2

LISTENING TO CHILDREN: THE INTERVIEW METHOD

PREVIEW

The most important requirement of assessment of children at school is that it provide information that helps teachers help children. Paper-and-pencil tests that dominate today's schools provide information such as the child's ranking on national norms, based on the number of right or wrong answers. Yet knowing whether a child's response is right or wrong, or knowing his rank is of little value in helping a teacher decide what to do next. Furthermore, having such information for ranking and labeling prevents teachers from really listening to children (O'Brien, 1982a). Throughout this book considerable evidence is given to support a view of the child as an active learner—constructing ideas of number through his own interactions. This alternative view necessitates an alternative method of assessment—one that allows the teacher/interviewer to follow the child's thinking as he works through tasks presented in the context of materials. In this view the thinking process is of greater interest than the correctness of the response.

The method of studying children's thinking devised by Piaget is known as the *clinical interview method.* This chapter will describe the clinical interview method—both as conducted by Piaget and as adapted for the explorations described in this book. Furthermore, it will identify some general questions about children's numerical thinking that the interview explorations throughout this book attempt to answer. The interview method will be discussed in sufficient detail to allow you to not only understand the method used throughout the book but also to undertake your own interview explorations.[1]

THE CLINICAL INTERVIEW METHOD: THE IDEAL AND THE ADAPTATION

In Piaget's clinical interview method, the adult interviewer involves the child in conversations through verbally-presented problems in the context of physical materials. In order to achieve its goal of exploring children's reasoning on intellectual tasks, the method seeks to encourage each child to verbalize freely and to interact with the objects, thus providing a basis for the interviewer's hypotheses about the underlying thinking. These hypotheses about the child's perspective of the problem are tested by spontaneously-invented questions based on earlier responses. Furthermore, the interviewer's role is to encourage the child to

1. Although Piaget has used the clinical interview method extensively in his research, he has left the detailed description and analysis of this method to others. A primary source of such information in the preparation of this chapter has been Opper (1977).

consider further, think more specifically, or rethink the process used in arriving at a solution. This is achieved through probing questions or comments that elicit explanations or justifications. Piaget's clinical method is marked by its flexibility in adapting the interview to the individual child in an attempt to follow his thinking.

Although the interview method illustrated throughout the book has features in common with Piaget's clinical method, it may be considered a pale imitation of the idealized method. A standardized introduction of the tasks was used to facilitate communication of the results of a number of interviews. At the same time, some of the flexibility of adapting questions and tasks as needed was retained. The most striking difference came as a result of my lacking considerable prior experience to develop the skill of on-the-spot invention of questions to test my hunches about children's thinking. Nonetheless, despite its limitations relative to the ideals of the clinical interview method, the approach used in this book has uncovered surprising views of number concepts held by children that have gone previously undetected.

QUESTIONS ADDRESSED BY THE CLINICAL INTERVIEW METHOD

The interview explorations conducted with first, second, and third graders have aimed to go beyond the traditional focus on correct answers to answering questions like the following about children's numerical thinking and its facilitation in the classroom.

1. What are children's natural tendencies in approaching numerical tasks? Are there identifiable levels in the ways they approach these tasks?

2. What are the limits of children's numerical abilities and understandings?
   a. What meanings do children assign to their computational procedures?
   b. Are children restricted to a single method of solution or are they capable of multiple solution methods?
   c. What level of conviction do children have in their answers?
   d. Is there any evidence of children's self-construction of strategies/procedures before any formal teaching (or in spite of it)?

3. What numerical meanings do children assign to mathematical models and symbols?
   a. What meanings do children read into materials used in the classroom, such as Dienes blocks or grouped objects?
   b. Do children place more trust in answers obtained through action on objects or in answers obtained by paper-and-pencil methods? Do they see the necessity of answers obtained by both methods coinciding?
   c. Are there identifiable levels of meanings that children assign to mathematical symbols, like equality sentences (5 + 3 = 8) or place value notation (235 vs. 198)?
   d. How do these meanings differ from those assigned by mathematicians?

4. Can the study of children's numerical thinking explain perennial stumbling blocks in teaching children mathematics and suggest alternative teaching methods?
   a. How can first graders' difficulty with missing addend tasks (7 + ___ = 9), or primary graders' difficulties with place value concepts be explained?

b. How can children's understanding at one moment but not the next be explained (also observed as excessive forgetting during a vacation period)?

c. How does the quality of interaction during the interviews compare to the quality of interaction in the classroom?

d. How does the natural inclination of children regarding numerical tasks compare to the expectations of textbooks?

e. How can teaching methods be altered to build on children's natural tendencies?

