Developmental Psychology
1996, Vol. 32, No. 3, 523-532

0012-1649/96/$3.00

Parental Scaffolding of Young Children's Spatial Communication

Jodie M. Plumert and Penney Nichols-Whitehead
The University of Iowa

Two studies documented and evaluated parental scaffolding of 3- and 4-year-olds' spatial communication. In Study 1, children gave directions to parents about locations of objects. Three-year-olds gave ambiguous directions more often than 4-year-olds, and parents used directive prompts more often with 3-year-olds than 4-year-olds. Study 2 compared the effectiveness of parental prompts in a controlled experiment. Each time children gave ambiguous directions, they were given either a directive prompt, nondirective prompt, or no prompt. Both age groups benefitted from directive prompts, but 3-year-olds benefitted less than 4-year-olds from nondirective prompts. Discussion focuses on parents' sensitivity to children's scaffolding needs and on developmental differences in children's responses to scaffolding.

The field of cognitive development has amassed a rich store of information about developmental differences in children's thinking and about the factors that account for these differences. Far less attention, however, has been devoted to understanding how cognitive change occurs (Siegler, 1993). In particular, little is known about the kinds of experiences that lead to cognitive change in children. As others have pointed out, one type of experience that may play an important role in children's cognitive development is guidance from older, more experienced individuals such as parents (Rogoff, 1990; Vygotsky, 1978). The basic premise underlying this approach to cognitive development is that children often acquire knowledge and skills through social interaction with more skilled individuals. Adult guidance of cognitive performance is thought to be particularly important during times of transition, sometimes referred to as the zone of proximal development (Vygotsky, 1978). During such times, children are sensitive to experiences that allow them to try out new ways of thinking and acting. More specifically, children are in a state of readiness to benefit from guidance that provides them with the necessary support to use their skills in novel ways. Over time, scaffolding can be modified or withdrawn as the child becomes increasingly competent at executing the skill. Developmental change results as responsibility for structuring cognitive performance shifts from the adult to the child.

Recent reformulations of Vygotsky's (1978) contextual approach to cognitive development stress the notion of "guided participation" as a vehicle for cognitive change (Rogoff, 1990). Guided participation emphasizes both active participation of children and guidance from others as contributors to the process of change. According to Rogoff (1990), older, more experienced individuals such as parents capitalize on children's eagerness to learn by providing guidance that advances children's skills and understanding. From this perspective, the primary task for the adult is to provide guidance that is appropriately geared to the developmental level of the child. That is, adults must provide guidance that supports and yet challenges children's skills and understanding.

Several studies have shown that adults adjust the amount and kind of guidance they provide depending on the age and expertise of the learner (e.g., Bellinger, 1979; Rogoff, Ellis, & Gardner, 1984; Wertsch, McNamee, McLane, & Budwig, 1980). For example, Rogoff et al. (1984) found that mothers gave more instruction to 6-year-olds than to 8-year-olds when teaching them about the same task. Moreover, when tested later, the younger children's performance on the task was as good as that of the older children. Thus, it appears that a high level of support from adults leads to increases in younger children's skills and understanding.

Studies also suggest that children benefit from challenging interactions with others who are more skilled than themselves (Dunn & Shatz, 1989; Mannle, Barton, & Tomasello, 1992). For example, Dunn and Shatz (1989) found that young children were more likely to contribute new and relevant information when intruding upon the conversation of others than when responding to speech addressed directly to themselves, suggesting that young children use more sophisticated cognitive and linguistic skills in more challenging communication situations. Similarly, Mannle et al. (1992) found that communicating with preschool-aged siblings presents a challenge to toddlers because preschool-aged siblings are not very adept at accommodating their speech to the needs of toddlers. As a result, toddlers may be forced to modify their conversational styles in order to interact effectively with their preschool-aged siblings.

The present investigation focused on the role of adult scaffolding in the development of young children's spatial communication. Spatial direction giving is a form of referential communication in which the goal is to enable the listener to

Jodie M. Plumert and Penney Nichols-Whitehead, Department of Psychology, The University of Iowa.

This research was supported in part by a Junior Faculty Seed Grant from the University of Iowa. We would like to thank Lisa Oakes for her helpful comments on earlier drafts and Leslie Downs, Dana Dunisch, Erika Gaylor, and Damien Ihrig for their help in data collection and transcribing.

Correspondence concerning this article should be addressed to Jodie M. Plumert, Department of Psychology, 11 SSH East, The University of Iowa, Iowa City, Iowa 52242. Electronic mail may be sent via Internet to jodie-plumert@uiowa.edu.

distinguish a target location from other possible locations. Recent work has shown that younger children are more likely than older children to give ambiguous spatial directions to their listeners (Craton, Elicker, Plumert, & Pick, 1990; Plumert, Ewert, & Spear, 1995). That is, young children often do not adequately distinguish a target location from other potentially confusable locations. In these studies, children typically help an experimenter hide a toy in or under one of several identical primary landmarks and then describe where the toy is to a listener. Therefore, it is necessary for children to relate the target primary landmark to another, or secondary, landmark in order to clearly distinguish the hiding location (e.g., "it's under the *hat* on the *table*"). Using this methodology, Craton et al. (1990) found that 4-year-olds were more likely than 6- and 8-year-olds to give ambiguous directions. In a similar study, Plumert et al. (1995) asked 3- and 4-year-olds to help an experimenter hide a miniature mouse in a one-room dollhouse and then describe its location to a small doll figure. Both 3- and 4-year-olds almost always referred to the target primary landmark (e.g., "it's in the *bag*"), but 4-year-olds were more likely than 3-year-olds to disambiguate the small landmark by referring to the secondary furniture landmark (e.g., "it's in the *bag* on the *bookshelf*"). Together, these results suggest that there are developmental changes between the ages of 3 and 6 years in children's ability to produce unambiguous spatial directions.

How might experience with feedback from older, more experienced listeners such as parents lead to these developmental changes in young children's spatial communication skills? First, feedback might help *motivate* young children to seek out new ways of communicating about location. That is, feedback about the inadequacy of their directions may help young children recognize the need for change. Second, feedback may provide young children with guidance about *how* to improve their spatial directions. That is, not only may feedback inform children about the inadequacy of their communication, but also about how to communicate more effectively. For example, imagine a scenario in which a parent asks a 3-year-old where his shoes are. The child answers that "they're under the couch." Confused, the parent responds by saying, "Do you mean the couch in the playroom or the couch in the living room?" The child then replies, "The couch in the living room." In this example, the parent's prompting serves both to draw the child's attention to the inadequacy of his message and to provide information about how to resolve the ambiguity of the situation. Presumably, repeated and varied experiences with such feedback in everyday interactions contribute to general developmental changes in the child's ability to appreciate and resolve spatial ambiguity.

