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Can older siblings scaffold?
Effects of task difficulty on use of instructional strategies

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Abstract

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Sibling teaching can be theoretically understood within current social cognitive

frameworks via concepts of guided participation and scaffolding (Vygotsky, 1978),

where the teacher creates supportive situations to help the learner extend current skills

and knowledge (Rogoff, 1990). Evidence suggests that young school-aged children

adjust their problem-solving strategies according to task requirements and

characteristics such as speed and accuracy (Garner & Rogoff, 1990). Moreover, young

school-aged sibling teachers demonstrate early signs of scaffolding during teaching

(Perez-Granados & Callanan, 1997). The purpose of the present study was to investigate

whether older siblings would adjust their strategies while teaching their younger siblings

a series of block tasks increasing in difficulty. Results indicated that older siblings

effectively scaffolded for their younger siblings by providing a greater number of

teaching strategies in the more challenging tasks. Also, across all tasks, siblings were

more likely to employ a greater number of strategies when learners were younger.

Finally, a larger age gap between older and younger siblings was related to use of a

greater number of teaching strategies across all tasks. Findings are discussed in terms of

their contribution to the knowledge of children's abilities to teach their younger siblings

and how these interactions may promote cognitive, social and emotional skills for both

teachers and learners. Clearly, teachers took account of developmental differences in
their scaffolding strategies and results provide strong support for current social cognitive
approaches (Rogoff, 1990).

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Statement of the Problem

Psychologists from diverse backgrounds have stated that early sibling relations may be developmentally important; nevertheless, direct studies of sibling interaction are scarce in the literature (Dunn, 2000, 1983). More specifically, studies on sibling teaching are found to be even sparser; therefore, research on this topic is needed. Dunn (1983) argued that siblings have a special relationship marked by a distinctive affective tone and they spend much time together, which brings them to develop consistent styles of interaction. Also, frequent prosocial interaction has been observed between siblings in home-based studies, especially when they have a friendly and affectionate relationship (Dunn, 1988). This, therefore, gives siblings occasions for repeated perspective-taking. Moreover, research has shown that the presence of siblings in the family increases children's cognitive skills, in particular cognitive and affective perspective-taking during siblings' social interactions (Howe, 1991; Perner, Ruffman, & Leekman, 1994). More specifically, sibling teaching has been found to be related to increased cognitive skills. In fact, research has found that sibling teaching results in higher test scores for the learner than does peer teaching and also increases in the language achievement of the teacher (Azmitia & Hesser, 1993). During their exchanges, siblings are at times involved in complementary interactions where one plays a more dominant or leading role than does the other (Hinde, 1979). An example of this type of interaction is sibling teaching.

Regarding the theoretical framework concerning the phenomenon of sibling teaching, theories from three main authors will be described: (a) Vygotsky and the concept of zone of proximal development, (b) Rogoff and the concept of guided

participation, and (c) Bruner with the concept of scaffolding (Rogoff, 1990; Vygotsky, 1978; Smith, Cowie, & Blades, 1998). These different concepts all consist of some type of assistance, guidance and support on the part of the teacher while the learner is an active agent of his or her learning. For theoretical purposes, the present proposal will be based specifically on the concept of guided participation by Rogoff. As for previous research studies concerning more structured situations of sibling teaching, Cicirelli (1971, 1972, 1973, 1975) has extensively studied several factors involved in this activity. He has found that sisters are more effective teachers compared to brothers, especially in a more formal and structured situation, regardless of the gender of the younger sibling. In addition, during sibling teaching, older sisters tend to use a deductive style of teaching whereas older brothers tend to use a more inductive style.

Other studies have found that children who are around seven years of age are capable of adapting their strategies depending on the specificity of a situation. Children aged seven to nine have been found to adjust their strategies according to task requirements and task characteristics (Gardner & Rogoff, 1990). Also, children seem to adapt their instructional strategies according to the characteristics of the learner, as they do not teach siblings and peers in the same manner. When teaching their sibling, children are more actively involved, more likely to correct and provide feedback to the learner compared to when they teach a peer (Koester & Johnson, 1984). Another study by Perez-Granados and Callanan (1997) reported that 7-year-old sibling teachers tended to offer informatives to their younger sibling while teaching them a picture categorization game, in a similar manner as their mother did while teaching this younger sibling, whereas 6-year-old sibling teachers did not. It, therefore, appears that the 7-

year-old sibling teachers may be illustrating early signs of a scaffolding approach to teaching.

Another factor found to be significant in affecting children's efficacy of scaffolding and guided participation during teaching is level of familiarity. Koester and Bueche (1980) reported that more familiar peer tutors used the assistance strategy more often, therefore including more active tutee involvement, compared to less familiar peers who used the demonstration strategy more often thereby decreasing tutee involvement. This familiarity factor could be interesting in the investigation of sibling teaching, considering the fact that siblings are very familiar with each other (Dunn, 1983).

Based on the findings and evidence described above, the present study investigated sibling teaching involving 7- to 9- year-old teachers with younger siblings during more and less difficult teaching tasks. In particular, the question investigated was the following: was the teacher able to adapt his or her instructional strategies, during guided participation, to the level of difficulty of the task for the sibling learner. The study also investigated how these specific instructional strategies changed, qualitatively and quantitatively, across these tasks.

The Special Sibling Relationship

Judy Dunn is a central author in the literature on siblings. She has investigated, for example, topics such as sibling interactions and relationships, as well as siblings' developing emotional understanding and socialization (e.g., Boer & Dunn, 1992; Dunn, 1983; Dunn, 1988). She believes that siblings can play an important role in children's development (Boer & Dunn, 1992). Dunn (1983) explained that children's interest in their sibling was revealed not only in the frequency with which they interacted at home

but also in the quality of their interactions. Among the many interactions between young siblings, second-born children frequently imitated their older sibling, which indicated the importance of the elder child as a model for the younger, whereas first-borns typically took on leadership roles (Abramovitch, Corter, & Pepler, 1980). In addition, sibling interaction was strongly marked by affective tone, whether it was positive or negative. Dunn (1983) stated that in home-based studies, friendly, cooperative, and helping acts were frequently observed (e.g., Howe & Ross, 1990). She added that the affective perspective-taking necessary to prosocial behavior, was probably due to the close familiarity, the evident warmth of affection, and the similarity of worlds existing between siblings.

Eisenberg (1992) explained how the sibling relationship is unique and distinct from the parent-child relationship. Siblings have more of an equal status when interacting with each other compared to parent-child interactions. Siblings also spend greater amounts of time with each other than they do with their parents, particularly in middle childhood (Cooper & St-John, 1990; Eisenberg, 1992). During the time they spend together, siblings have many opportunities to interact in a prosocial manner. Dunn (1988) argued that siblings who have a friendly and affectionate relationship will be more likely to act prosocially toward one another than will siblings who have an unfriendly relationship.

Siblings also have the possibility of engaging in two different types of interactions, namely reciprocal and complementary. Both these types of interactions offer different and unique contributions to the development of children in the same family. Play is one example of reciprocal prosocial interaction because both children

usually have a relatively equal status as well as equal opportunities to direct the course of the activity (Howe, Bukowski, & Aquan-Assee, 1997). Hinde (1979) explained that the reciprocal relationship concerned the extent to which the behavior of both participants was similar, which in turn could be based on similarity in personal characteristics. In fact, siblings possess more similar characteristics between themselves than they do with their parents due to their relative closeness in age.

Another type of interaction found between siblings is said to be complementary. Activities such as helping, caregiving and teaching are examples of complementary prosocial interactions. These types of interactions are defined as such because they involve hierarchical status (e.g., birth order) and therefore, one sibling has more knowledge or experience, or is older than the other and takes the lead in teaching, caring or helping (e.g., Brody, Stoneman, MacKinnon, MacKinnon, 1985; Cicirelli, 1973, 1971; Stewart & Marvin, 1984). Hinde (1979) stated that complementary interactions between individuals involved differing but complementary behavior in the participants and that dominant-subordinate interactions were by definition complementary. For example during an activity, one person may take the lead and the other will follow or vice versa. When investigating interactions between siblings, complementarity between them is inevitable due to the natural mismatch of their ages and competencies (Azmitia & Hesser, 1993).

Siblings have been known to engage in both reciprocal and complementary interactions under different circumstances. Among other things, siblings support each other in times of need, provide models for each other and give each other advice. Older siblings can also care for and comfort their younger siblings when they are distressed.

The intimate relationship siblings have and the amount of time they spend together both contribute to their deep understanding of each other's feelings and also permit them to develop familiar and consistent styles of interaction (Eisenberg, 1992). Considering the above information, we can conclude that the special sibling relationship offers unique and enriching opportunities and circumstances for prosocial interaction and for the development of children in the same family.

Previous findings have illustrated that the quality of the sibling relationship appears to be an important factor affecting interactions and cognitive understanding between siblings. For example, Howe (1991) found that during naturalistic observations of siblings in their home, preschoolers who directed more positive affective behavior toward their younger sibling also referred to internal states more often. In addition, more references were made about their younger sibling than about themselves. Also, older siblings appeared to be more concerned with the emotions, wants, and abilities of their younger sibling than they were with their own. Findings from this study appear to demonstrate that older siblings who have a good relationship with their younger sibling are clearly aware of and concerned with the existence and types of internal states their younger sibling is experiencing.

The present study explored the cognitive issues involved in sibling interactions and used the literature described above as evidence for the deep cognitive understanding and connection siblings have toward each other, particularly in circumstances where a positive affective relationship is present. More specifically, information concerning the quality of the sibling relationship was assessed, in order to help understand teaching interaction outcomes. The next section will discuss the theoretical framework relevant to

the teaching phenomenon in general. The perspectives of authors such as Lev S.

Vygotsky, Barbara Rogoff, and Jerome Bruner will be presented.

Theoretical Framework Related to Sibling Teaching

Three main authors found in the literature on education have analyzed, each

from their own perspective, the phenomena of teaching, instruction, or learning. One of

these authors is Vygotsky (1978), who analyzed children's development and learning.

He believed that: "...human learning presupposes a specific social nature and a process

by which children grow into the intellectual life of those around them." (Vygotsky,

1978, p. 88) Based on this social interaction, Vygotsky posed the concept of the zone of

proximal development. This term consists of the "...distance between the actual

developmental level as determined by independent problem solving and the level of

potential development as determined through problem solving under adult guidance or

in collaboration with more capable peers." (p. 86) He explained that children's learning

has been mistakenly restricted as matching only their actual developmental level, which

implies that children's mental abilities can only be determined by things they can do on

their own. The notion of what children can do with the assistance of others, in

Vygotsky's view, is more indicative of their mental development than what they can do

alone. The zone of proximal development, therefore, defines the functions that have not

yet matured but are in the process of maturation. By using this mechanism through

which the internal course of development can be understood, one cannot only take

account of the cycles of maturation processes that have been completed but also those

that are also currently being developed. Vygotsky stated that an essential feature of

learning was that it creates the zone of proximal development. Internal developmental

processes are provoked by learning and are functional only when the child is interacting with others in her or his environment. These processes are then internalized and become part of the child's independent developmental achievement. Vygotsky, therefore, believed that developmental processes follow the learning process and that the gap between these two is the zone of proximal development. In the context of the present study, the main variable of interest was whether the child teacher was capable of adjusting this zone of proximal development across the two levels of task difficulty, by providing more help and guidance to the learner during the more difficult tasks.

Barbara Rogoff (1990) is another author interested in this type of phenomenon of learning through social activity identified by Vygotsky: her interests lie with the concepts of guided instruction and participation. Rogoff's book (1990) entitled *Apprenticeship in Thinking* takes a sociocultural approach to cognitive development, using much of Vygotsky's theory. Rogoff refers here to interactions between children and caregivers who could either be parents, siblings, classmates, and teachers. The term, guided participation, suggests that both guidance and participation are necessary in children's apprenticeship in thinking, implying that children play an active role in their own development. It involves interpersonal communication (i.e., intersubjectivity) through words or emotional tone, as well as arrangements for setting the stage for the children's activities. It also must be jointly managed by the children and their companions, in ways that facilitate the children's developing skills and participation in the activities of the mature members of their community. The processes of guided participation include: building bridges between what children know and new information to be learned, structuring and supporting children's efforts, and giving

children the responsibility for carrying through the problem-solving, which together all provide direction and organization for children's cognitive development within the context of their culture. In addition, it entails having either adults or children challenge, constrain, and support children in the process of posing and solving problems. This can occur with children observing and participating at a comfortable but slightly challenging level, through material arrangement (e.g., retrieving an out-of-range object) and/or through interpersonal communication. Rogoff emphasized more tacit forms of communication during daily life exchanges in contrast to Vygotsky, who considered language as the most meaningful tool for thought. Also, Rogoff placed greater importance on the daily activities in which children participate that are not explicitly designed to instruct, contrary to Vygotsky who emphasized higher cognitive functions such as those found in formal schooling. The present research, therefore, involved siblings in a teaching situation who, as Rogoff has argued, could be possible caregivers to a younger sibling. As was mentioned earlier, to investigate more naturalistic interactions between the children, observations were made in the children's homes.

Another author concerned with a similar type of phenomenon to guided participation is Jerome Bruner. Bruner (1996) is in accordance with Vygotsky (1978) and Rogoff (1990) concerning the thesis that children's cognitive development does not occur in a vacuum or on its own. A child's development depends on her or his practical grasp of a certain topic or situation she or he is deciphering. The mastery of one stage will lead to better, earlier, and deeper thinking in the next stage, which involves novel and challenging problems in this area. In this case, scaffolding could be used to foster and deepen the child's knowledge and skills based on her or his current stage of

development. Bruner uses the term "scaffolding" to refer to similar concepts to Vygotsky's zone of proximal development and Rogoff's guided participation. Smith, Cowie, and Blades (1998) explain that Bruner's term refers to the wide range of activities through which either the adult or the more expert peer, help the learner achieve a certain goal she or he otherwise would not be able to attain on her or his own. Examples of scaffolding could be modelling an action, suggesting a problem-solving strategy, or by structuring an activity into manageable sections. Scaffolding involves a flexible and child-centered strategy and provides support to the child as well as feedback regarding the learner's performance. Scaffolding behavior on the part of the more experienced person can be more or less pervasive, according to the learner's level of mastery of the task at hand and her or his degree of dependence on the teacher. When a skill is mastered, scaffolding is no longer necessary. The present study, therefore, investigated the effects of these different levels of learner mastery and dependence on the scaffolding abilities of the older sibling.

