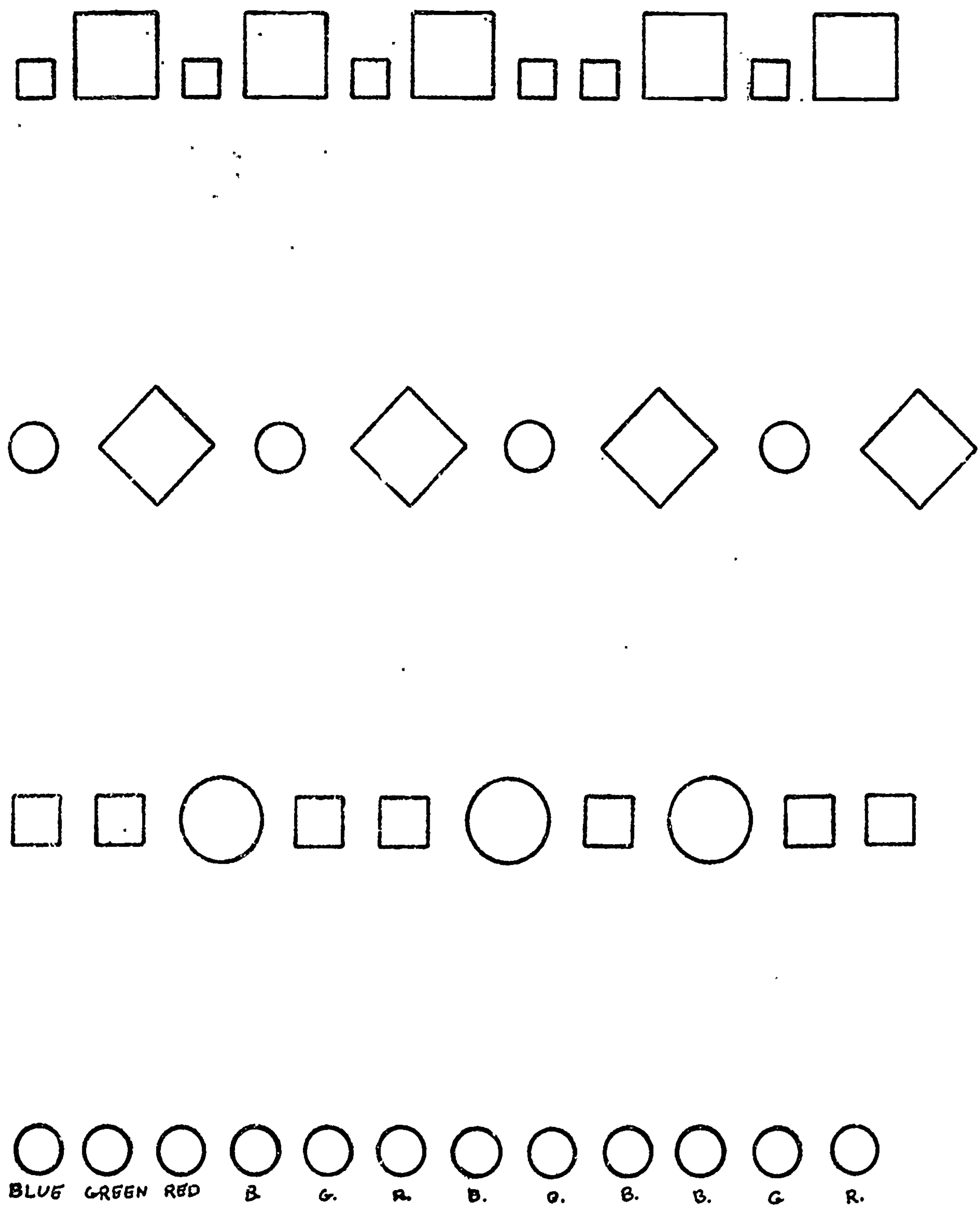
4. סמן ב-X כרטיס מתאים (10-בלי זכרון)



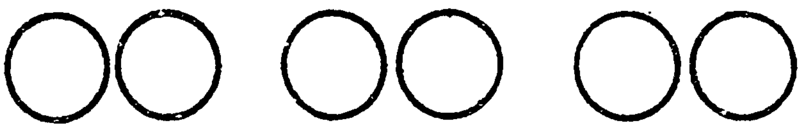
5. <u>סמן ב- x כרטיס מתאים</u> (26 - מתוך זכרון)

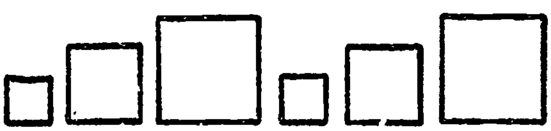


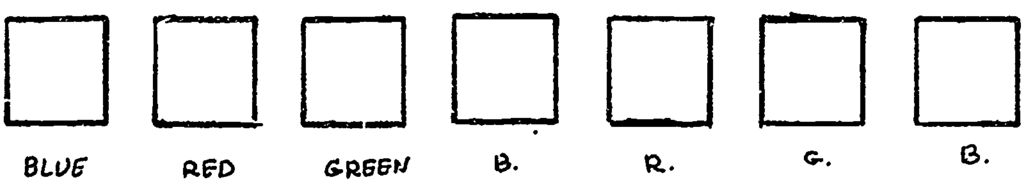
6. אילו עיטורים צריך לתקן? סמן איפה.