There is some evidence from the referential communication literature suggesting that children learn about when and how to provide disambiguating information through feedback from listeners (Robinson & Robinson, 1981, 1982; Sonnenschein, 1984). For example, both Robinson and Robinson (1981, 1982) and Sonnenschein (1984) found that 5-year-olds' ability to produce unambiguous messages increased when they were exposed to explicit feedback about message ambiguity. Specifically, Sonnenschein (1984) found that 5-year-olds who watched a listener doll give explicit feedback to a speaker doll (e.g., "They're both red. Do you mean the big one or the little one?") later produced more informative messages than did children who watched the listener doll always select the correct referent. Robinson and Robinson (1981) found that children whose mothers explicitly told them that their utterances were unclear when they were young children (e.g., "I don't know what you mean") displayed a higher level of understanding about communication failure when they were older. Thus, it appears that experiences with explicit feedback from listeners about message ambiguity may play an important role in the development of children's referential communication skills. However, because only one age group was studied in these investigations, important developmental issues related to listener feedback have not been addressed. Specifically, do parents tailor their feedback to the child's developmental level, and are some forms of feedback more effective at younger ages than at older ages?

As a first step in understanding the role of adult guidance in the development of children's spatial communication skills, the present investigation sought to document and evaluate the types of feedback parents give in response to 3- and 4-year-olds' ambiguous spatial directions. Three specific issues related to parental feedback were addressed. The first concerned whether parents use different kinds of prompts with 3-year-olds than with 4-year-olds. These ages were chosen because previous research has shown that 3-year-olds have more difficulty than 4-year-olds in communicating clearly about object locations (Plumert et al., 1995). The fact that these ages are transitional with respect to children's ability to communicate about two nested landmarks makes differences in parental scaffolding of 3- and 4-year-olds spatial communication likely. Specifically, if parents are sensitive to the child's level of communicative competence, then they should give more structured prompts to 3-year-olds than to 4-year-olds. The second issue concerned whether different kinds of prompts are more effective in eliciting unambiguous spatial directions from younger and older children. Because 3-year-olds' spatial communication skills are more fragile than those of 4-year-olds, 3-year-olds may be more likely to respond appropriately to structured than to unstructured prompts. Finally, the third issue concerned how parents' prompts and children's communication changed over time. In particular, as children gain experience with the task, do parents give fewer directive prompts and do children give more unambiguous directions? In this investigation, we examined changes over trial blocks within a single experimental session.

The aim of the first study was to examine whether parents adjusted their prompts according to the child's age and experience with the task. In this study, 3- and 4-year-old children gave directions to their parents about the location of a miniature mouse in a one-room dollhouse. As in Plumert et al. (1995), there were several pairs of identical hiding locations. While their parents were not watching, children helped an experimenter hide the mouse at one member of a pair, but the other member was always left empty. The parent was called back, and the two were encouraged to work together until the parent was sure about where the mouse was hiding. Within the session, there were eight direction-giving trials. We expected that parents would give more directive prompts to younger than to older children and that they would give more directive prompts earlier than later in the session.

Following a design developed by Callanan (1985, 1989), a second study was carried out to test the effectiveness of the two

most common parental prompts in a controlled laboratory situation. Children again helped an experimenter hide the mouse in the dollhouse, but instead of giving directions to parents, children gave directions to a small doll figure. Children were assigned to one of three prompting conditions. When children gave an ambiguous direction, the experimenter gave them either a directive prompt, a nondirective prompt, or in the case of the control condition, no prompt. The purpose of the control condition was to evaluate the extent to which children improved as the result of practice with the task itself. On the basis of the results from the first study, we hypothesized that younger children would benefit more from directive than nondirective prompts, but that older children would benefit equally from both types of prompts.

Study 1

Method

Participants. Participants were 32 parent–child dyads from predominantly middle- to upper middle-class Caucasian families. There were fourteen 3-year-olds and eighteen 4-year-olds. Twelve 3-year-olds were accompanied by their mothers and two by their fathers. All of the 4-year-olds were accompanied by their mothers. There were no discernible differences between how fathers and mothers responded to their children in this situation, and therefore no attempt was made to exclude fathers. The mean ages of the children were 3 years 7 months (range = 3 years 5 months to 3 years 8 months) and 4 years 7 months (range = 4 years 3 months to 4 years 10 months). There were 8 boys and 6 girls in the 3-year-old group and 8 boys and 10 girls in the 4-year-old group. Parent–child pairs were recruited from an existing child subject registry. Parents received a letter describing the study followed by a phone call inviting the parent and child to participate. Children received a small gift for their participation.

Apparatus and materials. The experimental space was a dollhouse, 28 in. (71.12 cm) wide × 12 in. (30.48 cm) high × 16 in. (40.64 cm) deep, with a clear Plexiglas cover (see Figure 1). Eight pairs of small identical objects served as primary landmarks. These included baskets, pillows, shoes, hats, shovels, plants, pails, and paper bags. Eight pieces of furniture served as secondary landmarks. These included a chair, couch, table, bed, dresser, bookshelf, piano, and TV. Across parent–child dyads, primary landmarks were randomly paired with secondary landmarks with the constraint that both members of a pair were placed next to adjacent secondary landmarks. For instance, if one hat was placed next to the table, the other hat was placed next to the bookshelf across from the table. This ensured that both primary landmarks were easily within view of each other. A miniature mouse served as the hidden object on all trials. The dollhouse was placed on a low table with the child seated directly in front of it. The experimenter sat on the child's left, and the parent sat on the child's right. An additional chair was placed facing away from the dollhouse. The parent sat in this chair while the experimenter and child hid the mouse. A Panasonic camcorder was used to videotape all parent–child interactions.

Design and procedure. Each parent–child dyad was tested individually in the laboratory. The parent and child were told that they would be playing a hiding and finding game in which the child and the experimenter would hide the mouse in the dollhouse while the parent was not watching. After hiding the mouse, the parent would be called back, and the child would tell the parent exactly where the mouse was hiding. Before beginning the game, parents and children were familiarized with all of the small and large landmarks in the dollhouse by asking the children to name each item. The parents or the experimenter helped children if they had difficulty naming an item, and that item was pointed out again later to make sure children remembered it. The experimenter pointed out the items in a random order with the constraint that he or she pointed out both members of each pair of identical primary landmarks together. That is, after the child named the first member of a pair, the experimenter would say "Did you see there is another_____, just like it right here?" This was done to ensure that both parent and child were aware of both possible locations.

