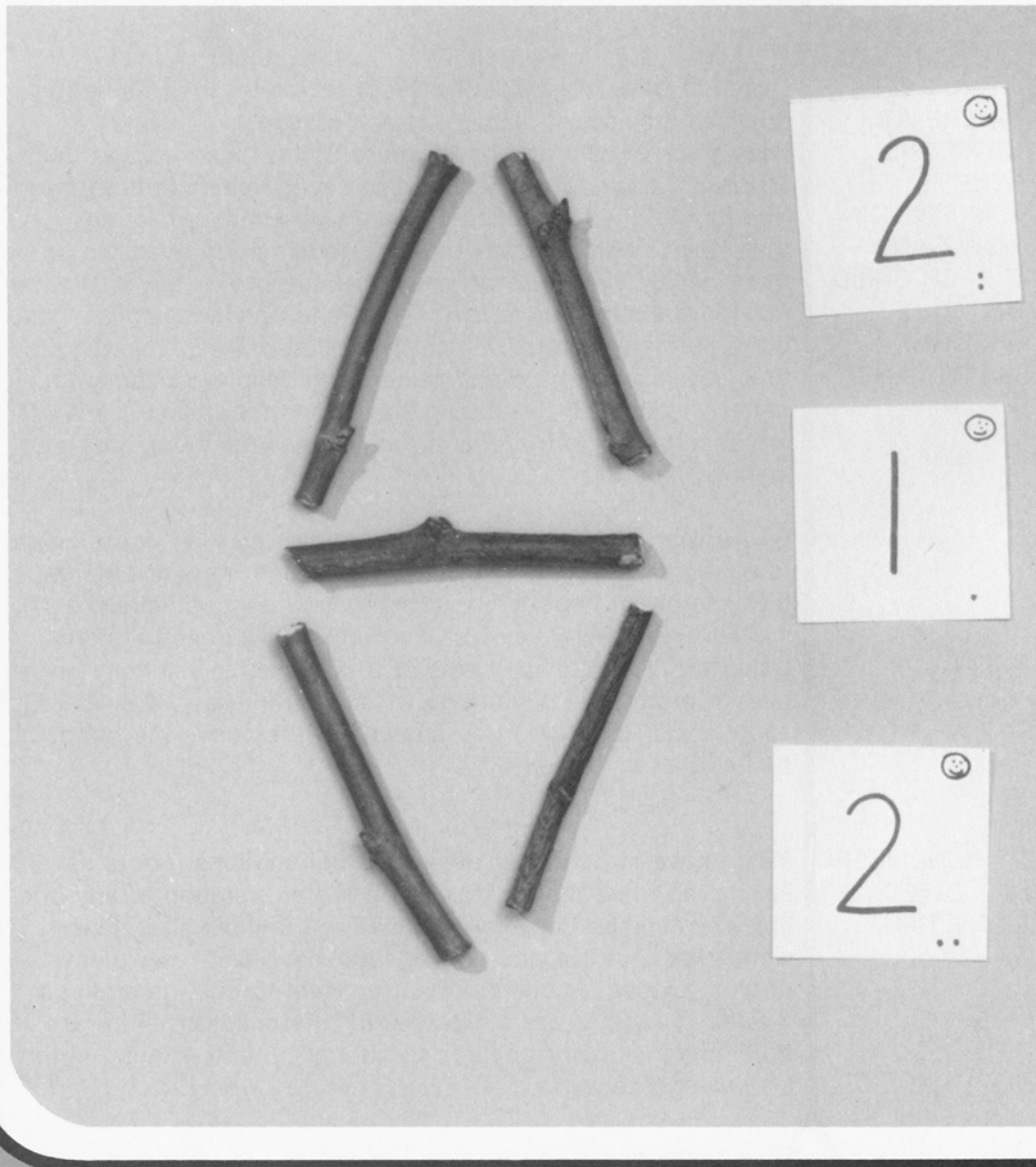
8

NUMBER AT THE CONNECTING LEVEL



8

SKILLS AND CONCEPTS

Connecting the concept of quantity to the appropriate mathematical symbolization
Observing mathematical symbols in real world situations
Adding and subtracting

