Problem-solving behaviors exhibited by kindergarten children

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PROBLEM-SOLVING BEHAVIORS EXHIBITED BY
KINDERGARTEN CHILDREN

A THESIS
SUBMITTED TO THE FACULTY OF THE SCHOOL OF EDUCATION,
ATLANTA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS OF THE DEGREE OF MASTER OF ARTS

BY
MATTIE H. POWELL

SCHOOL OF EDUCATION

ATLANTA UNIVERSITY
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\[ P = 70 \quad R = 61 \]
DEDICATION

To my husband and son
for their support, patience,
interest, encouragement and loyalty
during the period of this
research.

M. H. P.
ACKNOWLEDGEMENTS

The writer wishes to acknowledge with sincere gratitude, the assistance of those who have made possible the fruition of this study.
A "Thank You" to the kindergarten pupils and principal of English Avenue Elementary School; Atlanta, Georgia. The writer wishes to say a humble and perpetual "thank you" to Drs. E. K. Weaver, L. E. Boyd and L. D. Graves advisory committee for their helpfulness and consideration.

M. H. P.
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CHAPTER I

INTRODUCTION

Rationale.—Scientific methods are ways of thinking about problems and solving them. The mere identification or recognition of a problem dies not make its solution scientific, rather it is the method one uses to solve his problem or problems. The steps used today in solving problems the scientific way are general rules worked out by many men during hundreds of years.

Problem-solving has always been important to man. His natural gift of curiosity leads him into its depths as he seeks to understand the scheme of his creation, the offerings of the universe and the purpose of life itself. Through problem-solving, he has made discoveries, created, opened new frontiers in interpersonal relations and gained an increasing wisdom leading to more and more understanding of the forces which shape more satisfying civilizations. The levels of problem-solving are measures of his progress through the ages, expressions of his current personal fulfillment, marks of hope in his future destiny.\(^1\)

Probably the aspect of reasoning most universally agreed upon among writers as useful and creative reasoning is that of problem-solving. Whenever a new situation for which the individual has no habitual reaction presents itself, the individual is said to be faced with a problem. As long as life flows along familiar channels where no new or

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\(^1\) Alma Bingham, "Problem-Solving in All Areas of Learning," \textit{Childhood Education}, XXXV (December, 1958), p. 152.
unaccustomed action is demanded, habit may serve. But when a strange situation "arises" habit is insufficient. A new solution or a new pattern of action is needed and reasoning becomes important.¹

Undoubtedly the applications of Dewey's problem solving method did much to revitalize the nation's classrooms in its most stylish form. This method was procedure for improving upon the cut-and-dried classroom techniques that largely involved an assign-study-recite sequence.² The new methodology also gave educators some hope for helping children learn to deal with a variety of problems and situations as an important part of their education in a rapidly changing culture. Interdisciplinary experience in dealing with significant problems is an important educational function that often gets lost in the present debate regarding curriculum improvement.³

In the formal education of an earlier day, the teacher was satisfied if her pupils learned facts by rote. As our knowledge of children's learning has increased, the teacher has tended to add the element of understanding. Today the teacher believes in using children's knowledge of facts, not as an end in itself, but as a means of helping children acquire understanding. She believes that children need to acquire power in solving problems which depend upon these previously acquired knowledges and understandings. The child needs facts and ideas but these


acquire meaning as the child uses them in solving problems.¹

Many investigators have shown that children are capable, at an early age, of such reasoning processes as those exhibited by adults. However, as one would expect, there are limitations when children are called upon to deal with problems that go beyond their understanding and experiences. As a child increases in knowledge and experience, there is an increase in his ability to solve problems of greater number, variety, and complexity, in his ability to formulate answers and to give reasons, and in his ability to reorganize experiences and to arrive at generalizations.²

In reference to the ability of pre-school children to solve problems Arlitt says:

In spite of the inadequacies in the thinking process of young children as compared with adults, appeals can and should be made to reason, particularly with reference to conduct. Such appeals must be worded simply and clearly, and should be free of all irrelevant details. Children can and do reason relatively well when the problem is suited to the level which they have reached.³

According to Jersild Thorndike further states that very young children possess not only the requisite elementary processes involved in reasoning, but also the interest in reasoning. He said that in the usual formal schoolroom reasoning is discouraged by neglecting their questions, by making them accept mere words as explanations, by feeding

to them dry bones of mathematics and grammar and by teaching them to accept everything upon authority. It is not the case that interest in reasoning comes late in youth; it comes early, but often we restrain and dwarf it.¹

Whenever the concerns of pupils can be identified, problem-solving can take place. Recognition of a problem is itself a step in education. There are a great many situations where the problem is not recognized. One of the concerns of education is to help pupils develop the ability to locate and define these problems. The child must be guided in determining which problems must be dealt with first.²

The problem for the kindergarten child should be simple and easy to solve, and the time in which it takes him to solve the problem should be considered because the kindergarten child has a very short attention span. However, if he is successful in solving very simple problems, the problems may gradually be made more difficult. As Mills and Dean stated in Problem-Solving Methods in Science Teaching, the success at this level encourages further problem-solving. Constructive problems solved by careful observation and manual skills have been suggested even for the kindergarten level. As the child becomes more mature and has some facts to reason with, he should be encouraged to use them.³

Problem-solving seems to flourish where there are situations which

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³ Ibid.
call for their use, and where the child feels free to express himself, and in environments where curiosities are stimulated, where ideas can be tried and where there is a real purpose in learning. It is in this type of environment that the modern kindergarten should operate.¹

Problem-solving can easily be designed to fit the group approach to learning, in which students may be observed in group roles or group interaction, instruction provided and evaluation made in a group situation. Grouping, which is a manner of placing pupils in a particular pattern for instructional purposes, is a method used by many teachers who are interested in providing opportunities for children of different learning rates to proceed at the rate most beneficial to them. This method should prove effective when used in problem solving. Russell had this to say of problem-solving by the group method.

There seems to be some evidence from studies made of problem-solving that the dynamics of the group situation produce better problem-solving than would be achieved by a comparable individual working alone.²

Effective social organization requires that group members assume inter-dependent roles. Some children may take a role of initiating ideas or plans more readily than others. Other children may be particularly apt in examining and testing the adequacy of plans against realities in their situations and for reaching the goals which the group formulates. Still other children readily take the lead in acting on ideas. For children to solve problems, a team relationship among

¹ Gerald S. Craig, Science in Childhood Education (New York: Bureau of Publications, Teachers College, Columbia University), pp. 18-34.
them that embrace the necessary competencies for making the changes required by problem solving, needs to be developed. Stereotyping a child in a particular role should be avoided, however. An opportunity for meeting the requirement of different competencies assures the development of the various skills and insights of problem solving.  

It was decided by the writer to ascertain the characteristic behaviors of the scientific method of problem-solving exhibited by pupils of a kindergarten class in a group situation.  

**Evolution of the problem.**—As a teacher at the English Avenue Elementary School for the past six years, the writer has observed that many kindergarten children fail to solve simple problems which they may encounter in their everyday life. Many of them expect the teacher or an adult to tell them when to do something as well as how and why they must do it. This is not problem solving at all, it is simply carrying out the command of the adult. The child should be given experiences which will enable him to learn problem-solving behaviors as well as encourage him to use the scientific methods of reasoning in their various forms. It was decided that it would be worthwhile to investigate the area of problem-solving behaviors in children to attempt to identify these behaviors, and to teach for them.  

**Contribution to educational knowledge.**—This study may serve to:

1. Eliminate certain misconceptions about the feasibility of using the problem-solving approach in the kindergarten program.

2. Contribute to re-evaluation of the curriculum.

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3. Encourage further study of problem-solving as it is related to the kindergarten child.

Statement of the problem.—The problem involved in this study was to test the hypothesis that kindergarten school children can not exhibit behavioral characteristics which constitute elements of scientific methods of problem-solving.

Purpose of the study.—The general purpose of this study was to provide a sequence of learning experiences to a group of kindergarten school children designed to inculcate in them elements of scientific methods of solving problems.

More specifically, the purposes of this study were to:

1. Attempt to specify a taxonomy of behaviors which may characterize elements of problem-solving.

2. Structure teaching-learning situations designed to provide stimuli for attaining problem-solving behaviors.

3. Ascertain gains, if any, in attainment of problem-solving behaviors through manipulation and control of the teaching-learning situation.

Operational steps.—The following operational steps constituted the design of this study.

1. Permission to conduct this study was secured from the superintendent, area superintendent, and principal.

2. Literature related to this study was reviewed and summarized, and lists of behavioral characteristics of children and elements of problem-solving were structured from this literature.

