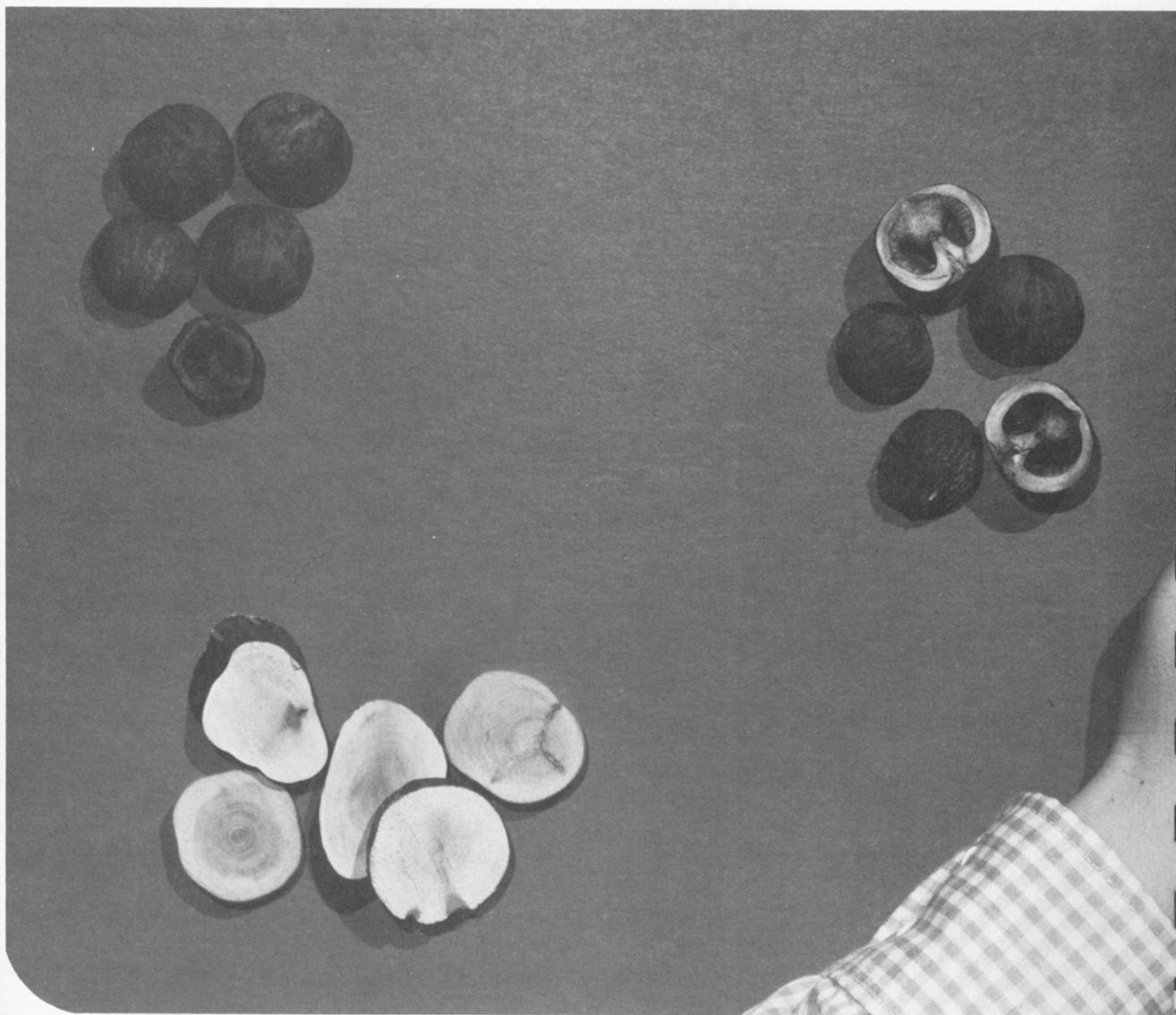