SELF CONCEPT AND SOCIAL INTERACTION

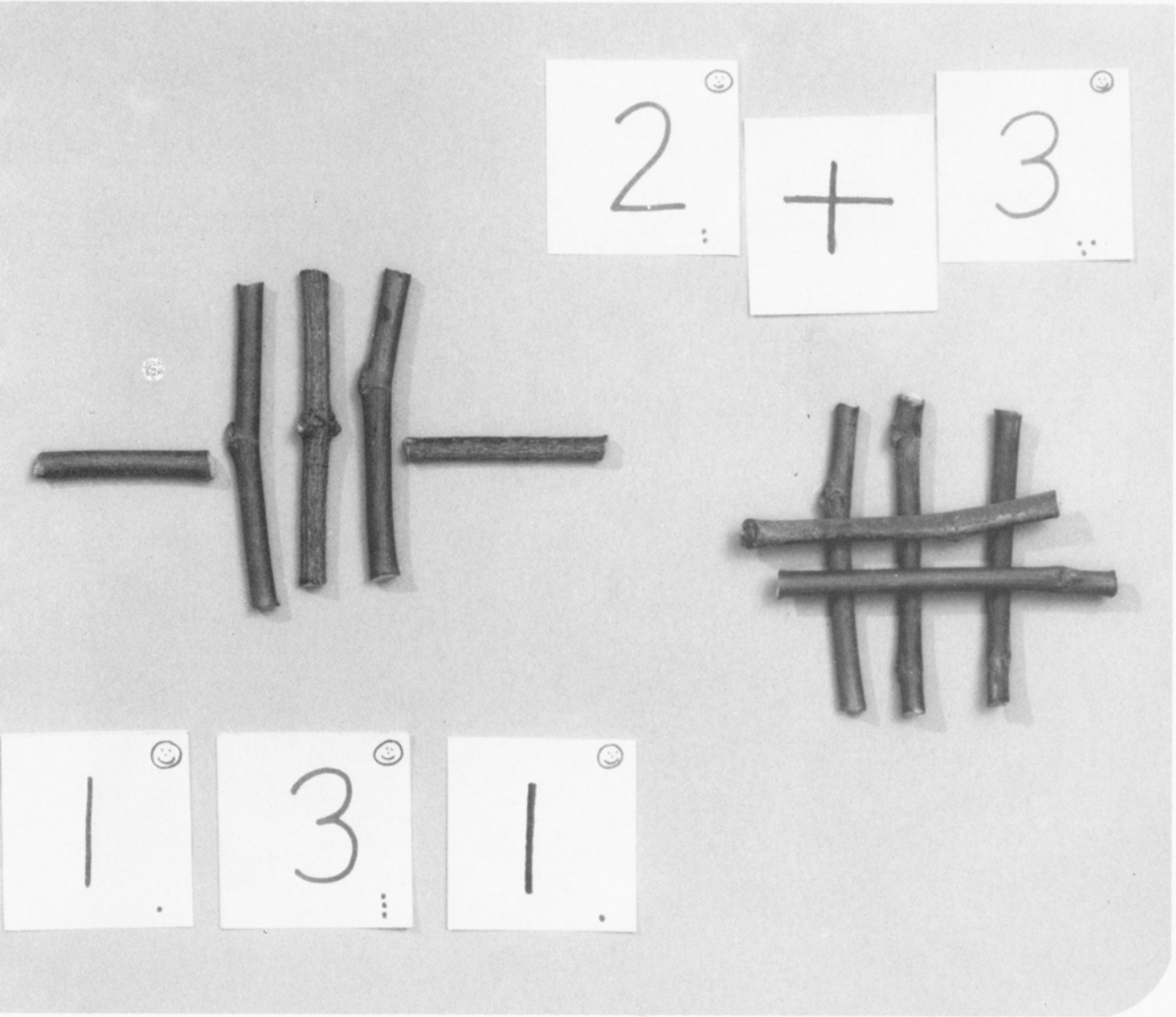
Gaining a feeling of self-worth through participating as a "teacher" as well as a learner
Enhancing one's image of self through seeing one's own work used by the whole class as an integral part of the classroom learning materials
Heightening awareness and visual imagery as a result of using all five senses in learning
Experiencing a variety of solutions to a problem each valued for its uniqueness with no one way valued above all the others

FUTURE APPLICATIONS

Measuring with standard units
Understanding mathematical symbols
Understanding the relationship between one number and another

PREREQUISITE CHAPTERS

Free Exploration
Counting
Comparing
Number at the Concept Level



8

NUMBER AT THE CONNECTING LEVEL

INTRODUCTION

The activities in this chapter enable the child to link the number concepts gained in the previous chapter to written symbols.

When a child internalizes the combinations of "four" as a result of exploring four in the Three Games and at the Number Stations, sheorhe repeats the activities in the previous chapter to explore the concept of five. When the combinations for five are firmly established, the student returns to the activities in this chapter, linking the written symbols with the concept of five. This cycle is repeated with six, seven, eight, nine, and ten.

Interpreting Symbols

SKILLS

Visual imagery
Connecting an abstract idea to the real world
Discovering a variety of solutions to a problem

MATERIALS

None

ACTIVITY

The teacher writes numerals on the chalkboard and the children think of different ways to interpret them by imagining and describing a variety of objects.

SAMPLE TEACHING STRATEGY

TEACHER	CHILDREN
"Who can tell me what you see in your mind when I write this symbol?" (The teacher writes a "4" on the chalkboard.)	"Four rocks."
"Who has a different idea?"	"I see four chairs at a table."
"Who has a different idea?"	"Four eyes on a monster."
"Judy."	"Four peanut butter cookies."
"Tony."	"Four yellow pattern blocks."

Continue asking the children to generate different images of four things. When the children are comfortable giving examples ask them to picture each suggestion and attempt to count them. This prepares the children for the following examples in addition and subtraction.

TEACHER	CHILDREN
"How could you picture this in your mind?" (The teacher writes "3 + 2" on the board.	"I see three red and two green Unifix cubes."
"Who has a different idea?"	"Three blocks on top of my bowl and two underneath."
"Paul."	"Three kids standing up and two kids sitting down."
"Mary."	"Three claps and two snaps."
"Susan, can you think of an idea using the hand game?"	"Uhuh. I have three beans in this hand and two beans in this hand."
"Let's all picture a junk box. Close your eyes and imagine yourself walking over to where the boxes are stacked up. Take one down. When you get back to the rug, you open your box and pick up some objects in both hands. See the colors and imagine how they feel. Open your eyes. What junk box did you have?"	"I had the buttons." "So did I!" "Not me, I had the glass blobs. They were heavy!" "I dropped my box but nothing spilled out." I had the shells." "I had the chicken rings and