3. These listings were formulated into taxonomies and submitted to a jury consisting of the following persons: the psychometrist
from Area I, a psychologist from Agnes Scott College, a pediatrician, two sociologists, and four educators interested in problem-solving as a screening panel for validating the listings. The list was then utilized as criteria to be applied in the study.

4. The children were oriented in group interaction process, taught roles and other functions called for in such interactions, provided opportunities to conceptualize or perceive their problem-solving behaviors, and to verbalize them.

5. Evaluation of mean - gains which enhanced problem-solving behaviors were continuously made.

6. The findings, conclusions, implications, and recommendations are presented in the final thesis copy.

Definition of terms.--The meaning of each of the basic terms as used in this study is as follows:

1. **Scientific Method.**--An investigation procedure which involves the application of principles of logic to the solution of scientific problems.

2. **Reasoning.**--The productive thinking in which previous experiences are reorganized or combined in new ways, to solve a problem.

3. **Insight.**--The solving of a problem through perceiving the relationships essential to solution.

Method of research.--The Experimental Method of Research, utilizing the single group pattern of classroom research was used in collecting and interpreting the data for this study.
Locale of the study.—This study was conducted at the English Avenue Elementary School, Atlanta, Georgia. This school is located in the Northwest quadrant of the city, in a neighborhood where the majority of the families reside in apartments and rented houses. However, there are a few home owners. During the school year 1964-1965, the total enrollment at the school was 1,679. Of this number 164 were enrolled in four kindergarten classes. Because of the overcrowded conditions, two of these kindergarten classes were held during the afternoon sessions and two in the morning.

Description of subjects.—The subjects involved in this study were 40 pupils enrolled in a kindergarten class regularly assigned to the writer.

Description of instruments.—The instruments used to collect the data pertinent to this study are described in the statements to follow.

1. Teacher made, verbal or oral, and pictorial tests were utilized. These tests were designed to ascertain the nature and extent of problem solving behavior exhibited periodically by the subjects.

2. Tape recordings. Recordings were made and analyzed periodically to ascertain the extent of growth and development in problem solving abilities of the subjects.

3. Resource Unit. A resource unit was formulated according to the procedures proposed in the pamphlet, "How to Make a Resource Unit." This resource unit was used as a reservoir for formulating the teaching units which were used with the children for a period of one semester.
Limitation of the study.---The paragraphs to follow describe briefly the limits of this study.

This study was limited to one kindergarten class at the English Avenue Elementary School. Too, this study was further limited by the fact that the tests used to collect data pertinent to this study were teacher-made.

Further limitations of this study was by the research method used. The Experimental Method utilizing the single group pattern was used. This method was selected and used because of the teaching-learning situation that existed in this particular school. There were four kindergarten classes scheduled, two in the morning and two in the afternoon. There are only two rooms available for kindergarten classes with two teachers assigned to each room; one in the morning and one in the afternoon. This made it impossible to apply techniques of control and the like associated with experimental studies of this type.

The research worker recognized that it was impossible to control all the variables in such a situation. The organization of this school supports only research that can be done without the rearrangement of the school program to any measurable degree. Therefore it was proposed that the researcher use only her kindergarten group, trusting that the variables not controlled were irrelevant, or would not seriously affect the results obtained.

Survey of related literature.---The literature reviewed in conjunction with this study reveals that in general, authorities agree that the kindergarten child does exhibit behavioral characteristics of scientific problem solving. In order for a child to employ the scientific
method of problem-solving in everyday environment, he must understand the problem and must have had some previous concept of the problem, before he can make any hypotheses or come to any conclusions.

The results of research have shown that even children of nursery school age can solve problems at their levels of maturity and experience. Young children solve problems best with concrete materials, primarily by manipulation and trial and error. They are ready to solve problems abstractly only after they have had many experiences and have matured over a period of years. Children and adults reason in much the same way and make the same kinds of errors in solving problems when they meet unfamiliar situations. The apparent dissimilarities are due to differences in knowledge, experience, and language development.¹

With reference to adult reasoning with wholly unfamiliar materials, Oakes made such a study in which he used thirty-five members of the faculty in a liberal arts college for his subjects. A number of experiments, demonstrating primarily certain principles of physics, were performed in the presence of these adults and the adults were asked to make a prediction as to what would happen or to give an explanation of what would happen. The variety of explanations that were offered included even some statements - twenty-three comments by eighteen different adults - that bordered on the mystical or magical (e.g., "It is a long time since I studied any science. Maybe nature has changed a little," or "That means the air is misbehaving," or "It seems a bit unfair that the iron doesn't get there first").² As we can see from this study,

¹Morrison and Perry, op. cit., pp. 28-30.
when adults are called upon to deal with wholly unfamiliar material, they tend to give some of the same types of answers as do children.

Problem-solving is most effective when it arises from the needs of the pupils. A problem exists when the pupil cannot achieve his purpose or reach his desired goal by means of the kinds of behavior which he has used previously. A problem, to be a true problem for the pupil, must be solved by organizing previous experience into a new way of behaving.¹

A problem situation may be illustrated by the case of a child in the kindergarten who is pulling a wagon around a table leg. He may pull the front wheels clear but may not allow for the clearance of the rear wheels. If he has a wagon of his own, he has undoubtedly learned to back and pull it in a wider arc to clear the rear wheels; therefore, no problem exists for him. If he has had no experience with a similar situation, he must create a new way of behaving. He may try to drag the wagon forward regardless of the obstruction. When he finds he cannot move past this obstacle, he may be able to solve the problem by reversing the rear wheels clear of the obstruction. In either case he has engaged in true problem solving at his level of maturity.²

A study by Oakes of children's explanations of natural phenomena indicates no evidence that the child's mind is unscientific because of maturational factors. While in general, understanding of essential relationships appeared to increase with age there were some answers given

¹ Morrison, op. cit., p. 27.
by kindergarteners which were superior to those of sixth graders, and some answers of sixth graders which fell below the average for kindergarteners. The young children were outstanding for their spontaneous interest, their willingness to revive their notions when observation showed them to be erroneous, and their ability to suspend judgment.

Lambert states the following in regard to the ability of pre-school children to solve problems involving the scientific approach:

Even the four-or-five-year-old child can use the problem-solving approach with problems that are within his understanding. The teacher can help children to form hypotheses by using as a point of departure the questions children ask or various everyday happenings in the kindergarten. A child notices, for example, that when he arrives at school on a wintry morning, the plants on the teacher's desk, however, is still as it was when he left the preceding afternoon. "What has happened?" he asked, thus stating the problem. The next step was to try out the hypothesis, to see what happens to plants when they are left out in the cold. The plant froze after being out in the cold overnight. The children then formulated their conclusions.

Hill studied the contributions of children made in science discussions in the sixth grades of an elementary school. She found that "young children are capable of questioning, identifying, speculating, recognizing casual relationships, drawing conclusions." The number of responses by the children was no greater in the sixth grade than it was

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1 Oakes, op. cit., p. 453.
in the first. However, the quality of their remarks was better showing a greater degree of discrimination and comparison, a broader basis of information and experience and greater recognition of relatedness.¹

Pre-school and kindergarten children rarely fail to test out their theories. Ideas there arise in concrete situations and are immediately put into effect, and their soundness or unsoundness is at once evident. As problems become more bookish and further removed from reality, the tendency to verify one's decisions is lost.²

The character of young children's attention, as well as their limited experience, makes accurate thinking difficult. Children are likely to make certain characteristic errors in reasoning because their attention is too unstable to permit concentrated thinking. Despite the fact that young children often give sustained attention to concrete materials for long periods of time, they seem, on the whole, incapable of entertaining abstract ideas in any appreciable sequence or for any long period of time. They may have all the necessary facts of solution of a problem, but unless some progress toward solution becomes evident fairly soon, they are likely to become distracted by some trivial aspect of the problem.³ The problems, therefore, for the young children should be simple and easily solved. Success at this level encouraged further problem-solving.

