A Study of Concept Learning in the Kindergarten

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A STUDY OF CONCEPT LEARNING IN
THE KINDERGARTEN

by

Mary Dinerstein

A Thesis Submitted to the Faculty of the Graduate School of Loyola University in Partial Fulfillment of the Requirements for the Degree of Master of Arts

June 1970
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CHAPTER I

INTRODUCTION

The roots of modern educational theory are in the seventeenth century. The Renaissance idea of the importance of the individual man led eventually to the concept of the importance of the individual child. How to educate that child has been a subject for much concern and argument. The child has been considered in Medieval times, a miniature adult. The European world had to expand its boundaries, the average man had to be exposed to cultures other than his own, to realize that all human beings do not perceive alike.¹ One question leads to another; if all adult human beings do not see and understand things the same way, perhaps children do not see things as adults do. These changes in attitude and the different viewpoints about the education of children that arose from them have contributed to current ideas about the teaching of five-year-olds.

Among the more recent philosophers who have been interested in the child as an individual, and as an individual whose perceptions and thought processes are different from the adult are Montessori, Dewey, and Piaget. In addition they regarded the child's intellectual growth as an evolving process. To them the human child has a different way of thinking than the human adult.

He learns not by sitting and listening and merely imitating, but by active participation. The intellect and the nervous system develop by interacting with the environment. The eye must have something to see in order to function; so with the ear and the hand.

In addition, according to Piaget, challenge is necessary for the human organism to be motivated. The key word in reading Piaget is "equilibrium." A lack of equilibrium must be felt for the child to feel the need to act. We know from working with children that learning should be a challenge, but not so difficult as to be discouraging. According to Ginsburg and Opper in their interpretive book on Piaget, "one way of putting the matter is to say that interest and learning are facilitated if the experience presented to the child bears some relevance to what he already knows but at the same time is sufficiently novel to present incongruities and conflicts."  

The concepts to be learned by the child not only need to be novel and challenging. They need to be appropriate to his level of understanding and he needs to actively participate in order to learn. From Ginsburg and Opper again we hear that, "Piaget believes that knowledge is not given to the passive observer; rather that knowledge of reality must be discovered and constructed by the activity of the child." On the subject of appropriateness of the

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learning task Hunt says, "inasmuch as experience and maturation are continually changing the schemata of the child, maximizing the richness of the environment calls for continual concern with the appropriateness of the match."\textsuperscript{5}

\textsuperscript{5}Ibid., p. 272.
CHAPTER II

THE EDUCATIONAL AIMS OF THIS STUDY

The purpose of this study was to find out if a child's understanding of time sequence could be improved by specific teaching techniques. By time sequence the researcher means a sequence of actual observable events. Examples of some typical sequences are: ice melting, sand pouring from a container, a car going down an inclined plane, or a house being built. This study was designed to find out whether children learn sequence better by actively participating in a learning experience in a concrete way, by the teacher's exposition in a verbal or symbolic way, or in a combination of these two techniques. The researcher also wanted to find out if the child's use of concrete materials could be made more effective for learning by the addition or appropriate verbal cues; this was the function of the story materials when used in conjunction with the concrete activities. The researcher felt that sequence is an important concept and an appropriate one for five-year-olds because of its significance in learning to read.

In reviewing the literature it was found that there is support for the idea that the child learns best by active participation. In addition, the activity must be matched to the child's cognitive level--just difficult enough

to be interesting, but not so difficult as to be discouraging. 7

Most children in our society learn about time sequence eventually because it is a part of our culture. They also learn something about time sequence just by being in the loosely organized program of the typical kindergarten.

This study was designed to find out if a kindergarten program could be improved by having clearly defined learning objectives implemented by:

1. Using materials available in most kindergartens for a specific teaching purpose (i.e. the teaching of one concept such as seriation, classification, or, as in this study, sequence).

2. Presenting these materials in an organized rather than incidental way.

3. Matching the materials to the child's cognitive level as indicated by the work of Montessori, Piaget, 9 and J. McVicker Hunt. 10

4. Making sure that each child has a chance to participate.

5. Testing for results on an individual basis.

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CHAPTER III

MATERIALS AND ACTIVITIES USED FOR LEARNING EXPERIENCES

The author wrote five short booklets and designed five brief activities which would teach kindergarten children about time sequence. These booklets did not teach children how to "tell time" but told about an experience which would involve the passing of time.