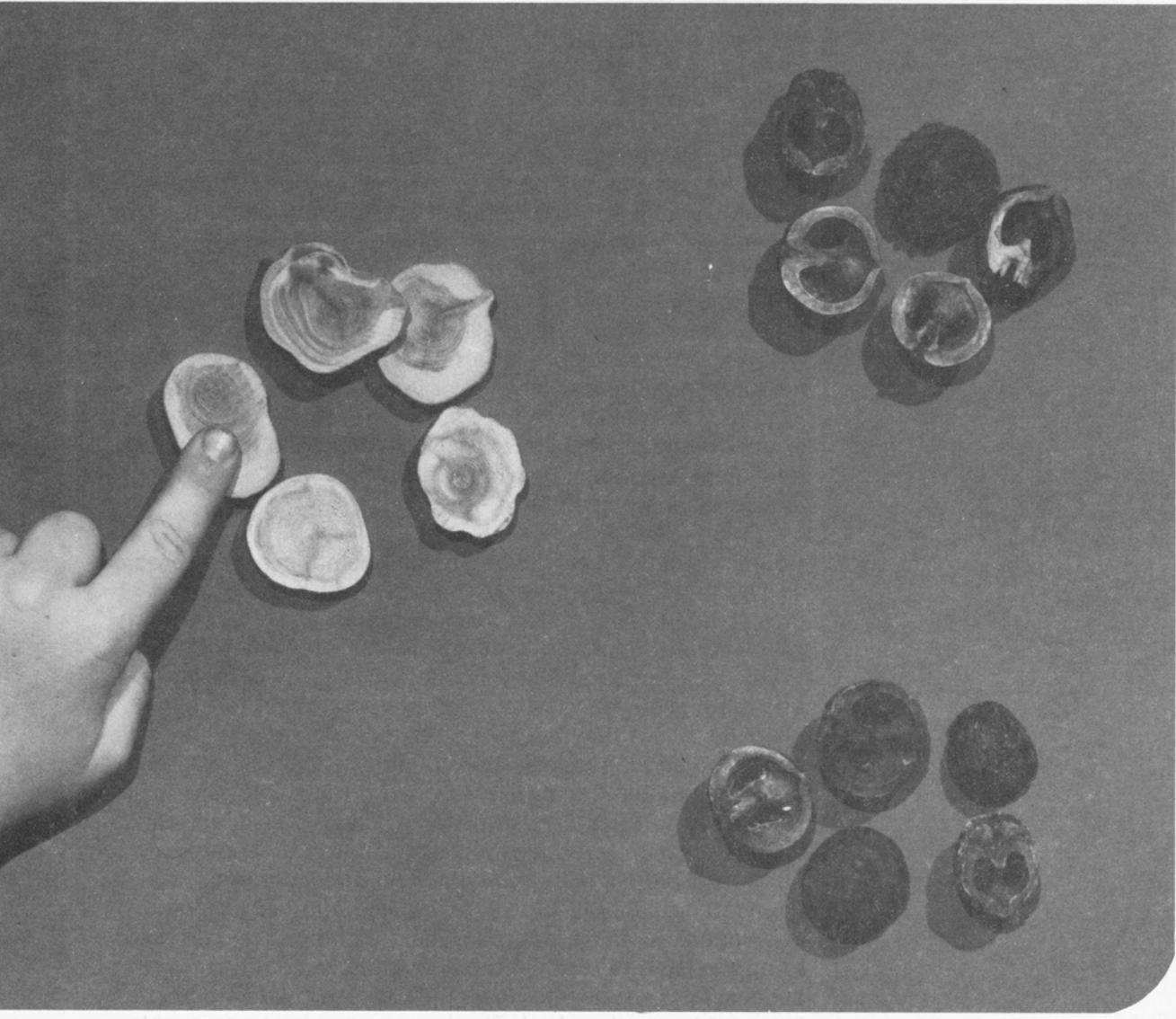