7. השלם את העיטורים הבאים:







9. <u>צייר מתוך הזיכרון</u> (כרטיס 22)

10. <u>נקוב בשמות עצמים בסביבה שבהם יש עיטורים</u>

| | | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

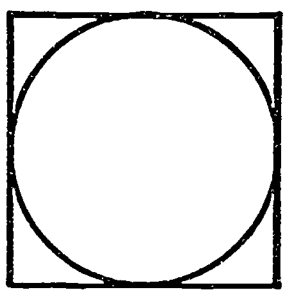
# E. Visual Skills Test for Unit 4 (Circle & Square)

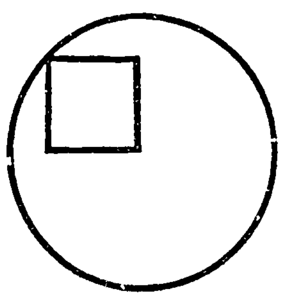
## מבחן לחוברת עיגול-ריבוע

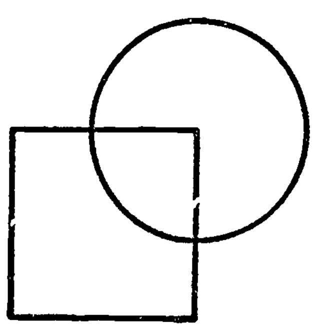
שם הילד: ______________ תאריך: __________