	all the yellow ones were snapped together. I had to take them all apart!"
"Close your eyes again and picture your junk box. Hold your hand out with your palm up and imagine yourself putting three objects from your junk box into your hand. Count them: "One, two, three." Now add two more objects to the first three. How many objects do you have in your hand now?"	"Five!"
"Open your eyes. I'm going to write something new on the board that I want you to picture." (The teacher writes, "5 − 2," and the children read it.)	"Five take away two." "I have five fingers sticking up, and I grab two and hide them with my other hand."
"Who has a different way of picturing five take away two."	"I see five cupcakes. I'm eating two of them."
"Francis."	"I see a pattern block wall with five red blocks standing up. John accidently knocks two of them down and I punch him in the nose—no I don't, not really!"
"Carol."	"I see five balloons. I get mad and pop two."
"Close your eyes. Picture your junk box. Hold out your hand and put five things out one at a time. One, two, three, four, five. Now pick up two of them. How many are left?"	"Three!"

Continue giving problems like this, encouraging the children to picture the action in a variety of ways. This activity helps children visualize the solution to abstract problems and connects the mathematical symbols to a variety of previous experiences.

Number Books

SKILLS

Labeling concepts with mathematical symbols
Addition
Pattern

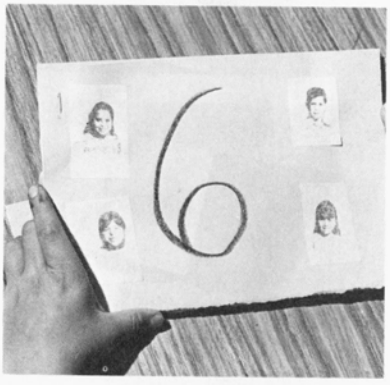
MATERIALS

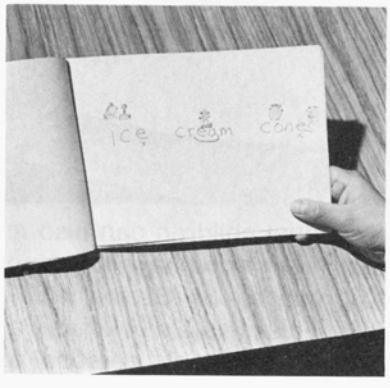
Records of toothpick, tile, and pattern block designs; paper, stapler

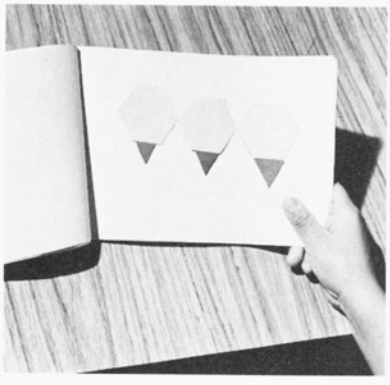
ACTIVITY

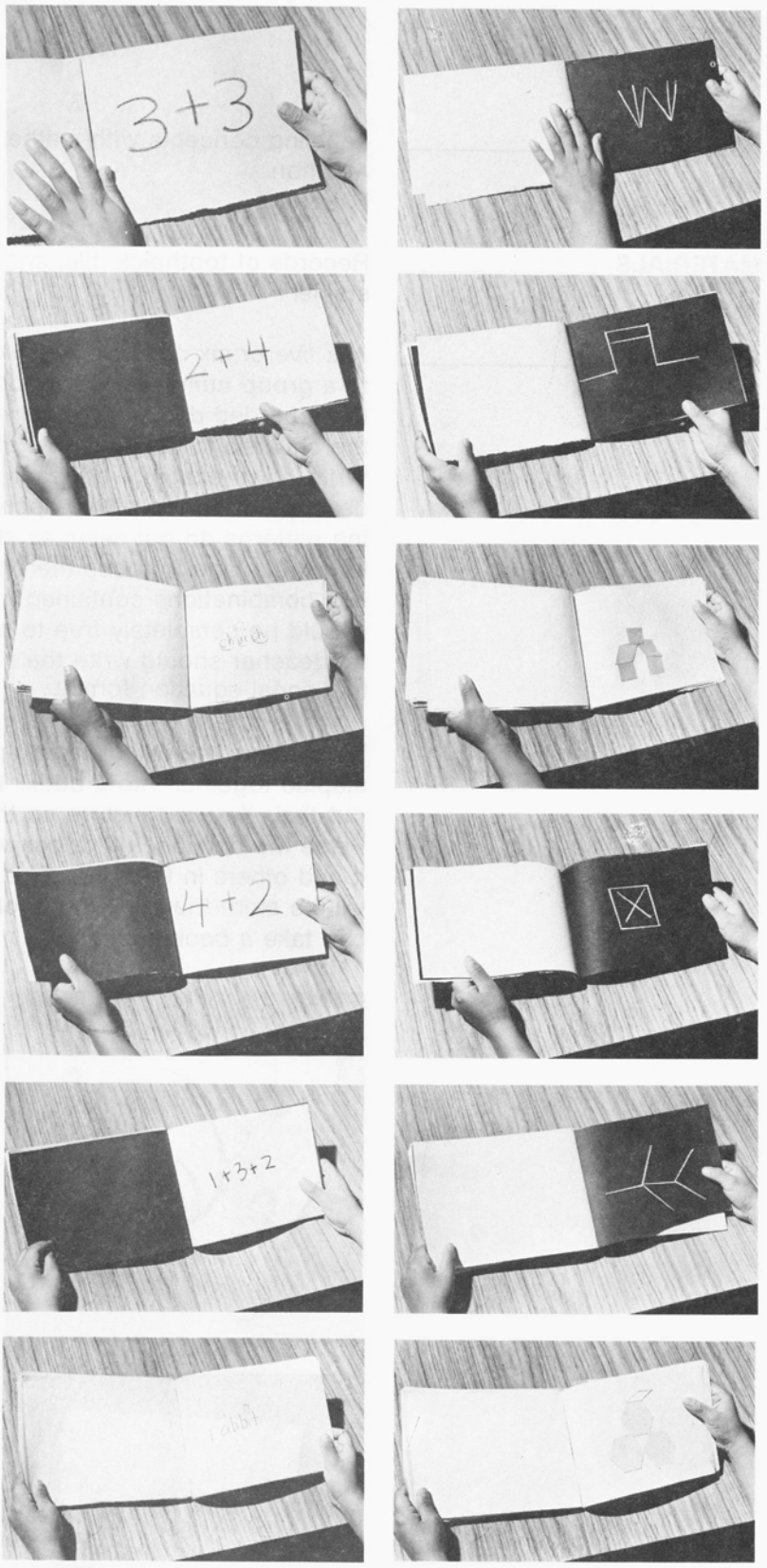
Ask five or six children who would like to contribute patterns to a group number book to join you at a table. Spread out the recorded designs so that everyone can see them. Invite the children to tell you what different designs remind them of. Write down exactly what each child says and put this written description on top of the appropriate page. When the remaining patterns do not seem as stimulating as the first ones, you know it is time to focus the children's attention on the addition combinations contained in these designs. The children should be completely free to describe the numbers used and the teacher should write the numerals freely rather than in the traditional equation format.