It should be pointed out that these were not "activity units" as they have been used for the past thirty years in schools throughout the country. The old style "units" dealt with a subject in a very general global way. "Time" would involve "telling time", a time line, historical time, time-of-day, etc. The "time sequence" this author is talking about is the individual child's physical perception of time. This perception is based on the individual child's sensori-motor experience. It is based on the child's physical interaction with his environment from birth onward. The teacher must design classroom experiences which expand on the structures (or understandings) the child has already acquired. These teacher-designed experiences can have a specific intent; they can teach seriation, conservation, or classification.

These particular activities, designed by the author, were designed to teach time sequence, which, in Piaget's psychological theory, is learned by the child by combining his sensori-motor understandings of seriation and space. Piaget

For the purposes of this study we will label the kindergarten in which both the booklet and the activity were used the Activity-Verbal Group. Where the booklet was used without the activity we will label the kindergarten the Verbal-Only Group. The third group will be called the Control Group.

The booklets are included in Appendix II at the end of this paper. Each booklet was read, by the researcher, to each of the two experimental kindergarten classes at the beginning of a twenty-minute teaching session. The control group also had a story read to them by the researcher, but it was unrelated to the concept being taught.

The booklets and activities were related in content. They concerned the following:

1. The use of an egg-timer
2. The melting of ice
3. The coasting of a car down an inclined plane
4. Pouring from one container to another
5. Building a playhouse with blocks.

The researcher did the teaching and conducted the activities related to this study in both the experimental kindergartens (the Activity-Verbal Group and the Verbal-Only Group). She also spent an equivalent amount of time with the control group, but in activities unrelated to learning about time sequence.
Appropriate materials were supplied to the Activity-Verbal Group by the researcher to provide for the activity period following the reading of the booklet. Sufficient material was provided to give each child a chance to participate.

One of the stories (booklets) and activities is described here as an example:

The story booklet, which was read first, merely tells what happens to ice on a warm day. The children in the Activity-Verbal Group were each given an ice cube on a saucer. Each child had a chance to handle the ice and was actively involved in the "change of state", some of the children putting their cube in the sun to hasten the process of melting. One can add, parenthetically, that Piaget's theory about "conservation" is pertinent to the melting of ice, but the emphasis of the booklet was on the sequence of events—on the ice cube getting smaller and the pool of water larger. (Again the relationship of time and space concepts). However, the children later in the week insisted on freezing water and were obviously interested in the reverse process. It would appear that ice cubes are useful in teaching many concepts.

Referring again to the literature—according to Roger Brown\(^1\) it is easier for the young child to attend to one variable at a time. Montessori also wrote that simplicity and directness were important when teaching young children.

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children. For this reason the story booklets were kept very simple and short and the focus of the teaching was on one variable, the understanding of time sequence.

The test material used by the researcher also has to do with time sequence. Most of it was taken from a test designed by Educational Testing Service called Let's Look At First Graders. The test is said to be based on Piaget's theories and the section which was used in this research relates to the child's understanding of time. This is a very good test for this age group; but like all tests, when using it with young children, the tester must keep in mind that the child being tested may understand the concept, but have trouble with either symbolisation or verbalization.

To sum up the procedure in this study:

The Activity-Verbal Group was given the opportunity to experience both the activity and the story-telling booklet. In this way they had the benefit of an activity designed to teach a specific concept, plus a special effort by the teacher (researcher) to get them to focus on this concept.

The Verbal-Only Group was exposed only to the story-telling by the teacher (researcher). Any related activity was random in the sense that similar materials were available for use in the kindergarten—i.e. water, sand, blocks, and cars.

The Control Group was given a chance to become equally well acquainted

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with the researcher and was tested before and after the teaching was done in the other, experimental groups. The pretesting and posttesting was done at the same time for all the groups.

When experimental work is done with intact school classes there are certain variables one cannot control. The three classes in this study were more or less equal in size and had available similar toys and equipment. My initial impression was that the control group was composed of more mature children and the class was more attentive to teacher direction. The control group performed the best on the pretest, which might confirm the researcher's initial impression that this group was more mature.
CHAPTER IV

SUBJECTS TESTED AND TEST USED

Three kindergartens in Park Forest, Illinois were chosen for this experiment. The three are located in similar neighborhoods. The children are from families renting rowhouse homes—usually young families for whom this is a temporary residence. The children come from all over the United States; their parents are from the smaller towns, though there are some from the ethnic enclaves of the larger metropolitan areas. There is a fairly even distribution of working class and semi-professional parents with a few professional parents or fathers working for degrees at nearby universities. All the classes were integrated to the extent that the community is—white, black, oriental, and middle-eastern.

