A COMPARISON OF TWO METHODS OF PRESENTING SCIENCE CONCEPTS TO PRESCHOOL CHILDREN

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A COMPARISON OF TWO METHODS OF PRESENTING

SCIENCE CONCEPTS TO PRESCHOOL CHILDREN

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Dedicated to

My Mother and Father

Girdie H. and H. G. Ware

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R. F. W.

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CHAPTER I

THE PROBLEM

Educators have long been concerned with the methods of teaching children which will set the stage for learning in any area or subject matter field. Today teachers are still challenged to find new methods and to test old methods for the purpose of measuring what children acquire as they may be involved in the teaching-learning process.

Recently there has been an intensified interest in scientific advancement throughout the world. The race for international supremacy to conquer outer space has pressured all levels of education including the elementary school, high school, and universities to expand their educational programs in the study of science. There appears to be real concern among educators about the lack of interest and knowledge which adults have in the field of science. As yet there has been no pressure on nursery school teachers to intensify the science program. Since the preschool child has an inquisitive mind that is ready for experimentation which may lead to the acquisition of knowledge concerning his understanding of the world in which he lives; the nursery school may be the logical place to begin teaching science to young children.

Need for the Investigation

A review of the literature revealed that there are two fields of thought concerning methods of presenting science to children in the

nursery school, kindergarten and primary grades. One group of educators advocated preplanning on the part of the teacher in presenting science concepts to children while another group indicated that science experiences for the young child should be an outgrowth of the child's natural curiosity. This investigation is a comparison of two methods of presenting science experiences, the planned and the casual, to nursery school children as related to their understanding of selected science concepts.

Planned Science Experiences

In this investigation, planned science experiences will be referred to as one in which the nursery school teacher has set the stage for learning by focusing attention upon natural phenomena in the immediate environment by preplanning. This means actually calling attention to happenings in the environment and not necessarily waiting for the child to initiate an interest.

Blough and Huggett (2) support this point of view when they state:

> Concepts in science are not discovered automatically by exposure - - as when one catches the mumps. They come to be part of the child's mental equipment when the teacher intends that they shall and helps the children to arrange the learning experience accordingly. They come to be real as the result of many experiences. (p. 13).

Blough and Huggett (2) use the aquarium as an example to interpret the need for planned experiences. They write:

> Often we assemble the material for it but pay little attention to it after the aquarium is stocked. Water evaporates from it, snails lay eggs on the glass, plants reproduce, tadpoles grow legs, and all sorts of other things go on unnoticed. There goes all that science to waste! With just a little planning potentialities such as these could be realized for the enrichment of children's experiences. (p. 4).

Leonard, Miles and Van der Kar (18) are other educators to advocate preplanning when they emphasized the learning of concepts:

In the school of early childhood no effort should be made to give the children a large fund of technical knowledge or to confine their interests to any one scientific field, such as botany. Instead there should be a well-balanced program aimed toward giving the children certain fundamental, though elementary concepts which will prevent them from ever accepting superstitious and unscientific ideas. The program should be planned in line with children's interests, which are as broad as the earth and as high as the stars. (p. 731).

Field (4) is another writer that implied that science in the pre-school is as important as any other activity, and that science experiences should be preplanned. She wrote:

A nature study program is of value and that it should be included in conjunction with other supervised preschool activities in order to give the child a well-rounded background. (p. 410).

Lambert (12) writes extensively supporting the planned science program.

Today, when a thinking citizen is more important than it has ever been, educators realize that science teaching is a valuable means of developing the habit of critical thinking and the techniques of exploration. Planned practical scientific education, beginning in the kindergarten, will help to provide children with the techniques and attitudes needed by the world in which they live. Science helps children to understand their world. Even more important, it is a tool that enables children to learn to observe in such a way that they can draw conclusions. (p. 244).

Lambert (12) writes further supporting this same belief.

While much of the science teaching in kindergarten is initiated in response to the spontaneous interests of children, the science program should not be based exclusively on such incidental learnings. If it is, science experiences will be random and much valuable material will be omitted. The interests of four and five-year-old children are rather limited, and certainly part of the role of education is to widen children's horizons and introduce them to new experiences. (p. 246).

Lambert (12) feels that not only will planned science experiences enable children to learn about the world but the teacher who plans with them may increase her own understanding of children.

The teacher who understands child nature uses every means at her command to help children clarify their understanding. She exploits children's spontaneous curiosity, but she goes beyond and expands their existing interests. She plans with children for their experiences. (p. 248).

Lambert (12) not only feels that the science experiences should be planned, she also states that science will be neglected unless preplanning is made.

Unless there is time allocated for the program of science in the elementary school, the program cannot be successful. A day or week in which science does not appear as a definite part of the program with time allotment indicated will end without any science..... The day and week are already too full, and addition can only be made through thoughtful planning. (p. 13).

Groups of individuals have been concerned with the importance of planned science experiences. A science steering committee of the Stockton, California School (5) recommended:

We should not rely entirely on getting "leads" from social studies or language arts for a science program. Neither can we depend entirely upon "incidental" science. Science concepts must be developed in some kind of sequential pattern if they are to become meaningful to children. This means that the teacher must do long term planning in terms of needs and interest of pupils. Science does have a relationship with other school subjects. At times there is a natural fusion of several subject areas; and at other times it is desirable to emphasize science problems that may not be directly related to the social studies program of that grade level. (p. 18).

In a comparative study of the science achievement of pupils in elementary schools, Boyer (3) recommends a flexible but carefully planned science program.

The science program is planned very carefully by teachers and science consultants and utilization is made of pupil's interests and experiences whenever feasible. The program is flexible with respect to schedules, content, and pupil experience. Research has shown that it is ineffective to offer a science program which is rigid in terms of the syllabus and allotted time. It is likewise undesirable to offer a science program which is not planned carefully and is merely introduced whenever the children or the teacher feel the need. (p. 3).

Mallinson (15) states that we may lose our objectives when we fail to plan. He criticizes the many critic teachers who believe that science experiences are best treated incidentally and contributory to the program of social studies. Mallinson says that in such cases, the major objectives of the teaching of elementary school science may be

disregarded. (p. 245).

Storme (20) strongly favored the planned science experience when she wrote:

If science is to be taught in the kindergarten it should not be taught haphazardly. Neither should it be cut and dried. There should be a well defined plan for the science that is to be taught throughout the year with plenty of time allowed for the spontaneous or unexpected things that may come up and, of course, there should be ample opportunity for enjoying the science material outside a science period. (p. 14).

Maddux (14) strengthens his point of view when he gives the following reasons for preferring a planned science program:

1. A planned science program helps children to see the expanding concepts in science and also to see interrelationships in the various areas of science.

2. Some areas of interest will never be opened to children for exploration if just the incidental approach is used.

3. An incidental program is likely to follow either the interests of the teacher or the most vocal member of the class.

4. A planned program provides for progress from simple to complex understandings. (p. 72, 75, 105).

Blough and Huggett (2) have stated an ideal objective toward which teachers may strive in planning science experiences for young children.

Young children deserve to find in schools a nurturing influence for their natural curiosity about their world. They deserve, too, to have this curiosity expanded to new fields, about which they have never wondered because they do not know that they exist. They deserve opportunity to appreciate, through understanding, the wonders of the world into which they have come. About how this appreciation is to be developed, we still have much to learn. We can perhaps provide opportunities to observe at first hand, to feel, to see, to use the senses so that satisfactory experiences will result. Certainly there can be great thrills in discovery, great satisfaction through contact with natural objects and phenomena. (p. 20-21).

Casual Science Experiences

In this investigation a <u>casual science experience</u> is one in which the science experiences are an outgrowth or they are incidental situa-

tions initiated by the child's interest or questions as they arise out of the immediate environment.

Some educators advocate casual experiences to be adequate to form sound concepts. Isaacs (10) stresses the point of view that in education the sciences and the humanities are not alternatives but interrelated components of the same general process of intellectual awakening. He further reasons that, especially in the first school years, science instruction be largely in the form of first-hand experiences with the environment and that if it becomes a subject and in any manner formalized it will thereby be sterilized and even strangled.

Hughes (9) is another science educator who advocated the casual experience. She writes:

> It is necessary for each teacher to make her starting point on the basis of her particular group's interests. What is vital, thrilling and alive for one group could easily be a forced interest to another. Science work at no time should be forced upon the child, but must come as a natural outgrowth of his interests and his desire to know. (p. 15).

Theoretically, Updegraff (21) states that the interest in science should come from children.

> It is best to make use of teaching experiences as they naturally arise among the children. The teaching is as informal as possible and the material used is of immediate interest to the child. The teaching of nature study is not a situation where the teacher tries to imbue the child with facts. Instead she makes use of any remarks, observations, or bit of information suggested by a child. (p. 135).

Basic Assumptions

The two following assumptions seem basic to this investigation.

1. Children have an inherent curiosity to find out about the world in which they live. Breckenridge and Vincent (16) in Monroe's Encyclopedia support this assumption when they state that, "Children probably learn more new things in the first five years of their life than in all the rest of their lives". (p. 856). In the same publica-

tion Jersild (16) writes that, "By the age of six a child has been initiated into most of the major forms of experience that can befall a human being during his life time". (p. 856).

2. "Physically, the child is equipped to learn about his world. The whole nervous system is so organized that satisfaction results when the needs of the organism are met." (17, p. 78).

Objectives of this Investigation

Since research findings are not available to indicate preferred methods for presenting science concepts to young children in the nursery school, the purpose of the present investigation is to compare two methods of presenting science experiences to nursery school children.

Hypothesis

The hypothesis to be tested in this investigation is that the two methods of presenting science experiences, the planned and the casual, do not result in a significant difference in children's understandings of selected science concepts.

CHAPTER II

PROCEDURE

The objective of this investigation was to compare the planned and the casual methods of presenting science experiences to young children in the nursery school.

The general procedure for achieving the foregoing objective was (1) the selection of the science concepts that could be used with nursery school age children, (2) the selection of the subjects to be used in this investigation, (3) the development of pictures to depict these selected science concepts, (4) the validation of the science concepts depicted in these pictures, (5) the development of Form A and Form B of the picture test, (6) the presentation of Form A and Form B test pictures to two groups of nursery school children to test their initial understanding of these science concepts, (7) the establishment of rater reliability on the children's responses to the pictures, and (8) the analysis of the data.

The Selection of the Science Concepts

The selection of the science concepts to be used in this investigation was made after the investigator had examined elementary science books and articles from scientific magazines which had been written by contemporary educators in the field of science.

The review of literature revealed that many educators (2, 12) had

based their writing on a report by the National Society for the Study of Education (17). The National Society for the Study of Education listed the six areas in science to be used as guides for planned science experiences in kindergarten and elementary programs. There has not as yet been any science areas designated for the preschool level, but it was assumed that these same areas may have value for science experiences in nursery schools.

The areas in science which the National Society for the Study of Education (19) specified as the ones for which there should be planned science experiences at every grade level, including kindergarten were the following:

1. The Universe -- Here provision is made for the study of the stars, the sun, the moon, the planets, and their interrelationships. Pertinent materials would include those essential to an understanding of the causes of day and night, seasonal changes, tides, eclipses, and (less completely) of the vastness of the Milky Way galaxy and galactic systems beyond our own.

2. The Earth -- Among the pertinent topics in this phase of the environment are such problems as the origin of the earth, the formation of mountains, weathering of rock into soil, erosion, volcanism, prehistoric life, and the forces which have changed and are still changing the surface of the earth.

3. Conditions Necessary to Life -- What living things need in order to exist, how they are affected by changes in the environment, and the struggle for the conditions necessary to life are suggested materials in the development of this aspect of the environment.

4. Living Things -- Suitable materials include the variety of living things, the social life of animals, adaptations for protection, life cycles of plants and animals, how living things obtain their food, the economic importance of living things, and man's influence upon nature.

5. Physical and Chemical Phenomena -- Such chemical phenomena as rusting are considered in this phase of the environment. Physical phenomena which may be appropriate include; light, sound, gravity, magnetism and electricity, changes in state of matter, and the phenomena associated with radiant energy and atmospheric changes.

6. Man's Attempt To Control His Environment -- In this aspect of science the child may study man's control in gardens, on farms, in orchards; his inventions and discoveries; his use of power, of minerals; his control over living things; his study of places he cannot reach directly; and other such topics. (p. 75).

The four concepts to be used in this investigation were selected from the six areas listed above on the basis that there would be opportunity in the immediate environment for the children in both groups studied to come in contact with these science experiences which were to be given emphasis in the planned experiences. The selection of the science experiences on this basis gave all children an opportunity to be exposed to similar scientific phenomena in the natural environment.