In attempting to answer such questions, I often began interview tasks as standard school tasks but presented them outside the context of familiar worksheets and pursued them in much greater depth than previously experienced by the children. Totally unfamiliar tasks were also included to gauge the limits of children's abilities. I also pursued in-depth understanding of children's numerical abilities by conducting a series of three interviews with groups of second and third graders. Although much of the discussion of teaching methods will be based on a logical extension of what I learned from children in the interview explorations, the book also includes a detailed study of the teaching-learning process (in Chapter 7).

INITIATING THE INTERVIEW

It takes considerable sensitivity, experience, and skill to become a good interviewer. A raw beginner might not uncover any more information than a standardized achievement test could. This might be due to either a failure to probe or an overbearing manner that inhibits the child. To help you get started with interviewing children, different aspects of the interview method will be discussed and illustrated. Examples will be taken from different interviews described in the book. Excerpts taken from the reports of student interviewers will illustrate both the problems they experienced and the insights they gained in the process of interviewing.

In initiating an interview with a child it is important to establish rapport and to prepare him for the process before beginning. This may be accomplished through a combination of the following procedures.

1. Initiate a conversation by asking personal questions such as the child's name, age, number of brothers and sisters, favorite things to do, and so on.
2. Introduce the materials being used and provide an opportunity for their free exploration. "Have you seen these things before? What can you do with them?"
3. Justify the need for any mechanical recording equipment and restrict the viewing/listening audience.
4. Orient the child to the interview situation. The following is a sample orientation used with second and third graders:

   "I'm interested in talking to you to find out how you think about numbers. I've been talking to a lot of children and do you know what I've been finding out? (What?) Everybody doesn't think about numbers in the same way. So, every boy and girl that talks to me teaches me something new. We're going to be doing some things with these materials. Some of the things we'll be doing are like games. The things we'll be talking about may be things you haven't studied in school and others will be things you have studied. I'm not really interested in whether you get the right answer. I'm more interested in how you figure out your answer. So, what we do here has nothing to do with your grade in school."

The interview should begin only after the child appears at ease and has begun to talk freely.

QUESTIONING

Although you may choose to begin a series of interviews with a standard presentation of each task, there will be frequent occasions when you will need to repeat or rephrase the question in the child's language while retaining the essential meaning, or to adapt the task to the level of the child.

When third graders were given the following addition task requiring regrouping, they were asked to demonstrate a solution with interlocking blocks (tens and ones). $\begin{array}{r} 28 \\ +37 \\ \hline \end{array}$ Some of the children merely combined the two sets and counted the pieces. Since I was interested in learning whether they could regroup 10 ones as a ten-group, these children received a prompt. If they did not respond to the first question, it was rephrased in one of the following ways.

> "Could you show 65 (sum) in another way?"
>
> "Can you show all of these ones (15) in another way?"
>
> "What can you do so that if someone walks in the room he can see there's 65 cubes without doing a lot of counting?"

These questions prompted the children to regroup 10 ones as a ten, which then allowed me to probe their understanding of its connection to the carried "1" in their earlier paper-and-pencil procedure.

When children respond to a task initially, they may do so in superficial terms. A further probing question can encourage the child to consider the task further and allow the interviewer to learn more about the child's numerical ability.

When the children were first asked to explain their procedure for the addition task, many replied in terms of a rule involving carrying the "one." $\begin{array}{r} {\scriptstyle 1} \\ 28 \\ +37 \\ \hline 65 \end{array}$ Their understanding was probed by questions such as

> "What does this 1 stand for?"
>
> "How come you don't carry the five instead of the one?"

This probe was extended to the children's demonstration with materials in which 10 ones had been regrouped as a 10-group. To test the limits of each child's understanding, the following question was asked:

> "Point to something on the board (of materials) that this 1 stands for."

Here, the child is required to extend his thinking to consider a connection between paper-and-pencil and physical procedures.

Another common response to tasks is in terms of adult vocabulary or with phrasings that suggest that the children are merely parroting what they've been taught. Here, probing would encourage the child to rephrase his response in his own words.

> "How would you explain this to a first grader who doesn't understand it?"

The child should be encouraged to elaborate on his responses and to support them with explanations or arguments as far as possible. Each probe has the potential of providing the interviewer with a better understanding of the child's thinking in this problem context.

Additional questions or tasks may need to be introduced to clear up inconsistencies in a child's responses.

When a child did a subtraction reversal, thereby avoiding the need for regrouping, I was able to provide him with feedback on the inconsistency of his method.

$$\begin{array}{r} 43 \\ -26 \\ \hline 23 \end{array}$$

> "I noted that the 4 was on top when you took 2 away and that 6 was on the bottom when you took 3 away. Does that make a difference?"