Twelve children, six boys and six girls, were chosen from each kindergarten. They were matched as closely as possible for age, some born early in the year, some later. All of the children were five years old by the time of the posttest.

The test which was used was made up from material designed by Educational Testing Service of Princeton, New Jersey in cooperation with the Board of Education of the City of New York. The Material is called Let's Look At First Graders. It is very well designed material based on concepts investigated

by Piaget. The materials were "designed for instructional and practice purposes as well as for assessment purposes". I used them for assessment purposes only. Added to these printed materials were several original printed sequences and some new manipulative materials which could show sequence without the need for marking a paper. The latter were sequences from puzzles manufactured by the Judy Company or sequences made into matrix-like puzzles with pictures from workbooks. The idea of biological growth was added as a temporal concept because it was felt that this, at least, was an experience shared by all children.

The same test was used before and after the experiments. A statistical analysis was made of the difference between the means before and after the experiment, the null hypothesis being that there would be no significant difference between the means of the control group and either of the experimental groups when comparing each group on the pretest and the post test. The direct-difference method between matched samples was used. In other words, the same child's score was paired on the pretest and the posttest. The mean differences between the experimental groups and the control group and between the two experimental groups were compared. A comparison between the results for boys and for girls in each class was also made. The statistical methods were taken from Elementary Statistics by Spence and Underwood.16

15 Educational Testing Service, Let's Look At First Graders, (Rev. Ed.), New York: Board of Education 1965,

The total experiment including the testing was completed in approximately seven weeks. The pretest was administered first to all thirty-six children; then the experimental work was done in each of the two test groups--five mornings in each kindergarten. The posttest period again covered about two weeks. The added weeks were due to holidays, absences, or finding a particular day more convenient for one teacher or another. All-in-all, the children and the teachers seemed eager to cooperate and interested in participating and it is hoped that the results can be shared with the helping teachers.
CHAPTER V

RESULTS

In Table 1 we can see that there was no significant difference between the three kindergarten groups on the pretest.

TABLE 1
BETWEEN-GROUP COMPARISONS BEFORE EXPERIMENT

<table>
<thead>
<tr>
<th>Group</th>
<th>$\bar{X}$</th>
<th>$S_{\bar{X}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity-Verbal</td>
<td>10.</td>
<td>.779</td>
</tr>
<tr>
<td>Verbal-Only</td>
<td>10.5</td>
<td>.335</td>
</tr>
<tr>
<td>Control</td>
<td>11.25</td>
<td>.64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>df ($m=n-2$)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity-Verbal and Verbal-Only</td>
<td>22</td>
<td>.588</td>
</tr>
<tr>
<td>Verbal-Only and Control</td>
<td>22</td>
<td>.9</td>
</tr>
<tr>
<td>Activity-Verbal and Control</td>
<td>22</td>
<td>1.43</td>
</tr>
</tbody>
</table>

Result: no significant difference between means of three kindergartens before experiment.
Table 2 show the matched-pairs data for the Activity-Verbal Group. Eleven children made gains on the posttest; one child remained the same. The mean score on the pretest was 10.0; on the posttest it was 13.6. The variation within this group was the greatest of the three groups.

**TABLE 2**

**ANALYSIS OF MATCHED PAIRS DATA ACTIVITY VERBAL GROUP**

<table>
<thead>
<tr>
<th>Subject</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>Difference</th>
<th>$D^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>18</td>
<td>+ 9</td>
<td>81</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>14</td>
<td>+ 2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>12</td>
<td>+ 6</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>14</td>
<td>+ 2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>12</td>
<td>+ 3</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>14</td>
<td>+ 4</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>11</td>
<td>+ 1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>13</td>
<td>+ 2</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>16</td>
<td>19</td>
<td>+ 3</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>17</td>
<td>+ 7</td>
<td>49</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>11</td>
<td>+ 5</td>
<td>25</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

$\Sigma X_1 = 120 \quad \Sigma X_2 = 164 \quad \Sigma D = 44 \quad \Sigma D^2 = 238$

<table>
<thead>
<tr>
<th>Pretest</th>
<th></th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{X}_1 = 10$</td>
<td>$\bar{X}_2 = 13.6$</td>
<td></td>
</tr>
<tr>
<td>$\bar{D} = 2.58$</td>
<td>$\bar{D} = 2.89$</td>
<td></td>
</tr>
</tbody>
</table>
Table 3 shows that in the Verbal-Only Group nine children gained, two remained the same, and one did less well on the posttest. The mean on the pretest was 10.5 and on the posttest was 12.9.