When there are ten or fifteen pages ready, they can be stapled together into a book. The children contributing can put their Xeroxed picture on the cover or on their pages. Place the new book in a box where the children can look at it and others in their free time. At the end of the year there will be more than enough books collected so that each child can take a book home.









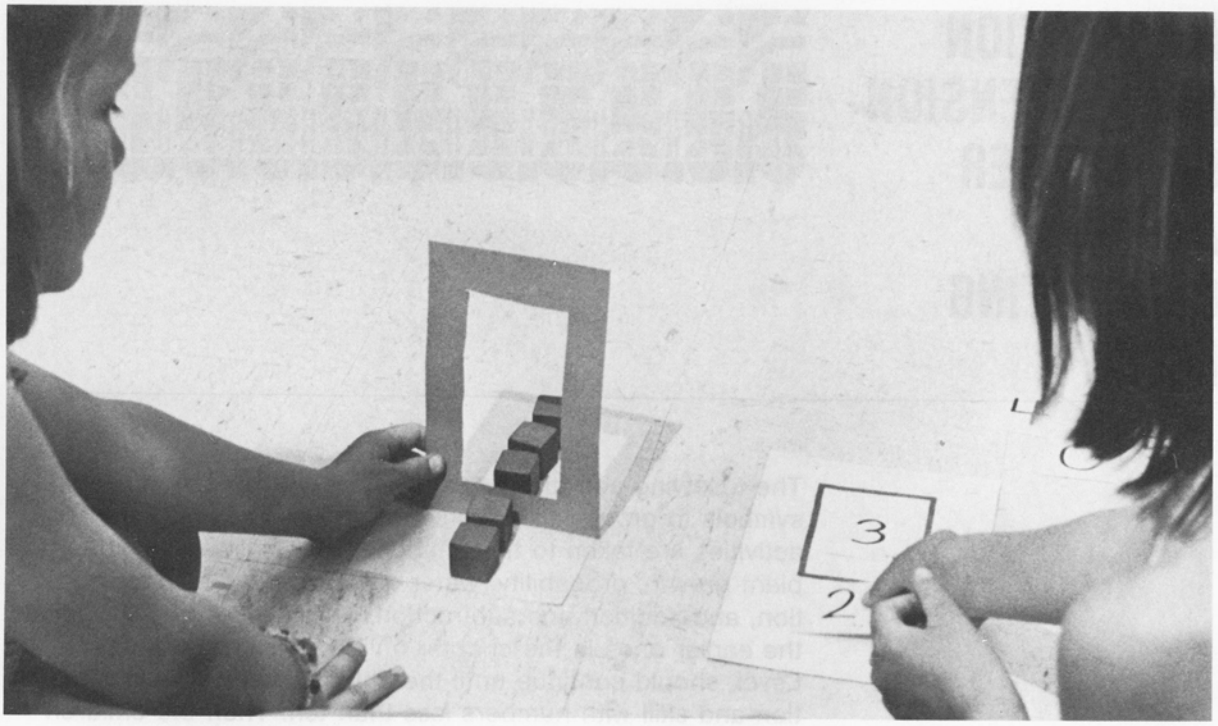
Individual children can also make books, but it is important that every child have an opportunity to make contributions to group books. Seeing your own efforts blending with your fellow classmate's to create a learning material for the classroom is a valuable personal experience.