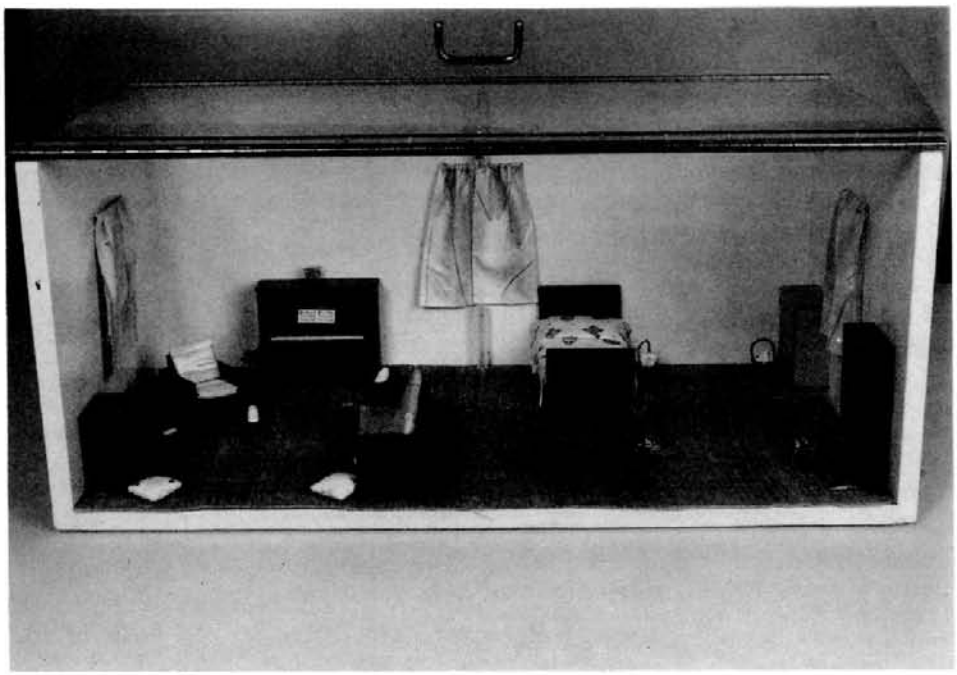

Figure 1. Dollhouse used as experimental space.

Following familiarization, the experimenter explained the game again. The experimenter stressed to children that they should tell their parents exactly where the mouse was hiding without pointing at it. The experimenter stressed to the parents that they and their children should talk with each other until parents were sure about where the mouse was hiding. Once parent and child indicated that they understood the instructions, the parent was sent behind the dollhouse while the experimenter and child hid the mouse. On each trial the experimenter would show the child where to hide the mouse, pointing to the location and saying, "Let's hide the mouse right here." The mouse was always hidden in or under one member of a pair of identical primary landmarks. (The mouse was hidden *under* four of the primary landmarks and *in* the other four primary landmarks.) Once the mouse was completely hidden from view, the experimenter closed the transparent cover and reminded the child not to point. The parent then was called back and the child was asked to tell the parent exactly where the mouse was hiding so he or she could find it right away. The parent and child also were reminded that they could talk to each other until the parent was sure where to look for the mouse. If necessary, the child was reminded not to point, but otherwise the experimenter refrained from intruding upon the parent–child interactions. Typically, however, the parents kept their children from pointing. The member of each pair of primary landmarks that served as the hiding location was randomized across children, as was the order of hiding locations.

Coding. The verbalizations of each parent and child were transcribed verbatim from videotape recordings. Trials in which parents looked for the mouse before their child conveyed information about both the primary and secondary landmark were not coded. Such errors were infrequent, however, and did not differ according to age, $F(1, 30) = 2.13$, *ns*. The mean number of errors made by 3- and 4-year-olds' parents was .43 and .11 out of 8, respectively.

All verbalizations were coded for presence or absence of the targeted information. The entire session was divided into four trial blocks (i.e., Trials 1 and 2, 3 and 4, 5 and 6, and 7 and 8). This allowed us to determine how parents' and children's responding changed over the course of the session. Within each trial, parent–child interactions were divided into segments. The initial segment always constituted children's directions about the location of the mouse before any prompts were given. Subsequent segments began with the parent's verbalizations and ended with the child's response. In the following example, the trial was divided into three segments, the initial segment and two prompting segments.

Child: "It's under the flower pot."
Parent: "It's under the flower pot. And which flower pot? Just tell, just tell mamma with your words."
Child: "I don't know."
Parent: "Well, what's the flower pot closer to?"
Child: "The TV."
Parent: "Well see, you can too tell me with words."

Children's verbalizations were coded for references to primary and secondary landmarks. Only the initial directions and those given in the first prompting segment were coded. Coding of primary and secondary landmark references was identical to that in Plumert et al. (1995). A *primary landmark reference* was coded as present when children mentioned or described the object with which the mouse was hidden (e.g., "the mouse is in the *bag*" or "the mouse is in the *brown paper thing*"). A *secondary landmark reference* was coded as present when children mentioned or described the object with which the primary landmark was placed (e.g., "next to the *bookcase*" or "next to the *book thing*").

Parents' verbalizations were coded for their responses to children's initial directions. Parental responses fell into four major categories: (a) no prompt, (b) repeat, (c) nondirective prompt, and (d) directive prompt. A *no prompt response* was coded when parents searched for the mouse in response to children's correct initial directions. A *repeat response* was coded when parents repeated the child's utterance or again asked where the mouse was hiding. A *nondirective prompt* was coded when parents pointed out that there were two identical primary landmarks (e.g., "I see two bags") or asked the child which of the two primary landmarks contained the mouse (e.g., "Which bag is it?"). This type of prompt was called *nondirective* because it drew children's attention to the ambiguity of their utterance but did not give them information about how to resolve the ambiguity. A *directive prompt* was coded when parents asked children to identify what the primary landmark was next to (e.g., "What's it by?" or "Is it by the couch or by the TV?"). This type of prompt was called *directive* because it gave children explicit information about how to resolve the ambiguity.

Parents often gave multiple prompts before children gave a verbal reply. Although it is impossible to tell how much children's responses were influenced by the entire collection of parental prompts, we reasoned that children's responses were most directly tied to the prompt that came immediately before they replied. Therefore, for each trial, only the last parental response from the first prompting segment was coded. In the example below, the parent first repeats the child's utterance, then gives a nondirective prompt, and finally gives a directive prompt. In this particular case, we coded the parent's response to the child's initial ambiguous direction as a directive prompt.