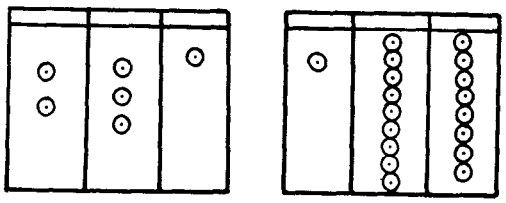
Upon receiving the feedback he became aware of his mistake and initiated steps for regrouping. Other children appeared satisfied with their answer (23). After obtaining a different answer (17) through physical modeling, the children were made aware of the inconsistency in these responses by the following question:

> "Is one of these answers better or are they both just as good?"

Such questions may provoke children into becoming aware of inconsistencies and into rethinking their method of arriving at an answer.

Additional questions can be introduced to check the stability of a child's response. By presenting an argument that counters the one given by the child, the interviewer may provoke the child to revert to an earlier level of thinking or to reject the countersuggestion while elaborating on his own argument in the process. This counterargument should be presented as one given by another child of the same age, not as the interviewer's argument, to avoid any interference with the child's autonomy of thought.

> Third graders were asked to compare the size of numerals such as 198 and 235 and to justify their choices. Different countersuggestions were given to the children according to their responses.
>
> Children selecting 198 as the largest number were asked to "build the numbers" using Dienes blocks. Children selecting 231 as the largest number were shown chip representations of the two numbers and asked, "Which board stands for the bigger number?" "How do you know?"



— color coded chips

> "The other day a boy/girl said, 'Look at all of these chips here. There's eight green chips here and only one there, nine yellow chips here and only three there. This board has more chips so it stands for the larger number.' What do you think about his/her answer?"

It is important to note that countersuggestions can check the stability of a child's response whether it is "correct" or not.

When an unexpected response is given by a child, it is important to have the child elaborate on or clarify this response. Unless the child's perspective now becomes apparent, the interviewer can construct an appropriate question on the spot to test a hunch about the child's thinking. Because of the sophistication of this technique, I haven't provided many examples of it in the following chapters.

The following excerpts from written reports of student interviewers illustrate both the problems experienced in, and insights gained from, this aspect of interviewing.

> . . . I also found that I have very little flexibility as an interviewer. I was always so concerned about asking every question verbatim from my notes that I sometimes lost sight of the purposes of the testing.
>
> M.B.

> . . . With regards to changes I would like to make, the first would be to cut down on the amount of talking I do, particularly in rephrasing my own questions and in canceling open-ended questions by following rapidly with closed ones.
>
> B.S.

> The major problem with respect to my questioning was excessive interrogation. Instead of asking a single question in response to children's actions, I tended to present a string of questions all at once. . . . I asked fewer questions of the nine-year-olds, thereby providing them with a greater chance for explanation. It seems that with younger children, I tend to overquestion because I want to be sure they are understanding the task. This I feel is a definite area to be changed. Children of all ages require time and patience from the interviewer/teacher.
>
> I would like to change my repetition of questions when met with an inappropriate response. This behavior did not appear to clarify or aid children's understanding and would be beneficially replaced with a rephrased question. Finally, I would like to change the pattern by using the child's answer to go on. In doing this, I believe the interviewer is in a better position to follow the child's line of thinking.
>
> N.L.

> . . . I could have focused on more possible tangents to pursue and asked in-depth questions along the way. For example, I could have asked Charles on Task #1 what the zero meant to get a deeper perspective of his thinking.
>
> K.C.

> . . . There were times when I became flustered at a child's response, or lack of response, and didn't know what further course to take in questioning. There were also times when a child was confused by my questions on the task and I had a hard time in making my intent clear and understandable.
>
> J.D.

> In asking for justifications for their answers, I tried to vary my wording, but relied on just a few phrases. "Why do you think so? What makes you think that? Why is that? How did you know that?"
>
> There were several times when I felt I should have followed up on an answer with some type of response to get more clarification. When listening to the tapes these seemed obvious, but they didn't at that time. . . .
>
> C.B.

> I learned that children (at least some third graders) give "reasons" for what they did based on what is

often illogical but seems to make sense to them. Unfortunately it occurred to me that some of these "reasons" were given because some children are conditioned to give answers without a chance or appreciation of "thinking them through."

N.L.

The most important point I saw demonstrated was the necessity for having the child justify her answers, whether they were right or wrong. In many instances I heard the child give the correct answer with an incorrect or inconsistent reason. Equally important were those children who gave the incorrect answer and had a valid reason for doing so.