The following concepts were selected to be used by the artist in drawing the pictures and by the investigator in planning the science experiences for this study.

1. Wind
   a. Air is moving around us all the time. When air is moving fast, we say that the wind is blowing.
   b. A breeze is air that moves slowly.

2. Sunshine and Shade
   a. Heat comes from the sun.
   b. Anything that is between the sun and the earth keeps away some of the sun's heat.

3. Growth Cycle
   a. All living things have definite life cycles -- they pass through stages as they grow to maturity and then produce new ones of their own kind.
   b. All living things need certain essentials in order to stay alive and grow.
   c. Living things are adapted to their environment.
   d. Living things go through a succession of stages in their development from egg to adult.

4. Seasons
   a. The motion of the earth around the sun and the tilt of the earth's axis cause our seasons.
   b. Plants make considerable adaptation to changes in the seasons.
   c. Spring, summer, autumn and winter are called seasons which follow in order. (17).

Subjects

The subjects used in this investigation were from two nursery schools under the supervision of the Department of Family Relations and Child Development at Oklahoma State University during the school year 1958-1959. The subjects from these two schools will hence be referred to as Group I - Experimental and Group II - Control.

Group I - Experimental was composed of twelve children within the Oklahoma State University all-day program located on the university campus. There were two teachers, one with the older children and one with the younger children. Although there were two separate groups in the nursery school they were in the same building with adjoining rooms enabling the children to move freely from one room to another. Each group within this school had a head teacher who planned the educational program for the children in this building. The planned science program was presented to all the children in this building for a period of four weeks. The preplanning was initiated by the teacher of the younger children who was also the investigator in this study. The guides which served as a basis for the preplanning may be found in Appendix H.

There were seventeen children in this all-day program from which five boys and seven girls whose ages ranged from three years and four months to five years and four months at the time of the initial testing were selected because they could be paired by chronological age with the children of the control group. These children were used as the subjects in Group I - Experimental. Five children of the seventeen were eliminated from the experimental group because four children were under the age of three years and three months, the base age and one was almost six years of age which exceeded the age limit in the control group.

Age was the criterion used in the selection of the subjects.

Group II - Control was composed of twelve children within the Oklahoma State University Veteran's Village all-day service program. There was a head teacher and an assistant teacher with the head teacher planning the educational program.

This control group consisted of six boys and six girls whose ages ranged from three years and three months to five years and nine months. These twelve children were selected from approximately twenty-five children on the basis of chronological ages which were comparable to the subjects' ages in Group I - Experimental. The science experiences in this program were left to chance with no preplanning being done by the teacher.

Table I shows a comparison by chronological age of the children in Group I - Experimental and Group II - Control.

TABLE I

A COMPARISON OF THE SUBJECTS BY CHRONOLOGICAL AGE IN GROUP I - EXPERIMENTAL AND GROUP II - CONTROL

GROUP I - EXPERIMENTAL Age in Years and Months		GROUP II - CONTROL Age in Years and Months	
1	3 - 4	1	3 - 3
2	3 - 6	2	3 - 7
3	3 - 7	3	3 - 8
4	3 - 11	4	4 - 1
5	4 - 3	5	4 - 3
6	4 - 5	6	4 - 5
7	4 - 10	7	4 - 9
8	4 - 10	8	4 - 9
9	5 - 1	9	4 - 11
10	5 - 3	10	5 - 1
11	5 - 3	11	5 - 4
12	5 - 4	12	5 - 9

Note:- 3 - 4 indicates three years and four months.

The Development of the Pictures

Elementary school science books which contained colored pictures that could be used to depict the concepts in specific areas were chosen by the investigator. These pictures, still in the books, were shown to children who were not affiliated with the Oklahoma State University Preschool Laboratories for the purpose of determining (1) whether children would react to the pictures and (2) whether their reactions would reveal an understanding of the scientific concepts. A trial experiment with pictures was conducted on two girls and one boy whose ages ranged from three years to four years and eleven months. The older boy and girl were interviewed in the investigator's home and the three year old girl was interviewed in her home. The reactions of these children gave the investigator an opportunity to try out various probing questions. The responses made by these children provided a guide for the investigator in the selection of the pictures which were used in this investigation.

An artist drew ten pictures which depicted the science concepts that had been selected from the six areas of science listed by the National Society for the Study of Education. (17).

Validation of the Science Concepts Depicted in the Pictures

To establish validity of the science concepts which were depicted in the pictures they were shown to three different classes of college students who were enrolled in the Department of Family Relations and Child Development at Oklahoma State University.

First Pictures and Checklist of Concepts. The first group of students to participate in the validation of the science concepts

depicted in the pictures were enrolled in an early childhood education course in the Department of Family Relations and Child Development.

Each student was given a checklist which contained the four science concepts. (Appendix E). Blank spaces were provided under each concept for the student's responses. The investigator presented the student with brief background information concerning the investigation and the purpose of the investigation.

The students were then asked to read the concepts and explanatory remarks under each concept. (Appendix E). Then the students were told there were two pictures depicting each science concept with the exception of the seasons which had four pictures. The pictures which illustrated the concepts of wind, sunshine and shade, cycle of growth and the seasons had been placed in random order and identified by a number.

The investigator held up the pictures one at a time and the student wrote the number assigned to that picture in the space with the concept which she felt it depicted. The pictures were shown only once.

Following the administration of the checklist, the investigator gave the correct answers to the students while they checked their own responses. The students were then asked to give their reasons for incorrect identification of the concept with the pictures. These suggestions were used by the artist to revise the drawing of the pictures.

There were two pictures that were not meaningful enough in drawing to depict the intended concept. They were number twelve in which the shade of a tree had prevented snow from melting, and number thirty, the picture depicting the season of spring. These two pictures were redrawn to clairify the intended concept.

Revised Pictures and Checklist. The artist redrew the two pictures,

then the ten pictures were again presented to a second group of students who were enrolled in a family relations and child development course in the Department of Family Relations and Child Development. The same directions and procedures were followed as with the group who was first presented the pictures. Again picture twelve, the one concerned with snow not melting was not checked correctly. The artist again redrew the picture.

Second Revision of Pictures and Checklist. After the revision of picture number twelve, the ten pictures and the checklist were given to a third group of students who were enrolled in a child development course in the Department of Family Relations and Child Development. The same directions and procedures were followed as in the preceeding groups. This time all pictures were identified by all the students in this group correctly with the concepts they were intended to depict.

Form A and Form B of the Picture Test

The six pictures depicting the science concepts of wind, sunshine and shade, and the cycle of growth had one picture for each concept placed randomly into Form A or Form B. The four pictures depicting the seasons of fall and winter, and spring and summer were paired and placed at random into Form A or Form B. This made a total of five pictures in Form A and five pictures in Form B.

Presentation of Form A and Form B to the Subjects

The subjects in Group I - Experimental were paired according to age. The subjects within a pair were randomly assigned to Form A or Form B for the initial testing. The subjects who were given Form A for

the initial test were then given Form B for the post-test, and the subjects who were given Form B for the initial test were given Form A for the post-test.

The subjects in Group II - Control, were treated the same as the subjects in Group I - Experimental. Table II shows the results of the random placing of subjects by age for testing by Form A and Form B for the initial test and the post-test.

TABLE II

RANDOM PLACING OF SUBJECTS BY AGE FOR TESTING BY FORM A AND FORM B

GROUP I - EXPERIMENTAL			GROUP II - CONTROL		
Initial Test	Form A	Form B	Initial Test	Form A	Form B
	3 - 7	3 - 4		3 - 3	3 - 7
	3 - 11	3 - 6		3 - 8	4 - 1
	4 - 5	4 - 3		4 - 5	4 - 3
	5 - 1	4 - 10		4 - 9	4 - 9
	5 - 3	4 - 10		4 - 11	5 - 1
	5 - 4	5 - 3		5 - 4	5 - 9
Post Test	Form B	Form A	Post Test	Form B	Form A
	3 - 7	3 - 4		3 - 3	3 - 7
	3 - 11	3 - 6		3 - 8	4 - 1
	4 - 5	4 - 3		4 - 5	4 - 3
	5 - 1	4 - 10		4 - 9	4 - 9
	5 - 3	4 - 10		4 - 11	5 - 1
	5 - 4	5 - 3		5 - 4	5 - 9

Note:- 3 - 7 indicates three years and seven months.

Presentation of the Pictures to the Children

Each child was taken individually by the investigator to a room

near or a part of the nursery school. A tape recorder was used to record the children's responses to the pictures. (Appendix D).

The investigator talked to each child a few minutes to establish rapport before beginning the testing. Each child was told by the investigator that she had some pictures to show for them to talk about. The initial picture shown was an introductory picture to start the subject talking, but was not used in the analysis of the data. (Appendix C). The test pictures were then shown in order with specific questions being asked by the investigator about each picture. (Appendix D).

Rater Reliability on the Children's Responses

The children's responses were tape recorded during the interview. The children's responses for each picture were then typed from the tape recorder on 3" x 5" cards and were submitted to two persons, who were trained in early childhood education. The two raters were asked to pass judgment upon the children's responses in relation to the children's understanding of the science concepts depicted in the pictures.

The two raters were given a brief description of the investigation and instructions for checking the subjects responses in relation to their understanding of the science concepts depicted in the picture. (Appendix F).

The raters scored each child's total response to a picture by giving it a value of one or zero based on the definitions given on the sheet of accompanying instructions. (Appendix F). The composite of the two raters values for each subject composed the raw score used in the analysis of this data. Each subject could have a final score that ranged from zero to ten points.

These raters obtained a 95 per cent agreement on the responses of four children to the Form A and Form B combined pictures. These four

subjects were not included with the twenty-four subjects used in this investigation.

This percentage of agreement was computed by the following formula: (11).

$$\frac{\text{number of agreements}}{\text{number of agreements plus number of disagreements}}$$

This same method was used to compute the rater's reliability on the children's total responses to Form A and Form B. This per cent of agreement was 92.

CHAPTER III

ANALYSIS OF THE DATA

The objective of this investigation was to test two methods, the planned and the casual, of providing opportunity for young children in the nursery school to understand selected science concepts.

To achieve the foregoing objective a Form A and a Form B of the picture test was devised for measuring young children's understanding of the selected science concepts. These two forms were assumed to be equivalent measuring devices, although no tests had been made to insure this fact. The assumption that Form A and Form B of the picture test was equivalent was based on the meticulous procedure by which the pictures were developed. (Chapter II). This was short of a scientific approach, but due to lack of time and experimental subjects available it was necessary for the investigator to assume the instruments equal and procede with the basic question of the study which was: Are the two methods, planned and casual, of providing opportunity for young children in the nursery school to understand selected science concepts equivalent?

This investigation was conducted on subjects selected from two all-day nursery schools at Oklahoma State University. (Chapter II). Group I - Experimental was presented with planned science experiences by the investigator of this study and Group II - Control was left to chance in relation to science experiences. No preplanning was done by the teacher of the control group of children.

Six subjects in Group I - Experimental and six subjects in Group II - Control were given Form A during the pre-test. The remaining six in Group I - Experimental and the remaining six in Group II - Control were given Form B pictures during the pre-test. At the end of an interval of four weeks the subjects were again presented the Form A and Form B pictures. Form A was given to the subjects that had taken Form B in the pre-test and Form B was given to the subjects who had been given Form A during the pre-test.

TABLE III

THE RAW SCORES OF ALL SUBJECTS IN GROUP I - EXPERIMENTAL AND GROUP II - CONTROL SHOWING INDIVIDUAL DIFFERENCES AND DIFFERENCE MEANS

	GROUP I - EXPERIMENTAL				GROUP II - CONTROL			
	Subjects	Pre-Test	Post Test	Difference	Subjects	Pre-Test	Post Test	Difference
Form A - B	1	7	8	1	1	0	0	0
	2	0	6	6	2	2	1	-1
	3	8	4	-4	3	2	0	-2
	4	1	4	3	4	0	0	0
	5	8	10	2	5	7	8	1
	6	5	10	5	6	4	3	-1
Form B - A	7	0	6	6	7	0	0	0
	8	0	0	0	8	0	1	1
	9	2	0	-2	9	0	4	4
	10	3	6	3	10	1	4	3
	11	4	3	-1	11	5	6	1
	12	0	3	3	12	6	6	0
	TOTAL	38	60	22		27	33	6
	MEAN SCORE			1.83				0.50

According to this method of presenting Form A and Form B pictures each subject was his own control and the measurement was his gain or loss

in understanding the specific science concepts measured by Form A and Form B pictures. A description of the procedure by which the subject's responses were rated and a final score determined is given in Chapter II.