שם הגננת: ______________ מבחן: __________

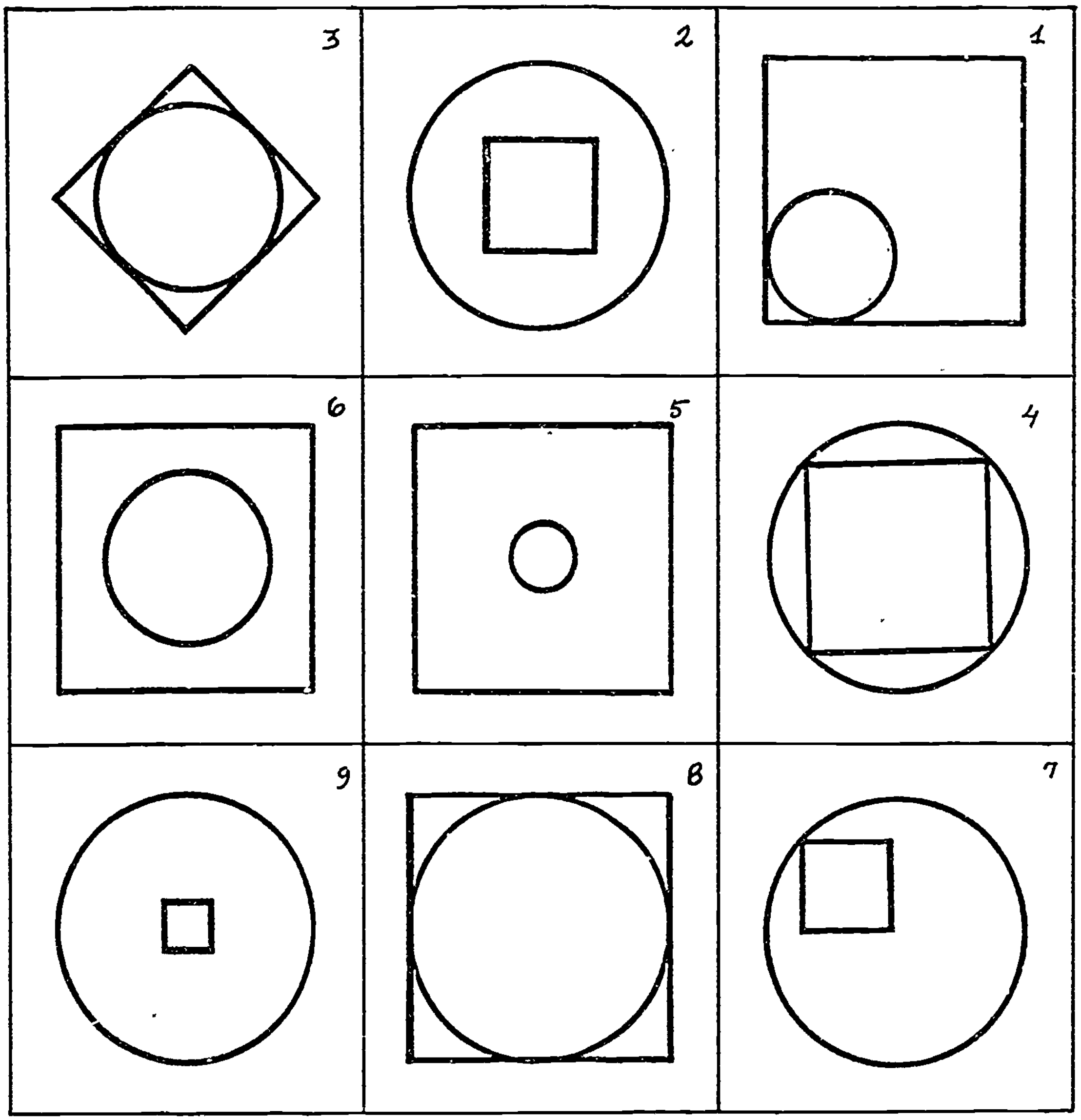
1. שיחזור - העתק



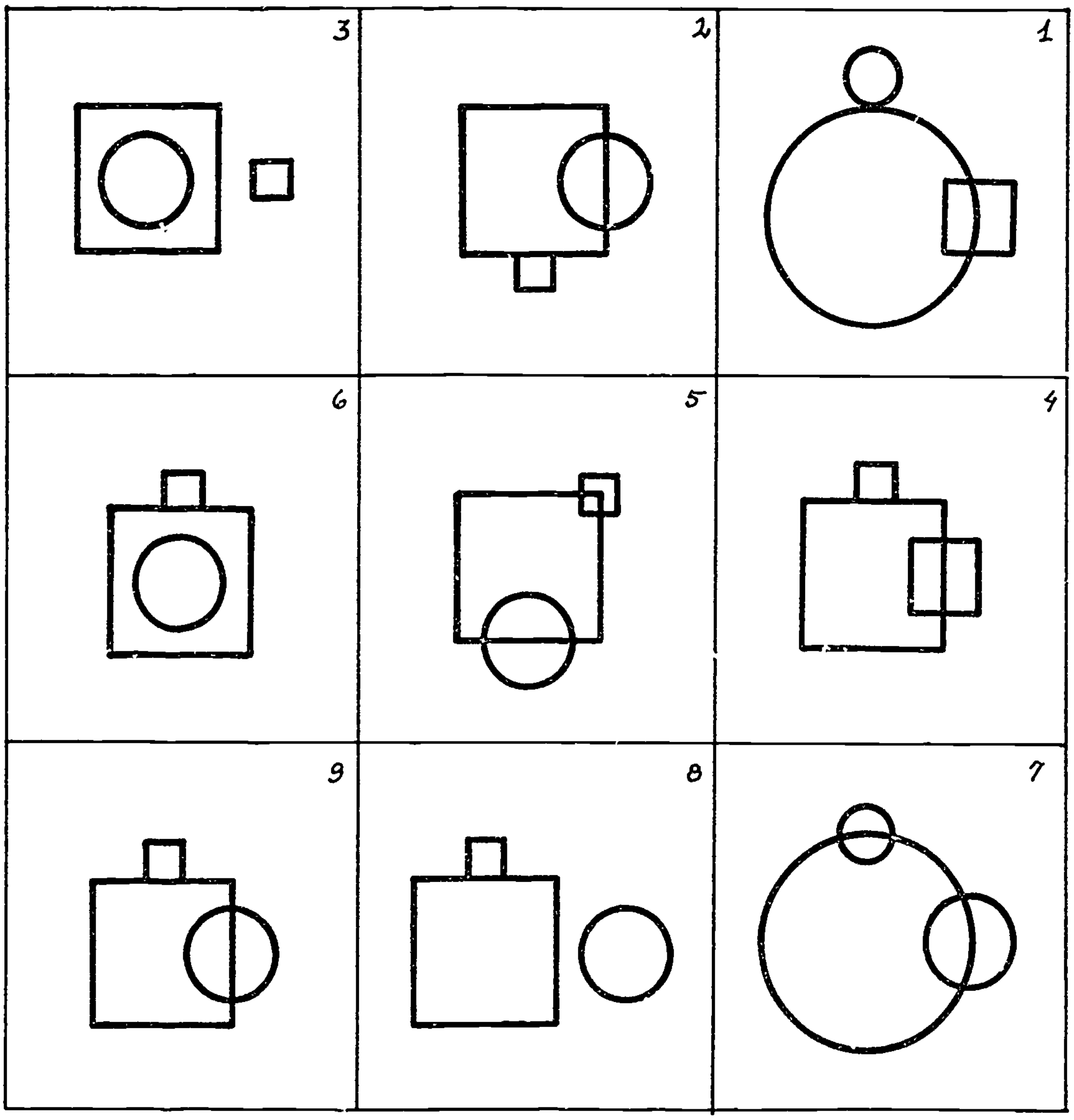




.2 <u>זיכרון</u> - סמן ב-x את הכרטיס המתאים (6)



3. סמן ב-x את הכרטיס המתאים



4. <u>שיחזור מזיכרון</u> - צייר מתוך הזיכרון כרטיס מס' 8

5. <u>זיהוי</u> - נקוב בשמות עצמים שיש בהם צורת עיגול בתוך ריבוע או ריבוע בתוך עיגול.

| | | |
|---|---|---|
| ______ | ______ | ______ |
| ______ | ______ | ______ |
| ______ | ______ | ______ |
| ______ | ______ | ______ |