APPLICATION AND EXTENSION OF NUMBER AT THE CONNECTING LEVEL

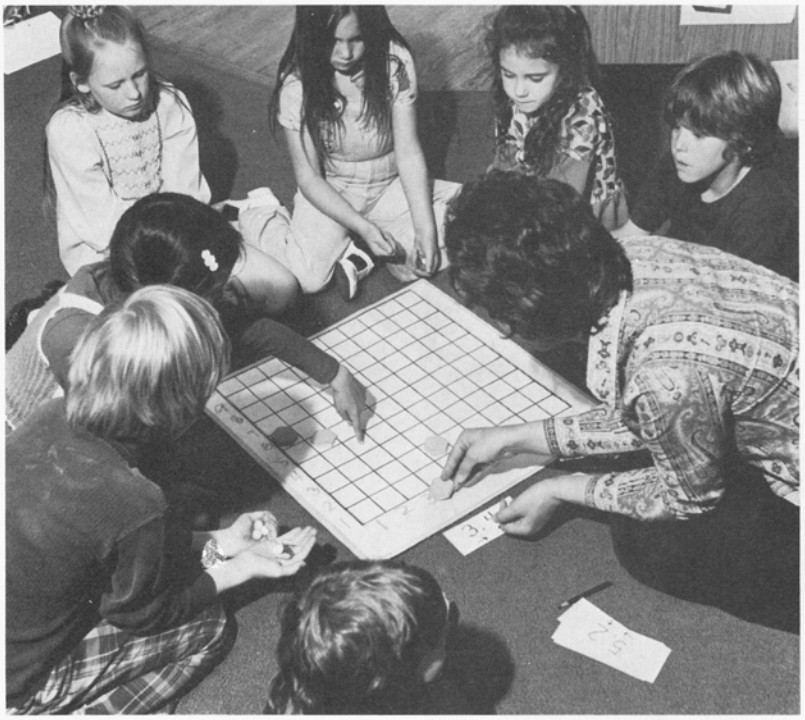
The following activities allow the children to apply numerical symbols to groups of objects in a variety of ways. Earlier activities are taken to the symbolic level; children explore plant growth, probability, water displacement, volume, duration, and addition and subtraction. These activities, as well as the earlier ones in the chapter on Number at the Concept Level, should continue until the children have a firm foundation and skill with numbers less than ten. Then the children can begin place value activities and explore numbers above ten.

Connecting Symbols to the Old Games

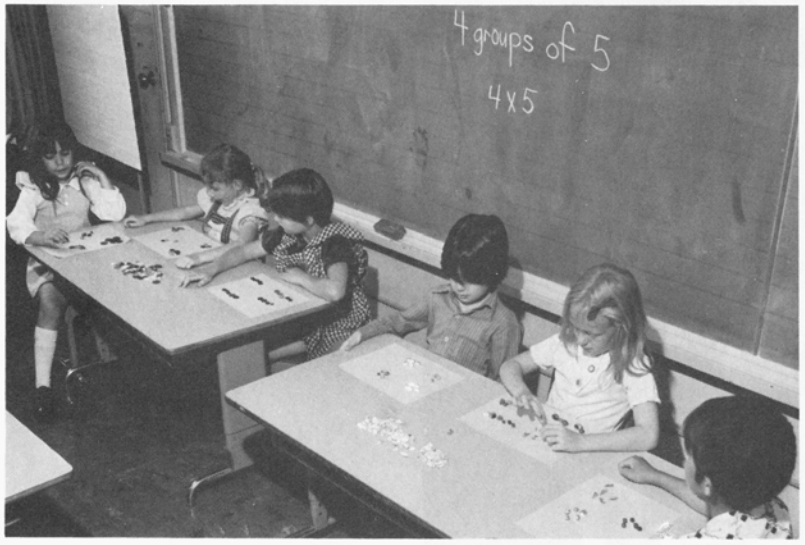
The Hand Game (p. 183). One child makes up a problem and the other child records it (see Worksheet 41).



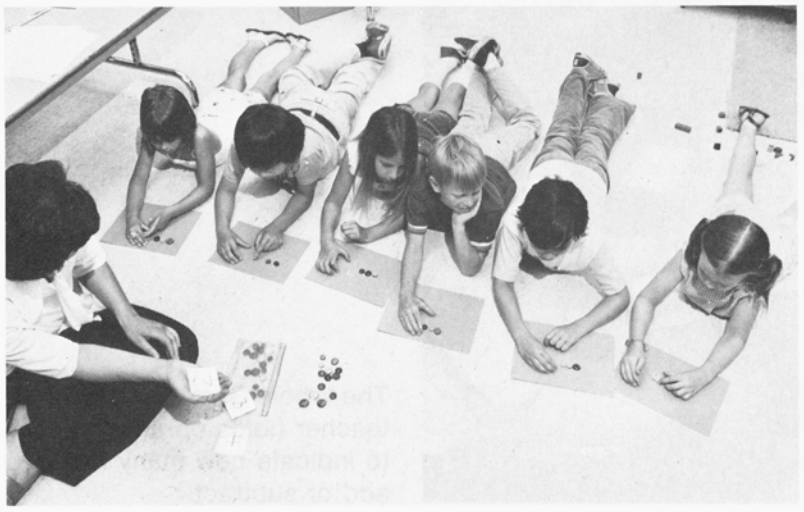
Peek Through the Wall (p. 180) and Lift the bowl (p. 181). One child makes up a problem and the other child records it (see Worksheet 40).



Capture: (p. 195) The children find all the possible combinations of a given number and plot them on a reduced-size gameboard looking for a pattern.



Presto-Change-O: (p. 197) The teacher writes on the chalkboard what groups the children are to make.



The Cave Game: (p. 192) The teacher holds up a numeral to indicate how many objects are to be hidden.

Concentration: (p. 191) The children substitute numerals written on small squares of cardboard for the stacks of Unifix cubes.

The Whale Game: (p. 188) The teacher holds up an equation to indicate how many fish to add or subtract.