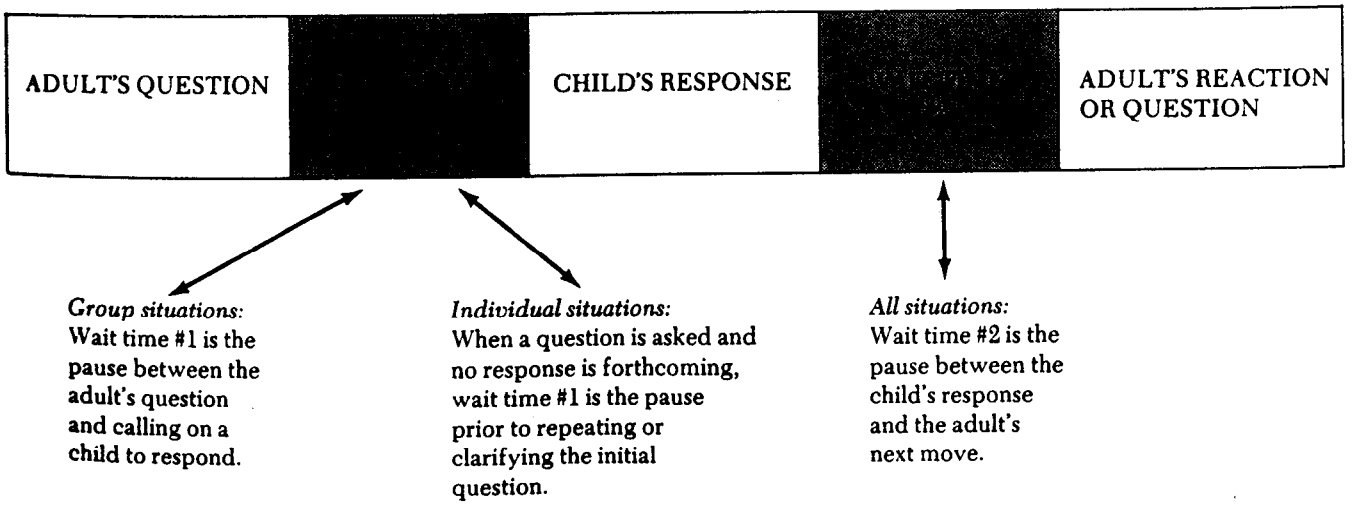
C.B.

Some of the difficulties identified by these student interviewers cannot be avoided consistently even by experienced interviewers because of the sophistication and spontaneity required. Some interviewers have worked in pairs with one person observing behind the camera or behind a one-way mirror and offering occasional suggestions or questions as needed. This may be done unobtrusively through a one-way communication system leading to the interviewer's earplug (O'Brien and Casey, 1982b).

WAITING AND LISTENING

An indirect measure of your listening ability is the amount of wait time or response time that you provide the child. Since reflection on intellectual challenges is to be encouraged, setting a pace that is comfortable for the child is important. By providing an adequate pause following the initial question (called wait time #1) and prior to repeating or rephrasing it, you are allowing the child time to interpret the question and to construct a response. By providing an adequate pause following the child's response (called wait time #2), you are indirectly encouraging the child to elaborate on his response. If you are listening only for a particular response, you will tend to shift abruptly to the next question after hearing what you want to hear. If, however, you are really curious about the child's reasoning, you will want to hear all that the child has to say. You can indicate this by an adequate pause following the child's response.

Although the idea of wait time (Rowe, 1973) is similar in all interactions, the definition of wait time #1 varies with group and individual situations. In group situations the teacher has some control over the length of the pause called wait time #1 before calling on a particular child to respond. In an individual interview, the child has control over the length of the pause before responding, except in the special case when the child has not responded yet and the interviewer interjects a clarification of the initial question. If the original question is followed immediately with a rephrasing, the pause called wait time #1 is nonexistent (0 seconds).[1]



1. Wait time #1 has been redefined for individual situations by Naomi Farina, one of the student interviewers at California State University, Northridge.

Based on small-group and classroom research (Rowe, 1973), an average wait time of at least three seconds seems to provide an adequate pause. However, you may find that the length of your pauses may vary both between and within interviews. Your longest pauses will be given to the child who is hesitant to speak and to the child who is experiencing difficulty with a particular task. As you adjust your pauses according to the natural pacing of the child, be certain that an impulsive responder receives adequate time for reflection. A comfortable pacing of the interview not only provides for the needs of the child, but also provides you with a better opportunity to listen to the child's responses and to reflect on their meaning.