In conclusion, the theories of Vygotsky (1978), Rogoff (1990) and Bruner (Smith, Cowie, and Blades, 1998) all consist of different explanations relating to a similar instructional phenomenon occurring between two individuals. Vygotsky emphasised school-age children's learning and therefore has dealt mostly with the zone of proximal development involved in formal scholastic teaching taking place between a child learner and an adult teacher. Similarly, Bruner has presented the process of scaffolding as occurring between an adult and child, but adds that this interaction can occur between child peers of differing expertise as well. Also, Rogoff explained that guided participation occurs essentially between adults or caregivers and children as well

as between peers; however, her interests are more focused on informal daily activities. Contrary to Vygotsky and Bruner who did not make explicit reference to sibling interaction in their work, Rogoff only sporadically and briefly mentioned in her book the existence of guided participation between siblings. Even current research on scaffolding and guided participation (Kermani & Janes, 2001; Mulvaney, 2001; Vandermaas-Peeler & Way, 2001; Vandermaas-Peeler, Way, & McClymonds, 2001) focused on adult-child interactions and failed to investigate this phenomenon with siblings. Recent research by Poris and Volling (2001) studied several social and cognitive correlates of sibling teaching while using Vygotsky's theoretical concept of scaffolding, but did not investigate the factor of task difficulty.

Although the phenomena described above concern the same type of interactions, the present study specifically used the concept of guided participation for purposes of theoretical framework precision and clarity. The rationale for this choice was based on Rogoff's clear illustrations regarding the processes and behaviors involved in teaching activities. Rogoff mostly described teaching between caregivers and children; however, the present study investigated teaching between siblings as they do engage in this complementary interaction (Hinde, 1979). Siblings also simultaneously possess the dual qualities of peers as well as dominant and subordinate partners. This is due to both their relative equal status in the family as well as to their natural mismatch in age and competencies (Azmitia & Hesser, 1993). Despite a careful review of the literature, however, it appears that there is an absence of studies having observed sibling scaffolding according to task difficulty, from Rogoff's perspective. The present sibling teaching research therefore provided additional knowledge and understanding of this

event. Concerning sibling teaching interactions, certain cognitive advantages have been found to result from the fact that children teach their sibling. Studies that have investigated this phenomenon will be discussed in the following section.

The Relation Between Sibling Teaching and Increased Cognitive Skills

Certain research studies have investigated the effects of sibling teaching on the cognitive development of children in the same family. Azmitia and Hesser (1993) compared the effects of child, sibling, and peer triadic interactions during (a) an unstructured building and teaching session, and (b) in a structured teaching-only session where children were given construction materials with movable parts. Learners were 7-year-olds, whereas older peers and siblings were both 9-year-olds. In the first session, all three children were present in the same room accomplishing the building task. During the second session either the older sibling or peer and the learner participated in the structured teaching situation. The learner then completed a posttest of the building task by him or herself. Findings illustrated that older siblings' and older peers' teaching behaviors shared certain similarities. Nevertheless, other teaching behaviors between older sibling and peer teachers were different from one another. Specifically, children taught by siblings obtained higher posttest scores than they did when taught by older peers. In the unstructured building context, siblings spontaneously provided more guidance than peers did. In the teaching context, siblings gave more frequent explanations and positive feedback than peers did. These findings indicate that sibling effects occur in different tasks and they do so both in the presence and absence of a peer. When analyzing the contribution of the learner in the unstructured building context, these children were more likely to observe, imitate, and request help from their sibling

than from their peer. In the teaching context, learners who were taught by their siblings were more active than the ones who were taught by their peers. Specifically, they asked more questions, requested more explanations, and challenged their siblings' control of the task more frequently.

Azmitia and Hesser's findings indicate that in the teaching situation, both the teacher and the learner actively contribute to the activity. This corresponds to contemporary models of cognitive learning, where the concept of coregulation is central to instructional interactions (Rogoff, 1990; Vygotsky, 1978). As Rogoff (1990) explains in guided participation, the learner is active in his or her own development as he or she seeks, structures and even demands the assistance of the teacher in learning how to solve problems. On the other hand, the teacher also needs to build bridges between the known and the new information, support the child's efforts and provide direction for his or her learning. This is achieved through intersubjectivity, a mutual understanding during communication between teacher and learner (Rogoff, 1990). The present study investigated these phenomena across tasks of differing difficulty.

Another study by Smith (1993) longitudinally investigated the advantages of sibling teaching. This study built on results originating from a previous study by the same author and brought further information to these findings by adding a 2-year follow-up study to the original sample. The participants in this study were students in grades 9 and 11 and their younger siblings, who had also been tested two years earlier. The author found that growth in language achievement during adolescence was positively associated with self-reported teaching of younger siblings. These results indicate important positive outcomes resulting from teaching a younger sibling.

Cicirelli (1971, 1972, 1973, 1975) has extensively investigated the phenomenon of structured teaching situations between siblings. This body of research has greatly contributed to the understanding of this type of complementary sibling interaction. The next section will concern the content of these studies.

Earlier Studies on Sibling Teaching

Few researchers have examined cross-age interactions among siblings in structured instructional situations, although, Cicirelli (1971, 1972, 1973, 1975) has conducted several studies on the theme of sibling teaching. Cicirelli (1972) investigated concept learning of young children as a function of whether the teacher was a peer or a sibling. This study was a quest for evidence demonstrating that sibling interaction was an intervening mechanism between sibling status and sibling achievement. Siblings and non siblings were paired and the older child taught a trapezoid concept to the younger child. The author found that sex of the learner had a significant effect, with boys scoring higher than girls. In addition, results showed an interaction between the gender of the teacher and the sibling relationship to the learner, irrespective of the sex of the younger child. Sisters were not only more effective than brothers in teaching younger siblings, but they were also more effective in teaching their younger siblings than girls were in teaching unrelated younger children. Brothers were not only less effective than sisters in teaching their younger siblings, but also less effective than boys in teaching younger unrelated children. In addition, there was little difference in the effectiveness of boys and girls as teachers of younger unrelated children, while sisters were more effective than brothers in teaching their sibling. These findings bring interesting and important

evidence to our understanding of the effects of older sisters when involved in the sibling teaching situation.

During the sibling teaching sessions employed by Cicirelli (1972), the teaching behaviors were coded using specific categories of instructional strategies. The author found that (a) girls who taught their siblings tended to use the deductive method (i.e., where teachers provided explanation of rules followed by examples) more often than other teachers, while boys who taught their siblings tended to use the inductive method (i.e., teachers provided examples and learners had to abstract the rules with varying degrees of guidance by teachers) more often than did other teachers; (b) girls teaching their siblings tended to do more explaining, describing, and defining of the concept than did other teachers; (c) girls teaching their siblings and boys teaching nonsiblings tended to do more demonstrating and illustrating attributes of the trapezoid than did other teachers; girls teaching nonsiblings did least of all; (d) teachers of siblings tended to be more selective of the examples presented than teachers of nonsiblings; (e) girls teaching their siblings tended to give less feedback than other teachers; (f) girls teaching nonsiblings tended to give incorrect feedback more often than other teachers.

One interesting finding from Cicirelli (1972) showed that overall, older sisters were the most effective teachers, regardless of the gender of the younger sibling. It would appear that older sisters were the most able to create the zone of proximal development between their younger sibling and themselves. This occurred through social interaction and guided problem solving, which then resulted in learning for the younger sibling (Rogoff, 1990). Based on this evidence, the present study on structured

sibling teaching hypothesized that older sisters would scaffold more effectively for their younger sibling in the more difficult tasks than would older brothers.

Another study by Cicirelli (1973) investigated effects of sibling structure and interaction on children's categorization style by observing sibling pairs: some with an age gap of two years and others with an age gap of four years. In some of the pairs, the younger sibling worked alone on an object-sorting task while in the other pairs, the older sibling helped the younger one. Subsequently, the younger siblings were asked to do the same task alone. The authors found that the younger siblings previously helped by their older siblings created more groups of objects. In addition, they found that younger siblings previously helped by siblings who were four years older, made larger groups and left fewer objects ungrouped on the second object sorting task than the children who had been helped by siblings only two years older. This study brings further knowledge to the understanding of the sibling teaching situation by indicating that a larger age gap between the siblings (four years) strengthens the performance of the learner. It appears, therefore, that a sibling who is four years older has increased scaffolding abilities, meaning he or she is better able to help the learner achieve a goal unattainable alone, when teaching a younger sibling (Smith et al., 1998). The present study observed siblings with age gaps that ranged from 1.3 to 3.6 years (mean age gap = 2.3 years). This permitted further exploration of the abilities of siblings with a closer age difference.

Cicirelli (1975) investigated the effects of mother and older sibling on the problem-solving behavior of the younger child. The subjects were young children with their older sibling and their mothers. There were three treatment conditions where the younger sibling worked: (a) on a practice problem-solving task alone, (b) with the help

of their sibling, and (c) with the help of their mother. Subsequently, the younger

children in each condition completed a second problem-solving task on their own. The

results indicated that children, who worked alone on the practice task and had an older

brother, obtained higher strategy scores than did children with an older sister. However,

the children who had an older brother and who were helped by this older brother or by

the mother showed no improvement in strategy over the children who had first worked

alone. When an older sister or mother helped, children demonstrated improved problem-

solving. This study's results indicated an interaction between the gender of the sibling

and whether this sibling was directly or indirectly teaching the child. One hypothesis

given here is that under informal or incidental learning conditions, the older brother's

competitiveness and rivalry stimulates the younger child to learn more than with the

older sister. Whereas, in a more formal teaching situation, the older sister expects to

give help and the younger child expects to receive it. These findings provide additional

evidence for the conclusion that older sisters are most effective at formal teaching in a

more structured situation. It therefore appears that older sisters are better able than older

brothers to scaffold and provide more adequate guided participation during a teaching

task, so that learning can occur (Rogoff, 1990).

Stewart (1983) observed sibling interaction in a quasi-naturalistic setting where

the older child taught the younger sibling how to use a toy camera. The older sibling

was between 3 and 5 years of age and the younger child was between 1 and 2 years of

age. The child teacher was taught how to use the camera, his or her conceptual

perspective-taking abilities were assessed through game-like tasks, and then he or she

was asked to teach the younger sibling how to play with the toy in the mother's

presence. The author found that the preschool-aged child was capable of providing instruction concerning the operation of a toy to a younger sibling, to a certain extent, when asked to do so. This finding appears to indicate that even young preschool children begin to develop scaffolding skills, guiding a less experienced child to achieve a goal, when teaching their younger sibling (Rogoff, 1990). However, the effectiveness of the sibling instruction in the study by Stewart (1983) was constrained by the competencies of both teacher and learner due to their young ages. In addition, results in Stewart (1983) showed that sibling teaching was highly dependent upon maternal intervention. Indeed, no intersibling instructional activity was observed unless the mother was active in either encouraging or assisting either the child or the infant during the sibling teaching. Results from this exploratory study of early sibling teaching behavior offer useful information; however, the pervasive involvement of the mother during the teaching situation renders the assessment of the mutually regulatory nature of the siblings' interactions difficult. The siblings in the present study were mostly 7- and 8-year-old children with their younger sibling. Their respective ages permitted for independent and sophisticated sibling teaching interactions without necessary maternal intervention.

There is an extensive literature on how mothers adjust their instructional strategies in order to correspond to their children's age and level of ability according to the task at hand (Bellinger, 1979; Bridges, 1979; Rogoff et al., 1981; Wertsch, McNamee, McLane, & Budwig, 1980). It is evident that mothers and their children are very close and familiar to one another, as the mother-child instruction studies have illustrated. However, siblings also have an intimate relationship and develop familiar

and consistent styles of interaction with each other (Eisenberg, 1992). The present study, therefore, investigated effects of teaching tasks of different difficulty levels on teachers' use of instructional strategies, to better understand guided participation involved in sibling teaching. The following section will discuss earlier studies that have shown children's ability to successfully adapt their strategies across different tasks.

Teachers' Strategy Adaptation across Tasks

Certain studies have looked at whether teachers are able to adapt their strategies depending on task variables and learner characteristics while accomplishing a task. In previous literature, this concept of varying support according to the needs of the learner has been discussed while using different terms such as scaffolding, effective guidance, fine-tuned or sensitive teaching, behavioral contingency, intersubjectivity, shared thinking, joint learning and transfer of responsibility (Göncü & Rogoff, 1998; Perez-Granados & Callanan, 1997; Poulin-Dubois, Graham, & Sippola, 1995; Vygotsky, 1978). These different labels all relate to the behavioral and psychological phenomena that occur during teaching interactions.