The Store

SKILLS

Connecting an abstract idea to the real world
Probability
Comparing

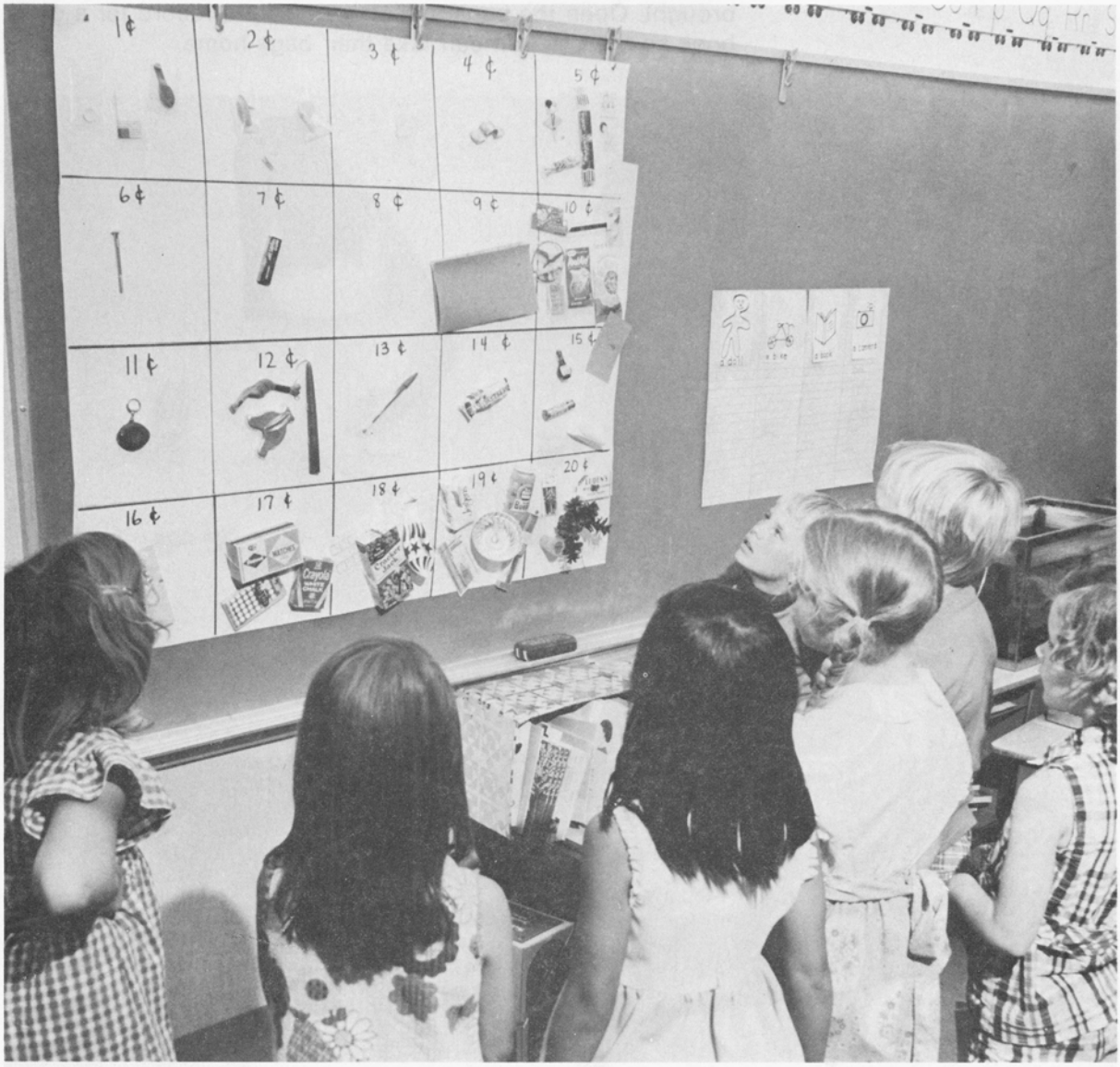
MATERIALS

Small items brought from home, pricing labels, paper, yarn

ACTIVITY

The children bring in items that cost different prices to pin on the bulletin board. Each item is pinned up in the appropriate section on the board according to its price.

The items will accumulate slowly so that the activity takes a month or more to complete. This slow growth has great value for the children, as they will discover certain priced items are difficult or impossible to find.



Extend this activity to higher numbers if it is appropriate.