Reactions of student interviewers to this aspect of the interview process include varied concerns for the length of their wait time, suggestions for orienting children to extended wait times and for waiting out "I don't know" responses, awareness of the impact of extended wait times on the quality of children's responses, awareness of personal implications of wait time, and insights into the essence of the interviewing process.

> . . . There were numerous times when my responding too quickly cut the child off. We both began speaking at the same time, and when I stopped to let the child speak, he/she was reluctant to continue or had lost his/her train of thought.
>
> B.S.

> . . . Sometimes I found I was trying so hard to remember what the next task was that I didn't listen to the children very well. When these become familiar I should be able to direct full attention to the child and what she is really saying.
>
> C.B.

> . . . Another point that I noticed was that I frequently presented two related questions to a child without allowing for any response time in between them. My purpose was to rephrase the question so that I would be sure to communicate precisely. The result, however, was that sometimes a child would begin to respond, hear me continuing to talk and therefore cease their response. I think this was probably the most valuable lesson I learned from analyzing my wait time. . . . Incredibly to me, there were a couple of times I actually interrupted a child's response in order to clarify my example. I was so surprised to hear this that I'm sure I will remain conscious of my tendency to be redundant for quite a while to come.
>
> M.S.

> . . . My wait time following children's responses ranged from one-half second to six seconds with an average of just over one second. I feel that this is a weakness in interviewing because at times in listening to the tapes, I felt as though the children may have expanded their answers when given the opportunity. . . . I found that in instances when more wait time was provided the quality of the children's answers increased. They tended to explain their answers in more than one way.
>
> N.L.

> Goals for change include being less of a "talker" and becoming more of a "listener." I think that this goal has import not only in math learning, but for development of self-worth and mutual respect among children. . . . I plan to implement wait time by consciously counting to myself, allowing increases in children's responses. It is hoped that this silent counting can eventually be replaced by a natural pause following questions and responses.
>
> N.L.

> As I was interviewing I was very conscious of waiting for the students to think. And I was amazed at how well they did think when I gave them the chance—and how their answers did come in spurts. The students didn't even feel uncomfortable when I just let them think and gave them lots of time. Before each of my first interviews I had told the students that I wanted them to think and would give them lots of time. I did that because I thought they'd be uncomfortable during the pauses.
>
> K.D.

> To encourage wait time I often just looked at the child and smiled or said "mmhmm" while still looking at the child. When the pauses were too long, Kenny would repeat the answer again and again until I gave him some kind of confirmation. It would have been better to have asked him if he could tell me anything else rather than making him uncomfortable.
> (Average wait time: 2.8 secs.) Z.K.

> . . . I was honestly surprised at the children's unfolding once they had realized that I was willing to wait as long as it took them to answer. I received more responses than I expected to my probing questions. Some strong "I don't knows" (which had obviously worked in the past as a way of dismissing the teacher) yielded answers after the child discovered my habit of waiting forever. Several times the children elaborated upon short answers to make comments that gave me unexpected insights into their ideas about and attitudes towards math.
>
> R.F.

> My wait time was variable and changed with the circumstance. . . . I was patient to wait for an answer, even if it took a long, long time. The second wait time, after the child's response, was more telling. At best, as in Hillary's interview, it averaged between four and five seconds. At worst, as in Brian's interview, it averaged less than one second. I was able to sustain a longer wait time 2 if I did not know the child from some other experience. I have known Brian for about

five years because his mother works with me and I have listened to him whine at her many times. I have a feeling tone about him, just as I have about other students at school. That feeling tone had an effect on my wait time.[2] When I asked Brian a question, I was patient to wait for an answer, but once the answer was there and right, I was ready to go on. A questionable response would bring more wait time. Had he wanted to, he could have read my wait time as a "correct" or "incorrect" after each response.

I hear myself doing this daily with other teachers also. Sometimes I cut off the last part of their word (How do I know it's the last word?) in order to go on—to move the agenda. Again, the more negative my feeling, the more apt I am to do it.

T.M.

I am feeling more and more the impact of lack of wait time (average of just over one second). In my case, the lack of wait time reflects a hidden agenda for the responder. The implication for the responder is that this is a guessing game in which he might get lucky and give me the "right" answers. My hidden agenda limited my scope of the interview and it was only in rereading the transcripts that I recognized how limited and limiting some interviews were. Examples of this can be seen in Scott's interview. He had one concept of "more" and I had another. In not really probing his concept of the task, I lost the opportunity to really assess his thinking about the number concept. He was answering a different question than I was asking.

Basically, providing wait time requires an inquiring rather than an anticipatory frame of mind. In this set of interviews there were several motivators for me. The largest one was to confirm or deny certain Piagetian observations as they might relate to math concepts. Therefore, I was not keying on the individual child so much as anticipating certain patterns of responses. My frame of mind was out of synch with maximizing wait time.