**TABLE 3**

**ANALYSIS OF MATCHED-PAIRS DATA VERBAL-ONLY GROUP**

<table>
<thead>
<tr>
<th>Subject</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>Difference</th>
<th>$D^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>16</td>
<td>+ 6</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>13</td>
<td>+ 2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>15</td>
<td>+ 4</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>16</td>
<td>+ 6</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>11</td>
<td>+ 2</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>13</td>
<td>+ 3</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>12</td>
<td>+ 3</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>10</td>
<td>- 1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>+ 1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>13</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>13</td>
<td>+ 3</td>
<td>9</td>
</tr>
</tbody>
</table>

$\sum X_1 = 126$  $\sum X_2 = 155$  $\sum D = 29$  $\sum D^2 = 125$

<table>
<thead>
<tr>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{X}_1 = 10.5$</td>
<td>$\bar{X}_2 = 12.9$</td>
</tr>
<tr>
<td>$\bar{O}_1 = 1.11$</td>
<td>$\bar{O}_2 = 1.84$</td>
</tr>
</tbody>
</table>
Table 4 shows the matched-pairs data for the Control Group. Six children gained, four lost ground, and two remained the same when comparing the pretest and the posttest. The pretest mean was the highest of the three groups, 11.25, but not significantly higher (table 1). The posttest mean was 12.41 which was not a significant gain.

**TABLE 4**

**ANALYSIS OF MATCHED-PAIRS DATA CONTROL GROUP**

<table>
<thead>
<tr>
<th>Subject</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>Difference</th>
<th>$D^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>13</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>10</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>11</td>
<td>+3</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>15</td>
<td>+6</td>
<td>36</td>
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<tr>
<td>6</td>
<td>8</td>
<td>6</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>15</td>
<td>+4</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
<td>14</td>
<td>+1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>18</td>
<td>+4</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>13</td>
<td>+3</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>11</td>
<td>-1</td>
<td>1</td>
</tr>
</tbody>
</table>

$\Sigma X_1 = 135 \quad \Sigma X_2 = 149 \quad \Sigma D = 14 \quad \Sigma D^2 = 100$

<table>
<thead>
<tr>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{X}_1 = 11.25$</td>
<td>$\bar{X}_2 = 12.41$</td>
</tr>
<tr>
<td>$\bar{D} = 2.12$</td>
<td>$\bar{D}_2 = 2.89$</td>
</tr>
</tbody>
</table>
Table 5 shows a graphic representation of the data. All the kindergartens gained during the seven-week period of the experiment, but the largest gain was in the Activity-Verbal Group.

**TABLE 5**

**ANALYSIS OF MEAN SCORE GAIN IN PRETEST AND POSTTEST**

<table>
<thead>
<tr>
<th></th>
<th>Kind. I (activity-verb)</th>
<th>Kind. II (verb only)</th>
<th>Kind. III (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prettest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6 is an analysis of the results for all three kindergartens. The gains of both experimental groups were significant at the .01 level. The mean difference for the Activity-Verbal Group from the first to the second test was 3.67 (t=4.82) which is significant at the .01 level. For the Verbal-Only Group the mean difference was 1.92 (t=3.2) also significant at the .01 level.

**TABLE 6**

**COMPARISON OF THREE KINDERGARTENS--ANALYSIS OF MATCHED-PAIRS DATA**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest $\bar{X}$</th>
<th>Posttest $\bar{X}$</th>
<th>$\bar{X}_D$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity-Verbal Group</td>
<td>12</td>
<td>10.0</td>
<td>13.6</td>
<td>3.67</td>
<td>4.82**</td>
</tr>
<tr>
<td>Verbal-Only Group</td>
<td>12</td>
<td>10.5</td>
<td>12.9</td>
<td>1.92</td>
<td>3.20**</td>
</tr>
<tr>
<td>Control Group</td>
<td>12</td>
<td>11.25</td>
<td>12.41</td>
<td>1.17</td>
<td>1.46*</td>
</tr>
</tbody>
</table>

* non-significant

** significant at the .01 level
Table 7 shows the difference between the gains of the boys and the girls. It clarifies the results of Table 6. The girls in the Activity-Verbal Group made the biggest gain. The boys in the Verbal-Only Group made significant gains, but the girls did not.