One study by Gardner and Rogoff (1990) illustrated this concept of strategy adaptation across different tasks. The authors investigated the strategies used by children while solving mazes. One of the tasks required children to be accurate in their problem-solving and was designed to increase their awareness of the importance of advance planning to avoid errors. Another problem-solving task, with instructions to use speed as well as accuracy, was designed to favor improvisational planning. In both these tasks the mazes involved long dead-end alleys that required quickly looking ahead in the maze to avoid errors. A third task with shorter dead-end alleys, which therefore needed only

quick looking ahead in the maze to avoid errors, was introduced with instructions to be accurate and was designed to elicit improvisational planning. The ages of the children in this study ranged from four to nine years. The authors found that the children adapted their deliberation in planning according to the circumstances of the problem, suggesting that an important aspect of planning skills was adaptation of planning strategies to varying goals and tasks. Even the younger children in this study (aged 4-7 years) used both advance and improvisational planning adapted to the problem's circumstances. However, the older children (aged 7-9 years) seemed more proficient in this adaptation than were the younger children. This study, therefore, indicated that children aged four to nine, especially the older ones (7-9 years), appear to possess the ability to adapt their problem-solving strategies according to the specific characteristics and circumstances of the task at hand, just as adults can. Based on this literature, the present study observed older siblings aged seven to nine in order to investigate whether they could apply this strategy adaptation ability to the scaffolding involved in teaching their younger sibling tasks of differing difficulty.

Another study investigated children's capacity to adapt their instructional strategies according to the characteristics of the learner. Koester and Johnson (1984) studied the instructional strategies of a child tutoring a younger sibling and then a younger peer. The older tutors were about six years of age and were paired with both a sibling and a familiar peer who were both about four years old. The tasks involved different block designs that were illustrated full-size onto a white background poster board. Each child had to place the blocks of different forms over the appropriate area of the design. The older tutor was first left alone to familiarize him or herself with the tasks

and practice. Then, the younger child was introduced and the older child was told to teach both the sibling and peer how to put together each of the block designs. When teaching siblings, the children were more actively involved, more likely to correct and provide feedback. These results indicated that child tutors were sensitive to the learner's characteristics and were capable of adapting their instructional strategies to this other child. This brings additional support to and also further extends the findings of the previously described study by Gardner and Rogoff (1990) demonstrating children's ability to adapt their problem-solving strategies according to task circumstances.

Comparing children's and adults' instructional strategies. Other studies in the literature have investigated the types of instructional strategies specifically used by children, compared to adults', during the teaching situation. This body of research appears to indicate that children's teaching strategies are qualitatively different from adults'. One study by Ellis and Rogoff (1982) compared adults and children as teachers; adult-child and unrelated child-child dyads participated in two teaching situations involving classification tasks that resembled home and school activities. The participating child teachers were 9-year-olds and the child learners in all dyads, both adult-child and child-child, were 7-year-olds. The authors found that during the classification tasks, the child teachers used more nonverbal than verbal instruction and provided information specific to the items or individual instances more often than group relationship information. On the other hand, the adult teachers used more verbal instruction and provided more group-related than item-specific information. However, adult and child teachers did not differ in the amount of nonverbal information provided. It, therefore, appears that when the children's results were compared to the ones obtained

by the adults, the former did not compensate for their lower level of verbal instruction by increasing their amount of nonverbal instruction. In addition, it seems that the learners who were taught by adults received more total information (especially verbal grouping information) and performed better on posttests of memory and generalization than did learners taught by children.

Ellis and Rogoff (1982) explained that it was possible the poorer teaching performance of the child teachers may have been due to the numerous demands placed on them. Specifically, not only did these tasks require that teachers transmit the appropriate information to the child learner, but also that they manage the interpersonal relations and roles with the other child during the teaching tasks. In addition, the tasks required that teachers provide information relevant to the learner's future performance on the posttest. The integration of these different demands could have been overly complex, cognitively and socially, for the child teachers. This may explain why they seem to have responded by distributing their limited cognitive resources to allow a successful resolution of the larger task through neglecting subtasks (e.g., by focusing on the placement of items and neglecting review of the material for the subsequent posttest). The authors added that the child teachers' performance regarding the limited learner involvement during the tasks suggested they had difficulty perceiving the zone of proximal development or region of sensitivity necessary for optimal instruction (Vygotsky, 1978). The authors also explained that previous research had shown that effective instruction aimed at a level that does not require the child to do too much alone, yet allows the child some degree of participation. This refers to the phenomenon of guided participation by Rogoff (1990) where the learner is actively seeking learning

while the teacher simultaneously needs to provide adequate support and guidance for this learning (e.g., building bridges between what is known and new information). Ellis and Rogoff (1982) also added that children may be more proficient teachers on problems that are more familiar to them and in which they are expert.

Ellis and Rogoff's (1982) arguments appear to be well-founded and logical. However, concerning possible future research attempts to improve certain aspects of this study, further investigation of teaching interactions could provide more information regarding this phenomenon. The authors mentioned in their discussion the importance of task familiarity in regards to child-teacher effectiveness. Other studies investigating the teaching phenomenon have explored the effects of the familiarity factor regarding different aspects of the teaching situation. For example, the degree of familiarity existing between teacher and learner appears to have a positive effect on the teaching situation. Earlier studies have found that the specific relationship between the teacher and the learner appears to be associated with increased efficacy of the teacher. Specifically, sibling teaching, when compared to teaching between peers, increases teacher effectiveness (Cicirelli, 1972; Koester & Johnson, 1984). As Eisenberg (1992) explains, siblings have a unique and intimate relationship due to the large amount of time they spend with each other and because of their relative closeness in age. These factors all contribute to the deep understanding siblings may have of each other's feelings and also permits them to develop familiar and consistent styles of interaction with each other.

Comparing siblings' and mothers' instructional strategies. Another study by Perez-Granados and Callanan (1997) investigated the specific teaching abilities of

siblings when compared to the teaching effectiveness of their mothers. Child teachers

were about six years of age and child learners were about age three. The mother-child

and sibling pairs played a picture categorization game. Results of this study showed that

siblings had different teaching styles and goals compared to mothers. In general, older

siblings' teaching style included more directives and emphasized making the correct

choices, whereas mothers' teaching style included providing information in a more

indirect way and did not emphasize their children making the correct choices. When the

authors further analyzed the older siblings' teaching style as a function of their age, the

7-year-olds tended to offer informatives whereas the 6-year-olds did not. Thus as they

got older, siblings approached the teaching tasks in a manner similar to their mothers,

that is by offering information to guide their younger siblings' classification choices.

Therefore, based on these latter results, it appears that older siblings may be illustrating

early signs of a scaffolding approach to teaching, which is similar to how mothers

approached this task. Based on the findings that 7-year-old older siblings' seem to have

acquired new scaffolding skills while teaching, the present research further investigated

this ability by observing children of this age while they taught their younger sibling

more or less difficult tasks. This permitted the discovery of whether siblings could adapt

their scaffolding behaviors to these different situations.

Studies have shown that children use specific types of instructional strategies

with different frequencies when they are teaching other children. Koester and Bueche

(1980) investigated the teaching styles and strategies used by 4-year-old tutors when

placed in an instructional task situation with a 3-year-old peer. The children were asked

to recreate and complete a series of seven block designs, based on specific designs that

were drawn beforehand on plates. They were required to lay the appropriate blocks over the design plate itself. The design plates were always presented in the same order during each session, beginning with the simplest working up to what appeared, as assessed in the pilot study, as slightly more complex tasks.

Results from the study by Koester and Bueche (1980) showed that the most frequent teaching strategy used was demonstration, followed by assistance with the task itself and then explanation about the block design. Tutors used the category of joint explanation and demonstration very little. It also appears that males used the correction strategy more than did females when teaching their peer. Regarding the tutees' general task responses, only the tutees paired with the tutors who predominantly used either demonstration or assistance were used in this analysis. Results regarding this showed that the tutor's use of demonstration was associated with lack of tutee participation, and the tutor's use of assistance was associated with active tutee involvement. It seems that the majority of tutors used nonverbal demonstration and did not actively involve the tutee in the learning process, although the second most important category of assistance did include active involvement of the learner. A most intriguing result from this study concerned the level of familiarity between the tutee and tutor affecting the teaching interaction. Specifically, tutors who were more familiar with their tutees used the strategy of assistance most often (therefore including tutee involvement); however, the pairs who were less familiar with each other used the strategy of demonstration most often (therefore lacking tutee involvement). This refers to the phenomenon of guided participation where the teacher guides the learner's skills to be acquired, however, the learner also seeks new knowledge and is active in this interaction (Rogoff, 1990).

Koester and Bueche (1980) explained that the seven block designs used were presented to the children in an increasing order of difficulty. In their results, however, the authors did not report how this gradual increase in difficulty affected the children's performances, either for the tutor or for the tutee. The present study, therefore, investigated these effects on the sibling teachers' strategies, by using a similar task as the one used in the study by Koester and Bueche, with increasingly complex block designs. In addition, the present study's coding scheme for teaching strategies was developed with the help of Koester and Bueche's comprehensive behavior categories. Additionally, the tutees' general task responses used in the authors' research, which were dichotomized as "Does not attempt task/Completes task," were used in a similar manner in the present study. The categories for response index of the learner were "Successful completion of task/ Unsuccessful completion of task," and this provided additional information concerning older siblings' teaching effectiveness.

The most relevant of Koester and Bueche's results for the present study indicated that more familiar peer tutors used the assistance strategy the most and also included more active tutee involvement. This finding was used as part of the rationale for the present sibling teaching study. Siblings have an intimate relationship, spend great amounts of time together, and therefore develop a deep understanding of each other's feelings and also develop familiar and consistent styles of interaction (Eisenberg, 1992). Observing siblings instead of peers in the teaching situation has permitted for a better understanding of teacher effectiveness in this type of interaction because of the increased level of familiarity between teacher and learner. The following section will present information specifically regarding the present study.

The Present Study

Previous studies on semi-structured sibling teaching situations (e.g., Cicirelli, 1972, 1973, 1975; Poris & Volling, 2001; Stewart, 1983) have explored various factors involved in such interactions; however, none of these studies has explicitly investigated Rogoff's (1990) phenomenon of guided participation across tasks of different levels of difficulty. Research by Perez-Granados and Callanan (1997) and Poris and Volling (2001) presented relevant theory by Vygotsky and Rogoff in their introduction. The study by Perez-Granados and Callanan observed and compared mothers' and siblings' semantic teaching styles while they categorized pictures that were controlled for difficulty. To bridge the apparent gap in the literature, the present study investigated sibling teaching during tasks of differing difficulty, to further examine the theoretical concept of guided participation. The sibling pairs studied consisted of child teachers aged seven to nine with their younger sibling.

Hypothesis 1: Other studies on mother- or adult-child interactions have investigated the scaffolding phenomenon occurring across instructional tasks differing in perceived difficulty for the child learner (Bellinger, 1979; Bridges, 1979; Rogoff et al., 1981; Wertsch et al., 1980). These studies showed that when mothers or adults were asked to teach children two different tasks or the same task at two different ages, adults effectively adjusted their instructional strategies or styles of communication to suit the child's level of perceived difficulty. One study by Rogoff et al. (1981) asked mothers to teach their child a home and school classification task where the latter was intended to be more difficult for the learner than the former. Possible confounding factors, however, emerging from the qualitatively different tasks used in this research, would require more

stringent control of the aspect of perceived task difficulty. The present research, therefore, investigated the perceived difficulty factor from a different perspective: the same task was used and only the level of difficulty was manipulated. This permitted for more detailed investigation of sibling teachers' scaffolding abilities during these tasks. The specific question of interest here was if the older sibling teacher effectively scaffolded for the child learner or not, and how this occurred. Scaffolding was analyzed regarding frequency and type of teaching strategies used across the tasks.

A study by Gardner and Rogoff (1990) showed that children aged seven to nine were able to adjust the strategies they used while solving mazes according to instructions that either emphasized speed or accuracy. This study illustrated that children of this age are capable of adjusting and accommodating their strategies according to what is required of them. In addition, Perez-Granados and Callanan (1997) observed and compared mothers and siblings playing a picture categorization game. The authors found that siblings aged seven years used informatives whereas siblings of six years did not, indicating that the older siblings approached the teaching tasks in a manner similar to their mothers, that is by offering information to guide the younger child's classification choices. This study, therefore, indicated that 7-year-old sibling teachers seem to be illustrating early signs of a scaffolding approach to teaching.

Given the above literature, hypothesis 1 was advanced: Overall, it was predicted that sibling teachers would use more scaffolding strategies with the learner in the more difficult tasks than in the less difficult tasks. That is, in the more difficult tasks all teachers would be more likely to engage in strategies such as physical demonstration, explanation/description, hint/prompt/question and corrective feedback.

Hypothesis 2: Moreover, studies by Cicirelli (1972, 1975) have found that older sisters appear to be the most effective teachers, especially in a formal teaching situation, irrespectively of the gender of the learner. Specifically, older sisters have been found to use a deductive style of teaching and are more likely to use strategies such as illustration of attributes and explanation, description, definition and demonstration of concepts compared to older brothers (Cicirelli, 1972). Older sisters were also found to give less feedback when teaching their sibling compared to older brothers, probably due to their deductive method of teaching, making feedback less relevant. On the other hand, older brothers were found to use an inductive style of teaching and were less effective teachers compared to older sisters. This may be due to sibling rivalry because boys have a tendency to react more intensely to sibling displacement. Older brothers close in age to younger siblings (2-4 years) would demonstrate more hostility, competitiveness, and jealousy than would older sisters.

Given the above literature, hypothesis 2 was advanced: (a) It was predicted that across all tasks older sisters would employ more strategies such as explanation/description, hint/prompt/question and more lower physical control (physical demonstration) and would employ less corrective feedback, praise and less higher physical control when teaching their younger sibling compared to older brothers; (b) It was predicted that across all tasks, older brothers would employ more teaching strategies such as higher physical control (physical demonstration), corrective feedback and would employ fewer strategies such as explanation/description, hint/prompt/question and less lower physical control (physical demonstration) than older sisters when teaching their younger sibling.