Russell had this to say about problem-solving of the pre-school child:

The problem-solving of young children must be considered as taking place in concrete, immediate situations rather than as occurring in abstract, verbal ones. Only on the basis of this definition is it possible to study the problem-solving behavior of the young child. Granting this interpretation, however, there is ample evidence that children are capable of problem-solving at three years or before.¹

Isaac has noted the following concerning the pre-school child and problem-solving:

Children as young as these (three plus) do reason quite successfully when their interests are engaged. What could be more typical than Dan's (3.5) protest of fear when I took away the stick with which Harold was threatening him, "But he will hit me with his hand!" In other words, it was the quarrelsome Harold I ought to remove, not the tool he was momentarily using.²

The thinking of the pre-school child has also been investigated in terms of the amount of insight he displays. One of the earliest studies in this area was that of Alpert with forty-four children ages nineteen to forty-nine months. In this study she employed material similar to that used by Kohler in his studies of the problem-solving of apes. The children had to use sticks, boxes, and chairs to obtain a prize. Alpert found that the children reached the solution in three different ways: (1) by immediate insight, 33 per cent (2) by gradual insight (partial or complete), 21 per cent, and (3) by sudden insight, their insight in this case maturing during exposure or between exposures, 18 per cent.

The remaining trials (28 per cent) were failures.¹

There is some experimental evidence which seems to indicate that it is possible for negative learnings to result when students learn to follow one procedure to solve a variety of problems. However, other experimental studies have been supportive of the application of a problem-solving teaching methodology. Curriculum literature often displays this supportive evidence creating unequivocally positive impressions of a problem solving teaching procedure.²

An important contribution to the child's mental growth can be made if we permit freedom for wide experience with things, with people and with situations. He learns through opportunity to solve his own problems, to do his own thinking whenever the situation involved in simple enough to permit reasonably sound solution from the background of his limited experience, or whenever the risk of a wrong solution is not too great.³

A child can only come to feel responsibility in relation to various problem situations, and to increase his skill in meeting these situations, by being encouraged to recognize them and to participate wholeheartedly in their solution on a level consistent with his understandings and capabilities. Problem-solving efficiency is an art that is developed through repeated opportunities to solve problems of vital importance to

³ Rand, et al., op. cit., p. 348.
Problem-solving has been analyzed by various authors. Five characteristics usually included in the process are as follows:

1. Problem-solving is creative since the child must plan a way of behaving which is new to him.

2. The pupil must always have a goal and some understanding of the situation.

3. He must select his solution from several possible alternatives which are chosen on the bases of some past experiences with related situations.

4. He must have from past experiences some understanding or insight into the application of his learnings in order to choose a plan for solving the problem.

5. Problem-solving has a critical element in the evaluation of the tentative solution in order to discover if a successful plan has been adopted.²

According to Mills and Dean in the use of problem-solving as a method of teaching we must have three conditions:

1. The problem to be solved is adapted to the student's maturity and experience.

2. The students have had analogous previous experience and must possess related information needed for the solution, or they must know how to proceed to get this information.

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3. The students are interested in solving the problem.¹

Most of the materials viewed so far concern the individual trying to solve problems by himself or in the presence of only the investigator or examiner. We will now look at the material on group processes in the elementary school and group dynamics in problem-solving.

Among the many important school learnings the most recent to be included are ways of working with others, yet this area can now be seen to be among the most important. Since most of our living today is cooperative, we are only effective insofar as we are skilled in our group relations.² The school environment bringing together many people of different natures, abilities and needs; providing many materials and resources for child growth and development; and offering a multi-purpose program is an appropriate setting for developing good group relationship and for identifying and solving problems.³

The democratic procedure should be practiced in the classroom as nearly as possible. Cunningham asserts that practice of democratic skills and development are of paramount importance. They provide the bases of understanding of the wider group dynamics of the community, of democratic society and of world cooperation.⁴

³ Bingham, op. cit., p. 4.
Miel found that teachers who earnestly employed cooperative procedures learned by doing and grew increasingly skillful in using and teaching democratic techniques.\(^1\)

Many possible ways should be utilized in stimulating group responsibilities in the classroom. Trow has this to say of school practices in stimulating group responsibilities. Many school practices, particularly in the extra-curricular field, have laid a foundation for group interaction. For a number of years group games and sports provided for cooperative as well as for individual effort and teacher-sponsored activities of the hobby-club variety tended to promote more informal teacher-pupil relationship. The project method, while it chiefly emphasized individual performance, also had a place for group activities. With the activity program comes the educational heyday of group participation involving the initiation of adult activities in stores, post offices and the like, but largely employed as a means for motivating learning and providing practice in the traditional subjects.\(^2\)

The group and the teacher exert direct influences on the motivation of the individual child of the group. Trow suggests three potential sources of increased motivation in the classroom activities, and consequently in learning, in a group atmosphere where good mental hygiene prevails. The first of these sources lies in the method of goal determination -- the extent to which the goals of the class are determined

by the entire group including pupils and the teacher. The second source of increased motivation lies in the extent to which the teacher and the pupils build a supportive atmosphere in the classroom, one which helps each child to realize that he is an accepted member of the group. A third potential source of increased motivation lies in the extent to which the various members of the class are accepted as participating members.¹

Cartwright and Zander state that besides the unique personal role that being in a group gives to each child, the classroom group serves as a teacher in four ways: (1) It exerts a power and influence toward conformity, (2) it lends itself to processes such as discussion and participation that involve the individual actively in the task at hand and gives depth to his learning, (3) it brings together children who can learn from each other, and (4) it furnishes a laboratory in which children can practice the cooperative procedure of democracy and have the personality-shaping experience of leadership.²

Group process plays an important part in teaching, learning and also in problem-solving. Cunningham says that if our groups are to identify problems in their experiences and learn how to solve these problems, they must be able to apply group techniques to these ends. Group problem identification and solution are not automatic, nor easily achieved. A number of complex group skills are involved, and these

skills are to be taught and learned just as the skills in other areas are taught and learned.\(^1\)

Jeep and Hollis observed two graduate classes taught by each other for the purpose of observing and studying how group dynamics may be used to establish a learning situation. They believe that group dynamics as a teaching method can be used with equal success in all grades and age levels and within broad limits in groups of all sizes. They stated that:

Group dynamics as a method of teaching helps individuals to grow toward independence and self-security while at the same time, learning that in a society one member depends upon another. We feel that group dynamics enables students to release their feelings and aggressions and thus increases their chances for individual and social adjustment. This in itself, is reason enough for our students having some contact with this method.\(^2\)

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\(^1\) Cunningham, op. cit., p. 6.

CHAPTER II

PRESENTATION AND ANALYSIS OF DATA

Organization and Treatment of Data.—The data for the purpose of this research as obtained from the literature, responses of parents and scores from six teacher-made tests, will be presented, analyzed and interpreted in this Chapter. The data are presented in the following sections:

1. Background and Orientation of Subjects.
2. Taxonomy of Behavior-Problem Solving.
3. The Resource Unit (Structured teaching-learning situation).
4. Problem Solving Behavior Observed and Tested.

Background-Orientation.—The procedure used in ascertaining the experimental background of the subjects on safety, and the orientation procedures utilized in introducing these kindergarten children to street safety are described in the following paragraphs:

The children were told that they were going to engage in an activity called street safety. This activity would take place at least three times a week and whenever they wanted to they could talk about it or ask questions. The definition of safety was then explained to them. After this was done they were given a chance to give some examples of what they thought by listing or naming some things that we can do to keep safe on the streets. It was explained to them that some times they would have safety lessons by looking at films, film strips, and learning to talk over the tape recorder. It was found that many of the children at this age level had never seen a tape recorder. Time was taken out to show
them a tape recorder and to explain how this machine operates. The question was asked as to what will happen to their voices after talking over the tape. Most of the children did not know. However two were able to tell that they would be able to hear themselves talk. The researcher was able to determine from this discussion that these children had some knowledge of a tape recorder.

During the first session the children gave examples of what safety on the streets meant and an additional list was supplemented by the writer. They were asked to think about the things or thing that they would like to spend more time on and work with. These ideas were to be brought back to school at the next meeting. Several pictures of safety on the streets were shown to the children to help motivate them and to help them to think critically. Playgrounds, streets, crosswalks, traffic light and many other such terms were pointed out in the pictures in order to prepare the children for pre-testing. After the readiness stage had been set, and interest seemed very high, the children were prepared for pre-testing.

The instructional materials were selected according to the interests, needs, and problems of the children and on the basis of the writer's experience with kindergarten children. Pictures that were large and colorful to make posters and charts were chosen. Words were defined such as safety, street, sidewalk, traffic light, crosswalk, corner, intersection, pedestrian, and other terms that needed defining when the situation presented itself.

Children at this age level usually do not respond to questions by formulating sentences. They merely answer by using one or two words; therefore in order to help the children speak through the tape recorder
or just for mere conversation they were guided into learning how to formulate complete sentences. This was done by using phrases and words that were familiar to the subjects. Of course when words were defined, that also helped to build their vocabularies.