Since there are only two groups for treatment the data could have been analysed by the t-test instead of the F-test, however, the same results would have been reached. The basic data used in the analysis of this investigation is presented in Table III.

Table IV shows that the evidence is not strong that one method of teaching is superior to the other, however, if one must accept one method over the other and if other things are equal, it would be desirable to choose planned experiences for providing opportunity for young children in the nursery school to understand selected science concepts.

TABLE IV

ANALYSIS OF VARIANCE OF GROUP I - EXPERIMENTAL AND GROUP II - CONTROL

Source	d.f.	SS	Mean Square	F	Probability Level
Total	23	151.33			
Treatment	1	10.66	10.66	1.67	$70<P<80$
Error	22	140.67	6.39		

This investigator recognizes that before confidence can be placed in planned science experiences above casual science experiences further experimentation involving more subjects with more rigid controls, more nursery school groups, and further testing of the reliability and validity of Form A and Form B pictures to be used as measuring devices is needed.

Three subjects in Group I - Experimental and three subjects in Group II - Control made lower scores on the post-test than they made on the pre-test. The investigator cannot scientifically account for these lower scores. The difference may be due to the difference in the Form A and Form B pictures, since the validity of the pictures to depict the concepts had been judged by adults instead of children.

In summary, it can be stated that the testing of two methods of providing opportunity for nursery school children to understand selected science concepts was not significant for either method at the .95 level of confidence, hence we cannot reject the hypothesis which was: The two methods of presenting science experiences, the planned and the casual, do not result in a significant difference in children's understandings of selected science concepts. The evidence in this investigation presented in Table IV favored the planned experiences over the casual ones at the .70 to .80 level of confidence.

CHAPTER IV

SUMMARY

This investigation was concerned with two methods of presenting science concepts to preschool children. The two methods to be compared were the planned and the casual. The planned science experiences were defined as ones in which the nursery school teacher set the stage for learning by focusing attention upon natural phenomena in the immediate environment by preplanning. The casual science experiences were defined as ones in which the science experiences were an outgrowth or they were incidental situations initiated from the child's interest or questions as they arose out of the immediate environment.

The subjects used in this investigation were from two nursery schools under the supervision of the Department of Family Relations and Child Development at Oklahoma State University during the school year 1958-1959. Group I - Experimental was composed of twelve children within the Oklahoma State University all-day program located on the university campus. Group II - Control was composed of twelve children within the Oklahoma State University Veteran's Village all-day service program. Age was the criterion by which the subjects were selected. The range in age was from three years and three months to five years and nine months.

The science concepts were selected by the investigator from the six areas which had been listed in the National Society for the Study

of Education's Forty-Sixth Yearbook, Part I. An artist drew pictures which depicted these selected science concepts.

The experimental method was used to obtain the data. The subjects in both groups were presented the pictures individually and their responses taped on a recorder. Group I - Experimental was presented planned science experiences by the investigator of this investigation. The science experiences in Group II - Control were left to chance without any preplanning being done by the teacher.

Two raters who were trained in early childhood education were asked to rate the children's responses to each picture and give it a score value of one or zero. A one value was given if the rater felt the child had some understanding of the concept and a zero was given if they felt the child had no understanding of the concept.

The rater reliability was .95 on a pre-test and .92 on the responses of the children that were used in this investigation. The combined scores of the two raters formed the raw scores that were used as data.

The difference in gain based on the subject's individual scores was subjected to the F-test. The results of this test were not statistically significant, however, if one must accept one method over the other and if other things are equal, it would appear to be desirable to choose planned science experiences for providing opportunity for young children in the nursery school to understand selected science concepts.

General conclusions are not warranted in this investigation or this limited evidence, however, the following recommendations for further research concerning the teaching of science concepts to young children in preschools should be examined before other investigations of this nature are conducted.

1. The standardization of Form A and Form B of the picture test should be made prior to the collection of additional data. This standardization should be made on a wider age range of subjects, perhaps nursery school, kindergarten, and primary grade children.
2. The subjects for the future investigations should be increased in the number selected with the recommendation that they be from several schools and several different locales which would provide different socio-economic levels. The groups should be equated on the bases of the subject's intelligence and the educational backgrounds of the subject's parents.
3. A longer period for experimental teaching should be provided; at least a semester of time duration is recommended.
4. The educational training as well as experience of the teachers should be given consideration in equating groups for further study of the present problem.

A SELECTED BIBLIOGRAPHY

1. Beauchamp, Wilber L., Crampton and Gray. Science Stories, Book One, Book Two, and Book Three. New York: Scott, Foresman and Company.

2. Blough, Glenn O. and Albert J. Huggett. Elementary School Science and How to Teach It. New York: The Dryden Press. 1951

3. Boyer, Donald A. "A Comparative Study of the Science Achievement of Pupils in Elementary Schools." Science Education. XXXIX. February 1955. pp. 3 - 12.

4. Field, Mary Louise. "Nature Study Activities for Three Year Old Children." (Unpublished M. A. Thesis). State University of Iowa. 1937. p. 410.

5. Gentry, Adrian N. "Science for Every Child." California Journal of Elementary Education. XXI, November 1952. pp. 5 - 29.

6. Greenlee, Julian. Teaching Science to Children. Dubuque, Iowa: Wm. C. Brown Company. 1951.

7. Greenwald, Mildred and Vivienne Hochman. Science Experiences in Early Childhood Education. Bank Street Publications.

8. Haupt, Dorothy. Science Experiences for Nursery School Children. National Association for Nursery Education. Kingston, Rhode Island. 1954.

9 Hughes, Loyola. "Physical Science in the Elementary School." Science and the Young Child. Association for Childhood Education. 1936. p. 15.

10. Isaacs, Nathan. "Education and Science." Intellectual Growth in Young Children by Susan Isaacs. New York: Harcourt. 1930.

11. Jahoda, Marie and Norton Dutsch, and Stuart W. Cook. Research Methods in Social Relations, Part I, Part II. New York: The Dryden Press. 1956

12. Lambert, Hazel M. Teaching the Kindergarten Child. New York: Harcourt, Brace and Company. 1958.

13. Leonard, Edith M., Lillian E. Miles, and Catherine S. Van der Kar. The Child at Home and School. New York: American Book Company. 1944.

14. Maddux, Grace C. "A Pro for the Planned Program." The Science Teacher. March 1958. pp. 72-75, 105.

15. Mallinson, George Griesen. "Preservice Experiences in Science." The National Elementary Principal. XXXIII. September 1953. pp. 245 - 248.

16. Monroe, Walter S. Encyclopedia of Educational Research. New York: Mac Millan. 1950.

17. National Society for the Study of Education. Science Education in American Schools. Forty-Sixth Yearbook, Part I. 1947

18. Russell, David W. Suggestions for the Care of Pets in the Classroom. New York: Scott, Foresman and Company.

19. Science and the Young Child. Association for Childhood Education. Washington, D.C. 1936.

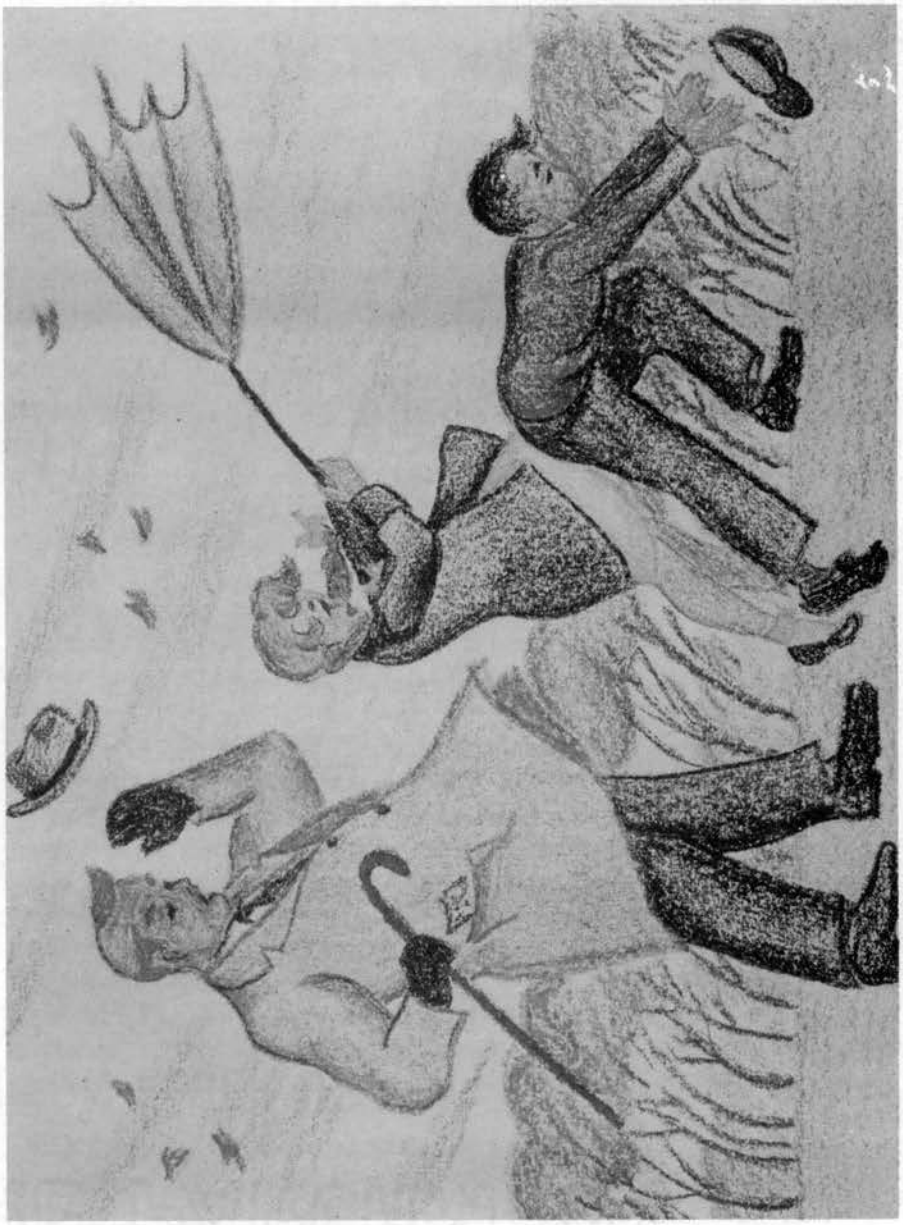
20. Storme, Bernice E. "Science in the Kindergarten." Science and the Young Child. Association for Childhood Education. 1936. p. 14.

21. Updegraff, Ruth. Practice in Preschool Education. New York: McGraw-Hill. 1938.

22. Zim, Herbert S. Science for Children and Teachers. Association for Childhood Education International. Washington, D.C. 1953.