Child: "It's right under the shovel."
Parent: "It's under a shovel. Do you know? Can you tell me which shovel? Is it by the bed or by the dresser?"
Child: "By the dresser."
Parent: "By the shovel by the dresser."

The number of different types of prompts parents gave in the first prompting segment did not differ according to age, $F(1, 30) = 2.39$, *ns*. Scores were calculated by dividing the total number of repeat, nondirective, and directive prompts by the total number of trials in which parents prompted children for more information. The mean number of different prompts parents gave to 3- and 4-year-olds was 1.58 and 1.41, respectively. It is also important to point out that when parents gave more than one prompt, they always ordered these prompts from the least directive to the most directive. As the example above illustrates, the most general type of prompt was a repeat prompt, followed by a nondirective prompt, followed finally by a directive prompt. Out of all the trials in which parents prompted children for more information, only once did a parent deviate from this ordering.

Intercoder reliabilities were calculated on eight randomly selected protocols using exact percentage agreement. Reliabilities for primary landmark references, secondary landmark references, repeat prompts, nondirective prompts, and directive prompts were 97%, 95%, 95%, 100%, and 88%, respectively.

Results

Children's references to primary and secondary landmarks. We conducted a set of initial analyses to provide a general picture of children's communicative performance. Of particular interest was how references to primary and secondary landmarks changed with age and experience with the task. Only children's references to primary and secondary landmarks prior to parental prompting (i.e., in the initial segment of each trial) were analyzed.

We first carried out an analysis of the percentage of trials in which children spontaneously referred to both the primary and secondary landmark. Parents of course prompted for more information when children omitted either the primary or the secondary landmark from their spontaneous directions. Therefore,

3- and 4-year-olds' spontaneous references to both landmarks provides a clear indication of the extent to which they needed parental prompting. The percentage of references to both the primary and secondary landmark was calculated by dividing the number of trials within each trial block in which children referred to both the primary and secondary landmark by the total number of trials within each trial block. Scores were entered into an Age (2) × Trial Block (4) repeated measures analysis of variance (ANOVA) with the first factor as a between-subjects factor and the second as a within-subjects factor. This analysis yielded a significant main effect of age, $F(1, 30) = 19.52$, $p < .001$. Four-year-olds ($M = 58\%$) referred to both the primary and secondary landmark in a higher percentage of trials than did 3-year-olds ($M = 22\%$). There was also a significant main effect of trial block, $F(3, 90) = 14.66$, $p < .0001$. Follow-up tests using Tukey's honestly significant difference (HSD) revealed that children referred to both landmarks in a lower percentage of trials in trial block 1 ($M = 13\%$) than in trial block 2 ($M = 44\%$), trial block 3 ($M = 48\%$), and trial block 4 ($M = 64\%$). No other differences were significant.

The preceding analyses provide information about children's overall communicative performance but do not tell us whether children were more likely to refer spontaneously to the primary or to the secondary landmark. Therefore, we conducted separate analyses of children's spontaneous references to primary and secondary landmarks. The analysis of the percentage of primary landmark references yielded a significant Age × Trial Block interaction, $F(3, 90) = 3.99$, $p < .05$. Simple effects tests revealed that 3-year-olds ($M = 100\%$) referred to the primary landmark in a greater percentage of trials than did 4-year-olds ($M = 69\%$) in trial block 1, $F(1, 30) = 8.58$, $p < .01$. No such age differences were found in trial block 2, $F(1, 30) = .49$, *ns;* trial block 3, $F(1, 30) = .80$, *ns;* or trial block 4, $F(1, 30) = 2.81$, *ns*. The mean percentage of trials in which 3- and 4-year-olds referred to the primary landmark was 89% and 81% in trial block 2, 77% and 89% in trial block 3, and 93% and 100% in trial block 4, respectively. With the exception of the 4-year-olds in trial block 1, these findings indicate that spontaneous references to primary landmarks were quite high across the entire session. This is consistent with previous work showing that 3- and 4-year-olds almost always refer to the primary landmark in their directions (Plumert et al., 1995).

The analysis of the percentage of secondary landmark references yielded a significant main effect of age, $F(1, 30) = 27.59$, $p < .0001$. Four-year-olds ($M = 69\%$) referred to the secondary landmark in a higher percentage of trials than did 3-year-olds ($M = 31\%$). Again, consistent with previous work (Plumert et al., 1995), 4-year-olds were more likely than 3-year-olds to refer to the disambiguating secondary landmark. There was also a significant main effect of trial block, $F(3, 90) = 12.74$, $p < .0001$, indicating that children of both ages showed improvement over the course of trials. Follow-up tests using Tukey's HSD revealed that children referred to the secondary landmark in a lower percentage of trials in trial block 1 ($M = 23\%$) than in trial block 2 ($M = 56\%$), trial block 3 ($M = 64\%$), and trial block 4 ($M = 67\%$). No other differences were significant. Thus, it appears that the major gains in references to secondary landmarks were made between trial blocks 1 and 2.

Parents' responses to children's directions. The primary goal of Study 1 was to document and evaluate the types of prompts parents used to elicit further information from their children about the location of the mouse. Given the fact that children's communication varied as a function of age and experience with the task, we were particularly interested in whether parents used different types of prompts for the two age groups and whether the types of prompts parents used changed over the course of the session. Scores for parental responses were calculated by dividing the number of trials within each trial block in which parents exhibited each type of response by the total number of trials within each trial block. These percentages are shown in Table 1.

Table 1
Mean Percentage of Trials Containing Each Type of Parental Response

Age and trial block	Parental response			
	No prompt	Repeat	Nondirective	Directive
Trial block 1				
3-year-olds	7	4	21	68
4-year-olds	22	3	28	47
Trial block 2				
3-year-olds	26	7	28	39
4-year-olds	58	6	19	17
Trial block 3				
3-year-olds	18	32	18	32
4-year-olds	73	11	8	8
Trial block 4				
3-year-olds	43	11	25	21
4-year-olds	81	8	11	0

We addressed the issue of whether parents' scaffolding varied according to the child's age and experience with the task by examining whether the frequency with which parents used directive and nondirective prompts differed across the two age groups and the four trial blocks. In the first analysis, the percentage of trials in which parents gave a nondirective prompt was entered into an Age (2) × Trial Block (4) repeated measures ANOVA. This analysis yielded no significant effects. The mean percentage of trials in which parents gave 3-year-olds ($M = 23\%$) and 4-year-olds ($M = 17\%$) a nondirective prompt did not differ, $F(1, 30) = .88$, *ns*. Likewise, the mean percentage of trials in which parents gave a nondirective prompt did not differ across Trial 1 ($M = 25\%$), Trial 2 ($M = 23\%$), Trial 3 ($M = 13\%$), or Trial 4 ($M = 17\%$), $F(3, 90) = 1.22$, *ns*.