The writer made use of charts, posters, pictures, film strips and films for readiness and they were used periodically. Sometimes they were used to introduce a lesson or unit or to supplement a unit, or to culminate a unit. Charts were made with the help of the children. Children were asked to bring pictures of various things related to street safety.

Charts were designed to aid the writer in preparing meaningful safety experiences for the children. They were designed to stimulate discussion and inquiry as well as to provide the class with a foundation of pertinent suitable materials. The children were introduced to terms they needed to know. Some of these words were used to build the desired safety concepts.

At the end of this period a verbal and a pictorial test were given.

**Taxonomy of Behavior-Problem Solving.**—This section of the data was derived from the literature, structured and validated by competent judges and used as criteria for measuring the ability, if any, that was shown among the kindergarten subjects to exhibit problem-solving behavior in safety education.

1. He must show an awareness of the problem.
2. He must understand the problem.
3. He must have some experiences, or experimental background related to the problem.
4. He must be capable of questioning, identifying, speculating, recognizing causal relationships and drawing conclusions.

5. He must show some curiosity toward re-examining his own conclusions. It should be a child's nature to ask "why."

The above statements drawn from conclusive statements in the literature served as the criteria by which the growth of the subjects was measured. After having been taught the lesson, students were checked periodically to ascertain whether or not one or all of the characteristics was or were in evidence.

The following section on resource unit was designed to provide the experiences necessary to this research.

The resource unit.—There is general agreement among educators that there is need for curriculum revision. This conviction is based on the belief that our schools are not assuming their full share of responsibility for developing democratic citizens. Many educators are confused as to the purposes of education, and the present curriculum reveals clearly the results of this confusion of purpose. Our current safety education curriculum is largely a hodgepodge of highly compartmentalized, logically organized subjects that are presented quite out of relationship to each other, and with little concern for the actual needs of youth.

The trend toward unit teaching represents an unmistakable emphasis upon direct activity. The work of modern psychologists points in the direction of curriculum reorganization in terms of comprehensive problems, area of living or projects that are uniting in nature, and which deal with the problems which beset young people in our modern world. Unit planning
and teaching call for a radical departure from conventional subject matter, and for teachers who have the courage to break away from the daily lesson-plan types of teaching.

Many educators believe that the purposes of education in the elementary school can best be achieved through the integrating experiences provided in a unit of work. The unit presents many problem-solving situations which require children to think critically; to recognize and define problems; to analyze them; to collect, organize, and evaluate information, to weigh choices; to draw conclusions; and to apply or act upon the conclusions they draw.

One aspect of unit teaching which has been neglected is the need for pre-planning the learning unit. Pre-planning is necessary if a teacher expects to work with boys and girls in problem-solving situations.

Pre-planning merely represents a listing or points of departure "suggestions for teaching," aids for planning with pupils. Pre-planning, then, is most helpful to the teacher, whether it is done by an individual teacher or a group of teachers.

The resource unit is prepared as a source to which the teacher may refer in his pre-planning for the learning unit. This planning should provide for opportunities for teacher-pupil purposing, teacher-pupil planning, teacher-pupil developing, and teacher-pupil evaluating. The resource unit cuts across subject-matter areas, and deals with life problems as integrated wholes, and therefore helps the teacher to break down narrow compartmentalized subject boundaries.

Functions.—Of the resource unit the following have been agreed upon as the major functions of the resource unit.

1. To furnish suggestions for materials, methods, activities,
teaching aids, and evaluate procedures for building learning units.

2. To provide a means for helping the teacher to organize materials so that he can depart from the traditional use of the textbook as a guide in curriculum development.

3. To provide suggestions for the teacher for translating an educational philosophy into practice.

4. To serve as a guide in helping the teacher to include in the learning unit certain important values basic to education in a democracy.

5. To sensitize the teacher to all of the significant problems and issues that have a bearing on an area of living.

6. To utilize the personnel resources of the school appropriate to the cooperative pre-planning of a particular unit.

7. To conserve the time of the teacher.

8. To make provision for having teaching materials available when needed.

Kindergarten.—The following unit on safety with its accompanying teaching plans were structured for the desired teaching-learning experience.

Unit On Safety In The Kindergarten Grade

I. Problem: Are there any dangers in the streets for boys and girls going to and from school?

II. Purpose: To teach children how to go to and from school safely.

More specifically the purposes are as follows:

1. To point out the danger in the street which the child may
encounter going to and from school.

2. To teach the importance of looking left and right before crossing a street.

3. To teach the importance of obeying the traffic policeman, school patrol, and the policewoman.

4. To teach the meaning of the traffic light.

5. To make the child realize his own responsibility in keeping himself from danger on the street.

III. Principal concepts to be developed:

1. Knows the safest route to and from school and goes directly to and from school by this route.

2. Knows his name, home address and the name of his school and can respond accurately and distinctly when asked for this information.

3. Refuses rides from strangers.

4. Does not play with strange animals.

5. Crosses the street at corners and not in the middle of the block unless there is a crosswalk.

6. Looks both to the right and left before crossing the street and knows the need for doing this.

7. Watches for broken glass, holes and other dangerous obstacles on the sidewalk.

8. Knows safe and unsafe places to play and knows the dangers of playing in or near the street.

9. Uses caution when getting a ball that rolled into the street.

10. Knows the danger and avoids going into the street behind or between parked cars.
11. Knows the policeman and safety patrol boys and the importance of obeying them.

12. Knows the meaning of traffic lights and understand the importance of obeying them.

13. Watches for cars turning at the traffic lights.

14. Knows how to interpret by shape such signs as stop, warning, and railroad signs.

IV. Suggested activities:

1. Play games where the child is lost and will have to tell the policeman his name, address, telephone number and name of his school.

2. Have the pupils bring in a map of the shortest and safest route to and from school.

3. Show picture of child riding with a stranger and point out danger.

4. Show picture of child playing with a strange animal and point out danger.

5. Visit most dangerous corner and point out hazards.

6. Show pictures of children crossing the street at an intersection, corner, or crosswalk.

7. Show and discuss picture of children looking to the left and right before crossing a street.

8. Have pupils name dangerous things to watch for in the street.

9. Show movie or film strip on safety in the street and point out safety rules.

10. Show pictures and discuss safe and unsafe places to play.

11. Color picture of children running into the street for obstacles.
12. Color pictures of the traffic officer, safety patrol boy and policewoman and discuss the roles they play in helping to keep us safe.

Teaching Plan I

I. Problem: Who helps us to be safe on the streets coming to and from school?

II. Purpose: To emphasize street safety

III. Recognition and statement of the problem:

A. Activities to interest and guide pupils in recognition of the problem.
   1. Have a sharing period.
   2. Show picture of a policeman helping children to cross a street.
   3. Have a safety patrol at your school visit the class.
   4. Read a story about a policeman.

B. Introductory questions relating to the problem.
   1. Who stands at the corner of busy streets to direct traffic?
      (a) The traffic cop.
   2. Who helps the policeman?
      (a) The safety patrol and the policewoman.
      (b) My mother

IV. Gathering evidence pertinent to the problem - Suggested teaching activities:

A. Demonstration experiments.—(Children should do the following for each experiment: Observe accurately what was done: record exactly what happened.) Do not tell children what to expect or
what should happen.

1. Make a bulletin board with pictures collected from home and pictures colored in class of the policeman, safety patrol boy, and police woman.
   (a) Recognition of policeman, patrol boy, and the police woman by sight.

2. Discuss the duties of the traffic officer.
   (a) The traffic officer helps us to keep safe in the streets.

3. Discuss the duties of the safety patrol.
   (a) The safety patrol can help us to cross a street near our school, but he can not direct traffic.

4. Discuss the duties of the policewoman.
   (a) The policewoman, like the policeman can direct traffic. She, too, helps us to cross the street safely at busy corners.

5. Discuss the importance of obeying the policeman and his helpers.
   (a) We should obey the policeman and his helpers because they help us to be safe.

B. Field Trips, excursions, and other learning experiences.

1. Visit a busy corner.

2. Visit a corner near school.

3. Visit a corner where the policewoman is at work.

4. Observe the traffic officer directing traffic and helping pedestrians to cross the street.

5. Observe the school safety patrol at work.

6. Watch the police woman as she stops the traffic and helps
children to cross the street.

C. Audio-visual aids.

1. The safety patrol.
   (a) The children observed all the people who help to keep them safe - from the traffic officer to the safety patrol boys.

