“The driver doesn't sit, he stands up like the Flintstones!”: Sibling Teaching During Teacher-Directed and Self-Guided Tasks

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Associations among sibling teaching strategies, learner behavior, age, age gap, gender, and social-cognitive skills (second-order false-belief and interpretive understanding of knowledge) were investigated in 63 sibling dyads in early and middle childhood. Two teaching tasks were introduced to the older sibling teacher: a teacher-directed task with unique subgoals (tractor construction) and a self-guided, repetitive task (tanagrams). Subsequently, the older sibling taught the younger sibling learner. Findings revealed effects for age and gender; older teachers employed a wider range of strategies, especially in the tractor task, and older learners were more successful and more involved. In the tractor task, teachers also used more instruction and encouragement with same-gendered siblings. Age-gap effects for teaching were evident in both tasks. Further, teachers employed more instruction, help, and demonstration strategies in the tractor task, whereas in the tanagrams task, they engaged in greater encouragement and verbal attention. Learner involvement in the two tasks was positively associated with teaching strategies reflecting guided participation but was negatively related to more controlling teaching strategies. Finally, the two social-cognitive measures were more strongly associated with teaching strategies in the teacher-directed tractor task. Findings are discussed in light of recent theory and research on sibling teaching and learning.

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According to social constructivist models of relationships, the sibling relationship may be a prime context for young children’s development due to its prominence in their lives (Carpendale & Lewis, 2004; Rogoff, 1998). Co-constructing a common history affords siblings many opportunities to develop a keen understanding of one another’s abilities and knowledge and to foster their development (Dunn, 2002; Howe, Ross, & Recchia, 2011). Specifically, this intimate knowledge as well as siblings’ prior shared experiences, beliefs, and emotional styles may promote their social-cognitive development (Flavell & Miller, 1998). Researchers have investigated the reciprocal features (i.e., equal, returned exchanges evident in play and conflict) of the sibling relationship (Dunn & Munn, 1986; Hinde, 1979; Howe, Petrakos, Rinaldi, & LeFebvre, 2005; Volling, 2003); however, less work has focused on complementary (i.e., hierarchical) features (Recchia, Howe, & Alexander, 2009). Examining the complementary features provides a unique opportunity to highlight the processes employed in siblings’ teaching (Dunn, 1983, 1988) and to study how social-cognitive skills are related to these processes.

Teaching is a dyadic exchange in which both the teacher and learner have important roles, although differences between dyads and contexts are evident (LeBlanc & Bearison, 2004). An effective teacher accounts for the learner’s prior knowledge and point of view while employing strategies to assist the learner in task completion (Rogoff, 1998). Our goal was to illuminate how age, age gap, gender, and social-cognitive ability are associated with the effectiveness of children’s teaching strategies during two tasks: a) a teacher-directed construction task with unique steps and subgoals requiring specific instruction, and b) a self-guided or repetitive puzzle task (i.e., after initial instruction, repeated steps are self-evident). Thus, we investigated children’s teaching strategies within and across the two tasks and associations of strategies with social-cognitive skills, while also considering effects of structural variables such as age, age gap, and gender. In addition, we consider the younger sibling’s involvement in the teaching process and success in completing the task steps as indices of how effectively the teacher engaged the learner while conveying important information.

Children Teaching Children

Piaget (1950) and Vygotsky (Tudge & Rogoff, 1989) argued that an asymmetry of knowledge rather than authority is critical in the teaching process; therefore, children can teach other children (LeBlanc & Bearison, 2004). Teaching involves the intentional transfer of knowledge and skill from one person to another (Frye & Ziv, 2005), a goal that can be accomplished in various ways. In the social-constructivist perspective (Palincsar, 1998), a more knowledgeable person (adult, peer, or sibling) may guide the learning
of a less knowledgeable person (Azmitia, 1988). Rogoff (1990, 1998) argued that guided participation—specifically guiding through the relevant steps of the task, providing verbal information (e.g., descriptions, explanations, feedback, scaffolding), and physical assistance (e.g., organizing materials)—is an important means of teaching. The teacher’s role is to build bridges between the known and unknown information, support and structure the learner’s involvement, and allow the learner responsibility for problem solving. Implicit in this dynamic and bidirectional approach is the development of shared meanings regarding the task—a process that may be facilitated by the teacher’s ability to understand the learner’s point of view (Göncü, 1993; Strauss, Ziv, & Stein, 2002). In contrast, an instructivist teacher controls the task by demonstrating while minimizing the learner’s control, hands-on involvement, and opportunities for independent practice; by default, the learner is more passive and has fewer opportunities to correct his/her own mistakes (Recchia et al., 2009).

Most research on child-to-child teaching addresses children’s teaching skills with peers (e.g., Ashley & Tomasello, 1998; Perez-Granados & Callanan, 1997; Wood, Wood, Ainsworth, & O’Malley, 1995); however, the sibling relationship presents a unique context for study. Sibling relationships are intense and involuntary, and children jointly co-construct a long history; thus, they gain an intimate understanding of one another’s abilities and knowledge. As such, there are many opportunities for teaching during ongoing sibling interaction (Dunn, 1983; Klein, Feldman, & Zarur, 2002). Although there is also an inherent mismatch in siblings’ competencies due to age differences, sibling interactions are relatively egalitarian compared with parent-child exchanges (Hartup, 1989). Azmitia and Hesser (1993) reported that compared with peers, older siblings engage in more guidance and positive feedback and younger siblings are more likely to seek help from their older sibling. Thus, sibling teaching interactions may offer unique affordances for learning about the complementary features of children’s relationships.

Age, Age Gap, and Gender Differences in Sibling Teaching

Researchers have begun to investigate how sibling structural variables (i.e., age, age gap, gender) are associated with children’s teaching. By age 3 years, children show early evidence that they can teach their sibling; however, these skills improve greatly with age (e.g., Howe & Recchia, 2005). Older school-aged teachers are more likely to employ scaffolding, support, and verbal instruction to guide and structure the task for the learner, but they are also less controlling (Azmitia & Hesser, 1993; Recchia et al., 2009). Howe, Brody, and Recchia (2006) reported that older school-aged teachers accounted for
both task difficulty and the learner’s developmental skills by adjusting their teaching strategies accordingly. These teaching behaviors reflect learner-centered strategies (Palincsar, 1998), such as encouraging the learner’s participation and allowing them to correct their own mistakes (Howe et al., 2006; Poris & Volling, 2001; Recchia et al., 2009). Thus, previous research indicates age-related changes in sibling teaching strategies; nevertheless, the specific abilities accounting for age effects have not been investigated. As such, following from Davis-Unger and Carlson (2008), we examined whether social-cognitive developments in middle childhood may account for these patterns; we return to this point below.