COUNTING



| | |
|--|---|
| SKILLS AND CONCEPTS _____ | Learning the sequence of number names both forward and backwards Using the sequence of number names to identify the quantity of various groups of objects Invariance or conservation of number Counting on |
| SELF CONCEPT AND SOCIAL INTERACTION _____ | Increasing body awareness and awareness of others through movement |
| FUTURE APPLICATION _____ | Problem solving Counting Understanding arithmetic operations |
| PREREQUISITE CHAPTERS _____ | None |



4

COUNTING

INTRODUCTION

The process of counting as seen through a child's eyes differs greatly from that same process seen by an adult. To a child, there is no reason why five has to come before six or nine can only come after eight. It is important to use the "number words" when counting, but no importance is attached to a particular order. Counting, "One, two, three, five, seven, ten, eleventy," is perfectly acceptable. Counting, "One, two, three, four, bed, shoe, rock," is ridiculous, and not considered counting.

Only through repetition and practice does the child sort out and learn the arbitrary order which makes up the sequence of number words. There is nothing to *understand* here; the counting order is a string of words which simply must be memorized. Until a child has committed the sequence to memory, sheorhe will be unable to count objects.

There is a paradox here: being able to recite the numbers in order does not necessarily mean the child is able to count. A child may know the counting sequence from one to ten perfectly and still be unable to use this sequence to count a group of objects. *Knowing* and successfully *using* the sequence are two separate, but sequentially related skills. A child might look you straight in the eye and rattle off the numbers from one to ten and yet look down at a group of four objects, touch one of them, and say, "One, two," touch another object and say, "three," skip over a third object entirely, and move hisorher finger up and down near the last object, and say, "four, five, six." This child has not yet put the words and objects in one-to-one correspondence. Sheorhe needs many opportunities to experience saying one number word with one motion or one object.

Counting with skill and understanding is an important problem-solving tool in mathematics. The activities in this chapter give children many opportunities to count in unison, which will build and reinforce the auditory pattern of the counting order. Children should start these activities by counting to one number beyond the point where they begin to have difficulty. When they become confident counting to this number in the sequence, one more number should be added to the sequence until the children build gradually to ten. There is no need to rush or push children ahead quickly to ten, for this pressure produces anxiety rather than learning. A firm foundation is laid gradually in an atmosphere of confidence and support; growth takes time and the children need adults to enjoy, not rush, their growing. You can learn to appreciate the child who has learned to count to four successfully just as you now appreciate a child who is able to count to one hundred. The journey can be as enjoyable as the arrival at the destination.

Before you begin the counting games, and periodically during the time the children are doing the following activities, you will want to know at which point each child is having success. The following assessment will quickly pinpoint strengths and weaknesses in the skills of rote counting and one-to-one correspondence. List each child's name and the number sheorhe is ready to begin working on (not the point at which sheorhe had difficulty). From this list, form your counting groups. In order to form reasonably sized groups, children can always begin practicing at a number that is too easy, but if possible, never place a child at too difficult a level.



COUNTING 101M514

COUNTING FORWARD

The Order Of Number Names

SAMPLE ASSESSMENT STRATEGY

| ACTION | INTERPRETATION | INSTRUCTION |
|--|--|---|
| Teacher: "Ginny, count for me." [†] Child: "One, two, three, five, two, eleven." | Ginny appears to be secure with the counting order to three. | Play the counting games to four (one number beyond the child's point of difficulty). |
| Teacher: "Donna, please count for me." Child: "One, two, three, four, five, six, nine, eleven, ten." | Donna appears to be secure with the counting order to six. | Play the counting games to seven (one number beyond the child's point of difficulty). |
| Teacher: "Hal, will you please count for me." Child: "One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, . . ." | Hal appears to be secure with the counting order to ten and above. | Assess 1:1 correspondence. |

One-To-One Correspondence

| | | |
|---|--|---|
| <p>Teacher: "James, can you find out how many buttons there are in one of these piles?"</p>  <p>Child: (James counts the pile with three buttons) "One, two, three."</p> | James appears to have 1:1 correspondence with three objects. | Check further. |
| <p>Teacher: "Try another pile." Child: (James counts the pile with seven buttons) "One, two, three, four, five, six."</p> | James appears not to have 1:1 correspondence with seven objects. | Direct the child to count the group of five buttons. (When a child has difficulty, always try a lower number.) |
| <p>Teacher: "James, count this pile of buttons, please." Child: "One, two, three, four, five."</p> | James appears to have 1:1 correspondence with five objects. | Check for six. If the child has difficulty, begin activities stressing 1:1 correspondence counting to six. If the child does not have difficulty, begin the games counting to seven (the number at which the child needs practice). |

[†]By leaving this question open rather than suggesting the child count to ten, the child will count as far as she or he is capable.