# F. First Year Summary Test

## מבחן מסכם א'

### חלק א'

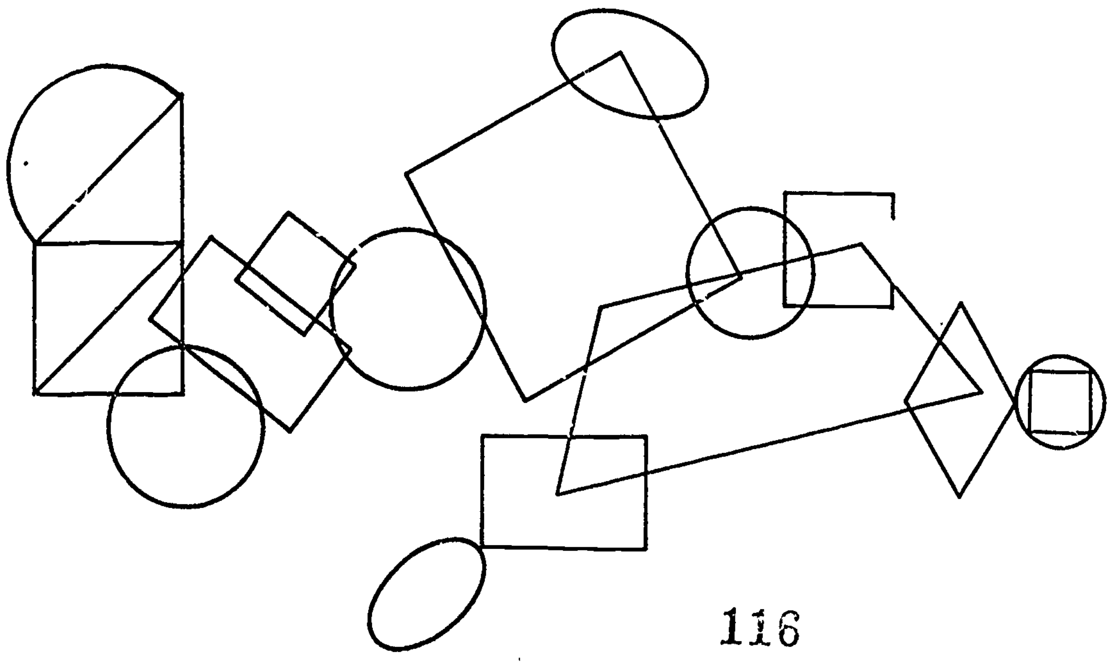
שם הילד: ____________ שם הבוחן: ____________

שם הגננת: ____________ תאריך: ____________

---

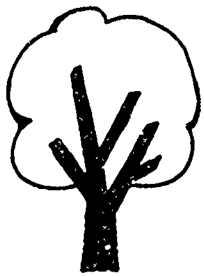
1. עבור בעיפרון אדום על כל העיגולים.