In addition to developmental effects, the age gap between siblings may reflect important differences in power that influence dyadic interaction (Perlman, Siddiqui, Ram, & Ross, 2000). That is, with a larger age gap, the difference between older and younger siblings’ knowledge or expertise may be greater, and therefore, older siblings may wield more authority and may direct instruction in a teaching context (i.e., more like an adult). However, the literature on sibling age-gap differences and teaching is mixed. For example, with a larger age gap, teachers employed more frequent and a wider range of sophisticated strategies (Perez-Granados & Callanan, 1997). In contrast, Howe and Recchia (2009) reported more sophisticated learner-centered strategies and less negative feedback with a smaller age gap; perhaps when siblings’ abilities are relatively similar, the teacher may take the learner’s knowledge into account and exert power less frequently as they engage in more reciprocal (rather than hierarchical) interactions.

There are some indications that the gender composition of the dyad may be a contributing factor to how older siblings approach teaching (e.g., Cicirelli, 1972), although some studies reveal no gender effects (e.g., Howe et al., 2006; Recchia et al., 2009). During early childhood, older brothers are more likely than sisters to highlight critical task features (e.g., by pointing), especially with younger brothers (Klein et al., 2002). School-aged girls teach more frequently than boys, particularly with younger sisters who are also more likely to be actively engaged in learning (Poris & Volling, 2001; Stoneman, Brody, & McKinnon, 1986). Given these findings, the literature on gender effects suggests that the gender match between siblings may be a factor influencing children’s teaching strategies.

The Role of Social-Cognitive Skills in Teaching

There are both theoretical arguments and emerging empirical evidence linking children’s teaching and social-cognitive skills—in particular, theory-of-mind abilities (Astington & Pelletier, 1996; Davis-Unger & Carlson, 2008; Olson & Bruner, 1996). By definition, successful teaching implies an understanding
of the other’s mind (Strauss et al., 2002). Specifically, because the other person is less knowledgeable, the goal of teaching is to assist the learner in developing this knowledge (Frye & Ziv, 2005; Olson & Bruner, 1996). To accomplish this goal, the teacher must understand the degree or nature of the learner’s lack of knowledge and employ optimal strategies to help him or her acquire information or skills. By teaching’s very nature, it is not easy for children to balance these aspects; thus, successful teaching may depend on an understanding of the mind (Davis-Unger & Carlson, 2008; Olson & Bruner, 1996). In fact, during the preschool period, children develop an understanding of the teaching process, in line with their developing understanding of the mind. Three-year-olds grasp the concept that teachers require sufficient knowledge and that the gap between the teacher’s and learner’s knowledge is the reason for teaching (Ziv & Frye, 2004). However, only 5-year-olds realize that teaching is also dependent on the teacher’s belief that there is a disparity between the teacher’s and learner’s knowledge (whether or not an actual difference exists), which is the key to determining the success of the teaching. Strauss et al. (2002) also reported that 3-year-olds employed demonstration and modeling strategies while teaching a board game to a peer, whereas 5-year-olds used more sophisticated verbal techniques (e.g., explanations, checking the learner’s understanding, responding to their actions). These more sophisticated strategies were positively associated with an understanding of false beliefs regarding teaching (see also Davis-Unger & Carlson, 2008).

In sum, only a few studies have investigated associations between children’s teaching skills and their social-cognitive abilities, and these studies have focused on development during early childhood. Yet children on the cusp of middle childhood also undergo significant developments in their social-cognitive skills (Rogoff, 1998) and teaching abilities (Howe et al., 2006; Koester & Johnson, 1984; Perez-Granados & Callanan, 1997; Strauss & Ziv, 2004). Ziv, Solomon, and Frye (2008) argued that second-order theory-of-mind skills, or the ability to understand that a person can be wrong about another’s divergent perspective, may be necessary for children to have a fuller understanding of the dynamics of successful teaching (i.e., selecting the optimal teaching strategies and adjusting them according to the learner’s abilities). To our knowledge, this argument has not been applied to investigations of children’s actual teaching strategies. Second-order theory of mind may be particularly relevant to learner-centered teaching strategies, because these strategies depend on the teacher’s capacity to gauge whether the learner understands or fails to grasp the teacher’s perspective (e.g., beliefs, intentions) of the task. Thus, second-order theory of mind may be a key condition for the ability to adjust one’s teaching strategies accordingly (e.g., by providing further and more detailed instructions). We argue that a second, distinct
social-cognitive achievement of middle childhood may also be relevant to teaching. Children’s interpretive understanding of knowledge develops between ages 6 to 8 years and is defined by the ability to grasp that two people can be exposed to the same information but arrive at divergent yet equally legitimate conclusions (Carpendale & Chandler, 1996; Lalonde & Chandler, 2002). Arguably, this skill may make an important contribution to effective teaching, as children become aware of the inherently ambiguous quality of some stimuli and some forms of referential communication. Thus, children with an interpretive understanding of mind may be more likely to use strategies that effectively overcome these ambiguities (e.g., verbal attention-getting strategies to ensure that the learner clearly understands the referent of communication) and may also adjust strategies in the face of the learner’s divergent interpretations.

