Through all of these activities, the teacher assists in the learning experience by guiding discussions and introducing problems. These activities provide readiness for the use of attribute blocks in the primary grades and allows the children to discuss and act out the solutions to problems presented by the teacher.

Estimation

Kindergarten children should be asked to estimate answers regarding real life situations. Children should record their estimates on a sheet of paper and then discuss the estimates with their teachers. Types of questions that could be asked are:

1. How many people in this room are left-handed?
2. How many people in this class have a dog?
3. How many people in this room are wearing glasses?
4. How many people in this room have a birthday in November?

It is important that all children estimate an answer. Interesting questions may arise relating to whether contact lenses are glasses and to whether the teacher is a person in the room. These provide the teacher with ample opportunities for problem-solving questions to relate children's responses to real-world situations.

Summary

Children live in a world of mathematics. A good environment for using mathematics in kindergarten and the early primary grades is essential so students have the opportunities to discover and solve problems. Do not underestimate the ability of primary grade students to solve problems. Often students will use strategies that teachers are unable to predict. Students in the primary grades are able to make estimates, keep records of their observations, account for all possibilities, and make decisions on the basis of what has or may happen in a given situation. Students must be taught to believe they can solve a problem and must also be confident when they arrive at a reasonable answer. Problems in the primary grades must be difficult enough to present some challenge, but easy enough so that solving them instills confidence. A student's tolerance time for dealing with a problem before giving up will be gradually increased as the student understands more strategies for solving problems.

Problem solving in the primary grades should not be dependent upon reading ability. Students should have problems read to them before and after they have learned to read. Students in the primary grades need to begin to develop a variety of strategies for solving problems and these strategies need to be identified and...
had a parent and two siblings so there was a total of about 45 people involved. Most of the students were first and second graders.

Before our session began the parents and children were given an attitude survey. The parents stated they were willing to spend twenty to sixty minutes a week helping their child, but they felt they didn't know enough about current math instruction or were insecure about their own math ability.

The children were also surveyed. Most of the students had a positive attitude toward math and felt confident about their ability in math. The things they liked most about math involved counting and addition activities. The thing they liked least was subtraction.

The format of the program was a meeting one evening a week for an hour. During that time the parents were given a brief introduction of the topic and then shown several activities to do with their children at home. After each activity was demonstrated, the parent and child were given an opportunity to practice their game and ask questions. At the end of the evening, the children had a snack while I talked with parents, distributed take-home materials, and answered questions.

![Image]

Cooking Experience

The everyday experiences in preschools and kindergartens provide numerous problem-solving activities involving the preparation of nutritious snacks. Each day a new plan is presented which follows a format such as:

1. Introduction and discussion of the snack for the day.
   Example: "Bugs on a Log"
2. Recipe on a large chart is presented:
   1 large celery stalk
   8 raisins
   1 teaspoon peanut butter
3. Children proceed to prepare the snacks for eating:
   Remove green leaves on celery. Wash celery stalk.
   Spread peanut butter on celery. Place raisins along stalk.

Another example is the Honey Balls recipe:

Combine: 1/2 cup powdered milk
          1/2 cup honey
          1/3 cup peanut butter


Through these activities, children learn to identify numbers, count, measure, and classify objects and act out the solution to the problem of equal food distribution. They can act out and see the difference between 1/3 cup and 1/2 cup. The recipe charts are important for the child to see the pictures and "read" the directions and ingredients.

Shapes and Sizes

Geometric shapes are explored through the use of crackers with the various shapes of circles, squares, rectangles, and triangles. Children can also find these shapes around the room – in table-top games, toys, furniture, and other objects within their environment.

Building blocks of all shapes and sizes fit right into the scheme of discovering geometric forms. A good supply of blocks includes a variety of shapes and sizes.

Outlines of six shells were made on each card. The real shells were placed in the middle of the table. Four to six children sat around the table. Each child reached out and "drew" a shell, held it up and placed it on the card where it matched. This sequence went on until all cards were filled. The teacher guided the discussion and directed the activity.

![Image]
housekeeping center, cooking corner and the woodworking bench. Many of these pleasant, worthwhile activities lend themselves to problem-solving — weighing, measuring, seeing spatial relationships and determining quantity.

Teaching problem solving requires a teacher to help students become willing to solve problems. Problem-solving strategies must be taught so students can solve problems. Teachers must teach students to think their way through problems to reasonable solutions. The skills taught should include listening and reading skills, skills related to following directions, and the skills that relate to the use of numbers, relations, and operations.

Strategies

Strategies are techniques for finding answers or explanations for questions or situations that present uncertainty or difficulty. There is no specific strategy to enhance successful problem solving. The only criterion is that the problem be solved in an efficient manner for the problem solver.

Suggested Problem Situations for the Primary Grades

Teachers of young children need to be able to rise to the occasion of a spontaneous experience such as the "teachable moment" of a special show and share time.