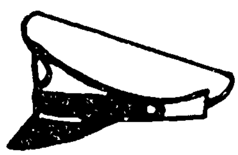
עבור בעיפרון כחול על כל הריבועים

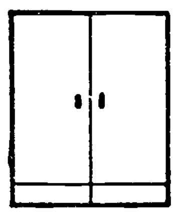


א

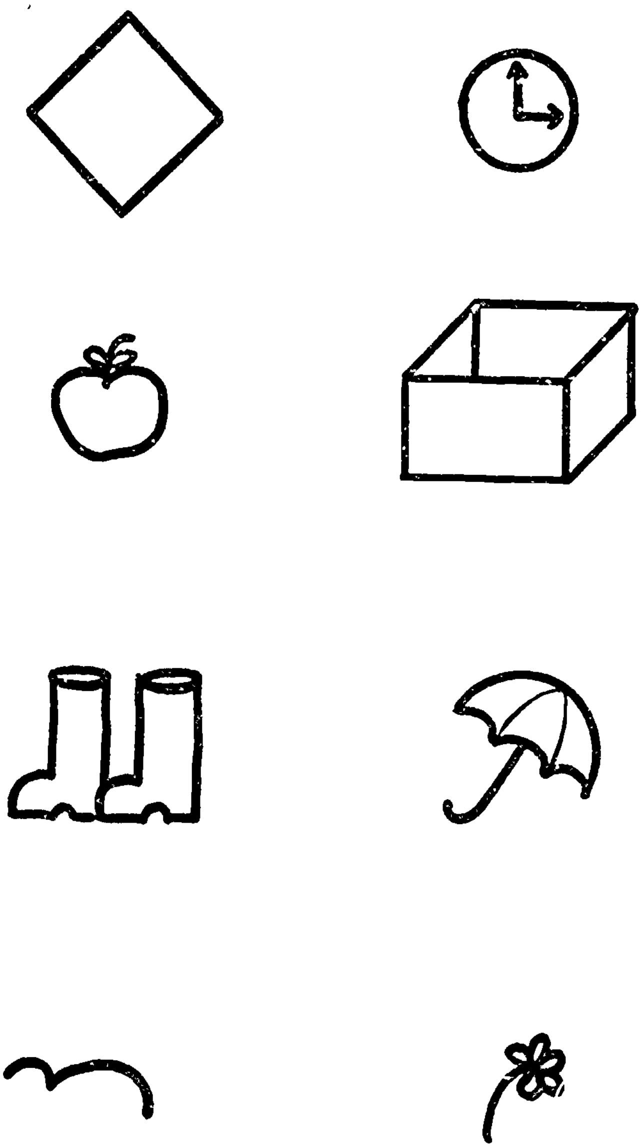
2. סמן ב-x את כל העצמים שראית





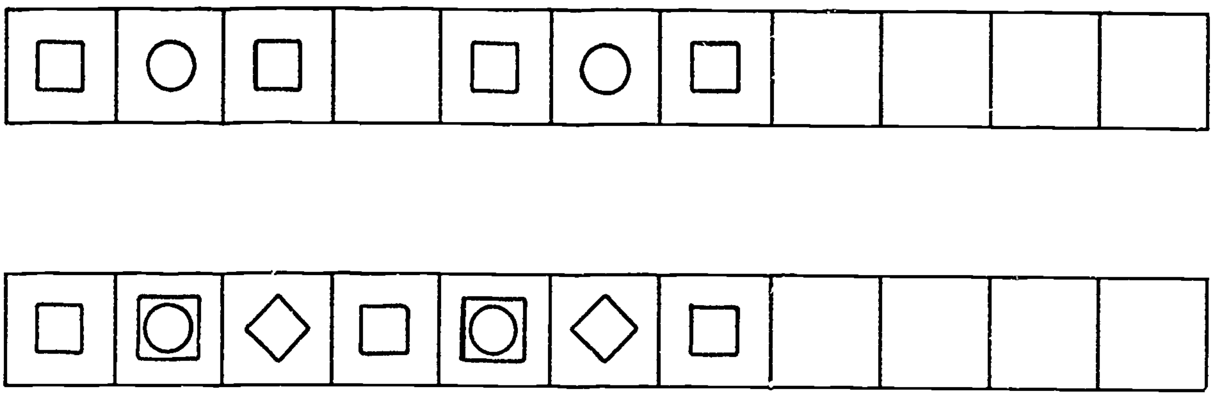