Hypothesis 3: Finally, another important aspect of the sibling relationship found to affect sibling prosocial interaction was the quality of the relationship. As Dunn (1988) explained, siblings who have a friendly and affectionate relationship will be more likely to act prosocially toward one another than will siblings who have an unfriendly relationship. In addition, Stewart and Marvin (1984) have found that friendly sibling relationships were positively associated with perspective-taking skills, which are essential for effective sibling teaching. The present study, therefore, assessed the siblings' relationship quality, while using a modified version of the Sibling Behavior and Feelings Questionnaire, to better explain the kinds of behaviors that occurred during the teaching sessions (Mendelson, Aboud, & Lanthier, 1994).

Given the literature, hypothesis 3 was advanced: It was predicted that sibling teachers reporting a more warm and affectionate relationship with their younger sibling would be more likely to effectively scaffold for their younger sibling in the more difficult tasks than would older siblings in a less warm and more conflictual relationship. More specifically, it was predicted that (a) older siblings in a warmer relationship would be more likely to engage in teaching strategies such as explanation/description, hint/prompt/question, praise, and a low-level of physical control (physical demonstration) than siblings in a more conflictual relationship. However, it was predicted that (b) older siblings in a more conflictual and less affectionate relationship would be more likely to engage in teaching strategies such as high-level of physical control (physical demonstration) and corrective feedback than siblings in a warmer and more affectionate relationship.

Hypothesis 4: Cicirelli (1975) found that learners taught by older sisters had higher strategy scores than children who were taught by their older brothers. In the present study, learner success was evaluated by whether the younger sibling completed the task correctly or incorrectly. Given this literature, hypothesis 4 was advanced: It was predicted that older sisters teaching their younger sibling would have a greater number of successful learner response rates (i.e., successfully completed tasks) overall, compared to older brothers.

Method

Participants

The sample for the present study was composed of French-speaking middle-class families living in the Montreal area. The number of years of education of one of the parents ranged between 12 and 30 years ($M = 18.5$ years, $SD = 3.79$ years). The number of children living in the participants' homes ranged between two and five ($M = 2.8$, $SD = .83$). Participants consisted of 28 sibling pairs where teachers ranged in age between 7.3 years to 9 years ($M = 8.2$ years, $SD = 6.38$ months) and learners ranged in age between 4.1 years to 7.7 years ($M = 5.11$ years, $SD = 10.05$ months). The age difference between siblings ranged from 1.3 year to 3.6 years ($M = 2.3$ years, $SD = 6.96$ months). The sample was balanced for gender composition of the dyads (i.e., 7 girl-girl dyads, 7 girl-boy dyads, 7 boy-girl dyads, and 7 boy-boy dyads).

Materials

Older siblings were asked to teach learners a series of ten block tasks. The concept of the block tasks for this study was derived from the block tasks of the

Weschler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) and the Weschler Intelligence Scale for Children Revised (WISC-R). The ten block tasks were composed of up to four wooden cubic blocks of 3 1/2 cm, derived from the block task of the WISC-R (Appendix A). Each block had exactly the same design: two red sides, two white sides and two sides diagonally separated with half of the side red and the other half white. Also, a series of ten block designs were drawn in colour (red and white) on square cardboards of 10 X 10 cm (Appendix A). The children were required to place the appropriate blocks over the corresponding designs in order to be successful in completing each task. The designs started with easier tasks and were followed with tasks of increasing difficulty. The task order was always from easiest to more difficult, so as not to discourage the children with a first difficult task. The ten designs were theoretically divided into two main categories of either easier or more difficult tasks. The easier tasks, the first five, only involved the use of block sides that were either fully white or fully red. The more difficult tasks, the last five, included at least one block with a diagonally two-coloured side; therefore, the criterion for the difficulty division was when the designs first involved blocks with red and white sides.

Procedure

The researcher contacted directors of French-speaking primary schools in the Montreal area and asked for permission to recruit 7- to 9-year-olds. All communications with parents and authorities were done in the French language. A letter explaining the study was presented to whom it may concern (Appendix B) and a meeting in person was arranged with the school authorities, to answer any questions or concerns. Once permission was obtained from school authorities, the class lists of children who were 7-9

years were requested in order to select students with younger siblings. Once sibling pairs corresponding to selection criteria had been identified, the researcher sent a letter home to all parents with the students. The letter explained the general topic, goal, and detailed procedure of the present study (Appendix C). Parents were also sent a permission form concerning acceptance or refusal of participation and any possible ethical concerns related to this study (Appendix C). The researcher was available by phone for any possible questions parents may have had. Once these forms were returned to the researcher, consenting parents were contacted to set a date for data collection.

The data collection phase of the present study took place in the participants' homes. Sibling teaching sessions occurred in the children's homes and were videotaped to record behavioral and verbal interactions between the siblings. One of the parents was usually present in the room or in an adjacent room during the sessions but was requested not to intervene. The children's parent was asked to fill out a short questionnaire regarding general demographics of the family (Appendix D). The siblings were then asked to sit at a table beside one another and the video camera was installed on a tripod in front of them and video recording began at this time. The siblings were reminded that they would be video recorded but that only the researcher would have access to these tapes (see point 1 in Appendix E). They were asked to partake in a warm-up session, which consisted of an open-ended game (farm set) together for five minutes in order for them to become more comfortable in the presence of the experimenter and the video camera. Then, while younger siblings continued to play with the farm set, older siblings were asked to individually and privately answer twenty short questions from a modified version of the Sibling Behavior and Feelings Questionnaire (Mendelson et al., 1994) in

order to give the experimenter an indication of their perception of the quality of the

relationship with their younger sibling (see point 6 in Appendix E and Appendix F). The

child answered each question by pointing to three circles of different sizes to indicate if

their answer was "often or a lot", "sometimes or so-so", or "rarely or a little bit". This

interview was counterbalanced across sibling pairs and was either given following the

warm-up session or after all the sibling teaching tasks were completed, to counter order

effects.

Subsequently, the experimenter explained to the siblings that teachers would follow

the experimenter to another room to be taught how to play a special game and that he or

she would then return to the younger sibling to teach him or her how to do the game (see

point 2 in Appendix E). While the experimenter taught the block tasks to the older

sibling in the separate room, the younger child stayed at the original table and was asked

to continue playing with the warm-up toy (farm set). The experimenter taught the older

sibling how to complete the block tasks from beginning to end and answered any

questions the child may have had about the tasks (see point 3 in Appendix E). Once the

child seemed familiar with the procedure and was able to do all the tasks successfully,

the older child was then asked to return with the experimenter to the table with his or her

younger sibling. The older sibling was then asked to teach the younger child how to

complete the same tasks (see point 4 and 5 in Appendix E). Time limits were not set for

the teaching sessions. At all times however, the experimenter closely monitored the

siblings' behavior and mood, especially during the more difficult tasks, and was ready to

intervene if levels of frustration became too high. This precaution was taken to prevent

discontinuation of the teaching interactions due to the children's discouragement and frustration. This situation, however, did not occur in the present study.

Measures

Teaching strategies. After having video recorded the sibling interactions during the teaching sessions, teacher behaviors were coded while using a frequency count, according to a coding scheme (Appendix G). The scaffolding behavior codes for the older sibling teachers used in the present study focused exclusively on explicit teaching strategies, which consisted of instances when the teacher was consciously using a teaching goal (Perez-Granados & Callanan, 1997). The behavior codes were based on modified versions of coding schemes by Koester and Bueche (1980) as well as by Poris and Volling (2001). The coding categories were not mutually exclusive; therefore, two codes could happen simultaneously and both were coded. Teaching strategies were coded by frequency count and the categories were the following: physical demonstration (of higher or lower level), corrective feedback (with a negative or positive/neutral tone), explanation/description, hint/prompt/question, praise/reinforcement/encouragement, checking, and arrangement of materials. Coding was done on grids and included each behavior category during each of the ten tasks completed by the children.

An additional coding category entitled "Introduction" was added to the grid and was coded separately from the block tasks (1-10). The decision to do this was based on the fact that the content of this part of the teaching session concerned description of the blocks and the cards and explanation of how the game was played and therefore did not concern the first task. As soon as the sibling teacher referred specifically to the first card, coding of the first task began.

Sibling Behavior and Feelings Questionnaire. This questionnaire was originally developed by Mendelson et al. (1994) and was modified by Howe, Petrakos, and Rinaldi (1998). The version used in this study consisted of 20 short questions that were asked to the older sibling only, since the interest of the present study focused on this child's perception of the quality of the sibling relationship and how this might affect his or her performance as a teacher. The questions were asked orally and the child answered them by pointing to either a big circle meaning "often or a lot,, a medium circle meaning "sometimes or so-so" and a small circle, meaning "rarely or a little," which were drawn on a cardboard placed in front of the child. Questions were asked in French and concerned areas such as positive feelings, closeness, conflict, companionship and support regarding the younger sibling (Appendix F). The researcher, fluently bilingual, translated the questionnaire from its original version in English to French. Subsequently, a professional collaborator translated the questionnaire once more, but this time from French back to English. Finally, the two English versions were then compared and terms were fine tuned to obtain the closest word equivalence between both languages.

Parent questionnaire. The children's parent present during the testing was asked to fill out a short questionnaire regarding general demographics of the family (e.g., number of children living in the home) (Appendix D).

Response index of learner. During the teaching sessions, after completion of each of the ten block tasks, the experimenter evaluated the success or failure of the learner with a response index, using a pen and pencil grid (Appendix H). The experimenter ticked off the appropriate responses because the camera angle did not permit for this to be observed after the fact on the videotapes. Tasks were either identified as correctly or

incorrectly completed by the younger sibling, depending on whether the experimenter noticed mistakes in the block tasks or not. No words were used when filling out the grid, in order for the child's response to stay anonymous. This precaution was taken because most of the children in the study were of reading age and therefore it was possible some may have discovered the successes and failures indicated on the experimenter's sheet.

Reliability. From the sample, a random and representative selection of 25% of the 28 dyads (i.e., seven sibling pairs) was chosen for reliability purposes. Before any coding by the researcher alone began, both the researcher and a colleague helping with the reliability coded three families. The mean reliability for these families reached 79% agreement. Then, when the researcher had coded half of the sample alone, both she and her colleague coded another two families and this reliability reached 78% agreement. When the researcher had coded the rest of the sample alone, both researchers coded two last families and the reliability reached 73% agreement. An overall Cohen's Kappa was calculated for these seven families and an acceptable interrater reliability was reached ($k = .71$).

Results

This study was a 2 X 2 X 2 within-subjects design due to the fact that each sibling dyad completed all 10 block tasks, where tasks one to five were easier and tasks six to ten were more difficult. Based on the four previously stated hypotheses, the factors compared were the following: (a) male and female older siblings, (b) more and less difficult block tasks, and (c) warmer and more conflictual sibling relationships. The dependent variables were number and type of teaching strategies and number of successful tasks accomplished by the learner. Results from this study will be presented

in the following order: (a) descriptive statistics, (b) analyses for hypotheses, and (c) additional analyses.

Descriptive Statistics

  Teaching strategies. As described in Table 1 (all tables are found at the end of the Results section), the frequency of particular teaching strategies used by teachers in the present study appeared to vary whether they were used in the introduction, during the easy tasks or during the more difficult tasks. Moreover, the kinds of strategies used within each of these parts of the teaching session were different. During the introduction, the most frequent strategies used by sibling teachers were arrangement of materials and explanation/description. Strategies such as negative and positive corrective feedback and checking were not used here at all.

  During the easy tasks, teachers used the strategies of hint/prompt/question and arrangement of materials most frequently. They also used praise and positive corrective feedback. In addition, explanation/description, physical demonstration, negative corrective feedback were used infrequently. Most of the strategies used in the easier tasks were used more frequently during the more difficult tasks such as physical demonstration, positive corrective feedback, hint/prompt/question, praise and checking. The frequency of explanation/description in the more difficult tasks decreased when compared to the easier tasks and arrangement of materials did not differ from the easier tasks. Also, when compared to the easier tasks, negative corrective feedback in the more difficult tasks did not increase while physical demonstration increased slightly but the frequency is still very low compared to the use of other strategies. Total strategies used by sibling teachers included strategies provided during the introduction, easy tasks and

hard tasks combined. When considering overall strategies, teachers used hint/prompt/question, arrangement of materials and praise the most and used negative corrective feedback, physical demonstration and explanation/description the least often.

Sibling Behavior and Feelings Questionnaire (SBFQ). The older siblings in the study were asked to respond to 20 items regarding their relationship with their younger sibling that corresponded to five subscales. They were asked to use a 3-point Likert scale to answer the questions. As described in detail in Table 2, the means for the five mean subscales were all situated in the middle (i.e., 2) of the 3-point Likert scale (i.e., "so-so" or "sometimes") and the range of the children's responses on all these indicators was quite small. This indicated that older siblings in the study were not likely to respond to the items in the questionnaire using the extremes of the Likert scale (e.g., 1 or 3). In addition, the variance of these responses was small, therefore all the children responded in a very similar manner.

To assess internal consistency within each of the subscales of the sibling questionnaire, five Cronbach's *alpha* were calculated: companionship (*alpha* = .61), closeness (*alpha* = .65), support (*alpha* = .79) and positive feelings (*alpha* = .87). The reliability for the conflict subscale (*alpha* = .41) was low, therefore item 8 was dropped from the calculation and this increased internal consistency (*alpha* = .66). Then the consistency between the four subscales (companionship, closeness, support, positive feelings) representing positive aspects of the sibling relationship was calculated. Each item from the four positive subscales was included in this calculation and resulted in a very high internal consistency (*alpha* = .92). Based on this high *alpha*, a warmth subscale (*M* = 2.43, *SD* = .42, *Range* = 1.35 - 2.95), composed of the four subscales, was

employed in subsequent analyses. The conflict subscale was considered separately.

These two indexes therefore represented positive and negative aspects of the sibling

relationship.