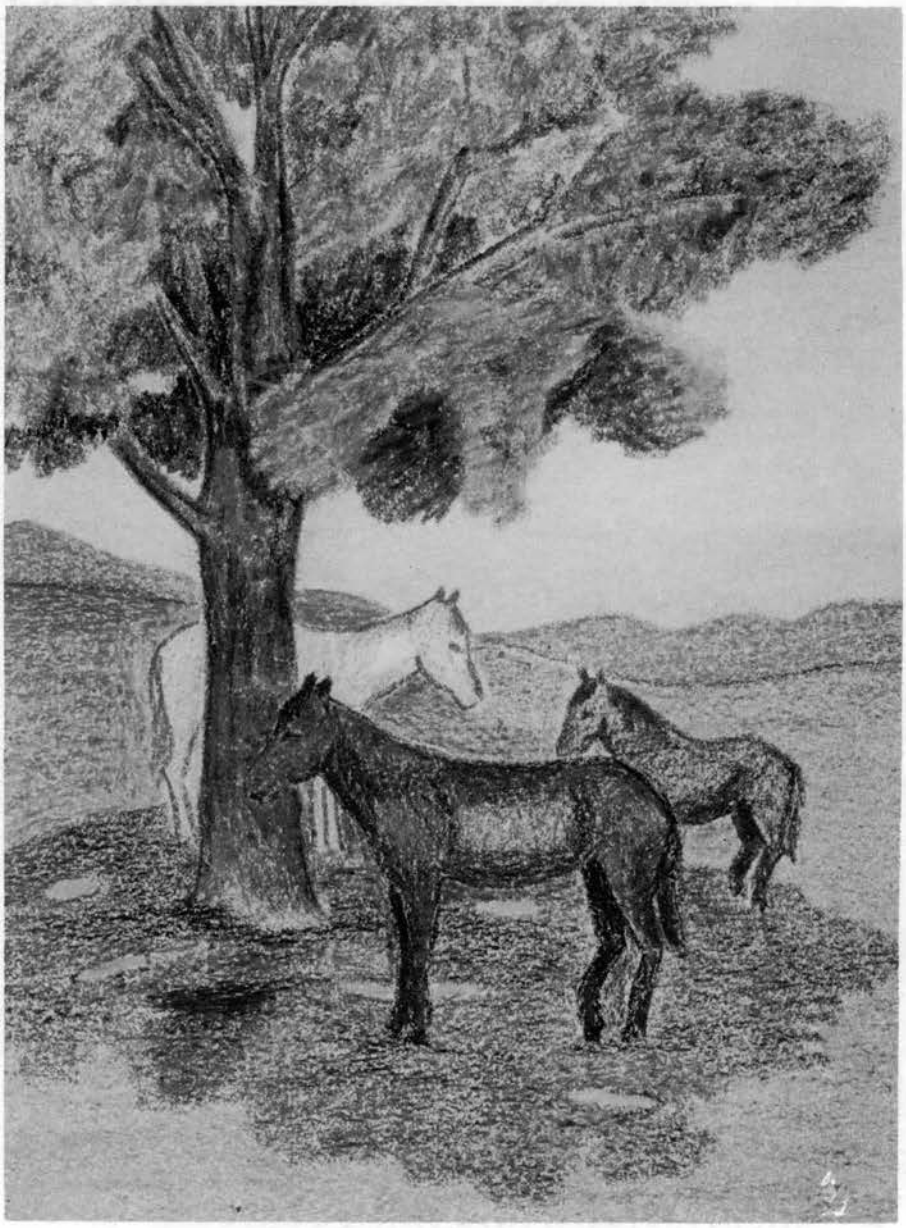
APPENDIX A

PLATE I

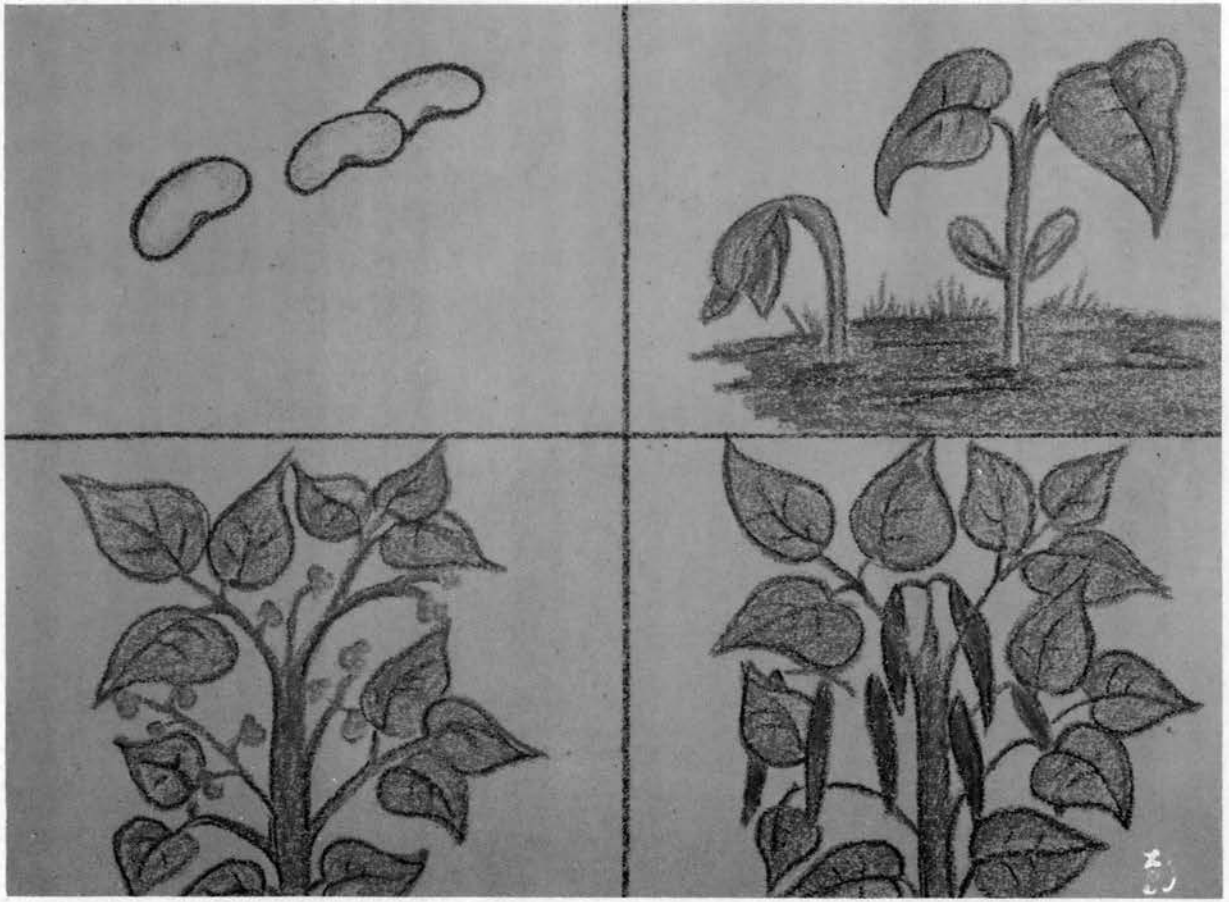


CONCEPT: WIND - AIR IS MOVING AROUND US ALL THE TIME

PLATE II

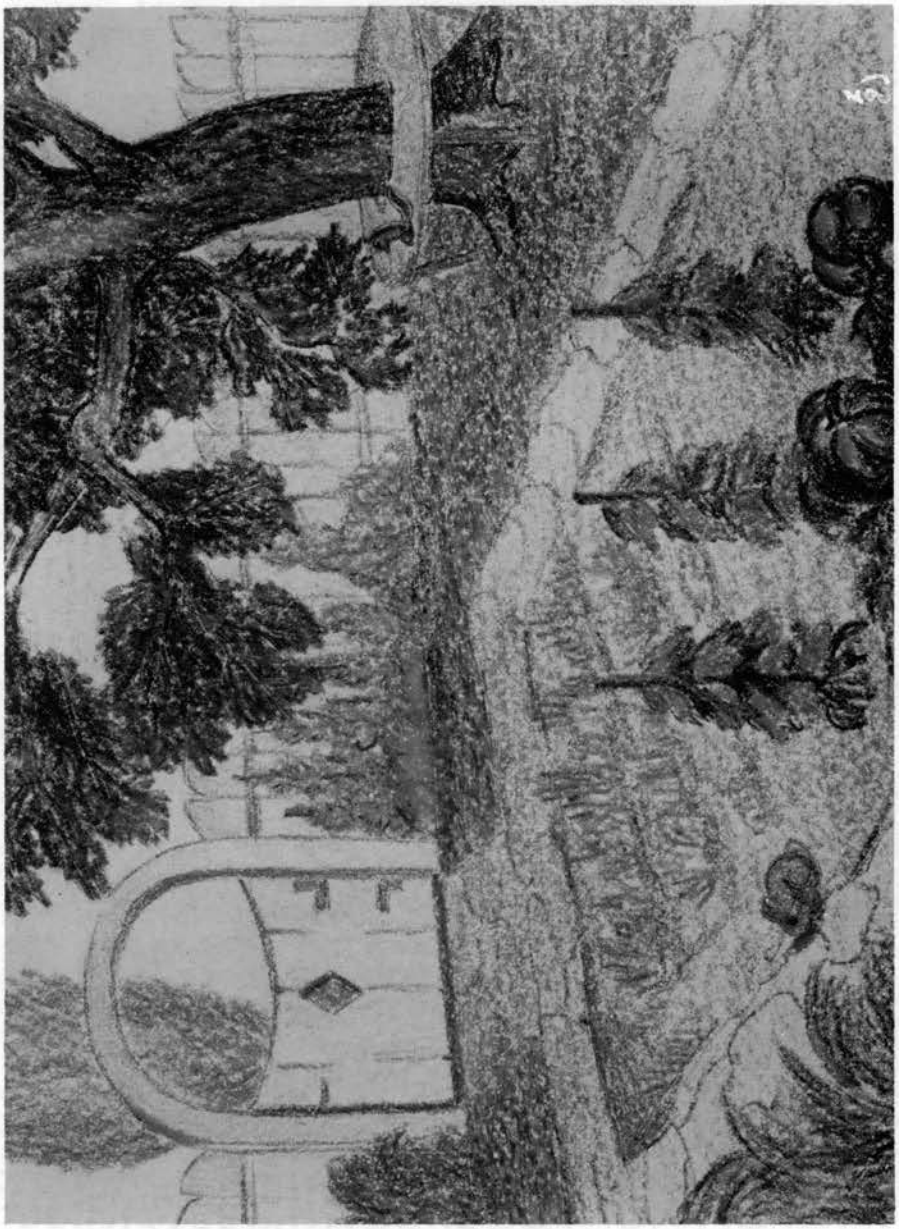


CONCEPT: SUNSHINE AND SHADE - ANYTHING THAT IS BETWEEN THE SUN AND THE EARTH KEEPS AWAY SOME OF THE SUN'S HEAT



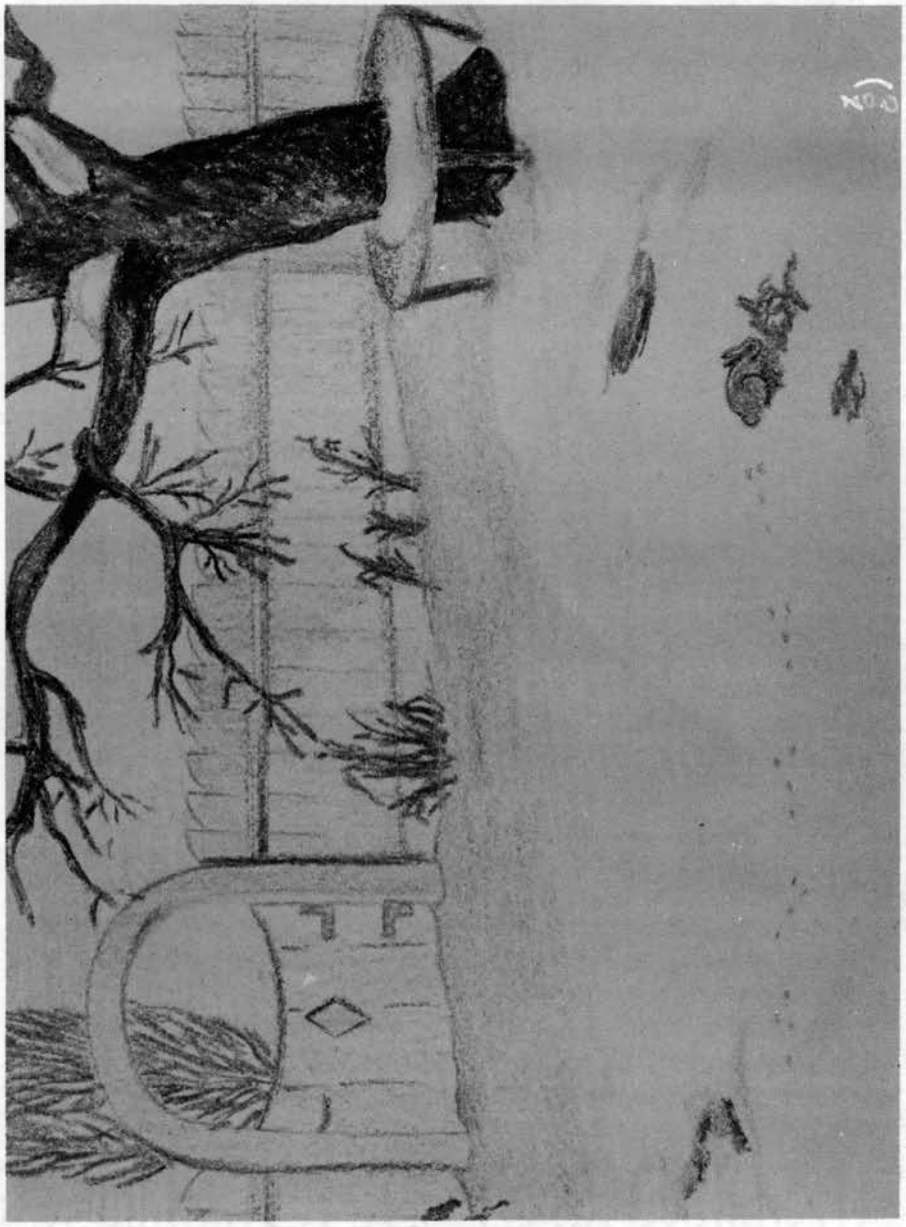
CONCEPT: CYCLE OF GROWTH - ALL LIVING THINGS HAVE DEFINITE LIFE CYCLES - - THEY PASS THROUGH STAGES AS THEY GROW TO MATURITY AND THEN PRODUCE NEW ONES OF THEIR OWN KIND