3. סמן ב-x את כל העצמים שראית



א

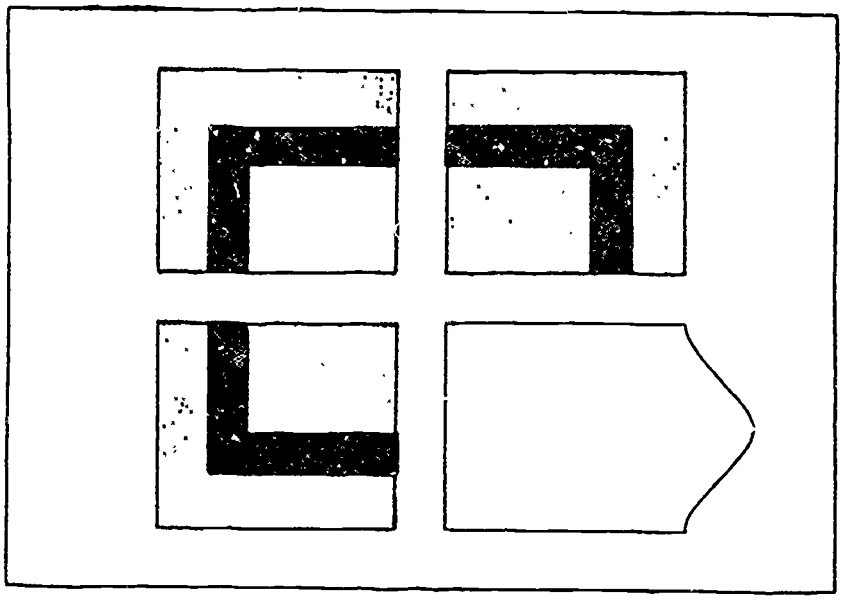
4. א. המשך את הציור

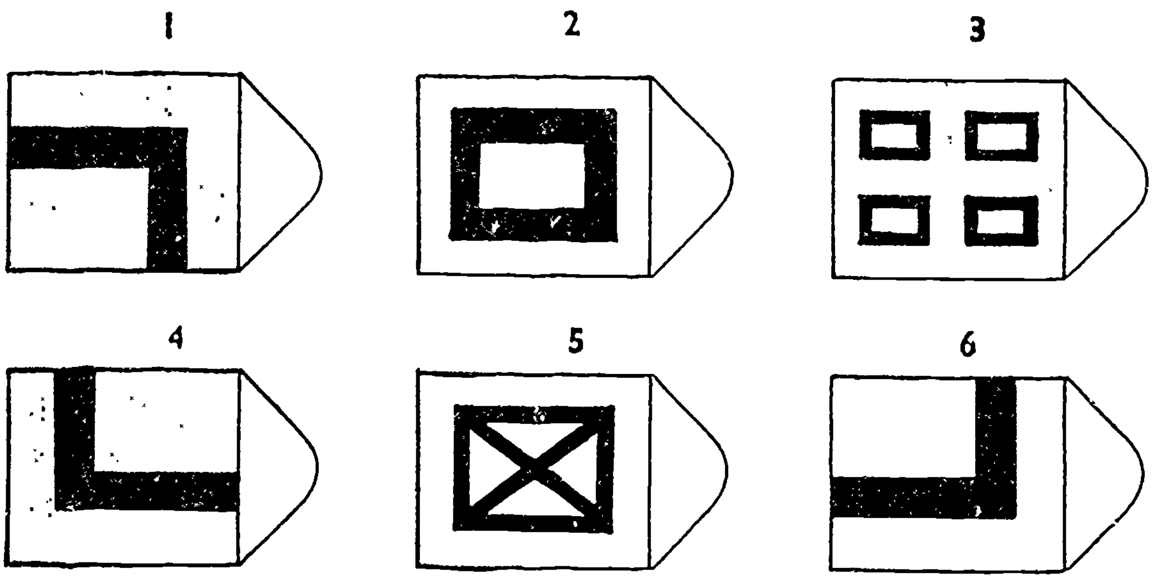


ב. שיחזור מתוך הזיכרון (עיטור)

א

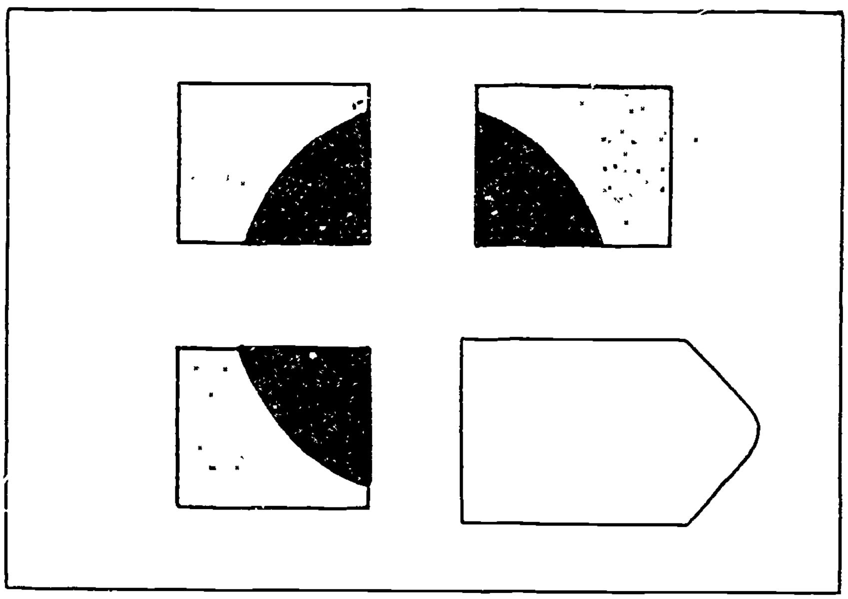
5. סמן ב-x את הצורה שחסרה למעלה (רייבן)