Response index of learner. The younger siblings in this study were

overwhelmingly successful in completing the 10 block tasks taught by their older

siblings. Each dyad had to complete 10 cards and there were 28 dyads in the present

sample; therefore, a total of 280 cards were completed. The learners were not successful

in completing a total of 30/280 cards (i.e., 10.71%). Of these failures, 11 occurred in the

easy tasks and 19 in the hard tasks. Table 3 describes the means, standard deviations and

ranges for the Response Index of the Learner (RIL) for the present sample (learner

success was coded as 1 and learner failure was coded as 2). The mean failure rates for

the easy and hard tasks were very similar and their variance was quite low. If we

consider the frequency counts for these two categories, however, the number of

occurrences of failures was greater in the hard tasks (19) than in the easy tasks (11).

Analyses for Hypotheses

Hypothesis 1. Findings from the present study fully supported hypothesis 1. This

hypothesis predicted that sibling teachers would use more scaffolding strategies with the

learner in the more difficult tasks than in the less difficult tasks. That is, in the more

difficult tasks all teachers would be more likely to engage in strategies such as physical

demonstration, corrective feedback, explanation/description, and hint/prompt/question.

Paired sample *t*-tests were conducted (see Table 4) between the easy and hard

tasks for different strategies (see Table 1 for means) to look for significant differences.

Findings showed there were significant differences between the easy and hard tasks for

several strategies. Specifically, teachers provided more physical demonstration, positive corrective feedback and hint/prompt/question during the hard tasks than during the easy tasks. However, the strategy of explanation/description was in the opposite direction and did not support hypothesis 1: there were significantly fewer explanations/descriptions in the more difficult tasks than in the less difficult tasks. Other strategies not included in this hypothesis but in the expected direction were also found to be significantly different when comparing easy and hard tasks: praise, checking, and total strategies used in the easy versus difficult conditions. Again these three strategies occurred significantly more frequently in the hard tasks than in the easy tasks.

Hypothesis 2. In order to test this hypothesis, the code of physical demonstration was dichotomized into higher and lower levels, by using the median, for easy and hard tasks. This hypothesis stated that (a) across all tasks older sisters would employ more strategies such as explanation/description, hint/prompt/question and more lower level of physical control (physical demonstration) and less corrective feedback, less praise and less higher physical control when teaching their younger sibling compared to older brothers; (b) across all tasks, older brothers would employ more teaching strategies such as higher level of physical control (physical demonstration), more corrective feedback and fewer strategies such as explanation/description, hint/prompt/question and less lower level of physical control (physical demonstration) than older sisters when teaching their younger sibling.

To test hypothesis 2, Pearson correlations were conducted between gender of the older sibling and teaching strategies used (see Table 5). Most relationships tested for this hypothesis were found not to be significant; only two results concerning strategies used

during the easy tasks were found to be significant. A significant negative correlation was found between hint/prompt/question during the easy tasks and gender, which indicated older sisters were providing learners with more hints/prompts/questions than older brothers. When physical demonstration was correlated with gender of the older sibling, results were significant for the easy tasks, indicating males were less likely to use physical demonstration in their teaching whereas females used more physical demonstration during the easy tasks. This result was contrary to what was expected in hypothesis 2. Results of the physical demonstration strategy during the hard tasks was found not to be significant. Based on the pattern of nonsignificant correlations, no further gender comparisons were conducted on these strategies.

Hypothesis 3. This hypothesis predicted that sibling teachers reporting a more warm and affectionate relationship with their younger sibling would be more likely to scaffold effectively for their younger sibling in the more difficult tasks than would older siblings in a less warm and more conflictual relationship. More specifically, it was predicted that (a) older siblings in a warmer relationship would be more likely to engage in teaching strategies such as explanation/description, hint/prompt/question, praise, and a low-level of physical control (physical demonstration) than siblings in a more conflictual relationship. However, it was predicted that (b) older siblings in a more conflictual and less affectionate relationship would be more likely to engage in teaching strategies such as high-level of physical control (physical demonstration) and corrective feedback than siblings in a warmer and more affectionate relationship.

Correlations were conducted between the warmth subscale on the SBFQ and the teaching strategies and also between the conflict subscale on the SBFQ and the teaching

strategies. Results are found in Table 6 and Table 7. No significant correlations were found between the subscales and the teaching strategies; therefore, no further statistical analyses were conducted.

Hypothesis 4. This hypothesis stated that older sisters teaching their younger sibling would have higher successful learner response rates (i.e., successfully completed tasks) overall, compared to older brothers. A one-way ANOVA was conducted to investigate effects of older siblings' gender on overall responses of learners. The independent variable was gender of teacher and the dependent variable was responses of learners. Results indicated that there were no significant differences. Results are found in Table 8.

Additional Analyses

Correlations between age of older and younger siblings with teaching strategies. Age of older sibling and especially age of younger sibling were found to affect teaching strategies used during the easy and hard tasks, as all significant Pearson correlations involving these factors revealed negative relationships. This means that as age increased, the number of strategies used decreased; inversely, as age decreased, the number of strategies used increased. Only a few strategies were correlated with age of the older sibling: physical demonstration during the hard tasks ($r = -.41, p < .05$), corrective feedback during the easy tasks ($r = -.38, p < .05$) and arrangement of materials in the easy tasks ($r = -.38, p < .05$). Significant negative relationships were more frequent regarding age of the younger sibling as found in Table 9. Results found in Table 9 show that specifically, on both easy and hard tasks, teachers provided less positive corrective feedback, corrective feedback, hint/prompt/question, praise,

arrangement of materials and total strategies with older learners. Alternatively, on both easy and hard tasks, teachers provided more of these kinds of strategies with younger learners. Also, on hard tasks, teachers engaged in fewer physical demonstration and checking strategies when the learner was older. Conversely, on hard tasks, teachers used more of these types of strategies when learners were younger.

Correlation of age gap between siblings with teaching strategies. Based on the relatively wide differences in age between the siblings in some dyads in the present study, another set of correlations was conducted to evaluate if there was a relationship between age gap and number of strategies used by the teacher. Details of these correlations are found in Table 10. The majority of correlations were significant and all of them were in the same direction (i.e., positive relationships). This indicated that as age gap between siblings increased, the number of positive corrective feedback, corrective feedback, hint/prompt/question, praise, and total strategies for each level of difficulty increased. Inversely, when the age gap was small, teachers were less likely to employ these strategies during the easy and hard tasks. Also, as the age gap increased, the number of checking and arrangement of materials strategies in the hard tasks increased. Inversely, when the age gap was smaller, teachers were less likely to use these strategies during the hard tasks.

Partial correlations between easy and hard tasks while controlling for age of siblings. Results from Pearson correlations between age of siblings and teaching strategies used during easy and hard tasks showed that age varied with teaching strategies; therefore, four sets of partial correlations were conducted to examine associations in more detail. First, partial intracorrelations of the teaching strategies used

only during the easy tasks were examined, controlling for both ages of older and younger siblings (see Table 11). Significant partial correlations were found for the great majority of strategies used during the easy tasks. More specifically, 31/45 correlations were significant. All significant correlations were positive; negative correlations only involved the strategy of checking but none were significant. The positive correlations indicated that, during the easy tasks, when teachers used a greater number of strategies during their teaching, they did so across the great majority of strategies used; inversely, when teachers used fewer strategies when teaching their younger sibling, they did so across most strategies used. For example, teachers who used a greater number of physical demonstrations during easy tasks also used negative and positive corrective feedback, explanations and descriptions, hints, prompt, questions, and arrangement of materials more frequently during easy tasks.

Second, partial intracorrelations (controlling for age) were conducted between strategies used only during the more difficult tasks (see Table 12). Here, once more, many strategies used in the hard tasks were found to be significantly correlated with other strategies used during these tasks. More specifically, 23/45 correlations were found to be significant: this ratio was slightly lower for the hard tasks than for the easy tasks. The great majority of strategies had a positive relationship; the only negative relationships found involved the strategy of checking but again none was significant. Results from the positive correlations indicate that, during the hard tasks, when teachers used a greater number of strategies, they did so across most strategies; inversely, when they used fewer strategies, they did so across most strategies. For example, teachers who used a greater number of corrective feedback strategies during hard tasks also used

explanations and descriptions, hints, prompts, questions, and praise more frequently during hard tasks. This correlational pattern for the hard tasks was similar to the one found for the easy tasks.

Third, partial intercorrelations were conducted between strategies used during easy and hard tasks while controlling for age. Older siblings taught learners while using the same kinds of strategies across both easy and hard tasks (e.g., corrective feedback, hint/prompt/question); therefore, two partial intercorrelations between easy and hard tasks were conducted to examine all possible relationships. Specifically, in Table 13 each strategy used during the easy tasks was intercorrelated with all strategies used during the hard tasks, including the same type of strategies found in both difficulty levels (e.g., physical demonstration during easy tasks was correlated with all strategies during hard tasks: physical demonstration, negative corrective feedback, positive corrective feedback, corrective feedback, explanation/description, hint/prompt/question, praise, checking, arrangement of materials, total of hard strategies). A total of 23/45 correlations were found to be significant and all relationships were positive. This indicated that as teachers used more of a strategy in the easy tasks, they also used more of this same strategy in the more difficult tasks; inversely, when they used a fewer number of a certain strategy in the easy tasks they also used less of this same strategy in the hard tasks. Fourth, in Table 14, intercorrelations were conducted once more between strategies used. This time, however, relationships involved each strategy used during hard tasks with all other strategies used during easy tasks (e.g., physical demonstration during hard tasks was correlated with other strategies during easy tasks: negative corrective feedback, positive corrective feedback, corrective feedback,

explanation/description, hint/prompt/question, praise, checking, arrangement of materials, total of easy strategies). A total of 21/45 intercorrelations were found to be significant. All significant correlations were positive meaning that as teachers used more of certain kinds of strategies in the easy tasks, they also used more of other kinds of strategies in the hard tasks. Inversely, when teachers used a strategy less frequently in the easy tasks, they also used less of another strategy in the hard tasks. This correlational pattern between easy and hard tasks was similar to the pattern found among the strategies used within the easy and hard tasks.

Partial intracorrelations of total teaching strategies. A partial correlation was conducted with the totals of the strategies used by the older siblings. Totals here included strategies used during the introduction, easy and hard tasks combined. In Table 15, results showed that 18/45 correlations were found to be significant. All relationships were positive, meaning that when teachers used a greater number of certain strategies they also used more of others; inversely, when teachers used a fewer number of certain strategies, they also used less of others. This correlational pattern between the strategy totals was identical to the ones found among the strategies used within the easy and hard tasks and to the ones found for strategies used between easy and hard tasks.

Table 1

Means, Standard Deviations and Ranges of Type of Teaching Strategies Used During

Introduction, Easy and Hard Tasks and Total Score (n = 28)

	M	SD	Range
Strategy			
INTRODUCTION			
Phys. Demon.	.21	.83	0 - 4
Neg. Cor. Feed.	.00	.00	0 - 0
Pos. Cor. Feed.	.00	.00	0 - 0
Cor. Feed.	.00	.00	0 - 0
Explan./Descr.	4.11	2.39	0 - 11
Hint/Prom./Quest.	1.93	2.55	0 – 11
Praise	.07	.26	0 - 1
Check.	.00	.00	0 - 0
Ar. of Mat.	4.39	3.08	0 – 11
Total	10.71	6.02	0 - 26
EASY TASKS			
Phys. Demon.	.93	3.05	0 - 16
Neg. Cor. Feed.	.07	.38	0 - 2
Pos. Cor. Feed.	3.46	4.01	0 - 16
Cor. Feed.	3.54	4.26	0 - 18

Explan./Descr.	.79	1.45	0 - 6
Hint/Prom./Quest.	12.54	12.05	1 - 47
Praise	8.57	6.72	0 - 32
Check.	2.32	3.54	0 - 16
Ar. of Mat.	12.32	5.64	5 – 32
Total	41.00	28.39	10 - 130

HARD TASKS

Phys. Demon.	1.96	4.94	0 - 24
Neg. Cor. Feed.	.07	.26	0 - 1
Pos. Cor. Feed.	8.50	7.86	0 - 32
Cor. Feed.	8.57	7.88	0 - 32
Explan./Descr.	.18	.55	0 - 2
Hint/Prom./Quest.	18.14	19.06	1 - 74
Praise	14.57	11.31	3 - 52
Check.	8.00	7.33	0 - 32
Ar. of Mat.	11.18	4.84	3 – 22
Total	62.61	44.41	12 - 190

TOTAL

Phys. Demon.	3.11	7.77	0 - 40
Neg. Cor. Feed.	.14	.59	0 - 3
Pos. Cor. Feed.	11.96	10.32	0 - 41
Cor. Feed.	12.11	10.48	0 - 41
Explan./Descr.	5.00	2.46	0 - 11

Hint/Prom./Quest.	32.61	30.50	3 - 123
Praise	23.21	17.14	7 - 84
Check.	10.32	10.18	0 - 48
Ar. of Mat.	27.89	9.96	12 – 53
Total	114.32	69.46	42 - 309

Note. Corrective Feedback equals Negative Corrective Feedback plus Positive Corrective Feedback. Also, note that totals include strategies used during the introduction, easy tasks and hard tasks combined.