L.W.

While some of these reflections consider the interview process in isolation, others consider it in relation to teaching. Many of the reflections focus directly on specific interactions and behaviors, or on the general interview process itself. Others extend to concerns for the quality of interaction in the classroom and with other people.

RESPONDING WITH ACCEPTANCE AND ENCOURAGEMENT

As highlighted by the last student interviewer comment, the essence of the interview process is the open spirit of inquiry in which the interviewer is curious to learn everything about the child's perspective on certain problems. By accepting the child's responses with nonjudgment and with encouragement to elaborate further, the interviewer communicates both a respect for the child's thinking and a genuine curiosity to learn more. In this kind of atmosphere the child is likely to feel free not only to do his best thinking, but also to verbalize his thoughts fully.

Each response, whether right or wrong, has the potential of providing information about the child's level of understandng at that moment. Children's responses, therefore, can be acknowledged as having been heard ("Uhuh," "Hmm," nod of the head), but this must be done in a neutral though friendly manner.[3] The interviewer's posture, facial expression, voice intonation, reaction, or phrasing of questions must communicate no information on the "correctness" of the child's response. Unless the interviewer refrains from direct or indirect evaluative feedback, the child is likely to begin to give responses according to the imagined expectations of the interviewer rather than to share his own spontaneous reasoning. In this way a child's thoughts become "adulterated."

> In interviewing second-grade children on their understanding of equality relations and their representation in number sentences, I demonstrated both sensitive acceptance of "incorrect" answers and insensitive biasing of children's responses.
>
> When exploring children's ability to represent

2. Another student interviewer, working with her daughter and other children in the neighborhood, reported shock at her impatience with her own child. The shortest average wait time occurred in her daughter's interview. There is risk in interviewing children in your own family or classroom if you are quick to assume responsibility for what they really understand.

3. Another form of acceptance is the repetition of a child's response. Not only does it provide an alternative neutral response for the interviewer, it also may encourage the child to clarify or extend his response. However, regardless of the neutral content of an interviewer's response, it is the tone of voice that ultimately determines acceptance. A conversational tone is more effective than a formal "teacher" tone (Scheer, 1980).

two equivalent groups of objects in a number sentence (4 = 4), I was able to accept other responses, such as 4 + 0 = 4, 4 - 0 = 4, and maintain the flow of ideas until I learned whether the children would entertain 4 = 4 spontaneously.

"That's one way. Is there another way to show they're the same?"

During these interviews my hidden agenda included eliciting only variations of number sentences. Therefore, when some children began to use pictorial representation, I quickly interrupted them and reminded them to use written notation. By not being open to information on children's informal representation of numerical ideas, I drastically limited my study of children's thinking and representation of equality.

The latter example clearly illustrates the importance of accepting children's responses and remaining open to all possibilities.

Most children appear comfortable with nonevaluative acceptance. Yet some children may be so readily attuned to getting the right answer and relying on the teacher for cues that it may take them a while to get accustomed to a different expectation, that the interviewer really is interested in how they figure out the answer, not in the answer per se.

In my interviews, one exception to the children's apparent comfort with nonevaluative acceptance was a boy who was very watchful for any clues about the correctness of his answers. When faced with "uhuh" or silent pauses, he quickly altered his response to see whether this produced a different reaction. His rapid vacillation between responses on one occasion almost resembled a disequilibrium state.

At the same time that the interviewer attempts to maintain a manner of neutral acceptance, he remains friendly and encourages the children's best efforts.

Since second graders found missing addend and comparison number stories to be quite challenging, sometimes their efforts appeared in need of encouragement. In response to a boy's concern about forgetting the details of the story problem, I replied,

"I can understand. There's a lot to remember."

Then I reread the problem.

In response to children who were extremely hesitant to write a number sentence for comparison number story problems, I replied,

"I know it's not easy to think about. Would you write down your best idea?"

"Let's pretend that you knew what to write down. How do you think it would come out?"

The latter forms of encouragement are effective for coaxing out responses about which children are unsure.

The following comments by student interviewers underscore the difficulty of implementing this very sensitive aspect of the interviewing process.

I used "OK" at least twenty-four times in only ten minutes. I believe half of the time it was used as a gap filler, and the other half as a sanction. I definitely want to reduce the amount of times I say this.

Z.K.

Numerous sanctions ("OK," "fine," "good," "right") were threaded through my sessions. As I listened to the tape I sounded like a used-car salesperson egging the customer to quickly "close the deal."

M.N.