In the second analysis, the percentage of trials in which parents gave children a directive prompt was entered into an Age (2) × Trial Block (4) repeated measures ANOVA. This analysis yielded a significant main effect of age, $F(1, 30) = 9.16$, $p < .01$, indicating that parents were more likely to give directive prompts to 3-year-olds ($M = 40\%$) than to 4-year-olds ($M = 18\%$). This analysis also yielded a significant main effect of trial block, $F(3, 90) = 12.63$, $p < .0001$. Follow-up tests using Tukey's HSD revealed that parents used directive prompts in a greater percentage of trials in trial block 1 ($M = 56\%$) than in trial block 2 ($M = 27\%$), trial block 3 ($M = 19\%$), and trial block 4 ($M = 9\%$). No other differences were significant.

This pattern of findings suggests that parents adjusted their

scaffolding according to the child's age and experience with the task. Specifically, parents did not simply give fewer prompts of *any* kind to 4-year-olds than to 3-year-olds. Rather, the distribution of directive and nondirective prompts differed across the two ages (see Table 1). That is, parents were equally likely to give 3- and 4-year-olds a nondirective prompt, but more likely to give 3-year-olds than 4-year-olds a directive prompt. Likewise, although parents were less likely to give prompts of any kind during the later than the earlier trials, the distribution of directive and nondirective prompts differed across the session. Specifically, parents were equally likely to give nondirective prompts across the four trial blocks but were more likely to give directive prompts in the first trial block than in the three subsequent trial blocks.

We assume that parents gave more directive prompts to the 3-year-olds than to the 4-year-olds because the two groups differed in communicative competence. In fact, children who produced fewer directions containing both the primary and secondary landmark also received more directive prompts from parents, $r = -.49$, $p < .01$. Thus, lower levels of communicative competence were associated with more directive guidance from parents. One question this finding raises is how do parents become aware of their child's level of communicative competence? In particular, did parents come into the lab already knowing what kind of feedback to give their child? We addressed this issue by comparing parents' use of directive prompts with 3- and 4-year-olds on the first direction-giving trial. This trial provides a good indication of parents' knowledge because they did not yet have experience with how children responded to feedback on this task. Thus, if parents came into the lab already knowing what kind of feedback to give their child, then they should have given more directive prompts to 3-year-olds than to 4-year-olds on the first trial. First, it is important to note that *every* child required a prompt on the first trial. The percentage of 3- and 4-year-olds who received a directive prompt was 64% and 67%, respectively, $\chi^2(1, N = 32) = .02$, *ns*. The fact that parents treated 3- and 4-year-olds similarly on the first trial suggests that they did not come into the situation knowing exactly what kind of feedback to give their child. Rather, it appears that differences in parents' use of directive prompts with the two age groups emerged over the set of interactions.

Effectiveness of directive and nondirective prompts. The second major goal of Study 1 was to determine whether directive and nondirective prompts were equally effective for the two age groups. We addressed this issue by comparing the effectiveness of nondirective and directive prompts in eliciting references to secondary landmarks from the two age groups. Only prompts about secondary landmarks were analyzed because most children spontaneously referred to primary landmarks in their directions. Scores were calculated by dividing the total number of trials in which children mentioned the secondary landmark in response to each prompt type by the total number of trials in which each prompt type was used. For example, if a child received three nondirective prompts over the course of the eight trials and gave two secondary landmarks in response to those prompts, he or she would receive a score of .67.

Two analyses were carried out to evaluate the effectiveness of prompts, one comparing 3- and 4-year-olds' references to secondary landmarks following nondirective prompts and the other comparing 3- and 4-year-olds' references to secondary landmarks following directive prompts. A comparison of the nine 3-year-olds and thirteen 4-year-olds who received at least one nondirective prompt over the eight trials revealed that the percentage of nondirective prompts that were effective in eliciting a reference to the secondary landmark was smaller for 3-year-olds ($M = 64\%$) than for 4-year-olds ($M = 92\%$), $F(1, 20) = 3.72$, $p = .07$, although the difference did not reach the conventional level of significance. Of these 3-year-olds, four always provided the secondary landmark, three sometimes provided secondary landmark, and two never provided the secondary landmark in response to a nondirective prompt. All but one of the 4-year-olds always provided the secondary landmark in response to a nondirective prompt.

A comparison of the eleven 3-year-olds and twelve 4-year-olds who received at least one directive prompt over the eight trials revealed no significant difference in the percentage of directive prompts given to 3-year-olds ($M = 97\%$) and to 4-year-olds ($M = 81\%$) that were effective in eliciting a reference to the secondary landmark, $F(1, 21) = 1.98$, *ns*. Of these 3-year-olds, 10 always provided the secondary landmark and 1 sometimes provided the secondary landmark in response to a directive prompt. Likewise, of the twelve 4-year-olds who received at least one directive prompt, 9 always provided the secondary landmark, one sometimes provided the secondary landmark, and 2 never provided the secondary landmark in response to a directive prompt.

Discussion

The results of this investigation clearly show that parents' scaffolding of young children's spatial communication varied as a function of the child's age and experience with the task. Specifically, parents were more likely to use directive prompts with 3-year-olds than with 4-year-olds and were more likely to use directive prompts earlier than later in the session. This suggests that parents were sensitive to the fact that younger children needed more guidance than did older children and that children needed more guidance earlier than later in the session.

One question left unanswered, however, is whether there are developmental differences in how children respond to directive and nondirective prompts. Although there was some suggestion that 3-year-olds were less likely than 4-year-olds to profit from nondirective prompts, definitive conclusions are difficult to draw because most parents used a mixture of both prompt types in their interactions with their children. Therefore, we designed a second study to test the effectiveness of these two types of parental prompts under controlled laboratory conditions. The task was the same as in the previous study except that when children gave an ambiguous initial direction, they received one of the two types of prompts (i.e., either a directive or nondirective prompt). There was also a control condition in which the experimenter gave children no feedback when they gave an ambiguous direction. The control condition was necessary to determine whether children, particularly the 4-year-olds, improved over trials merely as a result of familiarity with the task itself. On the basis of the results of the previous study, we expected that 4-year-olds would benefit more than 3-year-olds

from nondirective prompts, but that both age groups would benefit equally from directive prompts.