2. Lost at the fair.
   (a) The policeman helps lost children to find their way home.

V. Questions for which answers may be found in textbooks:

1. Why do the policemen need help?
   (a) There are not enough policemen to be on every busy corner.

2. What can we do to help the policeman and his helpers?
   (a) Obey all safety rules.

3. What information should be given to the policeman if we are lost?
   (a) Our name, address, telephone number, the name of our school and our parents' names.

VI. General reference:

1. Lets find out about policeman Martha and Charles Shapp.

VII. Enrichment by the teacher:

1. Dramatization.
   (a) Each child can have an opportunity to be a traffic cop directing traffic or a safety patrol boy helping the children cross the street; while the class act as pedestrians.

2. Display in the classroom pictures of the equipment.
   (a) The traffic cop needs equipment with which to work.
VIII. Formulating conclusions and making applications based on information gained:

A. Guides to conclusions.

1. Why is the policeman called a safety worker?
   (a) He helps us to be safe.

2. How can you tell a policeman when you see him?
   (a) By the uniform that he wears.

B. Application questions.

1. Why should we obey the policeman?
   (a) He helps others to be safe on the street.

2. Why do we need a policeman at a busy corner?
   (a) The policeman can help us to get across the street safely.

3. Why does the safety patrol stand on the sidewalk and help us to cross the street?
   (a) He is not allowed to direct traffic and if he stands in the street, he might get hit by a car.

4. What do we call the belt worn by the safety patrol boy?
   (a) A safety patrol belt.

5. Why does he wear this belt?
   (a) So that we will know him when we see him.

IX. Project:

1. Make a booklet with the traffic officer and his helpers. Include pictures of equipment used by the traffic officer and his helpers in the booklet.

X. Basic principles and understandings taught in this unit:

1. Many people help in many ways to keep us safe on the streets.
2. We should obey the policeman or anyone directing traffic because they help us to be safe.

3. The policeman and the patrols have saved thousands of schoolmates from being injured or killed in traffic.

Teaching Plan II

I. Problem: Are there any dangers in the street for boys and girls going to and from school?

II. Purpose: To foster an awareness of dangers in walking to and from school.

III. Recognition and statement of the problem:

A. Activities to interest and guide pupils in recognition of the problem.
   1. Have a sharing period.
   2. What should we watch for in the street?
   3. What might happen when children are careless in crossing the street?
   4. What should we watch for while walking to school?

B. Introductory questions relating to the problem.—(Questions should lead from the known to the unknown, pointing up the problem.)
   1. Why should we watch for cars backing out of alley ways or drive ways?
      (a) The driver may not see us or he might not be able to stop.
   2. Why should we watch for broken glass on the sidewalk?
      (a) We might get cut.
3. Why should we watch for cars turning at corners?
   (a) The car might hit you.

4. Why should you refuse a ride from strangers?
   (a) He might kidnap you or take you for a long ride.

5. When you jay walk what safety rule do you break?
   (a) Cross the street at corners only.

6. Why should you avoid strange animals?
   (a) They might hurt you.

IV. Gathering evidence pertinent to the problem - Suggested teaching activities:

A. Demonstration experiments.—(Children should do the following for each experiment; observe accurately what was done: record exactly what happened.) Do not tell children what to expect or what should happen.

1. Obtain pictures of children breaking traffic rules.
   (a) Observe rules broken in each picture and point out danger.

2. Make a play street and place the following in the street:
   (a) cars
   (b) street signs
   (c) traffic light
   (d) cross walk
   (e) intersection (marked)
   (f) people made of clothes pins

3. Observe several different situations from the play street such as:
   (a) Cars turning on green light
(b) Walking between two parked cars—point out danger.
(c) Crossing street at an unmarked corner.
(d) Sidewalk
(e) Corner unmarked

4. Obtain newspaper clipping of pedestrians involved in accidents.
   (a) Observe what might happen when we are careless.

B. Individual and small group experiments.
   1. Have pupils relate experiences resulting from some act of carelessness.
      (a) As pupils relate experiences the class will point out safety rules broken in each child's experience.

C. Field trips, excursions.
   1. Visit most dangerous corner near school—point out hazards.
      (a) Watch cars as they move along the street. Some go straight and others turn on the green light.

D. Audio-visual aids.
   1. Children have a busy day.
      (a) We saw children on the way to school, meeting friends and crossing the street carefully.
   2. Safety to and from school.
      (a) We saw how streets are made safe for us: how we should cooperate with the policeman. We learned that we can make safety rules.

V. Questions for which answers may be found in textbooks:
   1. Why should we watch for broken glass on the sidewalk?
      (a) If we are not careful we might get cut.
2. Why should we walk and not run when crossing a street?
(a) You may fall or you may not see danger in the street.

VI. Enrichment by the teachers:
1. Art
(a) Each child can be allowed to draw his interpretation of the correct way in which to cross a street.

VII. Formulate conclusions and make applications based on information gained:
A. Guide to conclusions.
1. What should we watch out for in coming to and from school?
(a) Cars turning at corners.
(b) Broken glass and holes in sidewalks.
(c) Strange dogs or other animals.
(d) Alley ways and drive ways.

B. Application questions.
1. Why is it important for us to know the meaning of the traffic lights?
(a) If we know the meaning of the traffic lights we will know what to do when the light is red, yellow, or green.

2. Why should you look left and right before crossing a street?
(a) To see if it is safe to cross a street.

3. Where must we cross the street?
(a) At a corner or crosswalk.

4. What light tells us when to cross a street?
(a) The green light.

5. Why should you refuse a ride from a stranger?
(a) Some strangers may be dangerous or even sick.
6. Why isn’t it all right to cross the street in the middle of the block if there is no policeman or traffic cop at the corner?
(a) Drivers of cars look for people at the corner and they drive slower.

C. Projects.
1. Make daily report on classmates observed going to and from school.
2. Make a map showing the safest route you travel to and from school.

VIII. Basic principles and understandings taught in this unit:
1. Watch for broken glass, holes and other dangerous obstacles on the sidewalk.
2. Refuse rides from strangers.
3. Do not play with strange dogs.
4. Boys and girls should be alert to the danger in the street.

Teaching Plan III

I. Problem: What should pedestrians know about street signs and signals?

II. Recognition and statement of the problem:
A. Activities to interest and guide pupils in recognition of the problem.
1. Show pictures of street signs.
2. Have pupils draw signs they see on the way to and from school.
3. Have students read signs by shapes.

III. Introductory questions relating to the problem:

1. How do we know a stop sign when we see it.
   (a) It is red. (b) It is yellow.
2. How many lights do you see on a traffic light?
   (a) It has eight sides.
3. What colors are the traffic light?
   (a) Red, yellow and green.
4. What color is the stop sign for pedestrians?
   (a) Yellow, or red.
5. What is the name of the shape of the stop sign?
   (a) Octagon.
6. How many sides does a stop sign have?
   (a) Eight sides.

IV. Gathering evidence pertinent to the problem - Suggested teaching activities:

A. Demonstration experiments.

1. Display traffic signs on bulletin board.
   (a) Observe shape, size, color, of the signs and signals.

B. Individual and small group experiment.

1. Make traffic lights from construction paper.
   (a) Note colors and position of each light.
2. Make road signs.
   (a) Note color and shapes of all known road signs.
3. Play a game of "it" about signs.
   (a) Let a child select a sign and hold it up. The one that guesses or knows the meaning and shape of the sign
becomes "it."

C. Field trip or excursion.
   1. Take a trip around the block.
      (a) Have pupils watch for and identify traffic lights, school sign, crosswalk and road sign.

V. Find answer to these questions:
   1. Why do we have traffic control devices?
      (a) To help protect us from danger.
   2. What shape are the warning signs?
      (a) Diamond shaped.
   3. What sign is shaped like a circle?
      (a) Railroad sign.
   4. What do the flashing signals mean?
      (a) Warning - slow down, danger ahead.

VI. Enrichment by the teacher:
   1. Art experience.
      (a) Each child can make traffic signs, road signs from either construction paper, or from regular paper and color them.

VII. Formulating conclusions and making application based on information gained:
   A. Guides to conclusions.
      1. Why should we obey the traffic signals?
         (a) To keep us safe and for our protection.
      2. Why should we as pedestrians know street and road signs?
         (a) Signs tell us what drivers should do, so that we know what to expect.
B. Application question.