PLATE IV



CONCEPT: SEASONS - PLANTS MAKE ADAPTATIONS TO CHANGES IN THE SEASONS

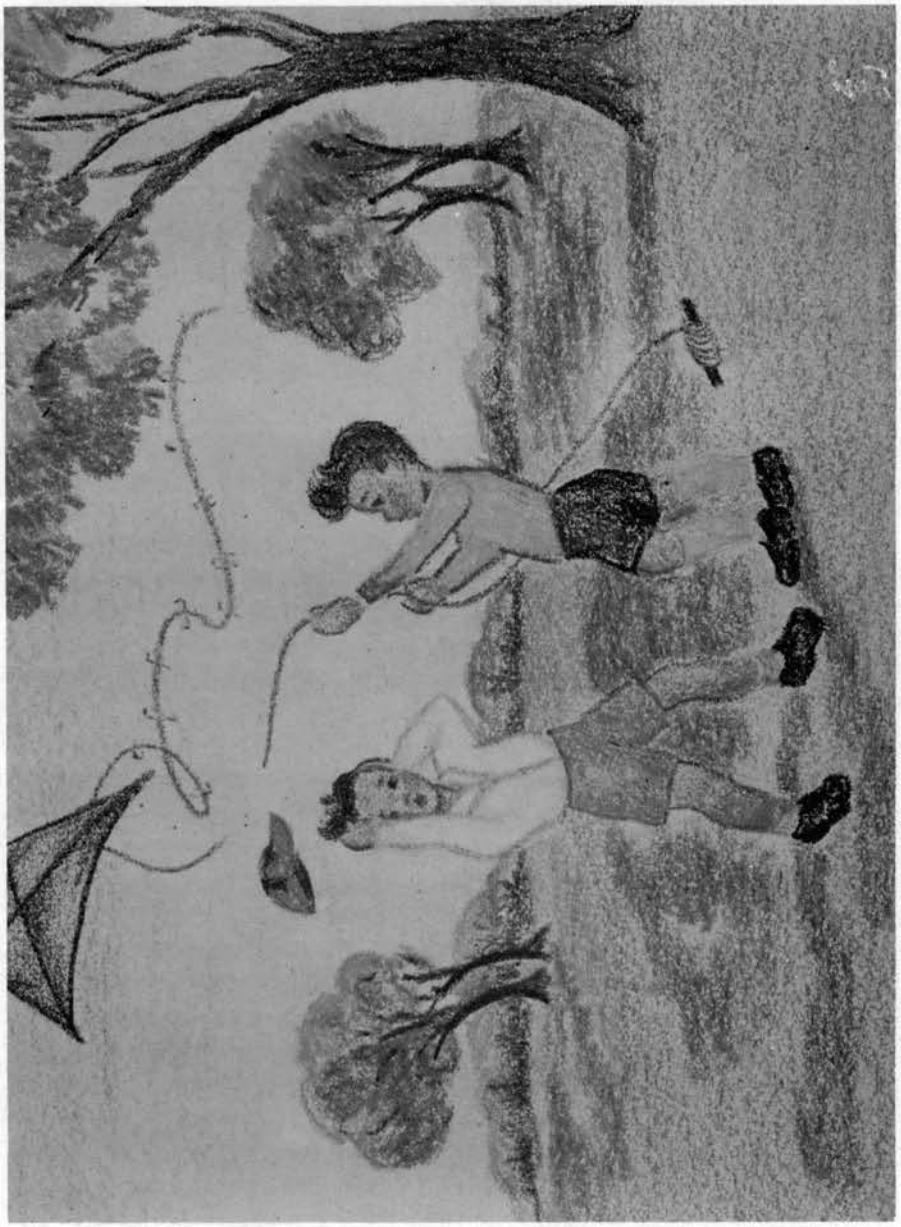
PLATE V



CONCEPT: SEASONS - PLANTS MAKE ADAPTATIONS TO CHANGES IN THE SEASONS

APPENDIX B

PLATE VI

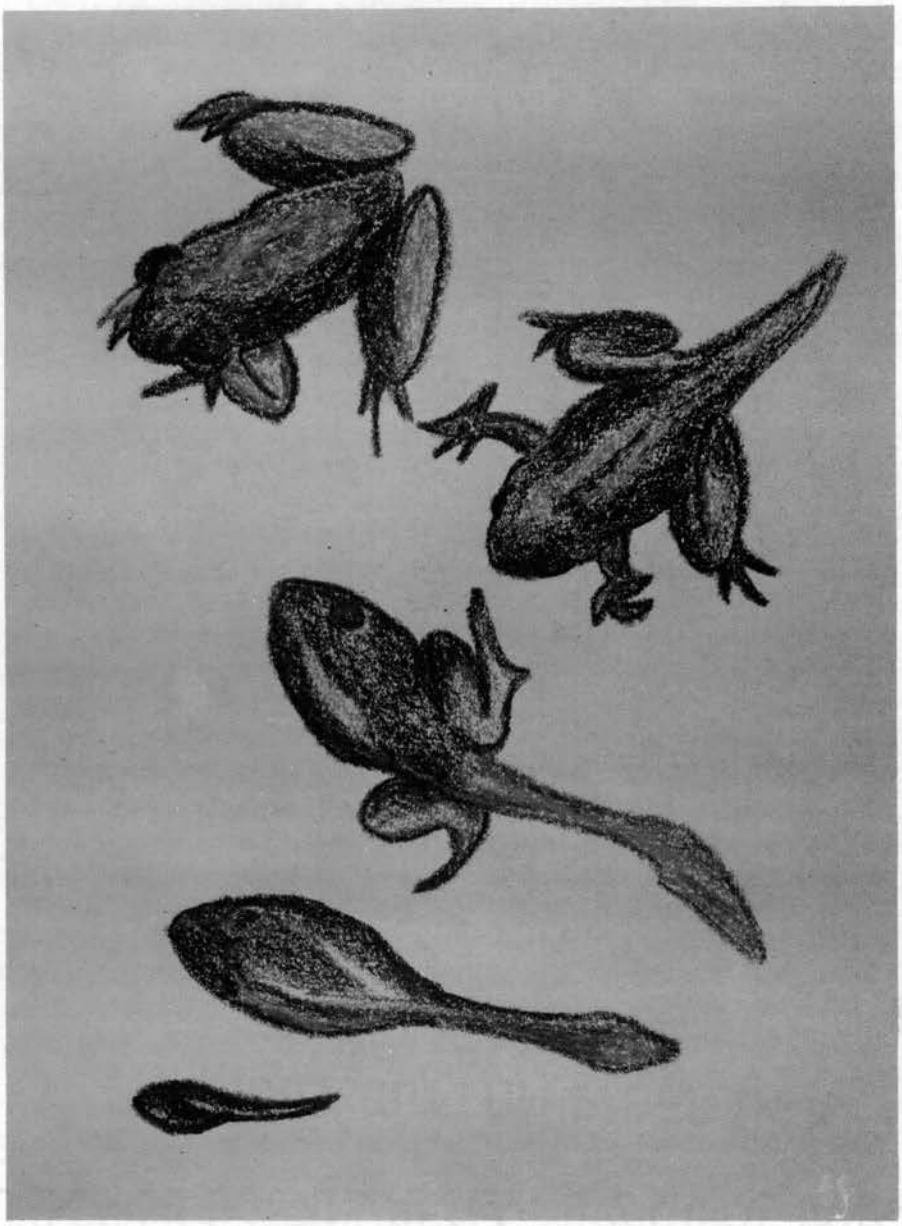


CONCEPT: WIND - AIR IS MOVING AROUND US ALL THE TIME

CONCEPT: SUNSHINE AND SHADE - ANYTHING THAT IS BETWEEN THE SUN AND THE EARTH KEEPS AWAY SOME OF THE SUN'S HEAT

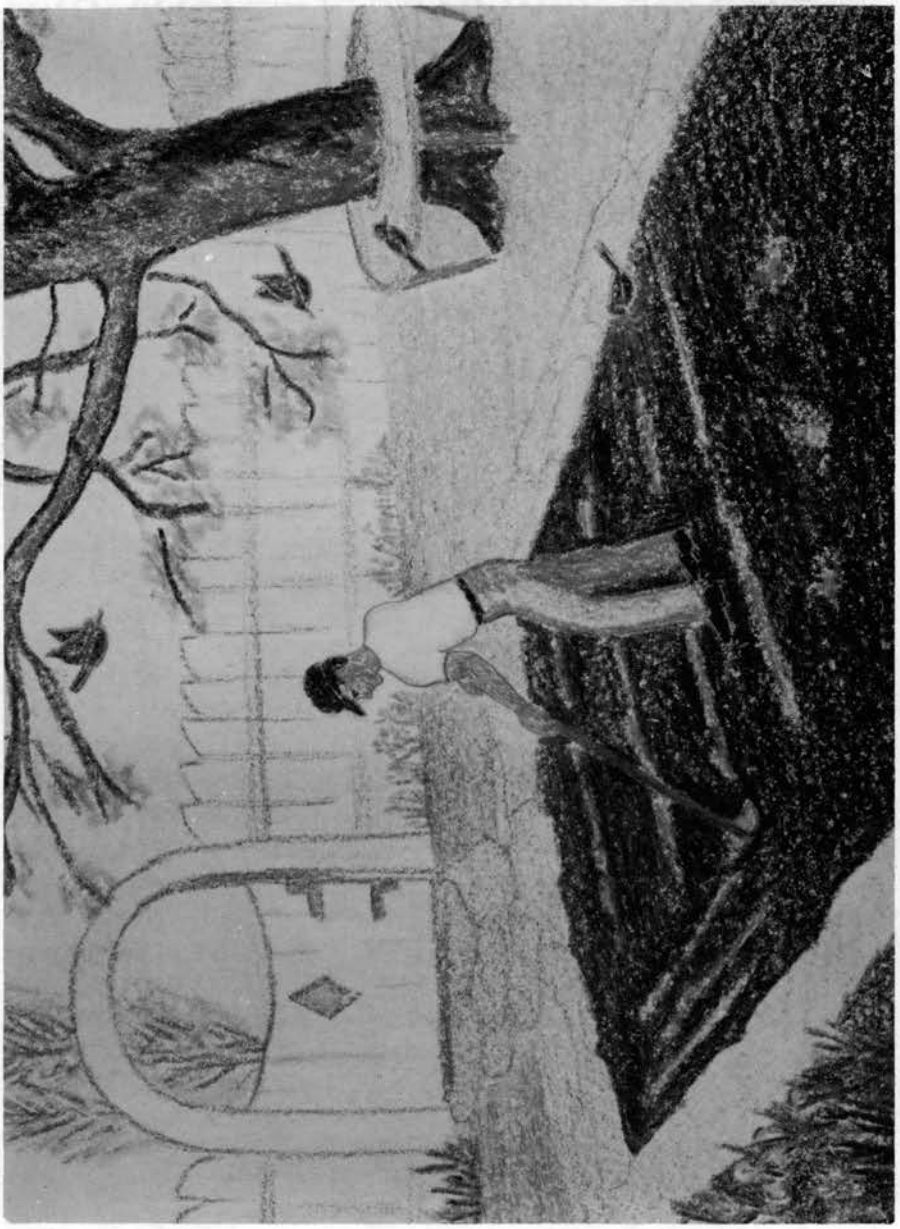
PLATE VII

PIATE VIII



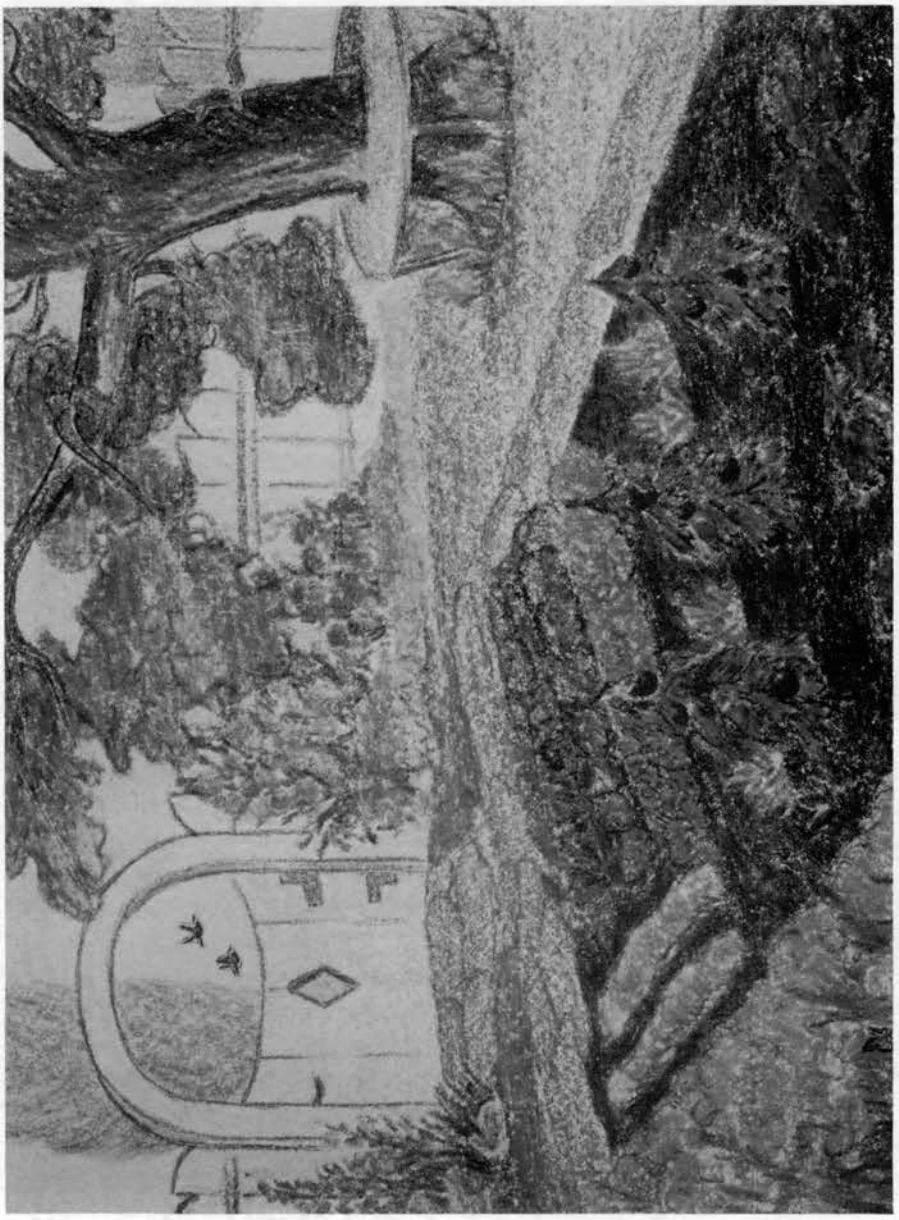
CONCEPT: CYCLE OF GROWTH - ALL LIVING THINGS HAVE DEFINITE LIFE CYCLES - - THEY PASS THROUGH STAGES AS THEY GROW TO MATURITY AND THEN PRODUCE NEW ONES OF THEIR OWN KIND

PLATE IX



CONCEPT: SEASONS - PLANTS MAKE ADAPTATIONS TO CHANGES IN THE SEASONS

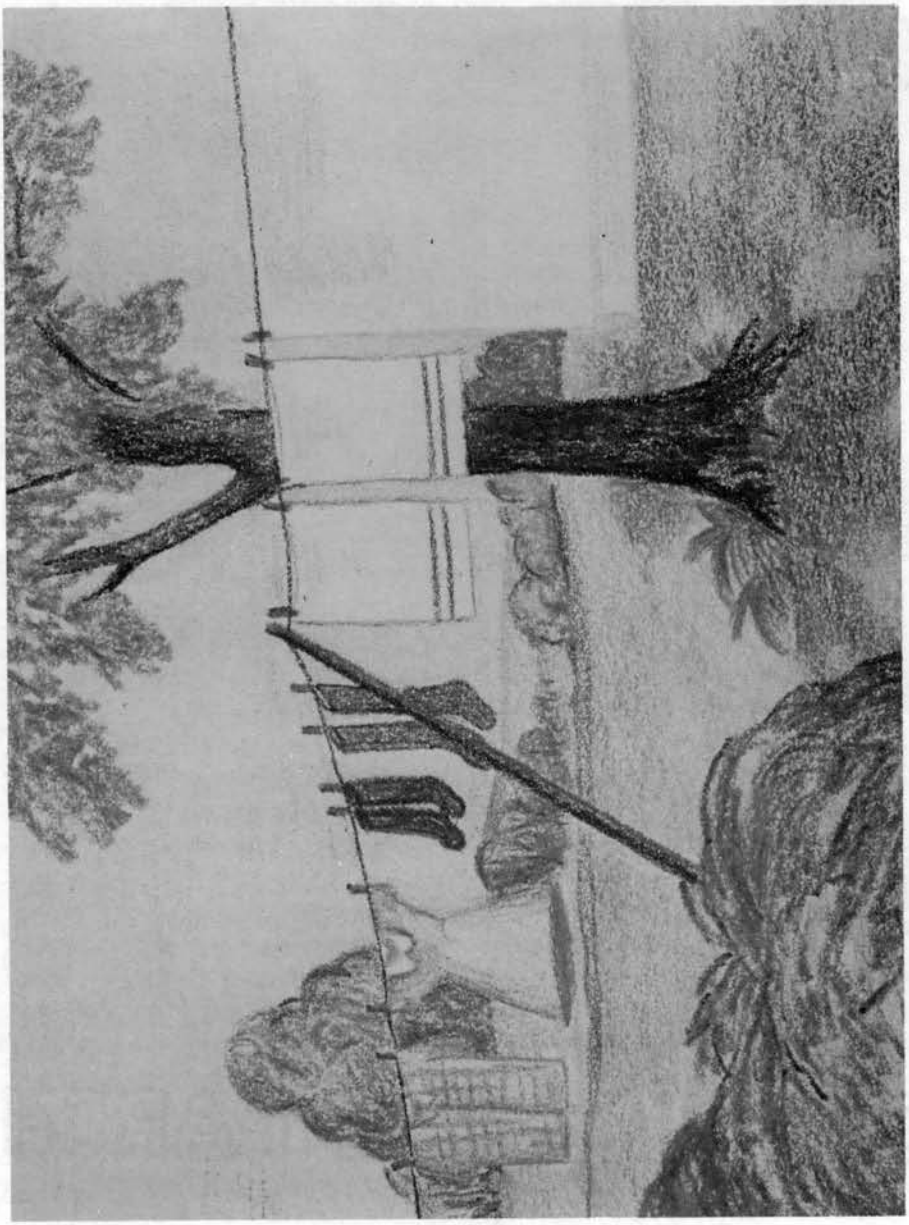
PLATE X



CONCEPT: SEASONS - PLANTS MAKE ADAPTATIONS TO CHANGES IN THE SEASONS

APPENDIX C

PLATE XI



INTRODUCTORY PICTURE SHOWN TO SUBJECTS BEFORE
FORM A AND FORM B

APPENDIX D

PROBING QUESTIONS

Tests Form A and Form B

Questions Used For All Pictures to elicit responses from the children.

1. Tell me what you see in this picture.
2. Tell me about this picture.
3. Would you like to tell me some more about the picture?
4. Do you see anything else in the picture you would like to tell me about?

Additional Questions Used For Individual Pictures

PLATE I - - How can you tell the wind is blowing?

PLATE II - - What are the horses doing?

PLATE III - - What are these, what is this?

PLATE IV - - What time of year is this picture? How can you tell?

PLATE V - - What time of year is this picture? How can you tell?

PLATE VI - - How can you tell the wind is blowing?

PLATE VII - - Why is the snow only on one side of the house?

PLATE VIII - - What is this? (smallest tadpole)

PLATE IX - - What time of year is this picture? How can you tell?

PLATE X - - What time of year is this picture? How can you tell?

SELECTED SAMPLES ILLUSTRATING CHILDREN'S RESPONSES TO CONCEPTS DEPICTED IN THE PICTURES

PLATE I - CONCEPT: WIND

Subject: Boy. Age: Five years and nine months

Teacher: Tell me what you see in this picture.
Subject: It is too windy and the boy's hat is trying to fly and the umbrella is upside down and the daddy's hat is about to blow away. Lots of trees are blowing.
Teacher: Anything else you want to ell me?
Subject: It is raining - raining, no wind - it is windy.
Teacher: All right.

Subject: Girl. Age: Five years and four months

Teacher: Tell me about this picture.
Subject: Daddy's hat blowed off and the little girl's umbrella is blowing away and the little boy's hat is blowing away. He runs to get it.

Subject: Boy. Age: Five years and three months.

Teacher: Tell me what you see in this picture.
Subject: A man and a girl and a boy.
Teacher: Anything else that you want to tell me?
Subject: The wind is blowing.
Teacher: How can you tell the wind is blowing?
Subject: All the clouds moved.
Teacher: Anything else that you want to tell me?
Subject: An umbrella...
Teacher: Yes, anything else?
Subject: No.

Subject: Boy. Age: Four years and ten months

Teacher: Tell me what you see in this picture.
Subject: I see the wind blowing and the man's hat blowed off.
Teacher: How can you tell the wind is blowing?
Subject: It is like that.
Teacher: Like what?