The Role of Context in Teaching and Learning

Although a variety of tasks (e.g., categorization games, constructing a toy, puzzles) have been employed in the literature, the influence of the task itself on children’s teaching strategies has rarely been examined. The issue of task differences can inform our understanding of how siblings approach teaching and adjust their strategies to reflect their conceptions of the process. Specifically, examining teaching across tasks that differ on key variables (e.g., transparency of the sequence of steps and task goals) provides insight into children’s understanding of teaching and illustrates how the teaching process may depend on the teacher’s attributions of the learner’s knowledge (Ziv & Frye, 2004). That is, although children start with the intent to teach, the unique steps and transparency of the task’s end goal may influence their use of specific strategies in the process of transferring knowledge and assessing what the learner knows. When the task is relatively repetitive or self-guiding (i.e., after the initial steps are explained, the same process is repeated across stages of the task), the need for detailed and elaborated teacher guidance diminishes. In this case, the learner may quickly demonstrate competence (and is no longer a novice), assume responsibility for learning, and complete the task relatively independently (Azmitia, 1988); thus, adept teaching may only require encouragement, praise, occasional help, and correction. In contrast, when engaged in a task having a number of discrete, sequential steps with ambiguous subgoals, teachers may need to employ more direct, extended, and elaborated strategies to ensure completion. Thus, by definition, effective teachers should recognize that the learner’s prior and developing knowledge differs across tasks, and they should use this understanding to adjust their teaching strategies to ensure the partner learns successfully (Ziv & Frye, 2004). In the present study, we employed two tasks differing
in degree of required teacher direction (i.e., based on unique or repeated steps) and transparency of the end goal.

The Present Study

We examined the associations between siblings’ teaching skills during two tasks and their social-cognitive abilities across the late-preschool and middle childhood years. We taught children two tasks: a) a self-guided or repetitive task (tanagrams puzzle), and b) a teacher-directed task (tractor construction). In the tanagrams task, the cards increased in difficulty, but the same procedure of matching pieces to the shapes to create pictures was followed for each card to achieve the end goal; thus, subgoals were repetitive and each new step did not necessarily require explicit instruction. In contrast, the tractor task was divided into discrete and unique subparts, and completion required the teacher’s direct instruction; the learner was informed about the end goal of constructing a tractor, but each individual step required explicit teaching. We assessed: a) types of teaching strategies, b) degree of learner involvement, and c) the learner’s successful completion of steps of the tasks.

The first set of questions examined whether our results supported previous findings regarding age and age-gap effects on sibling teaching strategies and learner success (Azmitia & Hesser, 1993; Howe et al., 2006; Recchia et al., 2009). We expected older teachers to employ more sophisticated and learner-centered strategies (e.g., instruction, verbal attention, demonstrating with learner participation, encouragement), whereas younger teachers would engage in more demonstration techniques without learner participation. Strategies were also predicted to be more strongly correlated with age in the tractor task, because the task demands (i.e., unique, sequential steps) should call for more sophisticated instruction to achieve the goal of construction. With a larger age gap between siblings, it was expected that the learner would be less involved and would demonstrate less success in both tasks (Howe & Recchia, 2009) due to the power and authority of the teacher who might be less likely to employ learner-centered strategies. Finally, both girls and boys were expected to be more effective teachers with same-gender siblings (Klein et al., 2002; Stoneman et al., 1986) but to employ somewhat different strategies. Specifically, girls would use more frequent teaching strategies (i.e., instruction, help, encouragement) with younger sisters, who would show greater success (Cicirelli, 1972, 1973; Poris & Volling, 2001), whereas older brothers might employ greater nonverbal attention (e.g., pointing) strategies (Klein et al., 2002) with younger brothers.

The second set of questions compared the patterns of teaching strategies in the self-guided or repetitive (tanagrams) versus teacher-directed (tractor construction) contexts. Questions regarding a) the consistency of children’s
style of teaching (e.g., learner centered or more teacher centered) across different contexts, and b) how the task demands influence teaching have received little attention in the literature. We expected that children’s approach or style of teaching would be consistent or relatively stable across the two tasks (Howe & Recchia, 2009) given children’s general conceptions of teaching (Recchia et al., 2009). Nevertheless, we also expected that the task demands would influence the relative frequency of particular strategies. Specifically, the teacher-directed task would require a greater variety of strategies (i.e., instruction, demonstrating with learner involvement, verbal attention, help) to convey the unknown information to the learner. In contrast, during the self-guided task, the procedure was repetitive and thus required less instruction, demonstration, and help but perhaps more encouragement to complete the increasingly difficult cards (Azmitia, 1988).

The final set of questions addressed how teachers’ social-cognitive skills (false belief, interpretive understanding of knowledge) were associated with teaching strategies, learner involvement, and task success. This set of questions extends the literature by identifying the abilities that may underlie age-related changes in the effectiveness of siblings’ teaching strategies. We expected the two social-cognitive abilities to make unique contributions to successful teaching (Austingon, Pelletier, & Homer, 2002; Carpendale & Chandler, 1996; Davis-Unger & Carlson, 2008), especially during the teacher-directed tractor task. That is, we expected both second-order false-belief and interpretive understanding to explain unique proportions of variance in relatively sophisticated strategies, which may be most reliant on the teacher’s ability to account for whether the learner’s task understanding matches his or her own knowledge. Specifically, we expected that, independent of age, teachers with more advanced social-cognitive skills would employ more instructions, use more attention-directing strategies, and more frequently involve the learner.

METHOD

Participants
The sample included 63 sibling dyads (17 female–female, 16 male–male, 14 female–male, and 16 male–female pairs). The mean age for older siblings was 6;3 (SD = 12.02 months), and for younger siblings, the mean age was 4;1 (SD = 9.84 months); the mean age difference between siblings was 2;1 (SD = 9.26 months). Families were generally middle class based on job descriptions, were from a range of ethnic backgrounds (South Asian, European, Black, Caucasian) and educational backgrounds, and lived in a
large urban (population of 3,000,000), bilingual (French/English) city. All children spoke English fluently. Written consent was obtained from parents, and verbal assent was obtained from children.

Procedure

Families were visited at home (58%), the university lab (27%), or day care center (15%). After a brief warm-up to establish rapport, the two counterbalanced teaching tasks (tractor, tanagrams) were individually introduced to the older sibling. Each task was videotaped and divided into a Research Assistant (RA) instruction session and a sibling teaching session, which occurred in immediate succession. In the tractor task, an RA instructed the teacher how to assemble 20 different pieces into a tractor and reviewed the steps by asking the child to construct the tractor. Subsequently, the child-teacher taught the task to his or her younger sibling (i.e., learner). The second task (tanagrams) included pieces of three shapes (triangles, diamonds, squares), two sizes (large, small), and four colors (yellow, green, blue, red), which were combined to form a preset pattern defined on a card (e.g., two triangles forming a diamond shape); each card increased in difficulty (i.e., more pieces and complex patterns). The same instructions were delivered for both tasks; children were told that they were going to learn to build a tractor (or make a picture on cards) and afterwards, they would teach the task to their sibling. All 63 dyads completed the tractor teaching; however, only 46 teachers had available data for the tanagrams task; reduced numbers were due to taping problems, instances in which less than 60% of the total cards were completed, or a lack of interest or cooperation. The older sibling’s social-cognitive understanding was assessed by two counterbalanced tasks: second-order false-belief understanding (Astington et al., 2002) and interpretive understanding of knowledge (Carpendale & Chandler, 1996).