1. What light tells us to stop?
   (a) Red light.

2. What light tells to wait?
   (a) Yellow light.

3. What light tells us to go?
   (a) Green light.

4. Give the meaning of these shapes.
   (a) Diamond
      a. Warning
   (b) Octagon (8-sides)
      a. STOP
   (c) Rectangular
      a. Information
   (d) Round
      a. Railroad crossing

C. Project.

1. Make a street crossing in the sand table complete with cross walks and signal lights.

VIII. Basic concepts developed in this lesson:

1. Safety is an individual's responsibility.

2. Knowing the traffic signs and obeying them insures our safety.

3. Signals, lights and road signs tell us what to do and what not to do. They are not for decoration.

Teaching Plan IV

I. Problem: How can we keep safe going to and from school.
II. Purpose: To concretize the necessity of safety and safe habits.

III. Recognition and statement of the problem.

A. Activities

1. Discussion

   (a) Discuss the importance of having marked intersections.
   (b) Discuss the signal lights used at intersections.
   (c) Discuss the correct way to walk in a crosswalk.
   (d) Discuss cars turning at corners.
   (e) Discuss the danger of jay walking.

2. Speaking

   (a) Have pupils tell about trips and excursions taken.
   (b) Have pupils tell of observations made when riding with father or mother.
   (c) Have pupils tell of observation made when walking to school with their siblings, peers or classmates.
   (d) Have pupils tell their observation of others crossing the street.
   (e) Tell about signal light at crossings.
   (f) Tell about pupils who they observed jay walking at crossings.
   (g) Have panel on "The safe way to cross a street."

3. Resource persons

   (a) Invite a safety patrol to talk about his work.
   (b) Invite a policeman to talk about his work.

4. Reading by the teacher.

   (a) Read story about what is meant by jay walking.
   (b) Read about the types of safety aids provided at street
intersections.

(c) Read about the safe way to cross a marked or unmarked corner.

Problem solving behavior observed and tested.—The results concerning the behavioral pattern of the forty kindergarten subjects toward problem solving were drawn from six teacher-made tests, tape recordings, teacher's diary of anecdotal records and responses of parents to 20 item questionnaire.

Tests.—During the period of this research, six objective tests were structured and administered. A test was given at the end of each sub-unit taught. The tests were non-verbal pictograms, requiring the children to place an "X" on the picture or pictures associated with certain traffic rules or the identification of safety workers. A test was designed so that it could be used several times to test for different concepts. Other tests were designed to test for one concept only. Directions were read aloud to the subjects each time by the teacher. Test items were selected on the basis of what the children should have learned from their study of "Safety in the Street," and from what was stressed throughout the study.

Directions.—At the beginning of each test, directions were given for handling crayons, and keeping markers under each row. Before each test that required the rise of cross marks or circles, the teacher drew these symbols on the board to insure understanding.

The tests were passed out to the subjects. Directions for taking the test was given by the writer after which, the writer checked to see if the subjects understood the directions. After being assured, by the
subjects, that they understood clearly how to mark their answers, the subjects were permitted to begin the test. Each test was timed and scored by the writer. The results, of which, are included in the paragraphs and tables which immediately follow.

**Pre-test.**--The purpose of this test was to ascertain whether or not the subjects were aware of safety measures they should use daily in the streets. Ten questions were asked and scored on the basis of 100. The data in Table 1, page 45 show the frequency and obtained from the test preceding the teaching of the unit.

The data revealed that of the forty subjects tested only one scored above fifty. Three made a score of 40, 3 scored 30, 5 scored 20 and 28 of the subjects scored 10.

Of the ten questions asked about safety the majority of the subjects answered only one correctly. This indicated to the researcher, that these children knew "very little" about rules governing safety in the streets. The results also gave the researcher an indication of what items from the pre test needed to be included in the unit of instruction on safety.

**Safety Test II - Traffic Light.**--After having taught about traffic lights, their color and meaning, test two was designed to ascertain to what extent the subjects understood what was taught. They were given construction paper of various colors, scissors and crayon to construct and color, if necessary, traffic lights. Next they were to draw a line from the light to the meaning of the light. E. G. - Color Red means STOP.

The data in Table 2, page 46 reveal the scores made on the above test. Five of the subjects made a perfect score, 6 answered nine
TABLE 1

FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON A PRETEST ON SAFETY BY FORTY KINDERGARTEN PUPILS OF ENGLISH AVENUE ELEMENTARY SCHOOL ATLANTA, GEORGIA 1964-1965

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</tr>
<tr>
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<td>100.00</td>
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</tbody>
</table>

correctly, thus missing only one, 3 answered eight correctly and 4 scored 70, thus missing three out of the ten questions asked, and 5 scored 60. Seventeen of the students scored below 60 and 23 scored above 50 on the second test. The writer had anticipated a larger number of the students scoring above 50, however; it was decided to use the traffic lights and color in the second plan to teach about signs.

Safety Test III-recognition of signs.—After having taught the various shapes, colors, and meaning of various street and road signs,
TABLE 2

FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON THE SAFETY TEST II TRAFFIC LIGHTS, BY FORTY KINDERGARTEN PUPILS OF THE ENGLISH AVENUE ELEMENTARY SCHOOL ATLANTA, GEORGIA 1964-1965

<table>
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<th>Scores</th>
<th>Frequency</th>
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<td>71 - 80</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>61 - 70</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>51 - 60</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>41 - 50</td>
<td>8</td>
<td>20.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>11 - 20</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0</td>
</tr>
</tbody>
</table>

test three was designed to ascertain if the subjects could distinguish between and/or among the various signs that had been seen. Too, the writer wanted to ascertain whether or not the concept that "signs are designed of various shapes and each sign is not only to regulate traffic but to help keep the streets and roads safe to travel on, was developed.

The data in Table 3, page 47 reveal the scores made by the subjects on the recognition and meanings of roads and street signs. Seven of the
TABLE 3
FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON SAFETY TEST III RECOGNITION OF SIGNS, BY FORTY KINDERGARTEN PUPILS OF THE ENGLISH AVENUE ELEMENTARY SCHOOL, ATLANTA, GEORGIA, 1964-1965

<table>
<thead>
<tr>
<th>Scores</th>
<th>Frequency</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 - 100</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>81 - 90</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>71 - 80</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>61 - 70</td>
<td>13</td>
<td>32.5</td>
</tr>
<tr>
<td>51 - 60</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>41 - 50</td>
<td>8</td>
<td>20.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>21 - 30</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>11 - 20</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.00</td>
</tr>
</tbody>
</table>

students scored 100, 7 scored 80, 13 scored 70, 8 scored 50 and 5 scored 40. More than one half of the class made scores above 50. To be exact, 27 of the subjects made scores ranging from 100 to 70. The results of this test indicate further; that the subjects, through experiences recognized the shapes as well as the meanings of the various street and road signs designed for our safety and/or protection.

Safety Test IV - identification of safety helpers. -- Test four was designed with a two-fold purpose in mind. The first was to ascertain
TABLE 4

FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON SAFETY TEST IV - IDENTIFICATION OF SAFETY HELPERS, BY FORTY KINDERGARTEN PUPILS OF THE ENGLISH AVENUE ELEMENTARY SCHOOL, ATLANTA, GEORGIA, 1964-1965

<table>
<thead>
<tr>
<th>Scores</th>
<th>Frequency</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 - 100</td>
<td>17</td>
<td>42.5</td>
</tr>
<tr>
<td>81 - 90</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>71 - 80</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>61 - 70</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>51 - 60</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>41 - 50</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>11 - 20</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>N = 40</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

whether or not, the subjects had changed their misconception of the purposes of the policeman as most of them considered the policeman as an enemy rather than a friend and secondly it was designed to ascertain whether or not they could identify the safety helpers that one would encounter in going to and from school.

The data in Table 4, page 48 reveal the results of this test. The scores ranged from a high of 100 to a low of 40. Seventeen of the subjects scored 100, 9 scored 80, 3 scored 70, 7 scored 60 and 4 scored 40.
The results indicated that the children were able to identify persons designated as safety helpers and too, that they had developed the idea that these persons were serving as friends for their protection rather than enemies.

Safety Test V—safety in the streets—places to play.—This test was designed to evaluate the unit on "Places to play." Too it was purposely designed to ascertain what the subjects had learned about safety in the streets and places to play. Some of the important items on this test were: (a) where to look when crossing a street, (b) the safe places to cross a street, (c) the safe places to walk and (d) places to play.

The results of scores made on this test are found in Table 5, page 50. The data indicate that 5 scored 100, 7 scored 90, 9 scored 80, 2 scored 70, 3 scored 60, 7 scored 50, 6 scored 40, 1 scored 30. The data further reveal that 14 of the subjects made scored between 50 and 30, and 26 scored from 100 to 60. The results of this test indicated that a large portion of the subjects were still not sure of the safe places to cross the streets, where to play and where to look when crossing the streets. However, the majority of the students indicated, by their scores, that they had learned the desired concepts.