Study 2

Method

Participants. Thirty-six 3-year-olds and thirty-six 4-year-olds from predominantly middle- to upper-middle-class families participated. The mean ages of the children were 3 years 7 months (range = 3 years to 3 years 11 months) and 4 years 3 months (range = 4 years to 5 years). The children from each age group were randomly assigned to one of three experimental conditions with the restriction that each group contain approximately equal numbers of boys and girls. Children were recruited in the same manner as in the previous study.

Apparatus and materials. The same dollhouse, landmarks, and procedure for pairing primary and secondary landmarks was used as in Study 1. A Panasonic camcorder was used to record the entire session.

Design and procedure. Children were tested individually in the laboratory. Children were told that they would be playing a hiding and finding game, in which they and the experimenter would hide a mouse in the dollhouse while a troll doll was not watching, and then they would tell the troll where the mouse was hiding. Using the same procedure as in Study 1, children were familiarized with all of the large and small landmarks in the dollhouse.

Following the familiarization, the experimenter explained the game to children again. As in Study 1, children were instructed to describe exactly where the mouse was hiding without pointing. Once children indicated they understood the instructions, the troll was placed behind the dollhouse so he could not "see" where the mouse was hidden. On each trial, children hid the mouse in or under one member of a pair of identical primary landmarks. The experimenter pointed out each location, saying "let's hide the mouse right here." When the mouse was hidden from view, the Plexiglas cover was closed and children were reminded not to point. The troll then was brought out and children were asked to tell him exactly where the mouse was hiding so he would know exactly where to find it.

Children were randomly assigned to one of three prompting conditions. Children in the *control* condition received no verbal feedback when they gave an ambiguous direction. After children provided their initial direction, the experimenter paused for a few seconds to give children an opportunity to add more information. If the child did not provide more information, the experimenter simply opened the cover and asked the child to retrieve the mouse. Children in the *nondirective* prompt group received a prompt that directed their attention to the ambiguity of their utterance but did not provide information about how to resolve the ambiguity. If children only referred to the primary landmark in their initial direction, the experimenter would say, for example, "Mr. Troll sees two hats. Which one is it?" Occasionally, children only referred to the secondary landmark in their initial direction. In this case, the experimenter would say, for example, "Mr. Troll sees two hiding places by the couch. Which one is it?" Children in the *directive* prompt group received a prompt that directed their attention to the ambiguity of their utterance and provided information about how to resolve the ambiguity. If children initially only referred to the primary landmark, the experimenter would say, for example, "Mr. Troll sees two hats. Is it the one by the chair or the one by the piano?" Again, children occasionally only referred to the secondary landmark. In this case, the experimenter would say, for example, "Mr. Troll sees two hiding places by the couch. Is it in the basket or under the shovel?"

Children in the directive and nondirective prompt groups were asked to retrieve the mouse for Mr. Troll after they responded to the experimenter's prompt. Children in all three conditions were asked to retrieve the mouse for Mr. Troll if they included both landmarks in their initial directions. As in Study 1, there were eight trials. The same randomization procedure was used to select the member of each pair of primary landmarks that served as the hiding location and to determine the order of hiding locations.

Coding. Each child's directions were transcribed verbatim from videotape recordings. References to primary and secondary landmarks were coded in the same manner as in Study 1. Intercoder reliabilities calculated on 18 children (6 from each experimental group) for primary and secondary landmark references were 99% and 97%, respectively.

Results

The primary goal of Study 2 was to examine the effectiveness of directive and nondirective prompts in eliciting unambiguous directions from 3- and 4-year-olds. Therefore, all scores for primary and secondary landmark references included directions children gave both before and after prompting.

References to primary landmarks. An initial analysis was carried out to examine the percentage of directions that contained a reference to the primary landmark. Scores were calculated by dividing the number of trials within each trial block in which children mentioned the primary landmark by the total number of trials within each trial block. These scores were entered into an Age (2) × Prompting Condition (3) × Trial Block (4) repeated measures ANOVA with the first two factors as between-subjects variables and the third as a within-subjects variable. Although references to primary landmarks were very high across the three prompting conditions, this analysis yielded a significant effect of prompting condition, $F(2, 66) = 4.14$, $p < .05$. Follow-up tests revealed that children in the directive ($M = 100\%$) and nondirective ($M = 98\%$) prompting conditions referred to a greater percentage of primary landmarks than did children in the control ($M = 92\%$) condition.

References to disambiguating secondary landmarks. The primary purpose of Study 2 was to evaluate the effectiveness of directive and nondirective prompts in eliciting disambiguating spatial information from 3- and 4-year-olds. Scores were calculated by dividing the number of trials within each trial block in which children mentioned the secondary landmark by the total number of trials within each trial block. These scores were entered into an Age (2) × Prompting Condition (3) × Trial Block (4) repeated measures ANOVA with the first two factors as between-subjects variables and the third as a within-subjects variable. This analysis yielded significant main effects of age, $F(1, 66) = 6.77$, $p < .05$; prompting condition, $F(2, 66) = 305.52$, $p < .0001$; and trial block, $F(3, 198) = 5.78$, $p < .001$. There was also a significant Age × Prompting Condition interaction, $F(2, 66) = 8.01$, $p < .001$, and a significant Prompting Condition × Trial Block interaction, $F(6, 198) = 3.16$, $p < .01$.

All of these main effects and interactions, however, were subsumed under a significant Age × Prompting Condition × Trial Block interaction, $F(6, 198) = 2.65$, $p < .05$ (see Figure 2). Simple effects tests revealed a significant Age × Trial Block interaction for the nondirective prompting condition, $F(3, 66) = 3.24$, $p < .05$, but not for the directive prompting condition, $F(3, 66) = .34$, *ns*, or for the control condition, $F(3, 66) = 1.63$, *ns*. As shown in Figure 2, 3- and 4-year-olds showed the same pattern of responding across trial blocks in the directive prompting and control conditions, but not in the nondirective prompting condition. Both 3- and 4-year-olds almost always re-