Table 2

Means, Standard Deviations and Ranges of Individual Subscales of the Sibling Behavior and Feelings Questionnaire (n = 28)

	M	*SD*	*Range*
Mean Subscales			
Positive feelings	2.49	.51	1.20 - 3.00
Closeness	2.23	.40	1.20 - 2.80
Companionship	2.51	.58	1.33 - 3.00
Support	2.49	.50	1.00 - 3.00
Conflict	1.99	.38	1.00 - 2.75

Table 3

Means, Standard Deviations and Ranges for the Response Index of the Learner in the

Easy, Hard, and Total Tasks (n = 28)

	M	SD	Range
Tasks			
Easy tasks	5.39	.63	5 - 7
Hard tasks	5.68	1.02	5 - 9
Total tasks	11.07	1.33	10 - 14

Table 4

T-tests Conducted Between Teaching Strategies Used During Easy and Hard Tasks (n =

28)

	t	df	p
Strategy			
Phys. Demon.	-2.05	27	.05
Neg. Cor. Feed.	.00	27	*ns*
Pos. Cor. Feed.	-3.80	27	.01
Cor. Feed.	-3.75	27	.01
Explan./Descr.	2.01	27	.05
Hint/Prom./Quest.	-2.53	27	.05
Praise	-4.45	27	.01
Check.	-5.58	27	.01
Ar. of Mat.	1.52	27	*ns*
Total Strat.	-4.07	27	.01

Table 5

Pearson Correlations Between Gender of Older Siblings and Teaching Strategies Used During Easy and Hard Tasks (n = 28)

	Easy tasks	Hard tasks
Strategy		
Phys. Demon.	-.41*	-.18
Neg. Cor. Feed.	-.19	-.28
Pos. Cor. Feed.	-.34	-.20
Cor. Feed.	-.33	-.21
Explan./Descr.	.10	-.33
Hint/Prom./Quest.	-.37*	-.20
Praise	-.12	-.10
Check.	.20	.12
Ar. of Mat.	-.28	-.32
Total Strat.	-.29	-.18

Note. * *p* < .05.

Table 6

Pearson Correlations Between Warmth Subscale and Teaching Strategies Used During Easy and Hard Tasks (n = 28)

	Easy tasks	Hard tasks
Strategy		
Phys. Demon.	.25	.17
Neg. Cor. Feed.	.22	.22
Pos. Cor. Feed.	.24	.30
Cor. Feed.	.25	.30
Explan./Descr.	.10	.05
Hint/Prom./Quest.	.28	.24
Praise	.18	.18
Check.	.05	.22
Ar. of Mat.	.24	.33
Total Strat.	.28	.30

Note. All correlations were *ns.*

Table 7

Pearson Correlations Between Conflict Subscale and Teaching Strategies Used During

Easy and Hard Tasks (n = 28)

	Easy tasks	*Hard tasks*
Strategy		
Phys. Demon.	.03	-.03
Neg. Cor. Feed.	.00	-.18
Pos. Cor. Feed.	.12	-.08
Cor. Feed.	.25	.31
Explan./Descr.	.05	-.08
Hint/Prom./Quest.	-.02	-.01
Praise	-.12	-.01
Check.	.04	.28
Ar. of Mat.	.01	.10
Total Strat.	-.01	.03

Note. All correlations were *ns.*

Table 8

One-way ANOVA for gender of older siblings on overall responses of learners (n = 28)

Source	Sum of squares	df	Mean square	F	P
Gender	.571	1	.571	.314	.580
Learner Response	47.286	26	1.819		
Total	47.857	27			

Note. Results were *ns.*

Table 9

Pearson Correlations Between Age of Younger Siblings and Teaching Strategies Used During Easy and Hard Tasks (n = 28)

	Easy tasks	Hard tasks
Strategy		
Phys. Demon.	-.28	-.45*
Neg. Cor. Feed.	-.26	-.11
Pos. Cor. Feed.	-.57**	-.61**
Cor. Feed.	-.56**	-.62**
Explan./Descr.	-.16	-.17
Hint/Prom./Quest.	-.48**	-.49**
Praise	-.50**	-.46*
Check.	-.30	-.47*
Ar. of Mat.	-.47*	-.48**
Total Strat.	-.57**	-.62**

Note. * *p* < .05   ** *p* < .01

Table 10

Pearson Correlations Between Age Gap Between Siblings and Teaching Strategies Used During Easy and Hard Tasks (n = 28)

	Easy tasks	Hard tasks
Strategy		
Phys. Demon.	.08	.27
Neg. Cor. Feed.	.07	.04
Pos. Cor. Feed.	.48**	.66**
Cor. Feed.	.46*	.66**
Explan./Descr.	.22	.33
Hint/Prom./Quest.	.45*	.58**
Praise	.49**	.55**
Check.	.34	.41*
Ar. of Mat.	.33	.55**
Total Strat.	.51**	.66**

Note. * $p < .05$ ** $p < .01$

Table 11

Partial Intracorrelations Between Strategies Used During Easy Tasks Controlling for

Age of Siblings (n = 28)

	PD	NCF	PCF	CF	ED	HPQ	PR	CHK	AM	TOT
PD		.96**	.67**	.72**	.71**	.54**	.36	-.21	.67**	.72**
NCF			.62**	.68**	.76**	.39*	.30	-.19	.66**	.63**
PCF				1.00**	.42*	.82**	.52**	-.24	.56**	.84**
CF					.47*	.80**	.52**	-.24	.59**	.85**
ED						.21	.29	.01	.64**	.53**
HPQ							.60**	-.23	.51**	.88**
PR								.18	.33	.76**
CHK									-.02	.02
AM										.74**
TOT										

Note. $* p < .05$ $** p < .01$.

Also note that abbreviations were used: physical demonstration (PD), negative corrective feedback (NCF), positive corrective feedback (PCF), corrective feedback (CF), explanation/description (ED), hint/prompt/question (HPQ), praise (PR), checking (CHK), arrangement of materials (AM), total strategies for easy/hard tasks (TOT).

Table 12

Partial Intracorrelations Between Strategies Used During Hard Tasks Controlling for Age of Siblings (n = 28).

	PD	NCF	PCF	CF	ED	HPQ	PR	CHK	AM	TOT
PD		.68**	.05	.08	.18	.38*	.42*	-.29	.34	.44*
NCF			.03	.08	.18	.16	.26	-.26	.23	.24
PCF				1.00**	.55**	.65**	.58**	.02	.11	.69**
CF					.56**	.66**	.59**	.00	.12	.56**
ED						.81**	.65**	-.24	.44*	.73**
HPQ							.77**	-.09	.43*	.92**
PR								.05	.47*	.90**
CHK									.18	.15
AM										.58**
TOT										

Note. * $p < .05$ ** $p < .01$.

Also note that abbreviations were used: physical demonstration (PD), negative corrective feedback (NCF), positive corrective feedback (PCF), corrective feedback (CF), explanation/description (ED), hint/prompt/question (HPQ), praise (PR), checking (CHK), arrangement of materials (AM), total strategies for easy/hard tasks (TOT).

Table 13

Partial Intercorrelations Between Strategies Used During Easy and Hard Tasks

Controlling for Age of Siblings (n = 28).

Easy Tasks					Hard tasks					
	PD	NCF	PCF	CF	ED	HPQ	PR	CHK	AM	TOT
PD	.88**	.65**	-.42	-.01	.11	.21	.27	-.24	.43*	.30
NCF		.70**	-.17	-.13	-.05	.05	.20	-.20	.37	.18
PCF			.14	.17	.44*	.63**	.49**	-.19	.53**	.61**
CF				.14	.40*	.59**	.48**	-.19	.53**	.73**
ED					-.18	-.05	.11	.02	.18	.08
HPQ						.75**	.49**	-.20	.50**	.67**
PR							.74**	.09	.38*	.75**
CHK								.69**	.09	.06
AM									.69**	.26
TOT										

Note. * p < .05   ** p < .01.

Also note that rows represented strategies used during easy tasks and columns strategies used during hard tasks. Note that abbreviations were used: physical demonstration (PD), negative corrective feedback (NCF), positive corrective feedback (PCF), corrective feedback (CF), explanation/description (ED), hint/prompt/question

(HPQ), praise (PR), checking (CHK), arrangement of materials (AM), total strategies

for easy/hard tasks (TOT).

Table 14

Partial Intercorrelations Between Strategies Used During Hard and Easy Tasks Controlling for Age of Siblings (n = 28).

Hard Tasks	Easy Tasks								
	PD	NCF	PCF	CF	ED	HPQ	PR	CHK	AM	TOT
PD		.88**	.77**	.81**	.70**	.55**	.51**	-.28	.59**	.74**
NCF			.49**	.53**	.44*	.19	.32	-.18	.35	.40*
PCF				.12	-.26	.34	.50**	-.09	-.25	.21
CF					-.24	.34	.52**	-.97	-.24	.22
ED						.61**	.60**	-.09	.09	.50**
HPQ							.62**	-.10	.14	.62**
PR								.06	.19	.56**
CHK									.05	-.02
AM										.63**
TOT										

Note. * p < .05   ** p < .01.

Also note that rows represented strategies used during hard tasks and columns strategies used during easy tasks. Note that abbreviations were used: physical demonstration (PD), negative corrective feedback (NCF), positive corrective feedback (PCF), corrective feedback (CF), explanation/description (ED), hint/prompt/question

(HPQ), praise (PR), checking (CHK), arrangement of materials (AM), total strategies

for easy/hard tasks (TOT).

Table 15

Partial Intracorrelations Between Total Teaching Strategies Used Across Tasks

Controlling for Age of Siblings (n = 28).

	PD	NCF	PCF	CF	ED	HPQ	PR	CHK	AM	TOT
PD		.90**	.36	.42*	.12	.43*	.44*	-.23	.47*	.57**
NCF			.21	.19	.20	.20	.30	-.25	.46	.38
PCF				1.00	.03	.80**	.73**	-.12	.21	.80**
CF					.04	.80**	.73**	-.14	.24	.81**
ED						.14	.32	.05	.43*	.31
HPQ							.73**	-.16	.41*	.90**
PR								.09	.37	.88**
CHK									.07	.09
AM										.60**
TOT										

Note. * $p < .05$ ** $p < .01$.

Total teaching strategies included ones used during the introduction, easy and hard tasks combined. Also note that abbreviations were used: physical demonstration (PD), negative corrective feedback (NCF), positive corrective feedback (PCF), corrective feedback (CF), explanation/description (ED), hint/prompt/question (HPQ), praise (PR), checking (CHK), arrangement of materials (AM), total strategies for easy/hard tasks (TOT).

Discussion

Siblings can play an important role in children's development (Boer & Dunn, 1992); however, recent studies on sibling teaching are sparse (Poris & Volling, 2001). Research findings have indicated that children aged seven to nine appear to adjust their problem-solving strategies according to task requirements and task characteristics (Gardner & Rogoff, 1990). In addition, 7- year-old sibling teachers have been found to illustrate early signs of scaffolding during teaching (Perez-Granados & Callanan, 1997). Based on this evidence, the primary purpose of the present study was therefore to investigate whether 7-9 year-old siblings would be able to adapt their instructional strategies (e.g., hints, prompts, questions) when teaching their younger sibling easier and more difficult tasks. The present study also studied the effects of gender, sibling relationship quality, age of the younger sibling and age gap between the children, on the teaching strategies used by older siblings.

Frequency of Teaching Strategies

During the introductory part of the teaching task, sibling teachers used strategies such as arrangement of materials, explanations and descriptions most often. This illustrates that at the beginning of the teaching sessions, teachers were verbally explaining and describing the game to their younger sibling while physically manipulating the blocks and the cards. Teachers also used some hints, prompts, questions and some physical demonstrations of how to complete the tasks. However, the low frequency of physical demonstrations indicated that older siblings were not doing the tasks for the learners while explaining to them how the game was to be played. Rather, teachers were using mostly verbal strategies to introduce the tasks.

During the easier tasks, teachers used strategies such as hints, prompts, questions and arrangement of materials most often. They also used some praise, positive corrective feedback, and checking strategies, which demonstrates that older siblings were using scaffolding-type strategies to teach their younger sibling during the easier tasks. These findings relate to work by Perez-Granados and Callanan (1997) who found that 7-year-old child teachers offered their siblings informatives (e.g., hints), whereas their 6 year-old counterparts did not. These authors also found that these early signs of a scaffolding approach to teaching resembled the manner with which the mother of these children was teaching her younger child. Also in the present study, during easy tasks, frequency of explanations and descriptions decreased compared to the introduction. This appears to indicate that once teachers had explained the game during the introduction, more explanation during easy tasks was not relevant. Also, during easy tasks the strategy of physical demonstration was used infrequently. This illustrated that teachers were not doing the easy tasks for the learner and therefore were permitting the younger child to have an active role in the activity. This result appears to be contrary to Perez-Granados and Callanan (1997) who found that children taught by siblings obtained higher scores when playing a game because teachers were actually doing the tasks themselves rather than providing guidance for the younger child. This scenario was not observed in the present study. Low levels of physical demonstration in this study do support, however, Rogoff's (1990) concept of guided participation in which the teacher gives the learner an active role in the learning process. In addition, the very low frequency of negative corrective feedback showed that when correcting learners, teachers were not doing so in a dominant or hostile manner.

During the more difficult tasks, the most frequent strategies used were hints, prompts, questions, praise, arrangement of materials, positive corrective feedback and checking. Physical demonstration, explanations and descriptions, and negative corrective feedback were almost never used. Here most strategies increased in frequency when compared to the easier tasks. Thus, teachers appeared to be giving more support to their younger sibling in the more difficult tasks than in the easier tasks by giving them information on how to do the tasks, correcting their mistakes, encouraging them, organizing the materials and checking what learners had done to see if it was correct or not. This demonstrates that the sibling teachers in this study, even when involved in more challenging tasks, were still able to teach while mostly providing informatives. They also were still not teaching in a dominant manner and were letting the learner be an active participant. It is also important to note that when comparing the decreasing order of importance of strategies used within easy and difficult tasks, ranking orders in both cases were the same. except for praise and arrangement of materials. In the more difficult tasks, praise became more important, which suggests teachers were providing more encouragement when the tasks were more challenging for the learners.