Measures

Teaching tasks. To assess the older sibling’s teaching strategies, behaviors were coded into seven categories based on Howe and Recchia (2009) and Wood et al. (1995). Strategies included: a) encouragement (e.g., positive comments, praise), b) nonverbal attention strategies (e.g., pointing, handing objects), c) verbal attention (e.g., naming objects, asking learner to look), d) instruction (e.g., providing information about the function or placement of a piece), e) demonstration with learner involvement (i.e., show steps and allow learner to do it independently), f) demonstration without learner involvement (i.e., show steps but not allow learner to do it independently), and g) help (e.g., physical assistance or working together). The same codes were
used for both tasks, with the exception of demonstration with learner involvement, which occurred very infrequently during the tanagrams, so it was dropped for this task. During both tasks, each learner move was coded as either: a) successful (e.g., correct assembly of a tractor wheel on an axle, or aligning the red and green triangles in the appropriate diamond space on the card), or b) unsuccessful (i.e., error in assembly or placement); the proportion of successful moves (ratio of successful/total moves) was calculated. Learner involvement was also noted (i.e., the number of steps that the learner completed independently).

**Second-order false-belief task.** To assess the older siblings’ ability to infer second-order false beliefs (i.e., a hypothetical protagonist can be wrong about what another person thinks), children were presented with two counterbalanced puppet plays (scenarios and response-coding scheme from Astington et al., 2002). For example, in one scenario, a boy deliberately misleads his friend by moving a board game from the closet to under the bed. However, unbeknownst to him, she witnesses the event. As such, the boy is mistaken about the girl’s belief regarding the game’s current location. After several control questions ensured that children understood each story and could pass a first-order false-belief test (i.e., whether the boy thought the girl saw him hide the game), children were asked where the boy thought the girl would look for the game and to justify their answer. Children’s replies were not included for a scenario if they answered any control question incorrectly; responses were scored as passing if they a) correctly answered the second-order false-belief question (i.e., “He thinks she’ll look in the closet”), and b) provided a relevant justification, such as referring to the protagonist’s mistaken belief (e.g., “He doesn’t know she saw him”) or the reason for this mistaken belief (e.g., “Her mom wanted to surprise her”). Scores were averaged across the two scenarios to yield an overall proportion score (i.e., number of correct responses to second-order false-belief questions, divided by the total number of scenarios for which the child correctly answered all control questions; range = 0 to 1).

**Interpretation task.** This task assessed children’s understanding that two protagonists could interpret the same ambiguous stimulus differently (Carpendale & Chandler, 1996). Children were presented with two counterbalanced scenarios using puppets as props. One scenario involved ambiguous referential communication (i.e., a penny hidden under a “red block,” when the setup included both a large and small red block). The other task involved lexical ambiguity (i.e., waiting for a pear/pair). For each scenario, two puppets were presented as coming to different but equally legitimate conclusions about the stimulus (e.g., a pear to eat/a pair of shoes). Children were asked: a) why the two puppets disagreed, b) whether it made sense that they
disagreed, c) why this did or did not make sense, d) whether it would be possible to predict how a third character would interpret the information, e) why it would or would not be possible to predict a third character’s interpretation, f) whether a deviant interpretation was plausible (e.g., that the penny was hidden under a third, blue block), and g) why a deviant interpretation was or was not plausible. Children received a score out of 7 for each scenario (1 point for each correct response) for a possible total score of 14; the proportion of correct responses was created (i.e., number of correct responses divided by 14; range = 0 to 1).

Reliability

Reliability was determined for the coding by assessing 20% to 25% of teaching sessions by different teams of naïve coders; reliability was calculated with Cohen’s kappas: tractor teaching and learning behaviors > .80; tanagrams teaching and learning behaviors > .84; second-order false-belief = .92; interpretive understanding of mind > .86.

RESULTS

Descriptive information is presented first, followed by the analyses of the sibling structural variables, patterns of teaching and learning across and within tasks, and finally associations with the social-cognitive measures.

Descriptive Information

Descriptive information for the teacher strategies and learner behaviors is reported in Table 1. Descriptive data for the two social-cognitive variables were: a) second-order false-belief \( (M = 0.42, \ SD = 0.43; \ N = 54) \) and b) interpretation task \( (M = 0.37, \ SD = 0.18; \ N = 60) \).

Sibling Structural Variables and Teaching and Learning Behaviors

Age of teachers and learners. First, in the tractor task, Pearson correlations with the teacher’s age revealed significant associations with: a) nonverbal attention, \( r = .31 \) (all \( ps < .05 \)); b) instruction, \( r = .34 \); c) demonstration with learner involvement, \( r = .37 \); d) help, \( r = .26 \); and e) demonstration without learner involvement, \( r = -.36 \). Similarly, in the tanagrams task, older teachers were more likely to use encouragement, \( r = .43 \). The other (nonsignificant) correlations between age and tanagrams teaching strategies were in the ±.20 range or smaller, suggesting that the greater preponderance of
age effects for the tractor task was not exclusively an issue of limited power to detect effects in the tanagrams task. Second, older learners were more successful in both the tractor and tanagrams tasks ($r = .47$, $r = .52$, respectively; all $p < .01$) and were more involved in both tasks ($r = .36$, $r = .58$, respectively). The pattern of findings supported our hypotheses and was generally in line with previous findings regarding age-related changes in sibling teaching. Below, we extend these findings by examining whether individual differences in social-cognitive skills (with age controlled) accounted for unique variability in these strategies.

**Age gap.** To examine age-gap effects, we controlled for the older or younger sibling’s age as appropriate (to avoid confounding chronological age and age gap) and then conducted partial correlations with mean age difference. In the tractor task, age gap was associated with teacher’s encouragement ($r = .26$, all $p < .05$), and in the tanagrams task, age gap was associated with demonstration without learner involvement ($r = .32$) and verbal attention ($r = .39$). There were no associations between age gap and learner behaviors in the tractor task, but contrary to expectations, in the tanagrams task, age gap and learner involvement were positively associated ($r = .26$, $p = .05$).