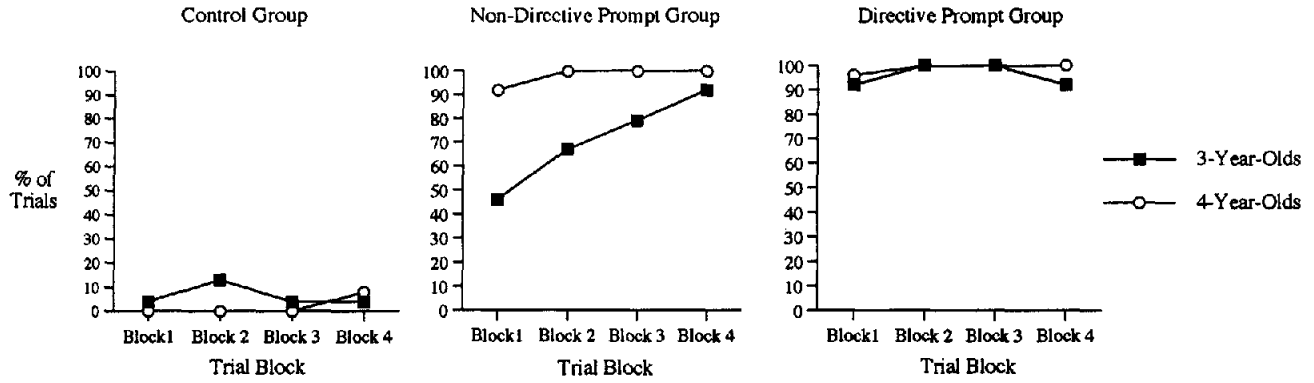

Figure 2. References to secondary landmarks in Study 2 as a function of age, condition, and trial block.

ferred to the secondary landmark in the directive prompting condition and almost never did in the control condition. In contrast, simple effects tests of the Age × Trial Block interaction in the nondirective prompt condition revealed that 4-year-olds were significantly more likely than 3-year-olds to refer to the secondary landmark in trial block 1, $F(1, 22) = 10.48$, $p < .01$, and in trial block 2, $F(1, 22) = 8.80$, $p < .01$. The difference between the two ages approached significance on trial block 3, $F(1, 22) = 3.31$, $p = .08$, but by trial block 4, there was no significant difference between the two ages, $F(1, 22) = 1.00$, *ns*.

Discussion

The results of this investigation show that 3-year-olds benefitted less than did 4-year-olds from nondirective prompts. That is, 3-year-olds were less likely than 4-year-olds to refer to the disambiguating secondary landmark in response to a nondirective prompt throughout the first three trial blocks. By the last trial block, however, 3-year-olds were just as likely as 4-year-olds to respond appropriately to nondirective prompts. Their steady improvement over the course of the four trial blocks shows that 3-year-olds were able to figure out how to disambiguate identical locations but took longer to do so than 4-year-olds. As in the previous study, both 3- and 4-year-olds almost always provided the secondary landmark in response to directive prompts. In contrast, 3- and 4-year-olds in the control condition almost never referred to the disambiguating secondary landmark in their directions.

What might account for the poor performance of 3- and 4-year-olds in the control condition? One possibility is that because children were communicating to a make-believe listener, they thought it unnecessary to provide the disambiguating information. That is, children may have thought it sufficient to say, for example, "the mouse is in the bag" because both they and the experimenter knew which bag was the primary landmark. If children are more likely to provide unambiguous directions to a real listener than a make-believe listener, then children should have given more unambiguous directions in the first trial to their parent in Study 1 than to the troll figure in Study 2. We found, however, that none of the children ever gave an unambiguous direction to their parent on the first trial. This suggests that the uniformly poor performance on the part of both 3- and 4-year-olds in the control condition was not an artifact of communicating to an imaginary listener. Rather, it appears that the feedback young children receive from listeners plays a critical role in their ability to communicate clearly about locations. Without such feedback, 3- and 4-year-olds typically only refer to the primary landmark in their directions. With even minimal feedback, however, 4-year-olds readily provide disambiguating spatial information to their listener.

General Discussion

The results of this investigation show that parents were more likely to use directive prompts to elicit disambiguating spatial information from their 3-year-old than from their 4-year-old children. Moreover, the results of Study 2 show that nondirective prompts were less effective in eliciting disambiguating spatial information from 3-year-olds than from 4-year-olds. That is, 3-year-olds were less likely than 4-year-olds to provide disambiguating spatial information in response to a nondirective prompt. Both age groups, however, usually provided the appropriate information in response to directive prompts. The results of Study 2 also show that 3- and 4-year-olds almost never provided disambiguating spatial information in the absence of feedback from the listener.

Consistent with other studies of adult scaffolding of children's cognitive skills (e.g., Bellinger, 1979; Rogoff et al., 1984; Wertsch et al., 1980), the results of the present investigation suggest that parents are sensitive to the scaffolding requirements of younger and older children. Clearly, 3-year-olds are less skilled than 4-year-olds in communicating about location. Previous work has shown that 3-year-olds are more likely than 4-year-olds to give ambiguous directions (Plumert et al., 1995) and less likely than 4-year-olds to detect ambiguous directions (Plumert, in press). Parents seemingly compensate for these skill differences by providing more directive feedback to younger than to older children. Younger children also benefit more from directive than nondirective prompts, suggesting that they actually do need more directive feedback in order to communicate clearly about location.

The results of the present investigation also suggest that children's readiness to benefit from feedback plays an important role in their communicative performance. Despite the fact that

parents adjusted their scaffolding according to the age of the child, 4-year-olds were more likely than 3-year-olds to provide unambiguous directions. These findings suggest that 4-year-olds came to this communication situation primed to benefit from feedback. That is, 4-year-olds probably have had more experience than 3-year-olds with communicating about location and therefore may more easily recognize what the appropriate response is in this situation. This hypothesis is consistent with other work showing that older children are more prepared than younger children to benefit from the same experience (Siegler, 1976). Specifically, Siegler (1976) found that 8-year-olds, but not 5-year-olds, showed improved performance on balance scale problems after experience with conflict problems. Although the feedback children received from experience with conflict problems informed them that their predictions about which way the scale would tip were wrong, only the older age group was able to use this feedback to figure out better strategies for solving the balance scale task. This suggests that even when children of different ages initially show the same level of performance, older children often benefit more than do younger children from additional experience.

Why did 4-year-olds benefit more than 3-year-olds from nondirective prompts? Clearly, nondirective prompts directed children's attention to the ambiguity of their utterance but did not help them figure out how to resolve the ambiguity. In this investigation, the only way to distinguish between the identical primary landmarks was to relate the target primary landmark to a disambiguating secondary landmark. Apparently, 3-year-olds had difficulty with figuring out the solution to this problem. The following example illustrates 3-year-olds' problems with using location as a means of disambiguating identical objects.

Child: "In the bucket."
Parent: "Which one?"
Child: "The red one."
Parent: "The red bucket? I see two red buckets."
Child: "I know."
Parent: "Which one should I look in?"
Child: "The one by the drawer."