Safety Test VI—total safety—play, strangers, crossing the streets.—This test was designed to help solidify the concepts of where to play, how and where to cross the streets, safety rules according to signs and what to do when offered a ride to or from school by a stranger or strangers.

The data in Table 6, page 51 indicate that 6 of the students scored 100, 8 scored 90, 10 scored 80, 5 scored 70, 5 scored 60, and 6 scored
TABLE 5
FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON SAFETY TEST V - PLACES TO PLAY BY FORTY KINDERGARTEN PUPILS OF THE ENGLISH AVENUE ELEMENTARY SCHOOL, ATLANTA, GEORGIA, 1964-1965

<table>
<thead>
<tr>
<th>Scores</th>
<th>Frequency</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 - 100</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>81 - 90</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>71 - 80</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>61 - 70</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>51 - 60</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>41 - 50</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>31 - 40</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>11 - 20</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Total Number 40 100.0

50. The scores further reveal that 40 of the students scored from 50 to 100. Too, 24 of the students scored between 100 and 80. The results of the final or total safety test reveal that the students were aware of safety rules, their meanings and what to do when approached by a stranger.

Behavior Observed.—In order to ascertain whether or not the experiences provided in the classroom were well learned by the students according to test scores and whether or not these experiences were carried over into the daily lives of the students, the parents were asked to participate
TABLE 6

FREQUENCY DISTRIBUTION OF TEST SCORES MADE ON SAFETY TEST VI - TOTAL SAFETY-PLAY-STRANGERS-CROSSING THE STREETS BY FORTY KINDERGARTEN PUPILS OF THE ENGLISH AVENUE ELEMENTARY SCHOOL, ATLANTA, GEORGIA, 1964-1965

<table>
<thead>
<tr>
<th>Scores</th>
<th>Frequency</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 - 100</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>81 - 90</td>
<td>8</td>
<td>20.0</td>
</tr>
<tr>
<td>71 - 80</td>
<td>10</td>
<td>25.0</td>
</tr>
<tr>
<td>61 - 70</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>51 - 60</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>41 - 50</td>
<td>6</td>
<td>15.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>11 - 20</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0</td>
</tr>
</tbody>
</table>

in this study.

Each parent was given a check list at the beginning of this study and asked to please return the same. The results were tabulated. At the end of this study the same check list was given to the parents. The comparative results are found in Table 7, page 52.

The checklist submitted to the parents consisted of 18 questions and 20 items as one question consisted of more than one part. The parents were asked to check "yes" or "no" to the question, "Did you
### TABLE 7
INVENTORY OF GROWTH IN PROBLEM-SOLVING ABILITIES AS RECORDED BY THE PARENTS
OF FORTY KINDERGARTEN PUPILS ENROLLED IN THE ENGLISH AVENUE ELEMENTARY
SCHOOL ATLANTA, GEORGIA, 1964-1965

<table>
<thead>
<tr>
<th>Questions</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most of the time</td>
<td>Sometime</td>
</tr>
<tr>
<td>1. Does your child know the shortest and safest way to and from school?</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>2. Can he show you the shortest and safest way to school by going in front of you?</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>3. Does he avoid walking on or near the curb?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>4. Does he avoid walking in the street while going to and from school?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>5. Does he play with others on the sidewalk while going to and from school?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>6. Does he run on the way to and from school?</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>7. Does he run while crossing a street?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>8. Does he look to the left and right before crossing a street?</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>9. Does he refuse rides from strangers?</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>10. Does he obey the safety patrol?</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>11. Does he show you traffic signs and tell you the meaning of them?</td>
<td>40</td>
<td>36</td>
</tr>
<tr>
<td>Questions</td>
<td>Before</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>--------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Does he go when the light is green?</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>13. Does he watch for cars turning when crossing a street?</td>
<td>3</td>
<td>37</td>
</tr>
<tr>
<td>14. Does he stop when the light is red?</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>15. Does he watch for the following while walking on the side walk?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Broken glass</td>
<td>40</td>
<td>36</td>
</tr>
<tr>
<td>b. Holes in the sidewalk</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>c. Wire or other things that he might get hurt from</td>
<td>40</td>
<td>34</td>
</tr>
<tr>
<td>16. Does he avoid going into the street between or behind parked cars?</td>
<td>40</td>
<td>37</td>
</tr>
<tr>
<td>17. Does he come straight home from school?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>18. Does he play with animals that are not his pet?</td>
<td>9</td>
<td>31</td>
</tr>
</tbody>
</table>
understand the question?" and to each of the questions, they were asked to check either "most of the time," "sometime" or "not yet."

The data indicate that all of the parents understood each question asked. To question one; "Does your child know the shortest and safest way to and from school?" 2 of the parents checked "sometime," and 38 checked, "not yet." However at the end of the experimental period in answering the same questions, 40 of the parents checked "yes." The differences between the responses given at the beginning and at the end indicate that the parents had observed a change in the children which designated that learning had taken place.

To the second question; "Can he show you the shortest and safest way to school by going in front of you?" 1 checked "sometime" and 39 "not yet." To the same question at the end of the experiment, all of the parents checked "yes." This data indicate that not only did the children know the shortest and safest way home, but they had developed the ability to show someone else the shortest and safest way home. To the third question, "Does he avoid walking on or near the curb?" 38 of the parents checked "some time," and 2 checked "not yet." At the end of the experimental period 40 of the parents checked yes. This then would warrant the assumption that the children were developing good safety habits in the street while walking to and from school. To the questions "Does he refuse rides with strangers?", "Does he obey the safety patrol?", "Does he show you traffic signs and tell you the meaning of them?", "Does he go when the light is green?", and "Does he stop for the red light?" 40 of the parents checked "not yet" as their answer to each of the questions.

After the experimental period was over, the same questions were
asked. The number of "yes" answers ranged from 40 to 35. All of the others checked "sometime." The twenty items in the questionnaire were selected to ascertain whether or not the behavior of the kindergarten children had changed desirously toward safety measures as a result of experimental teaching employing the method of problem solving through experiences.

Tape recordings.—The tape recording, at first, was somewhat of a novel experience to the subjects. They were accustomed to answering questions in monosyllables. They were also delighted, after a week, to hear the play backs. We developed a guessing game, to see how many could recognize each others voices. At first they were shy, but later developed a habit of coming to the microphone even when asking a question. The formation of sentences, their abilities to ask questions and conclude generalities were soon evident.

The data indicate that at the beginning of this research, the subjects were not aware of the many safety devises, personnel or rules that are used daily for protection; however, at the end of the experimental period, a majority, approximately 98 per cent of the subjects, not only knew the safety rules etc. but demonstrated their abilities to follow them.
SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction.---Scientific methods are ways of thinking about problems and solving them. The mere identification of a problem does not make its solution scientific, rather it is the method one uses to solve his problem or problems. The steps used today in solving problems the scientific way are general rules worked out by many men during hundred of years.

Problem solving has always been important to man. His natural gift of curiosity leads him into its depths as he seeks to understand the scheme of his creation, the offerings of the universe and the purpose of life itself. Through problem-solving, he has made discoveries, created, opened new frontiers in interpersonal relations and gained an increasing wisdom leading to more and more understanding of the forces which shape more satisfying civilizations. The writer then was seeking to ascertain to what extent these traits and abilities of problem solving, could be initiated at an early stage of life.

Recapitulation of the theoretical basis of this study

Evolution.---The writer had observed many kindergarten children failing to solve simple problems which they encounter in their everyday life. So, it was decided that it would be worthwhile to investigate the area of problem solving behaviors in children, to attempt to identify these behaviors, and to teach for them.

Contribution to educational knowledge.---The study may serve to:

(a) Eliminate certain misconceptions about the feasibility of
using the problem solving approach in the kindergarten program.
(b) Contribute to re-evaluation of the curriculum.
(c) Encourage further study of problem-solving as it is related to the kindergarten child.

The problem.—The problem involved in this study was to test the hypothesis that kindergarten school children can not exhibit behavioral characteristics which constitute elements of scientific methods of problem-solving.

Purpose of the study.—The purpose of this study was to provide a sequence of learning experiences to a group of kindergarten children designed to inculcate in them elements of scientific methods of solving problems.