Show and Share

Upon returning from a Spring vacation in Florida, a child who had enjoyed exploring the ocean beach brought to class a collection of beautiful shells. After discussion, show and tell, and sharing, the teacher led the group to more discovery involving:

1. classification
   - kind of shells, recognizing same and different kinds
2. shape
   - comparing various shapes
3. size
   - measuring; weighing; using terms of more, less, bigger, smaller
4. looking for patterns; grouping
5. counting

Displays using the skills were set up according to problem-solving activities. Learning and discovery games with shells were created using the skills. One special activity was a "Lotto" game created by using the shells. Six lotto cards were made.

As a pre-activity each week, there was an estimation jar filled with things such as gumdrops, goldfish crackers, or pretzels. Each person would make a guess and the winner would be announced at the end of the evening. Families were given an estimation project to do at home, such as, estimate the number of shoes in your house and then count to check your answer. Another one was to estimate the number of times in a day the refrigerator door was opened.

The first evening's topic was spatial visualization. Tangrams and grid games were used as a way to introduce geometric ideas.
The third evening was spent on introductory experiences with a calculator. Students became familiar with the keyboard, adding 1 more, 1 less, and were shown some ways to practice basic math facts with the calculator.

The fourth evening centered around logical thinking and some measurement activities.

In addition to the handouts, each family received a "Math Toolbox" at our first session. The toolbox contained a tangram set, dice, odd and even counters, two-sided beans, and a deck of cards.
A report on our major event of the year, the 1988 "Math + Females = Exciting Careers" Conference, will be published, together with ideas for its adaptation to local school sponsorship, in a forthcoming issue of the Ohio Journal of School Mathematics. Additional materials developed under the auspices of the project which may be of interest to teachers, program chairs, and other professionals include: 1) a library resource list of publications related to mathematics and gender issues, and 2) a computer program designed to compare male and female mathematics enrollments within a school or district and analyze the data for significant differences. Direct inquiries to the author (also the project director) at: School of Education and Human Development, State University of New York, Binghamton, N.Y. 13901.

REFERENCES

MATH SCRAMBLER
Unscramble these four mixed-up math terms, one letter to each blank:

TRYOF  
LUQEA  
RENGET  
RAFTOC

Now, rearrange the letters in the boxes to form the answer to the riddle below:

HOW MANY BIRTHDAYS DOES THE AVERAGE PERSON HAVE?

Answer is on page 32.

At the end of the four evenings the parents were asked to evaluate the program. All of the parents were positive about the classes. One parent wrote, "My child didn't realize he was learning, because it was so much fun." Another said, "Both my attitude and my child's were improved by this class. It was time well spent together. Thanks for a new way of looking at and teaching math, making it fun and very practical - not just the facts we learned in school." All of the parents surveyed also were interested in follow-up sessions.

Parent-child math nights are a rewarding experience. It gives the teacher an opportunity to get to know her students and parents in a relaxed and informal setting. It also provides the opportunity to explain the "Why" of mathematics. And most of all it created good feelings about mathematics.
interested elementary school could effectively conduct a similar program through their local parent-teacher organization. Further information may be obtained from: Lawrence Hall of Science, University of California, Berkeley, CA 94270, Attn.: FAMILY MATH.

Another avenue we used to reach parents was the annual Open House, which provided an opportunity to disseminate information about the importance of mathematics study. Again, this effort can easily be duplicated by any interested school or district. Often materials addressing mathematics and career and gender issues can be obtained for a nominal cost or free of charge from such organizations as the Mathematical Association of America, the Math/Science Resource Center, and the Office of Career Education of the U.S. Office of Education.

One example, the MAA leaflet "You Will Need Math", points out that more math is needed today than fifteen years ago, and lists jobs in three categories: those which formerly required little math and now require more, those which required some math and now demand much more, and new jobs developed within the last fifteen years which require substantial training in mathematics. The leaflet reports on the amount of math which is needed for careers such as fireman, postal clerk, plumber, dental hygienist, photographer, airline pilot, and meteorologist. In addition, it points out that students may anticipate at least six different job changes during their lives, but that the demand for more mathematics in the job market is likely to continue to increase. Permission is granted for local reproduction of both this and the leaflet "The Math in High School You'll Need for College". The MAA also offers the pamphlet "Careers in Mathematics". (Mathematical Association of America, 1529 Eighteenth St., N.W., Washington, D.C. 20036).

"Helping Children Make Career Plans: Tips for Parents" is another leaflet offering advice to parents on exploring children's career interests, avoiding gender bias, and ensuring the requisite academic background for various career choices. It is available from the U.S. Office of Education. For additional materials offering specific advice on how parents can encourage their daughters to continue mathematics study we recommend the Math/Science Network, Mills College, Oakland, CA 94613. It has been our experience that materials relating mathematics and careers, when available, are typically distributed to high school students. They often remain unread. Placing them in the hands of parents ensures them a far greater chance of being read and carefully considered.

REFERENCES