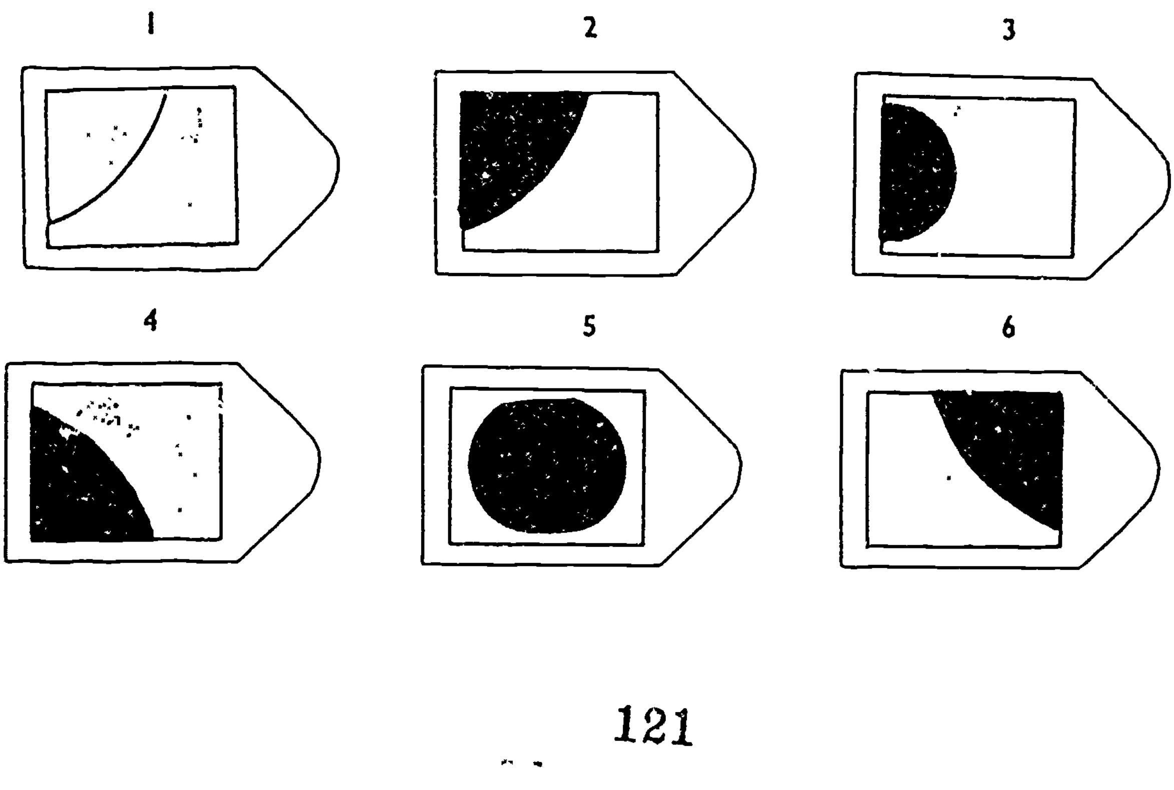




א

6. סמן ב-× את הצורה שחסרה למעלה (רייבן)





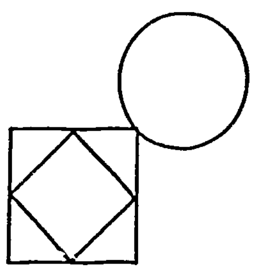
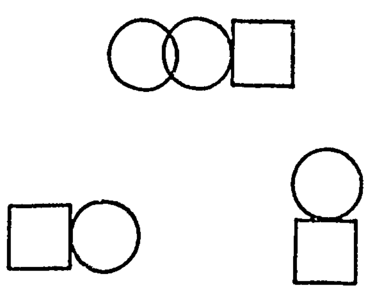
# מבחן מסכם א'

## חלק ב'

שם הילד:________ שם הבוחן:________

שם הגננת:________ תאריך:________

1. שיחזור - העתק

| | |
|---|---|
| | שלום |
| | Ray |
| |  |
| |  |

ב

2. צייר ציורים רבים ככל שתוכל

ב

3.

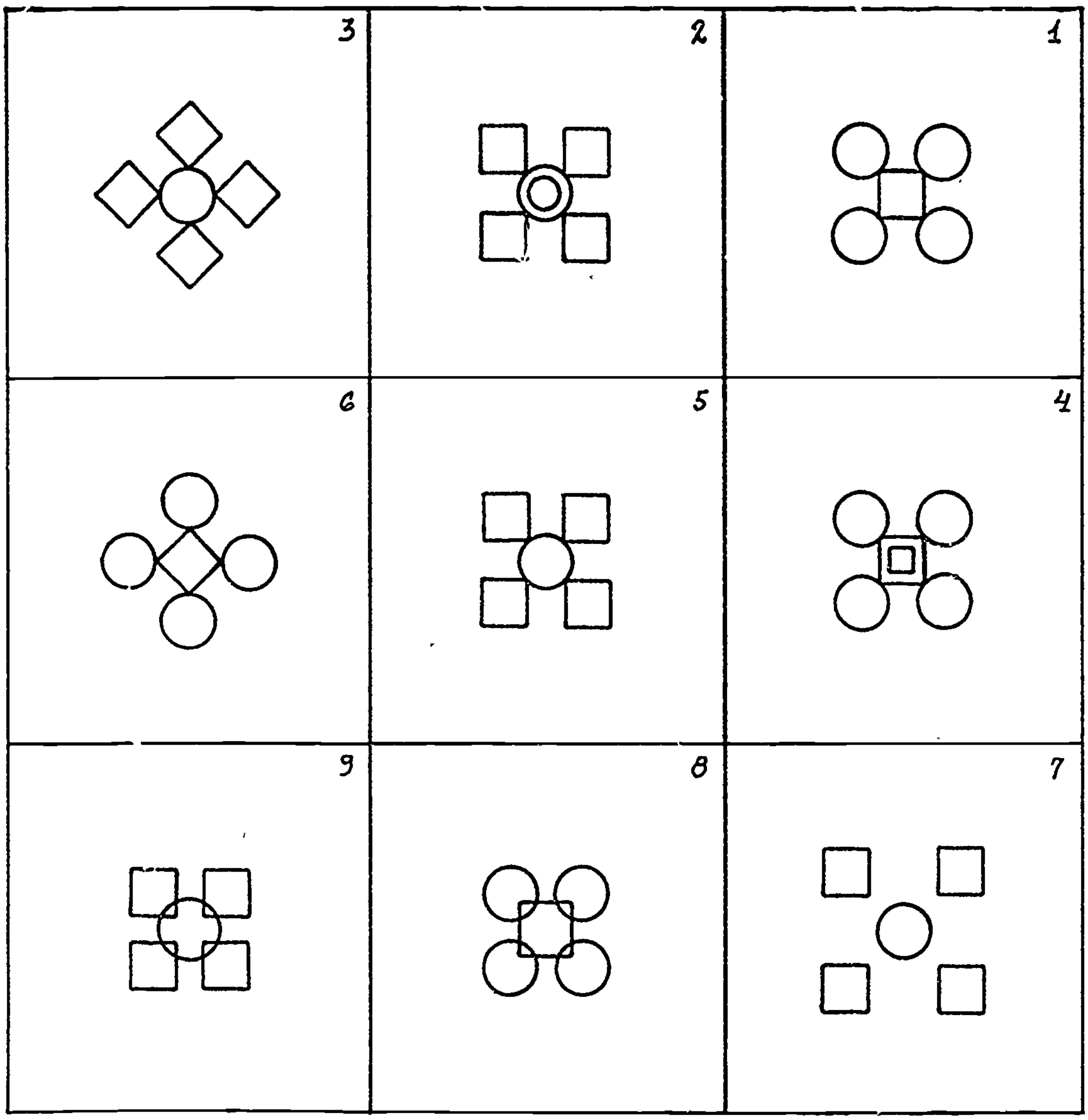
א. צייר עיגול הנוגע בריבוע בנקודה אחת בלבד