More specifically the purposes of this study were to:
(a) Attempt to specify a taxonomy of behavior, which may characterize elements of problem-solving.
(b) Structure teaching-learning situations designed to provide stimuli for attaining problem-solving behaviors.
(c) Ascertain gains, if any, in attainment of problem-solving behaviors through manipulation and control of the teaching-learning situation.

Locale and research design.—The locale and research design are set forth below.

Locale.—This study was conducted during the first semester of the school year 1964-1965 at the English Avenue Elementary School, Atlanta, Georgia. The school is located in the Northwest section of the city, in a neighborhood where the majority of families reside in apartments or
rented homes. However there are some homeowners in this community.

**Subjects.**—The subjects used in this study were forty kindergarten pupils enrolled in the English Avenue Elementary School, Atlanta, Georgia.

**Instruments.**—The instruments used to collect the data pertinent to this research were: six teacher made tests, a questionnaire check list, and a specially designed unit of study.

**Research method.**—The experimental method of research utilizing the single group pattern of classroom research was used in collecting the data for this study.

**Procedural steps.**—The data of this research were gathered, analyzed and presented as follows:

1. A review, summation and presentation of the literature pertinent to this research.
2. The development of a taxonomy of behavioral characteristics for problem solving.
3. The structure of a unit and teaching plans on safety, designed to give desired experiences.
4. The orientation of the subjects to the procedure in taking tests.
5. The teaching of the unit.
6. The testing of each phase of the unit.
7. The assemblage of the test data into appropriate tables as the basis for analysis, interpretation and comparison.
8. Findings, conclusions, implications and recommendations as derived from the data are presented in this thesis.

**Summation of related literature.**—The literature reviewed in connection with this study revealed the following generalizations:
1. In order for a child to employ the scientific method of problem solving in everyday environment, he must understand the problem and must have had some previous concept of the problem, before he can make any hypotheses or come to any conclusion.

2. The problem-solving of young children must be considered as taking place in concrete, immediate situations rather than as occurring in abstract, verbal ones.

3. Problem-solving efficiency is an art that is developed through repeated opportunities to solve problems of vital importance to the solvers.

4. Children of very early age, four or five, can use the problem solving approach with problems that are within their understanding.

Summation of data.—The summation of the findings of this study is presented in the immediate paragraphs to follow.

Taxonomy of behavior.—From the literature, and according to competent judges, the criteria for measurements were the following: (a) an awareness of the problem, (b) understanding the problem, (c) experiential background relating to the problem, and (d) the ability to question, speculate, recognize causal relationships and draw conclusions.

The resource unit.—The unit was designed to provide the experiences necessary to develop problem solving traits.

Problem solving behavior observed and tested.—The children were given a pre-test at the beginning of the study and a test was given at the end of each sub-unit taught.

Test I-Pre-test (Table 1): The data indicate that only 1 or 2.5 per cent of the subjects scored above 50, 39 or 97.5 per cent scored below 50. Of this number 28 or 70 per cent scored 10.
Test II-Traffic light (Table 2): The data reveal that 23 or 57.5 per cent of the students scored from 100 to 60 and 17 or 42.5 scored from 50 to 10. Although the students increased their scores on the second test, the writer had anticipated an even larger percentage scoring from 60 to 100.

Test III-Recognition of signs (Table 3): The data in Table 3 reveal that 27 or 67.5 per cent of the students scored from 100 to 70 with 7 or 17.5 per cent scoring 100. Only 13 or 32.5 per cent scored between 50 and 40. This indicated a slow but steady increase in the subjects' ability to deal with everyday problems.

Test IV-Identification (Table 4): Thirty-six or 90 per cent of the subjects scored from 100 to 60 with 17 or 42.5 per cent scoring 100. Only 4 or 10 per cent scored below 50; to be exact, the 4 scored 40.

Test V-Places to play (Table 5): The data on safe places to play indicate that 26 or 65 per cent of the students scored between 100 and 60, and 14 or 35 per cent scored between 50 and 30. This seemed to indicate that the desired concept of knowing the safe places to play was being developed.

Test VI-Total safety (Table 6): The data on total safety indicate that 40 or 100 per cent of the students scored between 100 and 50. Of this number: 6 or 15 per cent scored 100, 8 or 20 per cent scored 90, 10 or 25 per cent scored 80, 5 or 12.5 per cent scored 70, 5 or 12.5 per cent scored 60 and 6 or 15 per cent scored 50. The results reveal that the subjects were aware of safety rules, their meanings, signs, what to do when approached by strangers, places to play and the safe directions for going to and from school.
Observations (Table 7): The items in the questionnaire were structured to ascertain whether or not the behavior of kindergarten children would change as a result of experimental teaching. The data indicate that at the beginning of the experiment, the subjects were not aware of the many safety devices, personnel, or rules designed for protection; however, at the conclusion of the period a majority of the subjects, not only knew the above mentioned items of safety but demonstrated their abilities to follow them.

Conclusions.—The analysis and interpretation of the findings of this study utilizing the criteria of a validated taxonomy of behavior traits appear to warrant the following conclusions:

1. That children of kindergarten age do exhibit problem-solving behavioral abilities and/or traits.
2. That resource units when structured properly can provide experiences necessary to the formation of these traits.
3. That kindergarten children can display an interaction between classroom activities and everyday problems.

Implication.—The implication stemming from the findings and conclusions of this study is

Teachers of kindergarten children are not aware of the possibilities of problem solving among children of early age.

Recommendations.—The findings of this study appear to warrant the following recommendations:

1. That the administrative personnel appoint kindergarten teachers according to a certain age-bracket. This will tend to insure an energetic type of program needed to foster desirous attitudes
among the very young.

2. That kindergarten teachers avail themselves of the kinds of activities that will foster good behavioral traits in youngsters.

3. That children of very early age, four or five be permitted to use the problem solving approach with problems that are within their understanding.
BIBLIOGRAPHY

Books


Articles and Periodicals


Unpublished Material


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1959 with a major in Elementary Education.


Personal Information:
Married and the mother of one child.
Member of St. Paul of the Cross Church,
Atlanta, Georgia.
APPENDIX
Dear Parent:

We are in the midst of trying out an experiment which we feel may help your child learn the best and safest way of going to and from school.

We would like to have your help in seeing that this is properly done. Will you please help us by answering the following questions about your child.

Thank you very kindly.

Yours very truly,

(Mrs.) Mattie H. Powell
Inventory of Growth in Problem-Solving Abilities

Checklist: For parent or siblings or peers who may bring the child to school

<table>
<thead>
<tr>
<th>Did you understand the question?</th>
<th>Most of the time</th>
<th>Sometimes</th>
<th>Not yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Does your child know the shortest and safest way to and from school?
2. Can he show you the shortest and safest way to school by going in front of you?
3. Does he avoid walking on or near the curb?
4. Does he avoid walking in the street while going to and from school?
5. Does he play with others on the sidewalk while going to and from school?
6. Does he run while crossing a street?
7. Does he run on the way to and from school?
8. Does he look to the left and right before crossing a street?
9. Does he refuse rides from strangers?
10. Does he obey the safety patrol?
11. Does he show you traffic signs and tell you the meaning of them?
Checklist: For parent or siblings or peers who may bring the child to school

<table>
<thead>
<tr>
<th>Did you understand the question?</th>
<th>Most of the time</th>
<th>Sometimes</th>
<th>Not yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Does he go when the light is green?

13. Does he watch for cars turning when crossing a street?

14. Does he stop when the light is red?

15. Does he watch for the following while walking on the sidewalk?
   a. Broken glass
   b. Holes in the sidewalk
   c. Wire or other things that he might hurt from

16. Does he avoid going into the street between or behind parked cars?

17. Does he come straight home from school?

18. Does he play with animals that are not his pet?
Safety in the Streets

Put an x on the picture or pictures:

1. Children should playball in the—
   - Street
   - Playground
   - Backyard

2. Playgrounds are the places for—
   - Cars
   - Children
   - Horses

3. Streets are the places for—
   - Trucks
   - Buses
   - Cars
   - Children to play
At a house down the street up the street

You should cross the street at the —

Traffic light anywhere corner crosswalk

Put an X on the light that tells us when to go.

Children should walk on the

Side walk the street
Put an X on the one you would do, ride with a stranger or walk home.

Put an X on the people who help us to cross the street.
Put an x on the Stop sign.

Put an x on the Warning Sign.

Put an x on the sign that gives a message.

Put an x on the Yield - Right-of-Way Sign.

Put an x on the Railroad Crossing Sign.
Put an X on the policeman

Put an X on the Safety Patrols

Put an X on the policewoman