The activities in this chapter teach counting skills in a variety of ways. Select activities to use in your class according to the needs of your students.

Count and Turn

SKILLS _____ Practicing the counting sequence
Developing body coordination
Developing a sense of rhythm
Learning one-to-one correspondence

MATERIALS _____ None

ACTIVITY _____ The children stamp their feet as they count, throwing their arms up in the air to emphasize the last number in the sequence. The children change directions without losing the beat, counting "one" as they turn.

One, two, three, *foooooour*,
(turn) one, two three, *foooooour*,
(turn) one, two



The Counting Tape

- SKILLS** _____ Practicing the counting sequence
Learning one-to-one correspondence
- MATERIALS** _____ A counting tape,* blocks, 15 cm × 15 cm or 6" × 6" squares of construction paper
- ACTIVITY** _____ The children count along with the tape recorder, putting a block onto a square of paper as each number is recited. The teacher observes and assists the children if necessary.



One, two, three, four, five, six, (pause) one, two, three, four, five, six, (pause) one, two,

The children count with the tape until they have six objects on each paper. When they finish, the tape is started over and they check other children's papers, counting the blocks along with the tape.

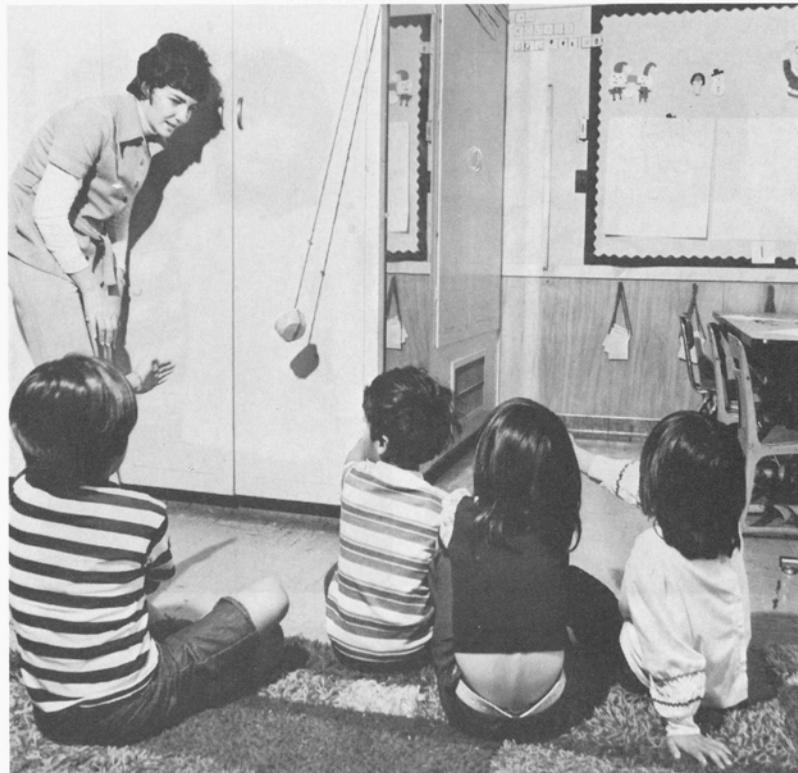
This activity can be easily adapted into a game called "Slide and Check." The children slide one tile at a time from a pile as they count aloud with the tape recording. When a child has counted out a group of tiles, she or he checks the total counting along with the tape and then pushes the tiles back into the original pile. This activity is repeated over and over until the recording is finished.