I was too quick to evaluate the response as right or wrong. I would then either immediately validate it with "OK" or respond with "but . . . "

L.W.

I used "OK," "uhuh," and "alright" as accepting responses . . . though at times my "OK" had a note of finality about it . . . .

C.B.

In my insecurity, I often prodded them gently for the answer, when what I was actually looking for was the *process* of problem solving, regardless of the answer. I had an irresistible compulsion to not leave the child with the wrong answer, and sometimes even supplied it. On the tape, this was usually followed by "—right?" as though that made it a question. . . . My second wait time (following the child's response) is all but nonexistent, replaced by verbal reinforcement in the form of "good," "very good," "right," and "OK"—the latter of which I also overused when moving on from one task to the next. What little instructing experience I've had has involved immediate positive reinforcement for appropriate responses, and that habit is hard to break. I wasn't even aware that I was doing it until I listened to the tape.

K.C.

> Interestingly, "OK" was the predominant interviewer response to both correct and incorrect responses by the child. I think this is probably due to the fact that I viewed these interviews as a series of observations without placing an emphasis on factors of right or wrong; therefore every response by the child, right or wrong, was viewed as being "OK. . . . I was surprised to find so many responses with positive connotation ("OK," "good," "oh, very good,"). Despite the apparent judgment of "correctness," the intention of these comments was simply to acknowledge the child's efforts. Nevertheless, since the responses could be misconstrued by the children (as could the absence of such responses) it would probably be a good idea to limit interviewer responses to more neutral utterances.
>
> M.S.

Again, one of the student interviewers captured the essence of acceptance in the interview method of studying children's thinking.

> If I withhold judgment (approval or disapproval) and just act as an active listener, that will give children the impression that what they think is important, rather than what they think I want them to think.
>
> S.B.

In addition to withholding judgment, it's ... to get excited about what's happening. Yet le... excitement show really affects what happens.

At the same time that the interviewer must accept all authentic responses by the child, it is also appropriate not to accept excessively diverting responses and behaviors (Alward and Saxe, 1975). A child who persists in playing with attractive materials may be told, "Right now, I need you to look at this problem. When we're finished you can play with the blocks again." Since you are working within certain time constraints you may decide to assert your needs. You need to be aware, however, that you may be running the risk of closing off behaviors that later prove relevant. If the child persists in diverting behavior you can say, "Since I need to have you look at this problem and you're not ready to do so now, maybe we can try this another time," and terminate the interview. The interview may also be terminated if the child is uncomfortable because of achievement anxiety, illness, missing other activities, and so on. It can be rescheduled at a time that is better for the child. In over two hundred interviews conducted for the explorations reported in this book, only six were terminated.

RECORDING AND ANALYZING INTERVIEWS

The benefits of recording and analyzing your interviews with children cannot be overemphasized. Since each interview has the potential of uncovering a wealth of information, we cannot depend on our memories to reconstruct each interview. There are a number of ways to record an interview:

1. Jot down notes on what the child says and does during the interview.
2. Have an unobtrusive observer jot down notes during the interview.
3. Audiotape the interview.
4. Videotape the interview.

A major problem in writing notes and interviewing simultaneously is the inability to give full attention to the interview process. This method, therefore, should be avoided whenever possible. An audiotape of the interview allows you to replay it for listening or jotting down notes on what the child and the interviewer said and did. Audiotaping may be supplemented by the interviewer's written notes on the child's inaudible behaviors, like interaction with the materials. Having a third person record observations can provide feedback on both the child's and interviewer's behaviors. The latter method is used best in conjunction with audiotaping. Although combinations of the first three methods of recording the interview provide adequate documentation of the process, the most complete documentation is offered by videotape recording. Both audible and visible behaviors can be replayed for analysis by the interviewer. The student interviewer reactions described earlier were based on an analysis of audiotapes. The interviews described throughout the book are illustrated from videotapes of the interactions.[4]

Orienting children to videotape equipment can be done best in a group situation prior to individual interviews. In addition to experiencing being videotaped and watching a video playback, the children can gain an understanding of the purpose of the recording during the interview and of its restricted audience.

4. The interviews were videotaped usually without the aid of a camera operator. By focusing the camera on the interview area in advance, the interviewer can turn on the videotape equipment quickly as the child enters the room. The availability of a camera operator adds the possibility of close-ups of facial expressions and manipulation of materials.

> "So that I can figure out how you think about numbers, I need the camera to help me remember what we did. After talking to you alone, I won't be playing it back for the whole class to see, or on Channel Seven News for the whole city to see. When I play it back it will be only for myself to study."

Each child can be given an opportunity to view a replay of a portion of his own interview at its completion.