A Bag From Home

SKILLS

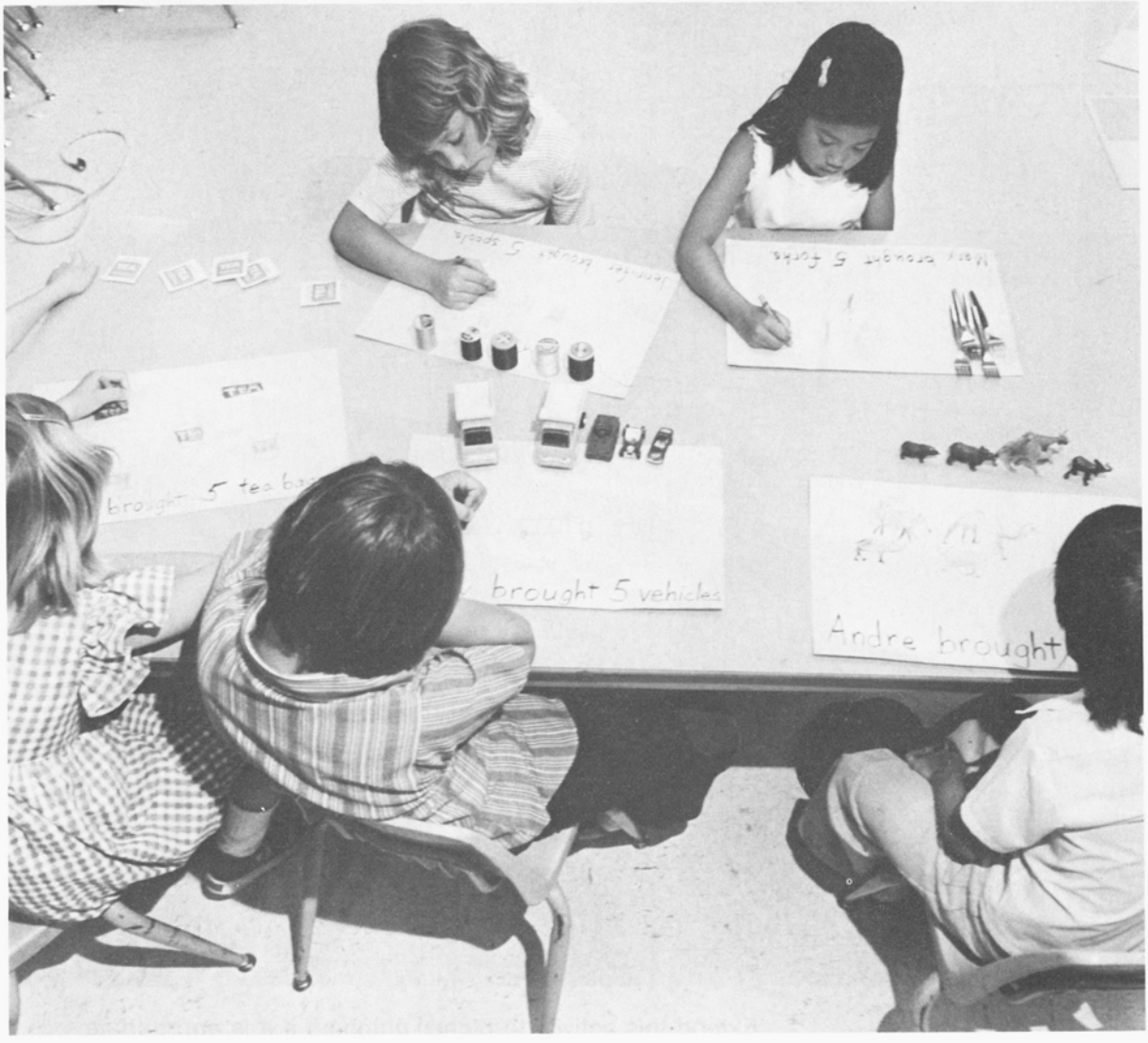
Connecting an abstract idea to the real world
Visual imagery
Counting

MATERIALS

A note to parents requesting their child be allowed to bring ____ things from home (Fill in the appropriate number).

ACTIVITY

Five or six children at a time take the note home and bring a bag of items for the class to see. Open the bags one at a time, count the items and talk about them. Put the items back in each bag, making sure each has the owner's name on it. Later in the day, take the bags down and read the names one at a time. See if the children can remember what each child brought. Open the bags and check. Make a record for a class book so the children can take their bags home.



Subtraction Race

SKILLS Subtraction
Comparing
Probability

MATERIALS Unifix cubes*, numbered dice

ACTIVITY The children work in pairs. They build two trains of equal length. Then they take turns rolling a die and breaking off the number of cubes from their train shown on the die. The first child to get to zero determines the length of the train used for the next game.

An interesting rule sometimes evolves if the children decide it is important to roll the exact number of remaining cubes in order to go out. This adds an element of probability at the end of the game.

The game can be repeated with a variety of other material: junk, tiles, Unifix cubes placed on geoboard nails, etc.