**TABLE 7**

**COMPARISON OF BOYS AND GIRLS—ANALYSIS OF MATCHED-PAIRS DATA**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest $\bar{X}$</th>
<th>Posttest $\bar{X}$</th>
<th>$\bar{X}_D$</th>
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<td>3.83</td>
<td>4.78**</td>
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<td>12.2</td>
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*Significant difference at the .05 level

**Significant difference at the .01 level

All other comparisons were non-significant.

Key

I-Activity-Verbal Group

II-Verbal-Only Group

III-Control Group
CHAPTER VI

DISCUSSION

The statistical results of this study support the view that learning takes place in the kindergarten when the teacher focuses the child's attention on a concept then gives each child a chance to participate in an activity which demonstrates the concept. It is interesting to note that it was the boys in the Verbal-Only Group who made the statistically significant gains; the girls did not. A possible explanation for this is that the teacher in the kindergarten which had the Verbal-Only treatment allowed a great deal of free unsupervised activity. During this activity time the researcher observed that the boys were engaged with blocks, cars, water, and paint--materials similar to those used in the Activity-Verbal Group with the deliberate encouragement of the teacher. The girls in the Verbal-Only Group seemed more restrained and less inclined to move about; they spent much of their free time talking and crayoning. Perhaps the boys in the Verbal-Only Group reinforced the verbal teaching in their more purposeful play activities following the reading of the story booklets.
CHAPTER VII

CONCLUSION

If we are to improve teaching in the kindergarten it is necessary to find and use tools for measuring the results of the learning activities we provide for children. If the knowledge children acquire is learned in a logically longitudinal way we need to measure what is learned in order to know when it is appropriate to teach what concepts. In this research a test based on Piaget's theories was used to evaluate the hypothesis that a child's active participation with concrete learning materials, appropriately and intentionally directed by the teacher, is a good way to learn a concept. The objective was to identify a specific ingredient of a good methodology for the kindergarten.

If the teacher is to teach, she must plan. She needs to know what materials are needed for concrete learning activities and be able to follow through by directing the individual child toward their use. She needs to know when to stand by and observe the child, and when to verbalize what is learned or to be learned. The only way to judge what has really taken place is by observation or testing or both.

This research shows that concept-related activities reinforce verbal learning in the kindergarten. It also shows that the teacher can plan and direct her own research. This is beneficial in two ways; first, the teacher who works with young children is very likely to have a feeling for what is an appropriate match for the child's developmental stage; second, a test will give her some feedback on whether what she is teaching or intends to teach is being learned.

The individual, as opposed to group, testing of children has an additional learning value for the kindergarten teacher. Some children appear to understand the concept but not the words—others react to the words but have a random and meaningless response to the concept. The teacher can be made aware of this by the testing procedure and attempt to bring words and concepts into a more meaningful relationship for the child.

In any experiment which uses intact classes it is difficult to sort out the variables which lead to experimental results. Some of the factors, such as age, sex of children, economic level, or time in school, can be equated; others that may be equally relevant are harder to account for statistically. Classroom climate and teacher characteristics are two very interesting variables and any test of children's progress ought to take some account of these. It might be a good idea to include some type of behavioral profile for the teacher to mark—as to her goals—when working with intact classes. This would make a good subject for further study.
APPENDIX I

TEST MATERIALS
Verbal Directions for the Test

We have some games to play today. There will be some questions in these games. I want you to help me find the answers. If you do not know the correct answer you may guess which one is correct. Take your time and try to mark an answer for each game.

1. In the first game we see some blocks. The pictures tell a story about building with blocks. First we see a small pile of blocks; the next space is empty; then we see a taller pile of blocks. Which of these last two pictures would fit in the empty space to tell the story about building with blocks? Put an X on it.

2. The next story is about a plant that is growing. The middle picture in the story is missing. Which of these last two pictures would fit in the empty space to tell the story? Put an X on it.