No matter what the interview method, having a record of the child's written work is important. In videotaping, the child can be given a felt marking pen and asked to write "large enough so the camera can see it" and given a model of the size required. In the absence of a videotape recorder, you might provide another piece of paper at the point when the child is about to erase or cross out his work and start over. This provides you with a complete record of the child's sequence.

Although this book contains summaries of relevant research on children's numerical thinking, as in the next chapter, most chapters are based primarily on videotaped interviews conducted by me. During the course of the interview explorations, I replayed the videotapes and took written notes on the same day as the interview. Following a series of interviews in the same content area, I summarized and analyzed the data. In the process of writing this book I reexamined the data and replayed many of the interviews. The videotapes contain such a wealth of information on both children's thinking and the interview process itself that each time I viewed the videotapes I observed something that previously went unnoticed. Also, on second viewing of a videotaped interview I often had a different interpretation of a child's response or actions. For this reason it was critical to have feedback from other viewers. Teachers as well as researchers have provided me with such feedback based on the study of both the original videotapes and illustrated interview episodes taken from the videotapes.[5] My interaction with the various sources of feedback has provoked some rethinking that ultimately strengthens this research.

Whereas maximum benefits can be gained from an analysis of your own interview tapes, there is also considerable value in group viewing and discussion of videotaped interviews.

> A reaction of one of my students to videotapes of second graders' sophisticated counting strategies was, "Where did these kids come from . . . Mars?" Although she was a second-grade teacher, she hadn't observed such behaviors before. However, once aware of the children's potential, she gradually saw what had previously gone unnoticed and unappreciated in her classroom.

During group viewing of videotapes, teachers become involved in making sense of what the children are doing in group discussion. This involvement is motivated by the realization that the better interpreters they become of how children are seeing a problem, the better their on-the-spot decisions in working with children in the classroom will be (Duckworth, 1981). Getting an intimate look at children in the process of thinking also offers a different perspective of teaching and learning. A teacher from a seminar conducted by Duckworth recorded the following reflections.

> As always the task is to be *really* invested in understanding what a child is thinking. And in the very process of unearthing that, learning, growing, changing is going on. I feel closer to being able to do that after watching than before. I feel closer to changing the vested interest in *my objectives*—or at least believing that the process alone is valuable. I guess for the first time clearly I saw children learning—the process of learning without the answers being fully intact. Ah, so many times around on this issue. (p. 20)

Observing children in the process of learning prompted this teacher to reconsider her role in the classroom.

Throughout this book you will have occasions to interact with illustrated episodes from interviews with children. These will provide opportunities for you to gain a deeper understanding of children's numerical thinking as well as for you to consider alternative ways of interacting with children. The interview tasks themselves may suggest starting points for teaching methods and checkpoints for assessing children's understanding in the classroom. Furthermore, interaction with the interview episodes will offer you opportunities to reexamine the teaching-learning process from different perspectives, and even to restructure your classroom.

5. Although considerable feedback provided a check on observations and interpretations of selected task responses, lacking a research grant to support an assistant, I was not able to do a systematic check of all responses. Feedback was sought especially for interpretation of unusual responses.

REFLECTIONS AND DIRECTIONS

Although much can be gained from group viewing and discussion of videotaped and illustrated interview episodes, you can gain maximum benefits from conducting your own interview explorations. Piaget himself has recommended that prospective teachers spend considerable time interviewing children as a preparation for the classroom. He recommends that such a study of children's thinking be conducted with a number of different children on the same tasks. This provides critical experience in rephrasing questions and inventing new ones in your attempt to follow each child's thinking.

You are invited to undertake your own interview explorations and to reflect on the following:

- Children's numerical thinking
- Quality of your interactions with children
- Classroom implications of what you've just learned

This is no simple undertaking. It is neither a one-shot affair nor is there one single way of approaching it. Here are some suggestions to get you started.

1. One way to begin is to engage children in conversation on numerical tasks with the intent of learning from them. If you have a curiosity about learning and a respect for children's thinking, the process of interacting with children will lead you progressively to deeper concerns about thinking, learning, and teaching.

2. At those times when you doubt that children really do respond in the manner described in this book, you are invited to try similar tasks with children of the same age in your school or neighborhood.

3. At those times when you wonder how the children described would have responded if the materials or the questions had been different, you are invited to devise your own tasks and try them out with children.

4. Although giving the same interview tasks to several different children is ideal, it may not always be practical. If the number of available children is limited you may choose to increase the number of tasks given. If the ages of the available children may vary greatly you may choose to vary the tasks for each child.

5. When you are ready to undertake recording and analysis of your own interviews, additional practical suggestions can be found in Appendix B.