**Gender of teachers and learners.** To examine gender effects, we conducted $2 \times 2$ (older sibling gender) × $2$ (younger sibling gender) multivariate

### TABLE 1
Descriptive Statistics for Teacher and Learner Behaviors in the Tractor and Tanagrams Tasks

<table>
<thead>
<tr>
<th>Teaching strategy</th>
<th>Tractor task</th>
<th>Tanagrams task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SD) $N$</td>
<td>$M$ (SD) $N$</td>
</tr>
<tr>
<td>Encourage</td>
<td>2.52 (3.80) 63</td>
<td>4.90 (5.80) 46</td>
</tr>
<tr>
<td>Nonverbal Attention</td>
<td>4.70 (3.80) 63</td>
<td>5.69 (5.63) 46</td>
</tr>
<tr>
<td>Verbal Attention</td>
<td>10.54 (9.46) 63</td>
<td>16.67 (19.80) 46</td>
</tr>
<tr>
<td>Instruction</td>
<td>22.57 (15.34) 63</td>
<td>14.82 (13.82) 46</td>
</tr>
<tr>
<td>Help</td>
<td>1.25 (1.93) 63</td>
<td>0.48 (0.81) 46</td>
</tr>
<tr>
<td>Demonstration Without Learner Involvement</td>
<td>14.62 (8.71) 63</td>
<td>4.00 (5.94) 46</td>
</tr>
<tr>
<td>Demonstration With Learner Involvement $^b$</td>
<td>7.86 (4.65) 63</td>
<td>n/a n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learner Behavior</th>
<th></th>
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<tbody>
<tr>
<td>Learner Involvement During Teaching</td>
<td>8.03 (5.85) 63</td>
<td>11.93 (8.97) 46</td>
</tr>
<tr>
<td>Proportion of Successful Steps During Teaching</td>
<td>0.71 (0.22) 54</td>
<td>0.74 (0.28) 40</td>
</tr>
</tbody>
</table>

$^a$When the child did not complete all the cards but had finished at least 60% of the task, this number was prorated to be expressed on five cards.  
$^b$This strategy was not coded for the tanagrams due to its infrequent occurrence.
analyses of variance (MANOVAs) examining gender effects on teaching strategies in the a) tractor (i.e., seven strategies) and b) tanagrams tasks (six strategies). Then, we conducted two similar MANOVAs (for the tractor and tanagrams tasks) to examine gender effects on each of two learner behaviors (i.e., involvement and proportion of successful steps).

The MANOVA examining teaching strategies in the tractor task revealed a multivariate interaction between older and younger siblings’ gender, Wilk’s $\lambda = .77, F(7, 53) = 2.28, p < .05, \eta^2 = .23$. Follow-up analyses of variance (ANOVAs) revealed significant interactions for instruction, $F(1, 59) = 6.38, p < .05, \eta^2 = .10$, and encouragement, $F(1, 59) = 12.74, p < .01, \eta^2 = .18$. Older sisters used more instructions with younger sisters ($M = 27.12, SE = 3.62$) than with younger brothers ($M = 16.93, SE = 3.99$). In contrast, older brothers used more instructions with younger brothers ($M = 27.06, SE = 3.73$) than with younger sisters ($M = 18.19, SE = 3.73$). In turn, older sisters used more encouragement with younger sisters ($M = 5.41, SE = 0.82$) than with younger brothers ($M = 1.14, SE = 0.90, p < .01$), whereas, older brothers were equally likely to encourage younger brothers ($M = 0.69, SE = 0.84$) and younger sisters ($M = 2.50, SE = 0.84$). The MANOVA examining teaching strategies and gender in the tanagrams task revealed no significant findings, nor did either MANOVA examining learner behavior.

Patterns of Teaching and Learning Behavior Within Tasks

The purpose of these analyses was to examine the associations between teaching and learner involvement within the two contexts. As evident in Table 2, learner involvement in both tasks (controlling for both learner and teacher age) was positively associated with teachers who were positive and helpful, focused the attention of the learner, provided some direct instruction, and demonstrated with learner involvement. When teachers demonstrated the task steps but expected the learner to be passive, not surprisingly, the learner was less actively involved in the construction process. Interestingly, in the tanagrams task, this strategy was negatively associated with the learner’s success during the teaching session. In other words, learners were not only less involved but were less successful when they were involved.

Patterns of Teaching Strategies Across Tasks

The purpose of these analyses was to determine whether teachers’ use of particular strategies varied across the tractor and tanagrams tasks. A 2 (task) × 6 (strategy) ANOVA revealed a main effect of strategy, $F(5, 225) = 40.22, p < .001, \eta^2 = .47$, which was qualified by an interaction, $F(5, 225) = 17.65, p < .001, \eta^2 = .28$. Specifically, teacher encouragement occurred
more in the tanagrams task ($M = 4.90, SE = 0.86$) than in tractor task ($M = 2.44, SE = 0.60$), as did verbal attention (tanagrams, $M = 16.67, SE = 2.92$; tractor $M = 9.78, SE = 1.10$). In contrast, teachers employed more instruction strategies in the tractor task ($M = 21.71, SE = 2.17$) than in the tanagrams task ($M = 14.82, SE = 2.04$), and employed more help (tractor, $M = 1.26, SE = 0.32$; tanagrams, $M = 0.48, SE = 0.12$). Demonstrating without learner involvement also occurred more frequently in the tractor task ($M = 13.78, SE = 1.31$) than in the tanagrams task ($M = 4.00, SE = 0.88$). Finally, there were no significant differences in nonverbal attention in the two tasks (tractor, $M = 4.41, SE = 0.56$; tanagrams, $M = 5.68, SE = 0.83$). In general, the findings supported the prediction that teachers would employ more instructional strategies and help in the teacher-directed tractor task and would employ greater encouragement and verbal attention in the self-guided tanagrams task.