Subject: There what they are.
Teacher: Yes, I see. Anything else you want to tell me?
Subject: No.

PLATE II - CONCEPT: SUNSHINE AND SHADE

Subject: Girl. Age: Four years and five months

Teacher: What do you see in this picture?
Subject: A white pony, and a brown pony, two brown ponies, and a tree - a shady tree.
Teacher: That's all? What are the horses doing?
Subject: They I don't know.

Subject: Boy. Age: Five years and three months.

Teacher: Tell me what you see in this picture.
Subject: Horses and a tree and grass.
Teacher: What are the horses doing?
Subject: Walking around under the tree.
Teacher: All right. Anything else you want to tell me?
Subject: No.

Subject: Boy. Age: Five years and three months

Teacher: Tell me about this picture.
Subject: I see hills, a tree, and some grass and some puddles - - some pictures and a mother horse.
Teacher: What are the horses doing?
Subject: They are taking some rest and they are just looking around.

PLATE III - CONCEPT: CYCLE OF GROWTH

Subject: Boy. Age: Five years and nine months

Teacher: Tell me what you see in this picture? (a and b)
Subject: Seeds and garden.
Teacher: What do you see down here? (c)
Subject: It is starting to grow from the garden.
Teacher: What do you see in this picture? (d)
Subject: When it is time for spring all the plants grow up.
Teacher: That is right.

Subject: Boy. Age: Four years and five months

Teacher: Tell me about this picture.
Subject: Peanuts and flowers, leaves...
Teacher: What do you see in this picture? (a), (b), (c)
Subject: (a) Peanuts, (b) leaves, (c) flowers.
Teacher: What do you see in this picture? (d)
Subject: Beans.

Subject: Boy. Age: Five years and three months

Teacher: Tell me about this picture. (a)
Subject: I see some seeds. I see a garden and some beans growing.
Teacher: What do you see in this picture? (b)
Subject: I see a seed there stuck on some leaves.
Teacher: What do you see here? (c), (d)
Subject: (c) Some leaves. (d) Some beans.

Subject: Girl. Age: Five years and one month

Teacher: Tell me what you see in this picture.
Subject: Well, there are some plants growing and some beans and yesterday we planted some beans.
Teacher: You did? What do you see in this picture? (a)
Subject: Beans.
Teacher: What do you see here? (b), (c), (d)
Subject: (b) A plant - a thing that has two leaves on it. That is a thing with so many (c) leaves and so many purple things, and (d) leaves.

PLATE IV - CONCEPT: SEASONS

Subject: Boy. Age: Four years and three months

Teacher: Tell me what you see in this picture.
Subject: I have already seen these before.
Teacher: Do you want to tell me about this one?
Subject: Pumpkins, yellow leaves, trees grow, table, door, gate, grass.
Teacher: Anything else? What time of year is this picture?
Subject: Fall, I think.
Teacher: Yes, How can you tell it is fall?
Subject: Because the leaves are turning different colors.

Subject: Boy. Age: Four years and ten months

Teacher: Tell me what you see in this picture.
Subject: Oranges and a garden and a little bunny.
Teacher: Anything else you want to tell me about the picture?
Subject: There are red leaves, and it is fall.
Teacher: How can you tell it is fall?
Subject: Because the leaves are turning different colors.
Teacher: Anything else you would like to tell me about the picture?
Subject: No.