The fact that 3-year-olds in Study 2 eventually figured out how to disambiguate the identical primary landmarks suggests that their spatial communication skills are not qualitatively different from those of 4-year-olds. Rather, it appears that 3-year-olds' skill in communicating about disambiguating secondary landmarks is more tenuous than that of 4-year-olds. As a result, 3-year-olds seem to require more experience with feedback for this skill to emerge.

The performance of children in the control condition in Study 2 underscores the importance of feedback in young children's spatial communication. In the absence of feedback, neither 3- nor 4-year-olds showed any improvement across the eight trials. Although one might argue that giving children no feedback implicitly informs them that their initial utterance was acceptable, the experimenter always waited a few seconds for children to say more before allowing them to retrieve the mouse. Children sometimes responded to these pauses by repeating their initial direction (e.g., "It's in the bucket."), as if the experimenter did not hear them the first time. Moreover, the finding that none of the 3- and 4-year-olds in Study 1 ever gave an unambiguous direction to their parent on the first trial also suggests that feedback is critical to young children's spatial communication.

The patterns of 3- and 4-year-olds' performance in the directive, nondirective, and control conditions in Study 2 suggest a developmental model of children's spatial communication. The finding that 3-year-olds in the control condition almost never provided disambiguating spatial information and 3-year-olds in the nondirective condition had more difficulty than 3-year-olds in the directive condition in providing disambiguating spatial information suggests that 3-year-olds' communication failures stem from two sources. First, they have difficulty recognizing the needs of the listener and second, they have difficulty knowing how to resolve spatial ambiguity. The finding that 4-year-olds in the control condition almost never provided disambiguating spatial information and 4-year-olds in the directive and nondirective prompt groups usually provided disambiguating spatial information suggests that 4-year-olds communication failures stem primarily from difficulty with recognizing the needs of the listener. At some later age, one would expect that children would overcome this difficulty and hence provide unambiguous directions even in the absence of feedback. Interestingly, one 5-year-old that we tested in the control condition but did not include in the analyses provided unambiguous directions on every trial.

If this model is correct, it would suggest that children's ability to *use* disambiguating spatial information develops prior to their recognition of the *need* to provide disambiguating spatial information to a listener. This seems somewhat paradoxical, because one might expect that children would recognize the need for disambiguating information before they learn how to resolve ambiguity. A recent investigation of young children's ability to recognize spatial ambiguity when they are on the receiving end of directions found that 3-year-olds are able to use disambiguating spatial information to locate a hidden object even though they do not distinguish between ambiguous and unambiguous directions (Plumert, in press). Together, these findings suggest that metacommunicative skills such as recognizing the need to provide disambiguating spatial information may emerge within the context of scaffolding from older, more experienced listeners. That is, through practice with providing disambiguating spatial information in response to requests from listeners, young children may become increasingly aware of the need to provide disambiguating information in ambiguous situations.

What implications do the results of the present investigation have for understanding the mechanisms underlying such developmental changes in children's spatial communication? The fact that parents used more directive prompts with 3-year-olds than with 4-year-olds suggests that parents first work to teach younger children about how to resolve spatial ambiguity. Once children have mastered the task of knowing how to provide disambiguating spatial information, parents may focus on teaching them about when they need to provide such information. This account makes sense if one thinks about the goals of everyday requests for spatial information. When parents ask children where something is, their aim is to elicit enough information to localize the missing object. Pointing out the ambiguity of a 3-year-old's description by saying "Which one do you mean?" is

unlikely to yield any relevant disambiguating information. Therefore, if the parent has any hope of eliciting the appropriate information from the child, he or she must provide feedback that helps the child learn how to resolve spatial ambiguity (e.g., "Is it the one by the couch or the one by the TV?"). Thus, almost by necessity, young children may first receive feedback from listeners that teaches them about how to provide disambiguating spatial information. Only after children have mastered this skill may parents find it useful to give children guidance that only directs their attention to the ambiguity of the utterance. This may explain why children learn how to use disambiguating spatial information before they learn when to use it. Thus, as parents and children work together to solve day-to-day problems, parents may provide children with guidance that affects the general course of communicative development.

References

Bellinger, D. (1979). Changes in the explicitness of mother's directives as children age. *Journal of Child Language, 6,* 443–458.

Callanan, M. A. (1985). How parents label objects for young children: The role of input in the acquisition of category hierarchies. *Child Development, 56,* 508–523.

Callanan, M. A. (1989). Development of object categories and inclusion relations: Preschoolers' hypotheses about word meanings. *Developmental Psychology, 25,* 207–216.

Craton, L. G., Elicker, J., Plumert, J. M., & Pick, H. L., Jr. (1990). Children's use of frames of reference in communication of spatial location. *Child Development, 61,* 1528–1543.

Dunn, J., & Shatz, M. (1989). Becoming a conversationalist despite (or because of) having an older sibling. *Child Development, 60,* 399–410.

Mannle, S., Barton, M., & Tomasello, M. (1992). Two-year-olds' conversations with their mothers and preschool-aged siblings. *First Language, 12,* 57–71.

Plumert, J. M. (in press). The early development of children's ability to detect ambiguity in spatial directions. *Cognitive Development.*

Plumert, J. M., Ewert, K., & Spear, S. (1995). The early development of children's communication about nested spatial relations. *Child Development, 66,* 959–969.

Robinson, E. J., & Robinson, W. P. (1981). Ways of reacting to communication failure in relation to the development of the child's understanding about verbal communication. *European Journal of Social Psychology, 11,* 189–208.

Robinson, E. J., & Robinson, W. P. (1982). The advancement of children's verbal referential communication skills: The role of metacognitive guidance. *International Journal of Behavioral Development, 5,* 329–355.

Rogoff, B. (1990). *Apprenticeship in thinking.* New York: Oxford University Press.

Rogoff, B., Ellis, S., & Gardner, W. (1984). Adjustment of adult–child instruction according to child's age and task. *Developmental Psychology, 20,* 193–199.

Siegler, R. S. (1976). Three aspects of cognitive development. *Cognitive Psychology, 8,* 481–520.

Siegler, R. S. (1993). Commentary: Cheers and lamentations. In C. E. Granrud (Ed.), *Visual perception and cognition in infancy* (pp. 333–344). Hillsdale, NJ: Erlbaum.

Sonnenschein, S. (1984). How feedback from a listener affects children's referential communication skills. *Developmental Psychology, 20,* 287–292.

Vygotsky, L. S. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.

Wertsch, J. V., McNamee, G., McLane, J. B., & Budwig, N. A. (1980). The adult–child dyad as a problem solving system. *Child Development, 51,* 1215–1221.

Received April 17, 1995
Revision received September 5, 1995
Accepted October 12, 1995 ■