As expected, a number of teaching strategies were positively correlated across the two tasks after controlling for teacher age (see Table 3). Teachers who employed encouragement strategies in the tractor context also did so during the tanagrams. The pattern of associations between teaching strategies was generally positive except when teachers demonstrated without actively involving the learner. In this case, they were less likely to provide

### Table 2

<table>
<thead>
<tr>
<th></th>
<th>Learner involvement during teaching</th>
<th>Proportion of successful steps during teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tractor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage</td>
<td>.42**</td>
<td>.14</td>
</tr>
<tr>
<td>Nonverbal Attention</td>
<td>.49**</td>
<td>-.08</td>
</tr>
<tr>
<td>Verbal Attention</td>
<td>.33*</td>
<td>.21</td>
</tr>
<tr>
<td>Instruction</td>
<td>.50**</td>
<td>.09</td>
</tr>
<tr>
<td>Help</td>
<td>.37**</td>
<td>.15</td>
</tr>
<tr>
<td>Demonstration Without Learner Involvement</td>
<td>-.37**</td>
<td>-.16</td>
</tr>
<tr>
<td>Demonstration With Learner Involvement</td>
<td>.55**</td>
<td>-.08</td>
</tr>
<tr>
<td><strong>Tanagrams</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage</td>
<td>.41**</td>
<td>.14</td>
</tr>
<tr>
<td>Nonverbal Attention</td>
<td>.48**</td>
<td>.12</td>
</tr>
<tr>
<td>Verbal Attention</td>
<td>.51**</td>
<td>.22</td>
</tr>
<tr>
<td>Instruction</td>
<td>.39**</td>
<td>.16</td>
</tr>
<tr>
<td>Help</td>
<td>.29†</td>
<td>.25</td>
</tr>
<tr>
<td>Demonstration Without Learner Involvement</td>
<td>-.46**</td>
<td>-.69**</td>
</tr>
</tbody>
</table>

†p < .10. ‡p < .05. **p < .01.
instruction, help, or encouragement (trend) and were less likely to demonstrate with learner involvement. Overall, these patterns support the hypothesis that teaching behaviors would be associated across contexts.

Patterns of Learner Behavior across Tasks

This set of analyses examined the patterns of learner behavior (i.e., involvement and proportion of successful moves) across the two tasks. A 2 (task) × 2 (learner behavior) ANOVA indicated main effects of task, $F(1, 35) = 8.00, p < .01, \eta^2 = .19$, and of learner behavior, $F(1, 35) = 174.98, p < .001, \eta^2 = .83$, which were qualified by an interaction effect, $F(1, 45) = 8.11, p < .01, \eta^2 = .19$. Although learner involvement occurred more in the tanagrams task ($M = 14.15, SE = 1.27$) than in the tractor task ($M = 10.61, SE = 1.27$), learners were equally successful in both tasks (tanagrams, $M = 0.77, SE = 0.04$; tractor, $M = 0.75, SE = 0.03$). Partial correlations (with learner age controlled) revealed no significant associations between measures of learner involvement or success in the two teaching sessions.

Social-Cognitive Measures and Teaching and Learning Behaviors

These analyses investigated the associations between teaching strategies and children’s social-cognitive skills (second-order false-belief and interpretation skills), after controlling for teacher age (see Table 4). Interestingly, the

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**TABLE 3**

Associations Between Teaching Strategies in the Tractor and Tanagrams Tasks (Teachers’ Age Controlled)

<table>
<thead>
<tr>
<th>Tanagrams task</th>
<th><strong>Encourage</strong></th>
<th><strong>Nonverbal attention</strong></th>
<th><strong>Verbal attention</strong></th>
<th><strong>Instruction</strong></th>
<th><strong>Help</strong></th>
<th>Demonstrate without learner involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tractor task</strong></td>
<td><strong>Encourage</strong></td>
<td><strong>Nonverbal attention</strong></td>
<td><strong>Verbal attention</strong></td>
<td><strong>Instruction</strong></td>
<td><strong>Help</strong></td>
<td>Demonstrate without learner involvement</td>
</tr>
<tr>
<td>Encourage</td>
<td>.56**</td>
<td>.27*</td>
<td>.70**</td>
<td>.40**</td>
<td>.12</td>
<td>–.25*</td>
</tr>
<tr>
<td>Nonverbal Attention</td>
<td>-.03</td>
<td>.13</td>
<td>.22</td>
<td>.07</td>
<td>.27*</td>
<td>–.23</td>
</tr>
<tr>
<td>Verbal Attention</td>
<td>.48**</td>
<td>.31*</td>
<td>.43**</td>
<td>.38*</td>
<td>.15</td>
<td>–.49**</td>
</tr>
<tr>
<td>Instruction</td>
<td>.26*</td>
<td>.24</td>
<td>.28*</td>
<td>.33*</td>
<td>.09</td>
<td>–.42**</td>
</tr>
<tr>
<td>Help</td>
<td>.21</td>
<td>.38**</td>
<td>.22</td>
<td>.25*</td>
<td>.31*</td>
<td>–.23</td>
</tr>
<tr>
<td>Demonstration Without Learner Involvement</td>
<td>-.11</td>
<td>-.22</td>
<td>-.13</td>
<td>.05</td>
<td>-.30*</td>
<td>.31*</td>
</tr>
<tr>
<td>Demonstration With Learner Involvement</td>
<td>.43**</td>
<td>.27*</td>
<td>.38*</td>
<td>.39**</td>
<td>.19</td>
<td>–.39**</td>
</tr>
</tbody>
</table>

$p < .10, *p < .05, **p < .01.$
magnitude of associations was stronger in the teacher-directed tractor task than in the self-guided tanagrams task. With age controlled, both social-cognitive measures were positively associated with more frequent encouragement, verbal attention, and help strategies, but only in the tractor task. Second-order false-belief skills were also associated with teachers who were more likely to engage in instruction during both tasks. The pattern of findings supported our hypotheses.