Subject: Boy. Age: Five years and three months

Teacher: Tell me about this picture.
Subject: Gosh that is pretty. I see a tree and a squirrel, and a bench and some pumpkins and a bunny rabbit and a gate. A tree and some bushes.
Teacher: Is there anything else you want to tell me about the picture?
Subject: No.
Teacher: What time of year is this?
Subject: Halloween.
Teacher: How can you tell?
Subject: I saw two pumpkins.

PLATE V - CONCEPT: SEASONS

Subject: Boy. Age: Four years and ten months

Teacher: Tell me what you see in this picture.
Subject: It is snowing and the bunnies are in the snow. And the trees are all covered and the leaves are down off of the trees.
Teacher: Yes. Anything else you want to tell me?
Subject: No.
Teacher: What time of year is this picture?
Subject: Winter.
Teacher: Yes, how can you tell it is winter?
Subject: Because it snowed.

Subject: Girl. Age: Three years and four months

Teacher: Tell me what you see in this picture.
Subject: Snow.
Teacher: Yes. Anything else that you want to tell me?
Subject: We can put our coats on and go out and play in the snow. Where did all the garden go? And all the bunnies came out to play.
Teacher: Anything else you want to tell me about the picture? What do you see?
Subject: Snow on top of the squirrel.
Teacher: Anything else you want to tell me?
Subject: All the leaves fell off. All the leaves. We don't have the leaves anymore.
Teacher: What time of year is this picture?
Subject: Snow, snow.

Subject: Boy. Age: Five years and three months

Teacher: Tell me about this picture.
Subject: Oh this is just like that other one. I see some snow, a bunny and some puddles, a bunny rabbit and that bench, of course. A tree, a gate, and fence.
Teacher: Anything else you want to tell me about it?
Subject: Those bushes are dead and those leaves. That is all.
Teacher: What time of year is this?
Subject: In winter.
Teacher: How can you tell it is?
Subject: Because they have snow.

Subject: Girl. Age: Five years and four months

Subject: It is snow time and the little birds are out and a gate and a tree and the leaves are off the trees.
Teacher: What time of year is this?
Subject: Santa Claus land... Christmas time.

PLATE VI - CONCEPT: WIND

Subject: Boy. Age: Four years and eleven months

Teacher: Tell me what you see in this picture.
Subject: A kite, string, two boys trying to fly it... hat blew off, their string broke off their kide. The kite is flying away somewhere else. Yellow socks, brown shoes, red shorts, sorta reddish, brown hair, and a yellow shirt. Black hair, blue hat, black inside and red shorts and blue short, and white shirt, and blue socks, and brown shoes.

Subject: Boy. Age: Four years and ten months

Teacher: Tell me about this picture.
Subject: It is about two boys flying a kite.
Teacher: Anything else you would like to tell me about this picture?
Subject: That string came off that kite.

Subject: Boy. Age: Three years and seven months

Teacher: Tell me what you see in this picture.
Subject: Flying kite.
Teacher: Anything else you would like to tell me?
Subject: Because it is so windy out, cause we play with kites and also his hat could blow away.
Teacher: Yes, how can you tell the wind is blowing?
Subject: Because the kites can fly, like ours.
Teacher: Do you see anything else you want to tell me?
Subject: Cause the trees are blowing on the top of them. The little baby cows get their milk.
Teacher: Anything else you want to tell me?
Subject: Well, the milk gets cold so the wind makes them cold. The cows might get cold so us too.

Subject: Girl. Age: Five years and four months

Teacher: Tell me what you see in this picture.
Subject: A white flag. A kite. And a hat blowing off the boy's head... and a boy flying the kite. Trees.
Teacher: Anything else you want to tell me?
Subject: No.

PLATE VII - CONCEPT: SUNSHINE AND SHADE

Subject: Girl. Age: Five years and four months

Teacher: Tell me what you see in this picture.
Subject: The snow on theground.
Teacher: Why is snow on one side of the house?
Subject: I don't know. Why?
Teacher: You tell me why.
Subject: Because on the other side it is sunny and it has melted.
Teacher: Yes. Anything else you would like to tell me?
Subject: A chimney, a brown house, and two Christmas trees on the side of the house. Sidewalk, trees, and a blue sky.
Teacher: All right.

Subject: Boy. Age: Five years and three months

Teacher: Tell me what you see in this picture.
Subject: I see a house, and a red chimney, and a door, see the sun, see some trees, winter trees, looks like it is snowing on them, I see some snow there.
Teacher: Why is the snow on one side of the house?
Subject: Cause it already snowed for us and the sun has melted half of it.
Teacher: Yes.

PLATE VIII - CONCEPT: CYCLE OF GROWTH

Subject: Boy. Age: Four years and ten months

Teacher: Tell me about this picture.
Subject: They are about Tim Tadpole turning into frogs.
Teacher: Is there anything else you want to tell me? What is up here?
Subject: Tim Tadpole.

Subject: Boy. Age: Five years and three months

Teacher: Tell me what you see in this picture.
Subject: It's not much. I see a little Timothy frog. I see a little Timothy, gosh, tadpole. I see a tadpole getting bigger and I see a tadpole with some feet, and he is getting larger, and see his tail is getting to look like a frog, and soon he turned into a frog.

Subject: Boy. Age: Five years and one month

Teacher: Tell me what you see in this picture.
Subject: A tadpole.
Teacher: Yes.
Subject: A tadpole that's got feet. I see a tadpole whose tail is getting up. I see a hop toad... a hop toad.

Subject: Boy. Age: Three years and seven months

Subject: Them is about frogs.
Teacher: Yes. Anything else you want to tell me?
Subject: Those tadpoles turn into frogs, and when they turn into frogs they have to stay all night in the water and when they swim around and get in the mud, and then when he turns into a frog, he can find the sun.

PLATE IX - CONCEPT: SEASONS

Subject: Girl. Age: Three years and eleven months

Teacher: Tell me about this...
Subject: A man digging and some plants, and a birdie flying around.
Teacher: What time of year is this picture?
Subject: Spring.
Teacher: How can you tell?
Subject: Because the leaves are on the tree.

Subject: Boy. Age: Five years and nine months

Teacher: Tell me about this picture.
Subject: There is a man making a garden, a tree, and a robin and a fence, and a tree.
Teacher: Do you know what time of year this is?
Subject: Spring.
Teacher: What makes you think it is spring?
Subject: Because the pretty flowers grow up.

Subject: Boy. Age: Three years and seven months

Teacher: Tell me about this picture.
Subject: Planting flowers and when they plant the flowers, the flowers come up, and they have beautiful tops and we can pick them and give them to our mommies, and put them in some water so they won't die.
Teacher: Anything else you would like to tell me about the picture?
Subject: If you plant the garden, the little flowers come up and petunias too, and tulips too, and little blue things. Those yellow things are tulips, and when the birdies come around they sing on the trees.
Teacher: What time of year is this picture?
Subject: Springtime.
Teacher: How can you tell it is?
Subject: Because all the little robin red birds come out.

Subject: Boy. Age: Five years and three months

Teacher: Tell me what you see in this picture.
Subject: Just like before... a man raking, some blue pants, and some black shoes, and a white shirt, and a red cap, and I see some flowers, and see some other little flowers, and some birds, and the seat around the tree, and see a gate, and some trees and some grass, and that is all.
Teacher: What time of year is this picture?
Subject: Spring.
Teacher: How can you tell?
Subject: Cause the birds are all around, and the trees are getting to bloom.

PLATE X - CONCEPT: SEASONS

Subject: Girl. Age: Five years and four months

Teacher: Tell me what you see in this picture.
Subject: Oh everything. Squirrel, some birdies, two black birdies. Flowers, and two butterflies, and a gate and some green on it, and two yellow and purple, and that is all.
Teacher: What time of year is this picture?
Subject: Summer.
Teacher: How can you tell it is?
Subject: The squirrels are out.

Subject: Boy. Age: Five years and three months

Teacher: Tell me what you see in this picture.
Subject: It's all finished... that man's finished the garden.
Teacher: Yes.
Subject: I see some little apples, apple trees, and some raddish and some lettuce, and what's this stuff?
Teacher: I don't know for sure what that is either.
Subject: Gate, flowers, tree, birds, grass, chipmunk.
Teacher: What time of year is this picture?
Subject: Spring too.
Teacher: How can you tell it is?
Subject: Cause it has all the stuff around that looks like spring, and it has spring trees.

Subject: Boy. Age: Five years and nine months

Teacher: Tell me what you see in this picture.
Subject: There is a black robin. A man lives in a house and everything is growing up. Apples.
Teacher: Anything else?
Subject: And a gate and a tree, and bushes, and sky, and grass.
Teacher: What time of year do you think this picture is?
Subject: Spring.
Teacher: And what makes you think it is spring?
Subject: It makes everything be pretty.

Subject: Girl. Age: Five years and one month

Teacher: Tell me about this picture.
Subject: I believe those are apple trees that grew and grew, and I think those are cabbages or what ever they are. We have a fence around our tree like that, and that is all I know about the picture... and we have some flowers too.
Teacher: What time of year is this picture?
Subject: Spring.
Teacher: How can you tell it is spring?
Subject: Because it is about like the other picture and everything is green.

APPENDIX E

SELECTED SCIENCE CONCEPTS PRESENTED TO THREE COLLEGE CLASSES FOR VALIDATION WITH PICTURES

WIND

1. Air is moving around us all the time. When air is moving fast, we say the wind is blowing.

2. A breeze is air that moves slowly.

SUNSHINE AND SHADE

1. Heat comes from the sun.

2. Anything that is wetween the sun and the earth keeps away some of the sun's heat.

3. We are cooler in the shade than in the sunshine.

GROWTH CYCLE

1. All living things have definite life cycles - - they pass through stages as they grow to maturity and then produce new ones of their own kind.

2. All living things need certain essentials in order to stay alive and grow.

3. Living things are adapted to their environment.

4. Living things go through a succession of stages in their development from egg to adult.

SEASONS

1. The motion of the earth around ths sun and the tilt of the earth's axis cause our seasons.

2. Plants make considerable adaptation to changes in the seasons.

3. Spring, summer, autumn and winter are called seasons which follow in order.

APPENDIX F

INSTRUCTIONS TO RATERS

Dear Colleague,

You have been selected because of your training and experience as a nursery school teacher to check children's responses which may indicate their understanding of certain science concepts for a research investigation which is being conducted at this time.

The purpose of this research is to measure children's understanding of certain science concepts in relation to two methods of presenting science in the nursery school.

One method is that of planned experiences in which the nursery school teacher has set the stage for learning by focusing attention upon natural phenomena in the immediate environment by preplanning. This means actually calling attention to happenings in the environment and not necessarily waiting for the child to initiate an interest.

The other method is the casual method in which the science experiences are an outgrowth or they are incidental situations initiated by the child's interest or questions as they arise out of the immediate environment, but the stage has not been set by preplanning by the teacher.

Two tests, a pre-test and a post-test, with Form A pictures and Form B pictures have been administered to two groups of children. There was a period of four weeks' time that intervened between the two tests.

The purpose of your checking of the subject's responses at the present time is to establish rater reliability on the children's responses. After this reliability has been established you will be asked to check both the pre-test and post-test responses of the subjects.

Each subject will have only one score for each picture.

To facilitate your checking, the child's responses have been underlined with red lines.

Please read instructions for checking on the following page.

Thank you,

Ramona Ware.

INSTRUCTIONS TO RATERS

1. PLEASE STUDY EACH CONCEPT AND EACH PICTURE

The science concept and statements which exemplify each concept are attached to each picture. Please study the concept and the picture and then rate each subject's responses on the following basis:

2. PLEASE CHECK EACH CARD WITH THE CONCEPT AND PICTURE

a. If you feel the subject has SOME UNDERSTANDING of the concept that is depicted in the picture, place 1 on the card in the space indicated for a score.

b. If you feel the subject has NO UNDERSTANDING of the concept that is depicted in the picture, place 0 on the card in the space indicated for a score.

3. DEFINITIONS

a. SOME UNDERSTANDING means the subject has either stated or implied his understanding of the concept.

Exemplifying statements:

1. I see wind blowing and the man's hat blown off. (Picture No. 1)
2. These are tadpoles and this is a frog. (Picture No. 8)
3. Because on the other side it is sunny and it is melted. (Picture No. 7)

b. NO UNDERSTANDING means that the subject's responses are not related to the concept depicted in the picture.