When comparing overall teaching strategies (including the introduction, easy and hard tasks), sibling teachers used hints, prompts, questions, arrangement of materials and praise the most often. They also used some positive corrective feedback, checking, explanations and descriptions. Physical demonstration and negative corrective feedback were used the least. This overall pattern of teaching strategies reflects older siblings' (7-9 years) ability to teach their younger sibling, which was found to be similar to previous studies' observations regarding mothers' teaching style. Kermani and Janes (2001)

investigated mothers who taught their child 3-D block tasks that were either previously introduced to the child or not. They found that mothers provided strategies such as inquiry and instructional directives (which would correspond to hints, prompts, and questions in the present study) most often and modeling and physical control (which would correspond to physical demonstration and negative corrective feedback in the present study) infrequently across both tasks. This similarity in teaching styles of siblings in the present study and Kermani and Janes' mothers provides additional evidence of older siblings' scaffolding approach to teaching.

Sibling Teachers and Scaffolding

The hypothesis that sibling teachers would use more scaffolding strategies with learners in the more difficult tasks than in the less difficult tasks was supported. As was stated in this hypothesis and more specifically, physical demonstration, positive corrective feedback. hints, prompts, and questions strategies were found to be significantly greater in the more difficult tasks than in the easier tasks. Also, additional analyses revealed that other strategies not included in this hypothesis were also found to be used significantly more frequently in the more difficult tasks. These strategies included: praise, checking, and total strategies for easy and hard tasks respectively.

The findings have illustrated that older siblings were able to teach their younger sibling while using mostly scaffolding-type strategies such as hints, prompts, and questions and refrained from using controlling kinds of strategies such as physical demonstration and negative corrective feedback across easy and hard tasks as discussed above. Moreover, these school-aged children have demonstrated their ability to adjust the frequency of their teaching strategies according to different levels of task difficulty

by giving learners more information, help, and support during more challenging tasks. This brings additional support, but from a different perspective, to the findings by Gardner and Rogoff (1990) who studied the behavior of children during two kinds of tasks. These authors found that children, especially aged 7-9 years, when required to either be accurate or use speed as well as accuracy, demonstrated the ability to adapt their problem-solving strategies according to the specific characteristics and circumstances of the task at hand, just as adults can. The findings from the present study also support Rogoff's (1990) theoretical concepts of scaffolding and guided participation during which the teacher structures and supports the learner's efforts, according to the younger child's needs while giving him or her an active role in the learning process.

Only one strategy used by older siblings did not support the hypothesis and this was for explanations and descriptions. Actually, it was found that this aspect of teaching was significantly different between easy and hard tasks; however, it was used significantly more frequently in the easy tasks. One explanation for this unexpected result was found in anecdotal observations during data collection. Although teachers provided explanations during the introduction, learners still at times needed additional explanations to understand the game during the easy tasks. By the time of hard tasks, learners had mastered the concept of the game. This would explain why the strategy of explanations and descriptions was still used during the easy tasks and then decreased significantly during the more difficult tasks.

Teaching strategies and age. Additional correlational analyses regarding strategies used by teachers and age of the younger sibling were conducted and indicated that the scaffolding ability of older siblings across more and less difficult tasks also

applied to strategies used and age of the younger sibling. Specifically, teachers provided greater support to younger learners and less support to older learners: more specifically, across both easy and hard tasks, teachers used a greater number of positive corrective feedback, hints, prompts, questions, praise, and arrangement of materials strategies when learners were younger. Conversely, teachers used fewer of these strategies when learners were older. The fact that all these significant relationships were in a similar direction and that they were consistent across both easy and hard tasks, demonstrated that sibling teachers were acutely aware of their younger siblings' skill level. Additional significant results indicated similar negative relationships but only for hard tasks and included strategies such as physical demonstration and checking. These findings illustrate that 7-9 year old siblings appear to be quite sensitive to the specific abilities of their younger sibling and that they also seem to be capable of adjusting their teaching strategies according to the learner's specific needs. This negative relationship supports previous findings in the literature regarding age of the learner. Perez-Granados and Callanan (1997) reported that when teaching their younger siblings, child teachers provided more informatives to younger learners and fewer informatives to older learners. The results from the present study bring additional evidence to the theoretical concepts of scaffolding by Rogoff (1990) and Vygotsky (1978), where the teacher guides the learner in a flexible manner according to the learner's level of mastery of the task at hand, while giving more or less support to the younger child, as needed.

Another study by Poris and Volling (2001) on sibling teaching found effects of age of older siblings on strategies used: older children (aged 6-10) provided more teaching to younger siblings and used a more sophisticated teaching style. The younger

siblings here were all four years old and no age effects were found for learners. In the present study, teachers were aged 7-9 years and age of older sibling was not associated with teaching strategies used. However, in the Poris and Volling study, the age difference of older siblings was much greater and therefore may explain why effects were found. In the present study, the age of younger siblings ranged from 4-7 years and in the Poris and Volling study all learners were four years of age; therefore, effects of age of learners may not have been found due to the lack of variance in ages of these children. It could be that if ages of learners had been more varied, effects of age of the younger sibling on teaching strategies might have been found in the Poris and Volling study.

Teaching strategies and age gap. In the present study ages of older and younger siblings varied; therefore, the effects of different age gaps between siblings on teaching strategies were also investigated. When the age gap was larger a greater number of strategies was provided and when the age gap was smaller, fewer strategies were provided by the teacher. It is important to note that these relationships were consistently found across both easy and hard tasks for several strategies, such as positive corrective feedback, hints, prompts, questions, praise, and total strategies for each level of task difficulty. Also, similar relationships were found for checking and arrangement of materials, but only for hard tasks. In sum, all of these were negative relationships and several were found to be significant across both levels of difficulty, which indicated a strong pattern for effect of age gap on teaching strategies. These illustrations of older siblings' skill to adjust their teaching strategies according to different circumstances bring additional support to the theoretical concepts of guided participation by Rogoff

(1990) and scaffolding by Vygotsky (1978). These concepts both describe effective teaching as an activity that is flexible according to the younger child's ability while being centred on his or her needs, as was demonstrated in the present study.

The results regarding age gap of siblings could be explained by the possibility that larger age discrepancies between siblings appeared to suggest that the teacher was more aware of ability differences between him/herself and the learner; therefore, these teachers might be more inclined to provide more support to the learner because they perceived their younger sibling's age and abilities as being very different from their own. Also, it could be that large age differences allowed teachers to offer help because it gave them higher status and power over their younger sibling and therefore learners were more willing to accept help. Conversely, when age differences between teachers and learners were smaller, teachers might not have been as aware of ability differences between themselves and their sibling and therefore may have perceived the younger child more as a peer. Also, it could be that when there was a small age gap teachers were less likely to offer help and learners less likely to accept it because of increased likelihood of sibling rivalry due to similar ages. A study by Cicirelli (1973) investigated effects of age gap on sibling teaching during categorization tasks. He explained that widely-spaced older siblings would be viewed as more powerful and competent models. Although children close-in-age tend to interact more often at home, this author made the distinction between amount of interaction and quality of interaction. Widely-spaced older siblings might be more effective as models on cognitive tasks, even though the amount of daily interaction at home between the siblings might be less than if the children were close in age. Cicirelli found that younger siblings previously helped by

siblings who were four years older, made larger groups in category grouping than the children who had been helped by siblings only two years older.

In the present study, sibling teachers were not models for the learners because they were not imitating their older sibling; however, older sibling teachers did have a more dominant role in this complementary interaction. Cicirelli's (1973) argument about age spacing related to what appears to have occurred in the present study: teachers who were much older than learners were more likely to take on the role of an authority figure and therefore were more willing to provide a greater number of strategies to their younger sibling and learners were also more likely to accept their help. On the other hand, when teachers were closer in age to learners, older siblings were less likely to play the role of an authority figure and younger siblings were therefore also less willing to accept their help. Anecdotal evidence of this was observed during data collection, where for example in a close-in-age sibling dyad, the younger sibling pushed away the teacher's hand and told him "No, I can do it myself!" when the teacher tried to show her how to place the blocks. The present study did not investigate learner behavior during the interactions, but it would be interesting for further research to observe learners' reactions to older siblings' teaching strategies.

Teaching Strategies and Gender

The hypothesis that male and female teachers would employ different kinds of strategies while teaching was not supported. No overall gender differences were found in the present study. The gender hypothesis was based on studies by Cicirelli (1972, 1975), which were conducted many years ago. The discrepancy in gender results could be due to cohort effects. More recent studies such as Poris and Volling (2001), Azmitia

and Hesser (1993), and Brody, Stoneman, and MacKinnon (1982) found no overall gender differences and the present study's lack of gender effects therefore supports this literature. An additional possible explanation for lack of gender effects in the present study could be due to characteristics of the specific teaching task. Stewart (1983) stated that the "nature of the toy is a potential constraining factor influencing the adequacy of sibling teaching" (p. 65). This comment appeared to be relevant to the present study as older siblings taught learners a series of block tasks. Previous findings have shown that boys seem to have greater visual-spatial skills than girls, and girls seem to report using more verbal means of communication than boys (Serbin, Zelkowitz, Doyle, Gold & Wheaton, 1990; Zeman & Shipman, 1996). However, it is important to note that the tasks in the present study were not only spatial but also verbal, based on the fact that older siblings had to teach the block tasks to learners; therefore, both spatial and verbal skills were needed for teachers to be successful. It could be that because the skills needed to be effective teachers were advantageous to both boys and girls in different ways that this could have cancelled out any gender effects. Future studies could use different types of tasks that would either be advantageous to boys or girls, to discover if gender effects may emerge.

Poris and Volling (2001) did find, however, one specific result regarding gender of older siblings and their teaching style: older sisters displayed more positive guidance than older brothers. In the present study also, a similar specific result concerning gender of older siblings was found: female teachers provided learners with more hints, prompts, and questions compared to male teachers, but only during the easy tasks. This finding partially supports the hypothesis that older sisters would use more of a deductive style of

teaching than older brothers, based on the literature by (Cicirelli, 1972). During the hard tasks, however, these gender effects were not found. Possible explanations for this could be that the sample size in this study was relatively small; increased sample size may have shown gender effects in the hard tasks. Future studies could further explore gender effects while observing a greater number of sibling dyads. A more plausible explanation for these gender differences only found in easy tasks, however, is based on anecdotal evidence observed during data collection. Previous literature indicated that older brothers close-in-age to younger siblings (2-4 years) demonstrated more hostility, competitiveness, and jealousy than older sisters (Cicirelli, 1972). This was explained by the possible presence of sibling rivalry because boys have a tendency to react more intensely to sibling displacement. The sibling dyads in the present study were close in age (M age gap = 2.3 years). Also, older brothers' hostility and competitiveness can take different forms: it was hypothesized that older brothers would express these feelings by increasing their level of physical control during teaching. In the present study, results appear to show, however, that older brothers instead refrained from providing learners with positive guidance in easy tasks, here taking the form of hints, prompts, and questions. Anecdotal observations revealed that learners sometimes requested guidance from their older sibling during the first few easy tasks, as they were still unsure of how to play the game. It was noticed that in dyads with older brothers, this request for help was at times met with reluctance and disinterest on the part of these teachers. Learners then continued the tasks as they thought best and when doing the hard tasks, they would then strongly refuse teachers' attempts to help them, as if they felt the need to prove they

could do these more challenging tasks on their own. Clearly, these speculations require further study.

Another gender difference was found in the present study and was contrary to what was hypothesized: when the code of physical demonstration was dichotomized into higher and lower levels of physical control, older sisters were found to use more physical demonstration (i.e., higher levels of physical control) than older brothers, but again, these results were only found during the easy tasks. These results are difficult to explain, but might be due to characteristics of the specific sibling dyads observed in this sample or to characteristics of the task itself. For example, it could be that during easy tasks older sisters may have acted in a more dominant manner because they were being overzealous due to the fact they were only beginning to exercise their role as the teacher. A plausible explanation for this scenario happening only in dyads with older sisters may be that learners were more willing to accept a dominant behavior from female teachers, possibly finding this less threatening than coming from an older brother. On the other hand, it could be that dyads with older brothers did not display these dominant teaching strategies because learners were not willing to accept such controlling behavior from older boys, finding them more threatening, and would therefore have prevented male teachers from using physical demonstration strategies.

Another hypothesis regarding gender of older siblings, based on evidence found in the study by Cicirelli (1975), was that older sisters would facilitate more successful learner response rates (i.e., successfully completed tasks) overall, compared to older brothers. No significant gender differences were found. As was described in the results section, learner response rates were overwhelmingly successful: overall, learners failed

to correctly complete tasks only 10.71% of the time. This low failure rate may indicate a possible ceiling effect with regards to task difficulty; in fact, it might suggest that these teachers were so good at scaffolding that they increased the likelihood that learners would succeed. However, this possibility of a ceiling effect does not render scaffolding results irrelevant, it only weakens the present study's ability to assess teacher effectiveness based on success rate of learner responses. Future studies would need to include more challenging tasks to permit researchers to discover the presence or absence of these gender differences.

Older Siblings' Teaching Style

Cicirelli (1972) found that older sisters and older brothers used different kinds of strategies and therefore had different teaching styles. Girls used a more inductive approach to teaching while boys had a more deductive approach. The present study did not find these gender differences in teaching style; however overall, older siblings' strategy use brought forward strong evidence for a consistent style of teaching their younger siblings. Several intracorrelations and intercorrelations were conducted among and between teaching strategies used during easy and hard tasks. All possible combinations of each strategy with all other strategies during easy and hard tasks were calculated. Findings indicated that whether correlations were within easy or hard tasks or between easy and hard tasks, *all* significant correlations indicated positive relationships. This illustrates that whether it was within task difficulty level or between task difficulty levels, when sibling teachers used more of a strategy they also used more of other strategies; conversely, when using fewer examples of a particular strategy they also used fewer number of other strategies. Another intracorrelation was conducted with

totals for each type of strategy used across tasks (including introduction, easy and hard tasks) and similar positive relationship patterns were found. In this case also, all significant relationships were positive. This illustrates that teachers, when using more of one type of strategy, used more of other types of strategies as well; conversely, when using fewer of one kind of strategy, they also used fewer of other kinds of strategies. The overall pattern emerging from these different correlational analyses regarding types of strategies used by sibling teachers suggested that 7-9 year-old children were highly consistent in the kinds of strategies they chose to provide their younger siblings, and this was true across different aspects of their teaching. This question of a general teaching style (irrespective of gender) has not been addressed before in the literature and future research is needed to replicate these findings.