The two social-cognitive measures were positively correlated ($r = .51$, $p < .05$), even with age controlled ($r = .29$, $p < .05$). Thus, in the three instances in which both social-cognitive variables were associated with teaching strategies in the tractor task, we conducted follow-up hierarchical regression analyses to test unique associations with second-order false-belief and interpretation skills. Teacher age was entered in the first step, followed by the two social-cognitive measures in the second step. The relevant teaching strategy was entered as the dependent variable. In the case of teacher encouragement, the addition of the two social-cognitive variables did not explain a significant amount of additional variance with age accounted for, $R^2\Delta = .10$, $p < .10$, and neither of the unique effects was significant ($\beta s < .27$, ns). In contrast, both second-order false-belief ($\beta = .42$, $p < .01$) and interpretive understanding ($\beta = .38$, $p < .05$) made unique contributions to the prediction of teachers’ verbal attention-getting strategies in the tractor task, $R^2\Delta = .28$, $p < .001$. Finally, the social-cognitive measures added to the prediction of teacher’s help in the tractor task, $R^2\Delta = .21$, $p < .01$. However,

TABLE 4
Associations Between Teachers’ Strategies and Scores on Measures of Social-Cognitive Ability (Teachers’ Age Controlled)

<table>
<thead>
<tr>
<th></th>
<th>Tractor task</th>
<th>Tanagrams task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Second-order</td>
<td>Interpretation</td>
</tr>
<tr>
<td></td>
<td>false-belief</td>
<td></td>
</tr>
<tr>
<td>Encourage</td>
<td>.24*</td>
<td>.18</td>
</tr>
<tr>
<td>Nonverbal Attention</td>
<td>.04</td>
<td>-.07</td>
</tr>
<tr>
<td>Verbal Attention</td>
<td>.42**</td>
<td>.37**</td>
</tr>
<tr>
<td>Instruction</td>
<td>.40**</td>
<td>.17</td>
</tr>
<tr>
<td>Help</td>
<td>.41**</td>
<td>.28**</td>
</tr>
<tr>
<td>Demonstration Without Learner Involvement</td>
<td>-.05</td>
<td>-.18</td>
</tr>
<tr>
<td>Demonstration With Learner Involvement</td>
<td>.14</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>-.04</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note. These analyses were also conducted controlling for mean length of utterance; however, there were no differences in the pattern of significant findings as reported in the table.

$\dagger p < .10$. $^* p < .05$. $^{**} p < .01$. 

$y$
while the unique effect of second-order false-belief understanding was significant \( (\beta = .44, p < .01) \), the effect of interpretive understanding was not \( (\beta = .23, ns) \).

**DISCUSSION**

First, we discuss findings related to the structural variables, then the patterns of teaching and learning across and within tasks, and finally associations with social-cognitive skills.

**Teaching, Learning, and Structural Features of Sibling Relationships**

These findings addressed how children’s teaching and learning behaviors were influenced by the structural variables defining sibling relationships. As expected, the age of the teacher was positively related to several teaching strategies, although the specific associations between age and teaching techniques varied between tasks, as predicted. In the tractor task, the unique and discrete sequence of construction steps apparently prompted older teachers to use a wide variety of verbal (i.e., instructions, help), nonverbal (i.e., pointing), and physical demonstration (i.e., both with and without learner involvement) strategies, which may indicate a learner-centered approach to teaching (Palincsar, 1998). This pattern is generally in line with the literature indicating that older teachers are more likely to employ verbal and physical instruction, scaffolding, and support to guide and structure the task for the learner (Davis-Unger & Carlson, 2008; Howe et al., 2006; Poris & Volling, 2001; Recchia et al., 2009). During the self-guided or repetitive tanagrams task, older teachers were only differentiated by their greater use of encouragement. Apparently, the repetitive nature of this task reduced the need for much direct instruction and the learner assumed greater independence (Rogoff, 1998). However, older teachers were more encouraging, perhaps as a strategy to motivate the learner to complete the cards or keep on task; nevertheless, given the reduced number of learners who completed the task, this strategy may not have been completely successful. Our findings make an important contribution to the literature by highlighting the flexibility in older children’s capacity to assess which strategies are appropriate in a given situation (see also Howe et al., 2006). Future research should consider the teaching context when assessing children’s skills.

Not surprisingly, older learners achieved greater success (i.e., fewer errors) and were more actively involved in both teaching sessions. Perhaps older learners approached the tasks with greater prior knowledge and understanding of the requirements for learning (Wang & Frye, 2010), such
as paying attention, asking questions, and requesting explanations (Howe & Recchia, 2009; LeBlanc & Bearison, 2004). Apparently, older learners also had a greater understanding of the tasks as evidenced by making fewer mistakes.

The age-gap variable was also a significant influence on children’s use of particular strategies, although not all associations were in the predicted direction. Interestingly, sibling age gap was positively associated with greater use of encouragement in the tractor task, perhaps suggesting that teachers were motivated to keep his or her much younger sibling focused on construction. In the tanagrams task, age gap was associated with teachers who demonstrated without learner involvement and employed verbal attention strategies, yet learners were more likely to be involved. In future studies, it may be helpful to chart how teaching behaviors vary across the course of a task (e.g., by examining whether teacher demonstrations give way to increasing learner involvement).

Our findings regarding gender differences in teaching styles supported previous literature, particularly research indicating that the same-gender match between teacher and learner may be a key factor. In our study, both male and female teachers employed more instruction and encouragement strategies with same-gender younger siblings during tractor construction, which echoes reports by Klein et al. (2002), Poris and Volling (2001), and Stoneman et al. (1986). Perhaps, in a context that demanded a more nuanced approach to teaching (tractor), similarities in style between siblings or knowledge of the other’s understanding and skills gained via their close relationship were responsible for the same-gender patterns; certainly, further study is required.

Patterns of Teaching and Learning Behaviors Across Tasks

Teachers were consistent in their approach to teaching as demonstrated by the positive associations between strategies across the two tasks, yet they also had a range of techniques in their teaching repertoire (Frye & Ziv, 2005). Apparently, some teachers employed a learner-centered or guided participation approach that included instruction, help, encouragement, and demonstration while expecting the learner to be actively involved in the process (Palincsar, 1998; Rogoff, 1990, 1998). In contrast, teachers who demonstrated the steps of the task but did not encourage or allow active learner involvement were less likely to use a range of strategies. This style of a highly controlling teacher and a passive learner defines a more teacher-centered or instructivist style (Recchia et al., 2009). In the tanagrams session, the instructivist style was negatively associated with learner success (even with children’s ages controlled), indicating that passive learners had more difficulty
figuring out how to complete the task correctly on their own. Perhaps this controlling approach to teaching was less effective in a task where, following the initial explanation, learners could have completed the task relatively independently (with only some encouragement by the teacher). This approach may reflect the teacher’s weaker understanding of the learner’s abilities or knowledge and requires further investigation.