The Pendulum Game

SKILLS _____ Practicing the counting sequence
Learning one-to-one correspondence
Developing a sense of rhythm

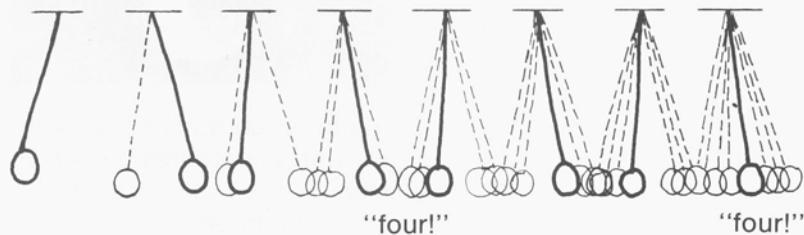
MATERIALS _____ A weight tied to a length of string

ACTIVITY _____ The children watch the pendulum swinging freely and count along with it. The teacher stops and restarts the motion at the end of the counting sequence.



One, two, three, four, (pause to restart) one, two, three, four

As soon as the children are confident with this level, let the pendulum swing freely without stopping it. Now, the children count the swings to themselves, saying only the final number in the sequence out loud. The children begin counting silently again, without missing a beat.



People Counting Games

SKILLS _____

Practicing the counting sequence
Learning one-to-one correspondence
Developing body coordination
Developing a sense of rhythm

MATERIALS _____

Ball or jump rope

ACTIVITY _____

To practice counting with one-to-one correspondence, the children do any of the following activities shown in the illustrations.



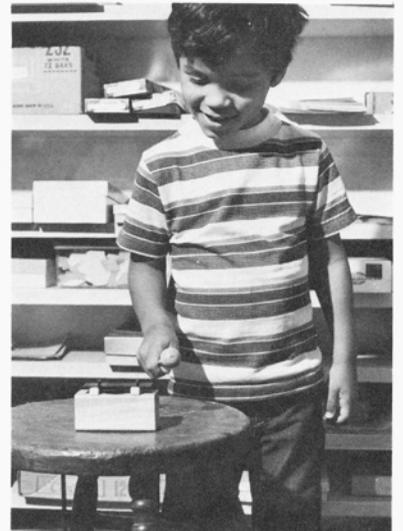
Stand and sit, linking arms if desired. "One (sit), two (stand), three (sit), four (stand)."



Hop forward while counting slowly, changing directions at the end of the sequence, "One, two, three, four, (turn around) one, two . . ."



Stand on an adult's feet and walk around counting each step. "One, two, three, four, one, two, three . . ."



Ring a xylophone, bounce a ball, or jump rope while counting. "One, two, three, four."

When the children are successful with the above activities, they will be ready for the people counting game using a large group of children.

Line the children up in rows of four, or whatever number is appropriate for the particular children participating. (The last row need not come out evenly.) Set a steady rhythm by tapping a bell to help the children internalize the rhythm they will use when counting. Stand in front of the first column of children, indicating they are to sit down on the count of "one." Move to the front of each column in turn, indicating it is their turn to count and sit down. The children should practice this until they can count and sit down column by column without the teacher's signals and without losing the steady rhythm.

When the children can do this, they are ready for more than one counting cycle. The count starts over again after the last number, except this time each column stands up as they count. The children continue counting, alternating standing and sitting with each cycle.



"One,



two,



three,



four,



one,

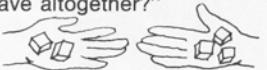


two . . ."

INVARIANCE OR CONSERVATION OF NUMBER

The concept of invariance of number is fundamental to a child's meaningful understanding of quantity. Only if a group of objects remains constant (invariant) while it is counted, separated into groups, or hidden (made abstract) will discussing the group's total make sense to the child. The following activities, The Piggy Bank Game, Spill the Beans, and Changing Chairs, reinforce the concept of invariance of number. By asking the following questions you can determine informally whether or not a child is secure with this skill.