Crazy Mixed Up Numbers

SKILLS

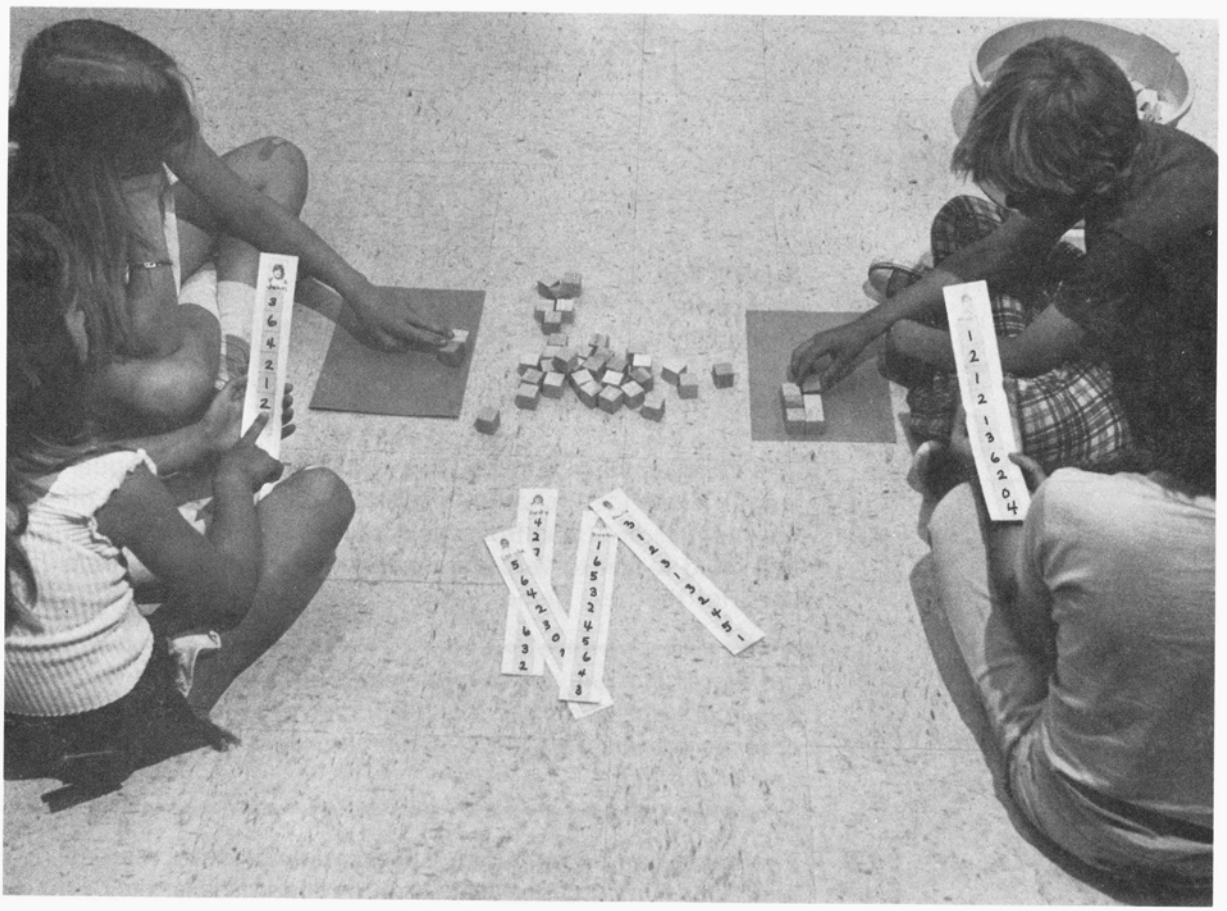
Addition
Subtraction
Comparing
Problem solving

MATERIALS

Graph paper, children's photocopied pictures*, clear contact paper

ACTIVITY

A group of five or six children take turns dictating a series of numbers for the teacher to write down. The children should use whatever numbers they are working on, and they can repeat these numbers as many times as they wish. Each child pastes his photocopied picture on his strip of "Crazy Mixed Up Numbers" and the teacher covers it with clear contact paper to protect it. In a few days, when several groups of children have dictated numbers, the children form into pairs. Each pair selects a strip of numbers to use. One child reads the numbers and the other child builds with materials. As the numbers are read, the second child changes the quantity of objects to reflect the number being read. At each step the children should tell how many objects they must add or subtract in order to move from number to number.



Grow and Shrink Balloon Game

SKILLS Addition
Subtraction
Comparing

MATERIALS Balloons, a die made from a milk carton, paper, pins

ACTIVITY The children help to blow up the balloons. Then they take turns rolling the die and adding or popping balloons so that the number rolled on the die matches the number of balloons on the bulletin board.

The Bell in the Box

SKILLS
Auditory perception
Labeling concepts with mathematical symbols
Counting

MATERIALS
A large box, a bell, cards with numerals for each child

ACTIVITY
One child gets inside the box and rings the bell a certain number of times (whatever number would be appropriate for the particular children participating). The rest of the children count the rings and then hold up the numeral that indicates how many times the bell was rung. When the child pops up, the children say the number and hold their cards up.

My Turn, Your Turn

SKILLS

Probability
Counting
Interpreting symbols

MATERIALS

Tape or chalk for preparing a large game board, a milk carton die

ACTIVITY

The children divide into two teams; each team stands at opposite ends of a row of squares. One child stands in the middle square of the gameboard (which is constructed with an odd number of squares).

This is a real problem solving situation. Allow the children to struggle with the problem of finding the center square. It is not important to play the game the first day you introduce the activity. Finding the center is a far too important experience. Take advantage of it! Let the children learn from the experience by suggesting and trying various methods. Resist the urge to abstract the solution for the children.

When a child is in the middle, the game begins with one team rolling the die, calling out the number, and counting aloud. Each time a team takes a turn, the child in the middle turns around to face the other team and walks toward them the number of steps indicated by the roll of the die. The object of the game is to capture the child in the middle. This is accomplished if the child in the middle steps off the gameboard during the count. Will anyone ever win? Play the game to find out!

Pairs of children enjoy playing a scaled-down version of My Turn, Your Turn.

Ordering by Volume

SKILLS

Measurement
Ordering
Counting

MATERIALS

Four jars, a measuring cup, rice

ACTIVITY

Prepare the jars in the following manner. Put one measuring cup of rice in one jar, two measuring cups of rice in another jar, three cups in a third jar, and four in the fourth. Mark the level of the rice in each jar with a permanent marking pen.

As the children learn more numerals, make the measuring cup smaller and add more jars to the series. (Old lines can be removed.)

This activity can be changed slightly to deal with other concepts.

Length: Draw four lines on a chart in different patterns and cut four lengths of string which match these lines.

Time: Four children perform an activity such as standing on one foot. Each child's time is determined by counting swings of a pendulum.

Weight: Prepare four plastic bags of materials which balance one, two, three, or four metal washers.