Exemplifying statements:

1. I see a boy and girl and an umbrella. (Picture No. 1)
2. A boy, a kite, a hat and a string. (Picture No. 6)
3. A house, a sun and the black tree. (Picture No. 7)

Thank you for your time and interest in this research.

APPENDIX G

SCORE SHEET - 1-24

Picture No. 1	Picture No. 2	Picture No. 3	Picture No. 4	Picture No. 5
Score	Score	Score	Score	Score
1-1 _____	1-2 _____	1-3 _____	1-4 _____	1-5 _____
2-1 _____	2-2 _____	2-3 _____	2-4 _____	2-5 _____
3-1 _____	3-2 _____	3-3 _____	3-4 _____	3-5 _____
4-1 _____	4-2 _____	4-3 _____	4-4 _____	4-5 _____
5-1 _____	5-2 _____	5-3 _____	5-4 _____	5-5 _____
6-1 _____	6-2 _____	6-3 _____	6-4 _____	6-5 _____
7-1 _____	7-2 _____	7-3 _____	7-4 _____	7-5 _____
8-1 _____	8-2 _____	8-3 _____	8-4 _____	8-5 _____
9-1 _____	9-2 _____	9-3 _____	9-4 _____	9-5 _____
10-1 _____	10-2 _____	10-3 _____	10-4 _____	10-5 _____
11-1 _____	11-2 _____	11-3 _____	11-4 _____	11-5 _____
12-1 _____	12-2 _____	12-3 _____	12-4 _____	12-5 _____
13-1 _____	13-2 _____	13-3 _____	13-4 _____	13-5 _____
14-1 _____	14-2 _____	14-3 _____	14-4 _____	14-5 _____
15-1 _____	15-2 _____	15-3 _____	15-4 _____	15-5 _____
16-1 _____	16-2 _____	16-3 _____	16-4 _____	16-5 _____
17-1 _____	17-2 _____	17-3 _____	17-4 _____	17-5 _____
18-1 _____	18-2 _____	18-3 _____	18-4 _____	18-5 _____
19-1 _____	19-2 _____	19-3 _____	19-4 _____	19-5 _____
20-1 _____	20-2 _____	20-3 _____	20-4 _____	20-5 _____
21-1 _____	21-2 _____	21-3 _____	21-4 _____	21-5 _____
22-1 _____	22-2 _____	22-3 _____	22-4 _____	22-5 _____
23-1 _____	23-2 _____	22-3 _____	23-4 _____	23-5 _____
24-1 _____	24-2 _____	24-3 _____	24-4 _____	24-5 _____

SCORE SHEET - 25-28

Picture No. 6	Picture No. 7	Picture No. 8	Picture No. 9	Picture No. 10
Score	Score	Score	Score	Score
25-1 _____	25-2 _____	25-3 _____	25-4 _____	25-5 _____
26-1 _____	26-2 _____	26-3 _____	26-4 _____	26-5 _____
27-1 _____	27-2 _____	27-3 _____	27-4 _____	27-5 _____
28-1 _____	28-2 _____	28-3 _____	28-4 _____	28-5 _____
29-1 _____	29-2 _____	29-3 _____	29-4 _____	29-5 _____
30-1 _____	30-2 _____	30-3 _____	30-4 _____	30-5 _____
31-1 _____	31-2 _____	31-3 _____	31-4 _____	31-5 _____
32-1 _____	32-2 _____	32-3 _____	32-4 _____	32-5 _____
33-1 _____	33-2 _____	33-3 _____	33-4 _____	33-5 _____
34-1 _____	34-2 _____	34-3 _____	34-4 _____	34-5 _____
35-1 _____	35-2 _____	35-3 _____	35-4 _____	35-5 _____
36-1 _____	36-2 _____	36-3 _____	36-4 _____	36-5 _____
37-1 _____	37-2 _____	37-3 _____	37-4 _____	37-5 _____
38-1 _____	38-2 _____	38-3 _____	38-4 _____	38-5 _____
39-1 _____	39-2 _____	39-3 _____	39-4 _____	39-5 _____
40-1 _____	40-2 _____	40-3 _____	40-4 _____	40-5 _____
41-1 _____	41-2 _____	41-3 _____	41-4 _____	41-5 _____
42-1 _____	42-2 _____	42-3 _____	42-4 _____	42-5 _____
43-1 _____	43-2 _____	43-3 _____	43-4 _____	43-5 _____
44-1 _____	44-2 _____	44-3 _____	44-4 _____	44-5 _____
45-1 _____	45-2 _____	45-3 _____	45-4 _____	45-5 _____
46-1 _____	46-2 _____	46-3 _____	46-4 _____	46-5 _____
47-1 _____	47-2 _____	47-3 _____	47-4 _____	47-5 _____
48-1 _____	48-2 _____	48-3 _____	48-4 _____	48-5 _____

APPENDIX H

TEACHING GUIDES FOR PLANNED SCIENCE EXPERIENCES
USEN IN GROUP I - EXPERIMENTAL

CONCEPT: WIND

GENERALIZATION ON WHICH PLANNED EXPERIENCES WERE BASED:

1. Air is moving around us all the time. When air is moving fast, we say the wind is blowing.

2. A breeze is air that moves slowly.

PLANNED SCIENCE EXPERIENCES TO FURTHER THE CHILDREN'S UNDERSTANDING OF NATURAL PHENOMENA CONCERNING WIND:

1. Making kites and flying them in the wind.

2. Watching the moving clouds.

3. Observing the wind blowing in the trees, grass, skirts, and other items that move when the wind is blowing.

4. Painting outside with water and observing how the wind dries the water.

5. Experiences in feeling the wind blowing in the children's faces.

LITERATURE EXPERIENCES TO HELP CHILDREN UNDERSTAND THE CONCEPT OF WIND:

1. Flack, Majorie. The Boats on the River. New York: The Viking Press. 1951.

2. Hall, William. Winkie's World. New York: Doubleday. 1958.

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CONCEPT: SUNSHINE AND SHADE

GENERALIZATIONS ON WHICH PLANNED EXPERIENCES WERE BASED:

1. Heat comes from the sun.

2. Anything that is between the sun and the earth keep away some of the sun's heat.

3. We are cooler in the shade than in the sunshine.

PLANNED SCIENCE EXPERIENCES TO FURTHER THE CHILDREN'S UNDERSTANDING OF NATURAL PHENOMENA CONCERNING SUNSHINE AND SHADE:

1. Sitting in the shade of a tree and feeling how cool it makes

our bodies and how cool the grass is.

2. Observation of the shadows of the nursery school building, trees and the children's own shadows.

3. Discussing, while looking at pictures, the snow melting in the sun and shadows.

4. Melting ice cubes in the sun and in the shade.

LITERATURE EXPERIENCES TO HELP CHILDREN UNDERSTAND THE CONCEPT OF SUNSHINE AND SHADE:

1. Hall, William. Winkie's World. New York: Doubleday. 1958.

2. Schneider, Herman and Nina. Let's Find Out - A Picture Science Book. Eau Claire, Wisconsin. Wm. M. Hale. MCMXLVI.

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CONCEPT: CYCLE OF GROWTH

GENERALIZATIONS ON WHICH PLANNED EXPERIENCES WERE BASED:

1. All living things have definite life cycles - they pass through stages as they grow to maturity and then produce new ones of their own kind.

2. All living things need certain essentials in order to stay alive and grow.

3. Living things are adapted to their environment.

4. Living things go through a succession of stages in their development from egg to adult.

PLANNED SCIENCE EXPERIENCES TO FURTHER THE CHILDREN'S UNDERSTANDING OF NATURAL PHENOMENA CONCERNING THE CYCLE OF GROWTH:

1. Opportunity to observe frog eggs, tadpoles, and a frog in the nursery school for a period of three weeks. Also, a toad was observed to discover the differences in a toad and a frog.

2. Trip to a nearby pond to get water for tadpoles.

3. Observing and caring for baby cottontail rabbits - seven or eight days old upon arrival to nursery school until after their eyes were opened.

4. Handling and caring for an adult rabbit for a day.

5. Observing and caring for baby sparrows for a period of two weeks.

6. Observing a dead Cardinal for two days.

7. Handling and observation of a baby pig for one day.

8. Care and handling of a hamster for a semester.

9. Caring for a turtle for several months.

10. Planting a sweet potato.

11. Preparing the soil and planting a garden for the purpose of watching the growth of raddishes, lettuce, and beans.

12. Visitation to a greenhouse to observe the growth of plants indoors.

LITERATURE EXPERIENCES TO HELP CHILDREN UNDERSTAND THE CONCEPT OF THE CYCLE OF GROWTH:

1. Boulton, Rudyard. Traveling With the Birds. New York: M. A. Donahue. 1933.

2. Bronson, Wilfred. Turtles. New York: Harcourt, Brace and Company. 1945.

3. Brown, Margaret Wise. Baby Animals. New York: Random House. 1941.

4. Davis, Alese Vaught. Timothy Turtle. New York: Harcourt, Brace and Company. 1940.

5. Flack, Majorie. Tim Tadpole and the Great Bullfrog. New York: Doubleday and Company. 1952.

6. Graham, Margaret Bloy and Gene Zion. All Falling Down. New York: Harper and Brother. 1951

7. Green, Mary McBurney. Everybody Has A House. New York: William R. Scott, Inc. 1945.

8. Henry, Marguerite. Birds At Home. New York: M.A. Donahue and Company. 1942

9. Huntington, Harriet E. Let's Go Outdoors. New York: Doubleday and Company. 1939.

10. Kraus, Ruth. The Carrot Seed. New York: Harper and Brothers. 1945.

11. Lewis, Howard J. Pet Care. New York: Maco Manufacturing Company. 1956.

12. Louv'a. Animals I Like. New York: Grosset and Dunlap. 1956.

13. McCloskey, Robert. Make Way For Ducklings. New York: The Viking Press. 1948.

14. Mitchell, Lucy Sprague. Guess What's In The Grass. New York: William Scott, Inc. 1945.

15. Pistorius, Anna. What Bird Is It? Chicago: Wilcox and Follett Company. 1945.

16. Roberts Mervin F. Jersey City, N.J.
Hamsters As Pets. TFH Publication. 1955.
Turtles As Pets. TFH Publication. 1955.
Guinea Pigs. TFH Publication. 1957.
Beginning the Acquarium. TFH Pub. 1956.

17. Robinson, Irene and W. W. Picture Book Of Animal Babies. New York: The MacMillan Company. 1947.

18. Webber, Irma E. Bits That Grow Big - Where Plants Come From. New York: William R. Scott. 1949.

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CONCEPT: SEASONS

GENERALIZATIONS ON WHICH PLANNED EXPERIENCES WERE BASED:

1. The motion of the earth around the sun and the tilt of the earth's axis cause our seasons.

2. Plants make considerable adaptation to changes in the seasons.

3. Spring, summer, autumn and winter are called seasons which follow in order.

PLANNED SCIENCE EXPERIENCES TO FURTHER THE CHILDREN'S UNDERSTANDING OF NATURAL PHENOMENA CONCERNING THE SEASONS:

1. Short trips to observe a redbud tree in blossom and later again to observe the same tree with leaves only.

2. Observing of the trees beginning to bud and leaf out.

3. Finding the seeds of trees.

4. Observing evergreen shrubs.

5. Watching the grass as it begins to turn green.

6. Observing the buds and blooms of flowers - many cut flowers were brought to school to observe.

7. Watching for the robins to come and begin building their nests.

8. Watching the many birds that flew in the nursery school area.

9. Discussion about the growth of pumpkins and their uses.

10. Numerous pictures were used in illustrating the four seasons.

LITERATURE EXPERIENCES TO HELP CHILDREN UNDERSTAND THE CONCEPT OF THE SEASONS.

1. Brann, Esther. Bobbie and Donnie Were Twins. New York: MacMillan Company. 1933.

2. Burton, Virginia Lee. Kathy and the Big Snow. Boston: Houghton Mifflin Company. 1943.

3. Lenski, Lois. Now It's Fall. New York: Oxford University Press. 1945.

4. Lenski, Lois. Spring Is Here. New York: Oxford University Press. 1945.

5. Tresselt, Alvin. Hi, Mister Robin. New York: Lothrop, Lee, and Shepard Company. 1950.

6. Tresselt, Alvin. Johnny Maple-Leaf. New York: Lothrop, Lee, and Shepard Company. 1950.

7. Tresselt, Alvin. White Snow Bright Snow. New York: Lothrop, Lee, and Shepard Company. 1947.

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Professional Organizations: Omicron Nu, Kappa Delta Pi, Oklahoma Home Economics Association, American Home Economics Association.