SAMPLE ASSESSMENT STRATEGY

| TEACHER | CHILDREN | INTERPRETATION |
|---|---|---|
| <p>"Please count five blocks into my hand."</p>  | <p>The child counts five blocks into the teacher's hand.</p> | <p>The child demonstrates skill in this area. Go to the next question.</p> |
| | <p>The child cannot count five blocks into the teacher's hand.</p> | <p>Ask the child to count three blocks. If this is successful, go to the next question. If it is not, work on the counting sequence for several more weeks before proceeding.</p> |
| <p>The teacher shakes the five blocks in hisorher hands, separates them into a group of two and a group of three and asks, "Now, how many blocks do I have altogether?"</p>  | <p>The child recounts and says, "five."</p> | <p>The child does not show an understanding of invariance for five. Continue to assess.</p> |
| | <p>The child instantly says, "five."</p> | <p>The child appears to show an understanding for five. Check several more times with five and then try six.</p> |
| <p>The teacher shakes the five blocks in hisorher hands, separates them into groups of four and one and asks, "Now, how many blocks do I have altogether?"</p>  | <p>The child says questioningly, "five?" and recounts to be sure.</p> | <p>The child does not show a strong understanding of invariance, but it is beginning to grow. Continue assessing invariance of five.</p> |
| | <p>The child says five without counting.</p> | <p>The child shows invariance skill for five, check six.</p> |

Continue separating the blocks and questioning the child until you feel confident you have assessed the child's level of skill correctly. Children who understand invariance of number are very confident and will tell you the total without recounting, wondering, perhaps, why you are wasting hisorher time with such an obvious question.

Keep a list of the children's names and the number at which they need practice with invariance. Children with similar needs should play the following games together. As the children show skill with a number, they should play the same games at the next number and gradually build their skill to ten.

Take four different objects and drop them through the slit one at a time while the children count out loud. Again ask the children to whisper in your ear and tell you how many things they think are under the carton. Then lift and count.

This activity should be repeated many times, increasing the total number of objects used as the children's skill increases.

Spill The Beans

SKILLS _____ Practicing the counting sequence
Using the counting sequence to determine quantity
Learning invariance of number

MATERIALS _____ Beans, Baggie

ACTIVITY _____ Counting aloud, place as many beans in a bag as is appropriate. The children then pass the bag around the group until they hear you ring the bell, which is the signal to "spill the beans." Ask the children to predict how many beans there will be when they are counted by whispering their prediction in your ear. Count the beans to check the total and reinforce the concept of invariance. Then put them back into the bag.

Continue passing the bag around the group, and when the bell rings again, the child holding the bag spills them onto the table or rug as everyone says, "Spill the beans!"

Changing Chairs

SKILLS _____ Practicing the counting sequence
Using the counting sequence to determine quantity
Developing body coordination
Learning invariance of number
Experiencing that a change of position does not affect quantity

MATERIALS _____ Chairs

ACTIVITY _____ Four children who need experience with invariance of number form a circle with four chairs. (If the children need to experience invariance at seven, you would need seven children and seven chairs.) Standing up each child counts off in turn and then sits down as she or he says the number. The child who starts the counting should be clearly delineated from the rest of the children by a hat or some other visual clue. When the

last child sits down, the whole group says this number. Play some music to signal everyone is to change chairs. When the music stops, everyone stands up and counts off again, sitting down as they say their number. As the last child sits down, the group chants the last number in the sequence together. Repeat this game as often as necessary. When you feel the children understand, ask them to whisper to you what they think the last number will be *before* they count off.



COUNTING ON

The skill of counting on is a useful problem-solving tool in solving addition problems. It involves the child being able to perceive the number of objects in one group and count from there to obtain the total. Children who have this skill solve addition problems more quickly. When faced with a group of four objects and a second group of three objects, for example, these children *know* there are four objects in the first group so they merely count from there: *four*; five, six, seven. Children without this skill must find the total by counting both groups: One, two, three, four, five, six, seven. A child who has this skill quickly discovers that the total can be found by counting on either group, which encourages flexibility and a concrete understanding of the associativity of addition.

The following activities stress the skill of counting on and should be repeated many times, increasing the number of objects as the children's skill in counting develops.

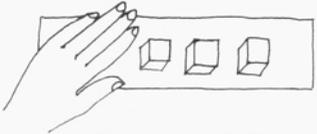
Cover Up

SKILLS _____ Counting on
 Practicing the counting sequence
 Invariance of number

MATERIALS _____ Working space papers,* blocks

ACTIVITY _____ The children work with whatever number they have mastered in counting. They lay their hand over part of the objects, saying the number of covered objects, and add on the remaining ones by counting from there.