The demands of the two tasks appear to have influenced older siblings’ teaching strategies. The teacher-directed tractor task, in which the learner did not have prior knowledge of the specific steps, in fact, pulled for greater instruction, help, and use of demonstration without active learner involvement. This pattern of findings does not seem surprising given the demands of the task and that each step required new and unique pieces of information be completed, which could not easily be gleaned from the previous steps (e.g., “The driver doesn’t sit; he stands up like the Flintstones!”). In contrast, once the first tangrams card was explained, a set procedure was repeated requiring minimal further instruction, and thus, the learner could guide his or her own learning. Teachers did employ more verbal attention strategies to point out the correct shapes or orientation of the pieces (e.g., “See the point? You need a piece to fit in there.”), which is a relatively more passive teaching strategy than, for example, demonstration or instruction. One purpose of verbal attention strategies may be to structure the task so the learner can focus on the correct steps while being able to complete it independently (Rogoff, 1990, 1998). At the same time, teachers employed encouraging statements (e.g., “good job”; “carry on”) so as to keep the learner engaged as the cards became increasingly difficult. In sum, teachers appeared to adjust their strategies appropriately given the requirements and constraints of the two tasks. These findings provide converging evidence that teachers in early and middle childhood have an understanding of the nature of teaching and what kind of knowledge the learner may lack for completing a task (Frye & Ziv, 2005; Olson & Bruner, 1996) and that they adjust their strategies accordingly (Howe et al., 2006).

Sibling Teaching and Social-Cognitive Skills

As described above, past research has examined developmental age-related patterns in sibling teaching. However, to our knowledge, our study was the first to attempt to delineate the underlying social-cognitive abilities that may explain these effects. In particular, we investigated associations between the older child’s teaching strategies and their performance on two social-cognitive measures: second-order false-belief and interpretive theory of mind. While accounting for teacher’s age, both measures were positively associated with two teaching strategies in the tractor task (i.e., verbal attention, help),
whereas instruction was only positively associated with second-order false-belief and encouragement with the interpretation measure. In the case of verbal attention, with age accounted for, both skills made unique contributions to the prediction of this teaching strategy. However, only second-order false-belief emerged as a significant unique correlate of teacher help. The only significant finding for the tanagrams task was the positive association between instruction and second-order false-belief understanding. These patterns once again implicate the nature of the teaching task, in this case, qualifying associations with children’s social-cognitive skills. Interestingly, it was during the teacher-directed tractor task that children’s understanding of belief was most related to the types of strategies they employed. As noted earlier, the steps in this task were not apparent without instruction, and success depended upon the teacher’s understanding of the learner’s lack of knowledge and of how to transfer the appropriate knowledge to the learner (Frye & Ziv, 2005; Rogoff, 1998) in unambiguous ways. In the tanagrams task, learners also initially required an explanation of the task, and apparently, teachers with greater social-cognitive understanding more frequently engaged in this strategy.

By including school-aged children in our sample, we have extended the literature demonstrating associations between preschoolers’ teaching strategies and their social-cognitive skills (Davis-Unger & Carlson, 2008). As Wood et al. (1995) and Ziv et al. (2008) argued, second-order false-belief skills may be necessary for children to have a fuller understanding of the dynamics of teaching, specifically which strategies are optimal given the learner’s knowledge of the teacher’s goals or beliefs and how to adjust the use of strategies accordingly. Our findings also indicate that having an interpretive understanding of knowledge—specifically, that two people can be exposed to the same information but arrive at different but plausible conclusions—may be a skill that is relevant to teaching. Nevertheless, the findings also suggest that the contributions of the two social-cognitive skills are not identical. That is, interpretive understanding may possibly facilitate the teacher’s ability to structure the context so as to promote learning (LeBlanc & Bearison, 2004), perhaps by recognizing the inherent ambiguity surrounding particular steps and how to proceed with highlighting critical factors (e.g., verbally indicating the correct piece or orientation). Teachers may use such strategies intentionally so as to promote the learner’s understanding (Ziv & Frye, 2004; Ziv et al., 2008). Yet it must be noted that the observational nature of our study does not allow us to determine the extent to which teachers were explicitly aware of the strategies that may be most appropriate for each task. As such, investigating the extent to which teachers can express an explicit understanding of these issues is an important direction for future research.
CONCLUSIONS

Our findings are limited by several factors, including the predominately middle-class participants and a moderate sample size. Further, the reluctance of some children to complete the tanagrams task resulted in a somewhat smaller sample size for this task, perhaps limiting our ability to detect differences. Yet, as noted above, the patterns of significance across tasks did not seem to be solely due to differences in power, as the size of the effects in the tanagrams task were generally rather modest. Further studies might include multiple instances of each type of task to clarify the differences between teacher-directed and self-guided tasks. Also, it would be informative to employ self-correcting materials (e.g., puzzles, stacking toys) to determine if learners can recognize and correct their own mistakes after initial teaching. Finally, given possible associations between (a) siblings’ social-cognitive abilities within the same family, and (b) the learner’s social-cognitive abilities and siblings’ teaching/learning behavior, it may be informative in the future to assess the learner’s social-cognitive skills. This may provide insight into how the learner’s understanding may be linked to dyadic behavior in various teaching contexts.

Nevertheless, our study makes an important contribution to the literature on children’s teaching. By focusing on sibling dyads, we have examined children’s understanding of the dynamics of teaching within the context of a close, often affectively intense relationship, characterized by a long history of shared experiences. This context provides an excellent opportunity to assess how both teachers and learners co-construct their understanding during a bidirectional activity and establish a shared and collaborative understanding of the task (LeBlanc & Bearison, 2004). Further, by focusing on children teaching their sibling and not an adult learner, we have investigated children’s skills in a context defined by an asymmetry of knowledge rather than an asymmetry of authority, which is more evident in adult–child contexts (Piaget, 1950; Tudge & Rogoff, 1989). Certainly, our findings have educational implications for the literature on peer tutoring, where both the tutee and tutor gain knowledge through collaborative learning (Flynn, 2010). Additionally, these findings highlight that a focus on the processes involved in peer teaching are warranted (Wood et al., 1995)—namely, that the context and nature of tasks, gender composition of teacher–learner dyads, and the teacher’s social-cognitive skills may each be associated with the nature and success of peer-tutoring experiences for children.

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