3. The next story is about a snowman. In this story the last picture is missing. Which of these two pictures would fit in the empty space? Put an X on it.

4. The next story is about a ball rolling down some stairs. The last picture is missing. Which of these two pictures belongs in the empty space? Put an X on it.

5. This story is about a piece of pie. First we see the whole piece and then in the next picture part of it is gone. Which of these two pictures belongs
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6. This is a story about an apple falling from a tree. Which of these two pictures belongs in the empty space? Put an X on it.

7. This is the story of an apple. Look at the last two pictures in the row. Which of these two pictures belongs in the empty space? Put an X on it.

8. Here is a story about a glass of water somebody spilled. Look at the last two pictures in the row. Which one of these pictures belongs in the empty space? Put an X on it.

9. This is a story of a cake that a mother baked. The family was eating it. Which one of these two pictures belongs in the empty space? Put an X on it.

10. This is a story about a fish bowl. Someone is pouring water into it. Which of these two pictures belongs in the empty space? Put an X on it.

11. This is the story of an ice cream cone. Which of these two pictures belongs in the empty space? Put an X on it.

12. This is a story about the sky. Which of these two pictures belongs in the empty space. Put an X on it.

13. This little girl is taking down a block tower. Which of these two pictures belongs in the empty space? Put an X on it.

14. This boy is blowing bubbles with his gum. The bubble burst. Which of these two pictures belongs in the empty space? Put an X on it.
15. This glass is being filled with water. Which one of these two pictures belongs in the empty space? Put an X on it.

16. This is a story of a leaf falling from a tree. Which of these two pictures belongs in the empty space? Put an X on it.
Directions for the manipulative part of the test:

Here are some puzzle pieces that tell a story.

I want you to put them in the right order so that they tell the story correctly.

17. This is a story about an egg-timer. The sand is pouring from one part to the other. Can you make these puzzle pieces tell the story? Put the first piece here. Put the rest of them after it to tell the story.

18. This is a story about a baby who grows up. Can you make the puzzle pieces tell the story? Put the first one here. Put the rest of them after it to tell the story.

19. This is a story about a snowman. Can you make these puzzle pieces tell the story? Put the first one here. Put the rest of them after it to tell the story.

20. This is a story about a playhouse some children are building. Can you make the puzzle pieces tell the story? Put the first one here. Put the rest of them after it to tell the story.
The Egg Timer

Ben's dad gave him an egg timer. Ben's mother said she could use it for cooking—especially for timing eggs. She would get all the sand in one end and then turn it upside down. The sand poured from one end to the other. Ben kept track of the time on his watch. It took exactly three minutes for the sand to go from the top to the bottom of the timer. Ben had a good time playing with the timer. This is what he did:
The Ice Cube

The day was hot and sticky and Kate was very thirsty. Her mother told her that there was a big pitcher of lemonade in the refrigerator. That sounded very good to Kate.

She opened the refrigerator door and took the pitcher out. Then she poured herself a nice, cool glass of lemonade. Kate thought that a cube of ice would make the lemonade even better so she took a tray of ice cubes from the freezer. She put one cube of ice into her glass of lemonade and another on a plate on the kitchen table. While she was drinking her lemonade she watched the ice cube on the plate. This is what happened.
Watering the Flowers

Ben's mother asked him to water the flowers in her planting box. The hose couldn't reach them so he used a watering can. He had to fill it three times to water all the plants. He watched the water as it ran from the can and filled it again when it was empty. In the picture you can see where the water is in the can. I think he will have to fill it again.
The Toy Truck

Ben had a red oil truck. He liked to build roads with his blocks so that the truck would roll by itself.
He could put two long boards together over a big block.

He would have to push it up hill and then it would roll by itself down the other side.
The Play House

Kate wanted a real play house of her own. Her friends, Dan and Bill offered to build her one. They used some old crates from the store and some lumber that their father had left after making some shelves. It took quite a long time to do, but the children built the play house by themselves. Here is what they did:
First they put the crates down to make a frame.
Then they put a piece of wood across to hold the crates together.
They put up supporting boards for the roof.

Then they put on the roof.
BIBLIOGRAPHY


ADDITIONAL BIBLIOGRAPHY


APPROVAL SHEET

The thesis submitted by Mary Dinerstein, has been read and approved by members of the School of Education.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

May 12, 1970
Date

[Signature of Advisor]