SAMPLE TEACHING STRATEGY _____

| TEACHER | CHILDREN |
|--|--|
| Teacher: "Put five blocks on your paper." |  |
| Teacher: "Use one hand and cover up two." |  |
| Teacher: "Watch me say how many is under my hand—twooo, three, four, five. Again, twooooo, three, four, five. Now, you try it." | <p>"Twooo, three, four, five, twooo, three, four, five."</p>  <p>"two" "three"</p>  <p>"four" "five"</p> |
| "Use your hand to cover up three blocks. Threeeee, four, five. Again, threeeeeeee, four, five." | "Threeeee, four, five, threeeee, four, five." |
| Teacher: "Now, cover up two blocks. Ready?" | "Twoooooo, three, four, five, twoooooo, three, four, five." |



Bite Your Tongue

SKILLS _____

Counting on
Practicing the counting sequence
Invariance of number

MATERIALS _____

None

ACTIVITY _____

Ask the children to bend to one side two times, counting silently, then bend to the other side, counting aloud from three to six. This cycle is repeated over and over again with the children "biting their tongue" so the first two beats are silent.



★



★



three,



four,



five,



six

Change the number of times the children do the first motion and continue playing the game several times, keeping the total constant.

"★★★★ five, six, ★★★★★ five, six, ★★★★★ five, six."

On other days use a different total and, again, vary the number of silent counts used. Have the children count over and over without losing the count between the last number and the first silent count.

4

COUNTING

COUNTING BACKWARD

Children who are skillfull at counting forward and backward understand and have equal skill with both the process of subtraction and the process of addition. Knowing the pattern backwards and forwards gives the child a number line in hisorher head with which to solve problems. A child with both skills, who has six objects in front of himorher and sees someone take one object away, *knows* there are five objects left. A child who cannot count backward, however, must *count* the remaining objects, "One, two, three, four, five," to know there are five left. In many cases like this it is much quicker to count backward than to count forward in order to determine a total.

Teach this skill to your children the same way you taught counting forward. Start with a low number, such as three or four, and select two or three of the counting backward games to play each day for a week or more. Then add another number to the sequence and play the same games for another week or two using this slightly extended sequence. When the children seem confident, lengthen the sequence again by one number. The secret is to proceed slowly. To build real strength and skill the children need time to practice at each level and attain success and confidence before going to the next.



Earlier States

SKILLS _____ Preparing for subtraction
Thinking logically

MATERIALS _____ Pictures cut from magazines

ACTIVITY _____ The teacher shows the children a series of pictures one at a time, and the children attempt to imagine previous stages of objects in each picture. For example, if shown a plant, the children might tell about it being planted from a seed. If shown a plate of cookies, the children might recall raw dough or the basic ingredients. If shown a fried egg, the children might imagine a chicken laying an egg or a carton of eggs in the store or refrigerator.

This activity requires the children to reverse their thinking, something rarely required of them, but which prepares them to understand subtraction. Children are often asked what a ball of yarn will *become* but seldom are shown a sweater and asked to undo the stitching in their mind and recall the ball of yarn. This activity introduces thinking in reverse, an important mathematical skill.



Snap and Clap

SKILLS _____ Counting forward and backward
 Developing body coordination
 Learning one-to-one correspondence
 Developing a sense of rhythm

MATERIALS _____ None

ACTIVITY _____ The children clap together in rhythm, counting forward, "One, two, three, four" and then snap their fingers counting backward, "Four, three, two, one." Repeat this over and over again without losing a beat between the last clap and first snap.



The sequence used for this activity should be extended as the children's skill counting forward and backward grows.

Stand Up, Sit Down

SKILLS _____ Counting forward and backward
Developing body coordination
Learning one-to-one correspondence
Developing a sense of rhythm

MATERIALS _____ Chairs

ACTIVITY _____ The children count forward, standing in front of their chair. Then they sit down and count back to one. Get a steady beat going and count over and over without losing the rhythm.



One, two, three, four;



four, three, two, one.



“One, two, three, four;



four, three, two, one.