ב. צייר עיגול הנמצא כולו בתוך ריבוע

ג. צייר עיגול החותך ריבוע בכמה נקודות

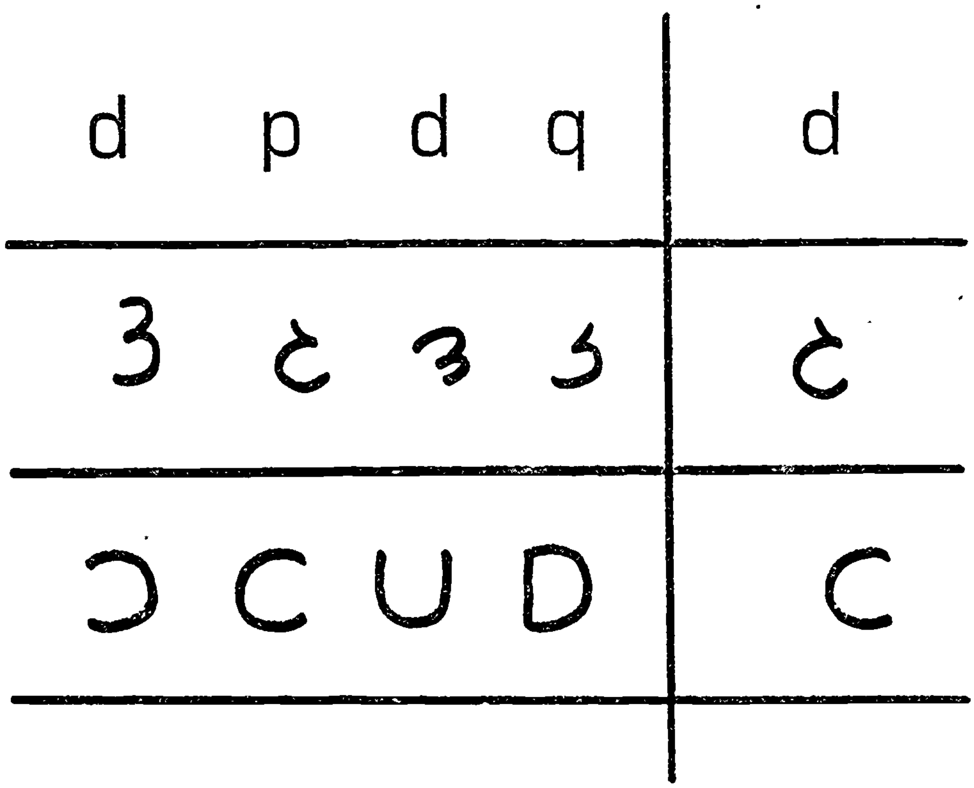
ב

4. סמן ב-x את הצורה המתאימה



ב

5. סמן ב-x את הצורה המתאימה (אותיות)



# G. Summary of Cognitive Research Instruments

Test Instruments

| 1983-84 | Experimental Classes 4-year-olds | Experimental Classes 5-year-olds | Comparison Classes 4-year-olds | Comparison Classes 5-year-olds |
|---|---|---|---|---|
| **Beginning of year baseline tests** | | | | |
| Intelligence tests | | | | |
| Raven Progressive Matrices | + | + | + | + |
| WPPSI | + | Sample of 5 | + | Sample of 5 |
| Draw-a-Man | + | + | + | + |
| Draw-a-Woman | + | + | + | + |
| Creativity | | | | |
| Draw-a-Model | + | + | + | + |
| Sample of free art | + | + | + | + |
| Count of free art | + | + | + | + |
| **Concurrent tests** | | | | |
| Cognitive visual skills tests | | | | |
| Pretests, units 1-7 | + | - | - | - |
| Posttests, units 1-7 | + | - | 1/2 the children | - |
| **End of first year tests** | | | | |
| Cognitive visual skills test | | | | |
| Summary test | + | + | + | + |
| Intelligence tests | | | | |
| Raven Progressive Matrices (2 items) | + | + | + | + |
| Draw-a-Man | + | + | + | + |
| Creativity | | | | |
| Free drawing | + | + | + | + |
| Torrance-type item | + | + | + | + |