One, two . . .”

The sequence used should be extended as the children gain skill in counting forward and backward.

QUESTIONS FROM TEACHERS

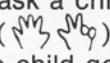
WHY DON'T YOU HAVE THE CHILDREN COUNT TO TEN, RATHER THAN JUST PART WAY? WON'T IT TAKE FOREVER FOR THEM TO LEARN TO COUNT TO TEN THIS WAY?

I have tried it both ways and I find that the children who are having difficulty gain in self-confidence and get much more reinforcement by counting with a shorter sequence, gradually extending the sequence to ten. In a few weeks everyone is secure counting to ten and no one has been threatened by the learning process. It's not just the counting that I'm concerned with; I want to build up each child's opinion of himself as a successful learner. Children need *time* to grow.

I FEEL OVERWHELMED BY THE NUMBER OF DIFFERENT ACTIVITIES DESCRIBED ONE AFTER ANOTHER. DO YOU REALLY DO ALL THAT IN ONE LESSON?

I do this intentionally to surround the children with counting experiences. Children who are having difficulty with a concept make greater gains by having a variety of activities concentrated in a short period of time. I spend whatever time is needed to give the children the experiences they need and I try not to be concerned if we spend two hours one day but only fifteen minutes another day. I let the *children's needs* be the determining factor, rather than a schedule which knows nothing about the particular group of children I am working with. Concentrated time encourages the development of a concept, while spreading that same amount of time over several days dilutes the effect and makes the concept harder, not easier to develop. Several activities, one after another, dealing with the same skill, surrounds the child with the concept and enables him or her to gain the skill effortlessly.

COUNTING ON: WHAT KIND OF EVIDENCE SHOULD I LOOK FOR THAT MY CHILDREN ARE REALLY USING THIS SKILL IN THEIR LIFE AND NOT JUST LEARNING TO PLAY THE "COVER UP" GAME OR THE "BITE YOUR TONGUE" GAME?

That's a very important question! I have to skip ahead a little to answer your question completely. With the activities in the chapter on "The Concept of Number" you will be able to observe your children applying or not applying the skill of counting on. If you ask a child to tell you how many fingers you are holding up () and the child says "eight" all you know is that the child got the correct answer and can count correctly. But if you ask the child, "How did you find out?" and she or he says, "By counting: one, two, three, four, five, six, seven, eight" you know that child is *not* using the skill of counting on. If the child says, "By counting; *three* here, four, five, six, seven, eight" or the more usual, "five, six, seven, eight" then you know the child *is* using this skill.

You will see this over and over in such games as Say It Fast, Presto Change-O, Word Problems, and of course at the number stations.

IS THERE A QUICK WAY TO ASSESS CHILDREN'S SKILL IN COUNTING BACKWARDS AS THERE IS FOR COUNTING FORWARD?

There are several different ways to assess this skill. First, check to find out if the child knows the sequence. Ask the child to start from different numbers and count backwards to one: "Count backwards to one starting at seven." ("Seven, six, five, four, three, two, one.") "Count backwards to one starting at four." ("Four, three, two, one.")

Now check to see if the child *uses* the sequence as a problem-solving tool when confronted with a real situation: Set up a stack of blocks like the following. Point to one stack at a time and ask the child to tell you how many blocks are in each stack. (The first stack must be counted but from then on the child has the opportunity to compute the totals by counting on or counting backwards.)

If the child works silently, ask, "How did you figure that one out?" The child who says, "I counted them; one, two, three, four, five, six" is not counting backwards. The child who says, "This was eight, seven, six" is counting backwards.

Remember, an assessment tool is just that, a technique whose purpose is to gather information. It should not be used as a teaching tool for then it may no longer be useful as an assessment device. Assess your student's skill development and then use the results to help you determine who needs work on that skill.

Another technique for assessing a child's level of skill in counting backwards is to take a pile of objects and ask the child to count them. (Make the total no more than the child can easily count.) Now remove one object at a time and ask the child each time, "Now how many are there?" Observe how many the child finds out. Does the child count from one each time, or does the child merely count backwards? When this is easy for the child, remove two at a time.