Teaching Strategies and Relationship Quality

The hypothesis that sibling teachers reporting a warmer and more affectionate relationship with their younger sibling would be more likely to scaffold effectively in the more difficult tasks than would older siblings in a less warm and more conflictual relationship was not supported. The present study did not find that differences in relationship quality affected siblings' teaching strategies and this does not support previous findings in the literature. Poris and Volling (2001) reported that older siblings who were highly conflictual toward younger siblings provided less structuring and positive guidance while teaching. The authors explained that these effects during teaching could be one way that older siblings in highly conflictual relationships expressed dominance and displayed power over the younger children. These sibling teachers did not appear to feel the need to teach in an empathetic manner.

Results from the present research may be due to specific sample characteristics; future studies could observe samples of sibling dyads with more varied relationship quality. The lack of differences of the present research may be due to older siblings' overall pattern of responses on the items of the sibling questionnaire. Across subscales, older siblings responded to questions using the middle of the scale; moreover, the range of their responses on all these indicators was quite small. When responses are close to the mean and there is little variability, it is therefore difficult to find differences. It is possible that these children did not want to respond by using extreme ends of the scale for fear of being judged by the experimenter or by the younger sibling for taking a strong stance on the emotional and relational components of the questions. Anecdotal evidence illustrated that this may have occurred, as at times children seemed uncomfortable and refused to answer questions that related to conflictual aspects of the relationship with their younger sibling. At other times, when hesitating to answer a question, older siblings asked the experimenter if their younger sibling would become aware of their answers on the questionnaire. A more likely explanation for the lack of differences, however, may have been a measurement problem due to the 3-point Likert scale. The scale used in this study had been previously used with younger children than in the present study (Howe et al., 1998) and the 3-point Likert scale seemed appropriate due to the fact the children were between the ages of five and seven. In the present study, it was estimated that because the youngest teachers were 7 years of age, the 3-point Likert scale would be appropriate as well. However, a greater range of response options may have been needed for the children to provide more varied results. Further

studies, therefore, could investigate whether a 5-point Likert scale would yield sibling relationship differences.

Limitations

The present study has helped to contribute to the understanding of the sibling teaching literature; however, several limitations should be noted. One of the limitations of this study was that the sample consisted of middle-class families and therefore results cannot be generalized to all sibling dyads. Also, the sample size used was relatively small and therefore certain differences may not have been detected. This may be the reason behind results not reaching level of significance because statistical power was relatively low. Another limitation was that behaviors of younger siblings were not coded and the results only depicted part of the sibling interaction. Also, the coding did not explain teachers' reactions to learners. In the present study only one indicator for learner behavior was assessed through success or failure of young siblings on the block tasks. Learner responses, however, were overwhelmingly successful and differences were not detected. This possible ceiling effect was a limitation. It could be that learners had such success because tasks were not challenging enough and therefore failure rates were very low. An additional limitation in this study was the lack of differences found for sibling relationship quality. This appears to be due to the specific measure used and perhaps the sample studied. It could be that siblings, when only having three options in answering the items on the questionnaire, chose the middle answer and not the extremes for fear of others' judgement of their personal feelings. Also, it could be that sibling dyads in this specific sample did not rate highly on either warmth or conflict.

Future Directions

Previous literature on sibling teaching is sparse, although studies that have investigated this specific type of interaction (e.g., Cicirelli, 1971, 1972, 1973, 1975; Maynard, 2002; Poris & Volling, 2001) bring valuable information to the fields of developmental psychology and education. Findings from the present study were promising and illustrated that 7-9 year-old siblings had sophisticated abilities in teaching younger children. Future research, however, is needed to further develop the understanding of this unique relationship and would also permit researchers to address the limitations of the present study.

Based on the fact that the present sample was composed of middle-class families, future research could observe sibling dyads from different socio-economic backgrounds to investigate whether this would affect their teaching interactions. Also, the sample size used in this study was small. Other observations of sibling teaching should use greater sample sizes because this would increase chances of detecting significant results. In addition, learners' behaviors were not investigated during the sibling teaching. More specifically, a future study could code for both teacher and learner behavior and, therefore, better understand the specific causes and consequences of each sibling's behavior toward one another. For example, other studies could investigate dominant teachers who insist on providing strategies: learners could either react by being submissive and complying, or by resisting and refusing the intrusive help. Thus, coding learner behavior as well as the teacher's would permit for a more complete representation of the bi-directional sibling interaction. One indicator for learner behavior, however, was assessed in the present study by observing younger siblings'

success or failure on the tasks. Findings demonstrated that ceiling effects could have occurred and therefore might have prevented the finding of differences. In other studies these effects could be corrected by increasing the range of difficulty of tasks by including even more challenging block designs.

Finally, relationship differences were not found in the present study. Further research would need to use a different measure to assess relationship quality with school-aged children. Perhaps other studies could use a 5-point Likert scale instead of a 3-point Likert scale to permit for a greater response range and thus possibly increase the likelihood of detecting differences. Also, future samples could observe sibling dyads with a greater range of relationships (some high in conflict and others high in warmth) in order to assess if this factor was associated with teaching strategies.

Implications for Parents and Teachers

Results from this study have practical applications in settings such as homes and schools. Findings concerning the phenomenon of sibling teaching can benefit parents by illustrating the importance of the kinds of prosocial behaviors and skills children develop and use during teaching interactions. Parents could be encouraged to promote these kinds of activities between their children, to further their development through the learning and practice of essential cognitive, social and emotional skills (e.g., perspective-taking, sharing, empathy). Benefits from sibling teaching also have practical applications in the classroom, where peer teaching or tutoring is involved. Siblings are typically the first peers children encounter and the skills siblings develop when interacting with each other may later be transferred when the children come into contact with peers in the school environment. Classroom teachers could encourage either

older/younger or more knowledgeable/less knowledgeable peers to help and teach one another. More specifically, these children could be encouraged to use such strategies as hints, prompts, and questions when teaching other children as these were the most frequent strategies used in the present study and they correspond to a scaffolding approach to teaching that has been found to be developmentally appropriate for young school-age children (Maynard, 2002; Perez-Granados,& Callanan, 1997; Poris & Volling, 2001). Teaching between classroom peers can also promote the children's self-esteem, sense of autonomy from adults in their learning, as well as increase cognitive, social and emotional skills.

Conclusion

It is important to note that the sample used in this study consisted of a middle-class population and results should not be generalized to interactions between all siblings. Nevertheless, consistent results from this study demonstrated that young school-aged children were capable of scaffolding while teaching their younger sibling. Strong patterns were found regarding different factors affecting teaching strategies and three of them were most evident: level of task difficulty, age of the younger child, and age gap between the siblings. These results illustrated that the scaffolding abilities of these children were found in more than one context; this indicated they were able to put these skills to use in concrete every day life activities and that they were also able to find the cognitive, emotional and social resources within themselves to effectively use them. These overall findings bring strong support to the theoretical concepts of scaffolding and guided participation by Rogoff (1990) and Vygotsky (1978) where effective teachers are sensitive to learners' needs while using flexible instructional

strategies that provide support and feedback regarding learners' performance. The effects of practicing these teaching activities may not only be beneficial to sibling teachers themselves but may also be helpful to younger children in the family who can also further promote their own developing skills through their participation in these complementary interactions. Both children may then generalize these skills while being involved in activities with other family members and peers. This can be important in order to promote prosocial interactions among young children. Moreover, the practice of sibling teaching may encourage not only the development of positive and diverse skills, but to may also strengthen sibling bonding and overall family ties.

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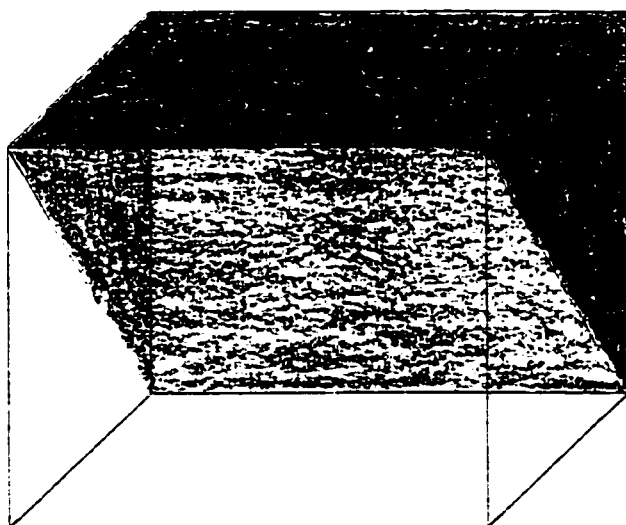Weschler, D. (1989). Manual for the Weschler Preschool and Primary Scale of

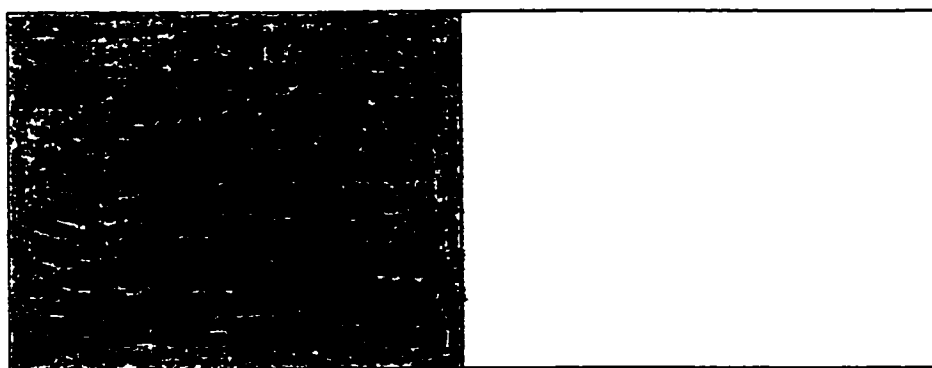Intelligence-Revised. New York: The Psychological Corporation.

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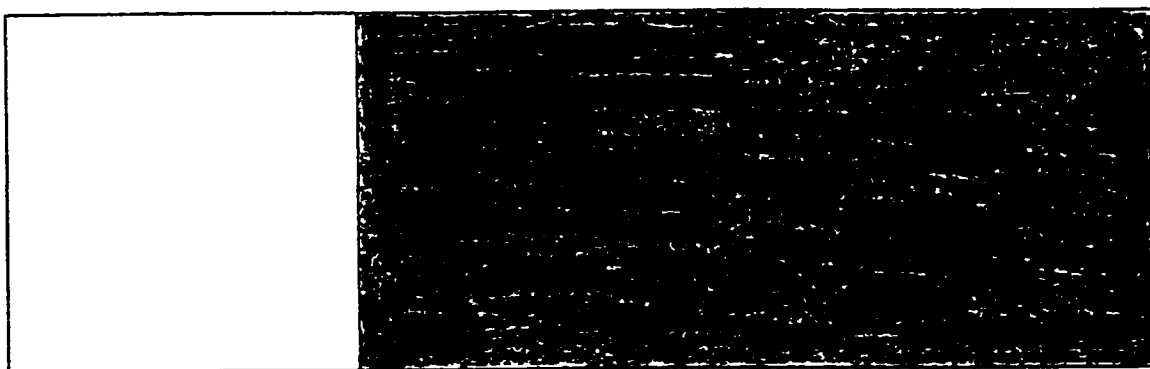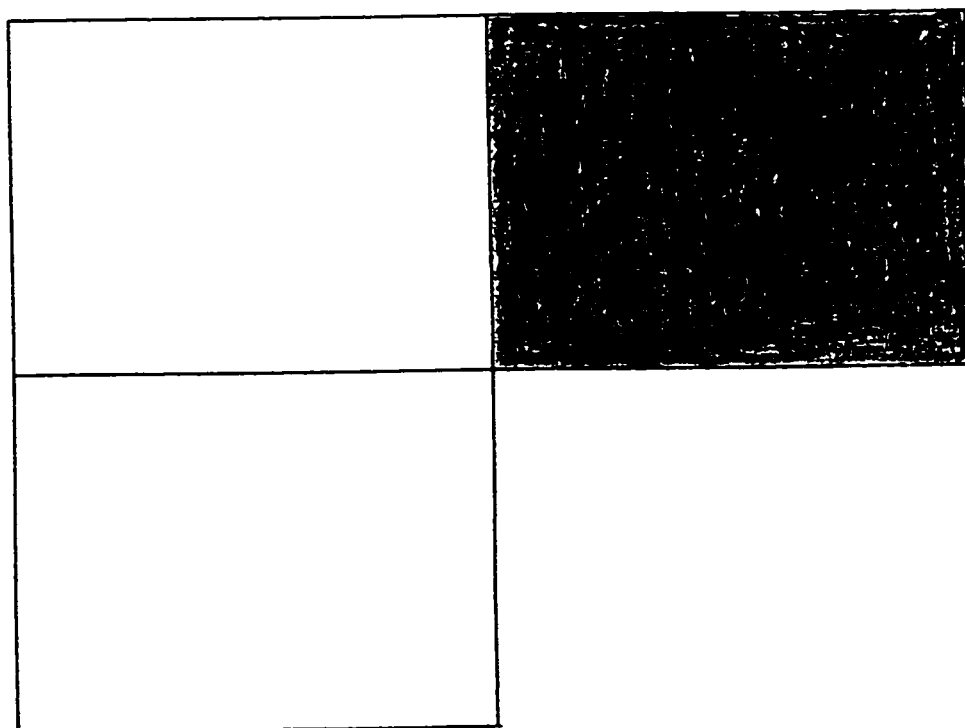methods. *Developmental Psychology, 32,* 842-849.
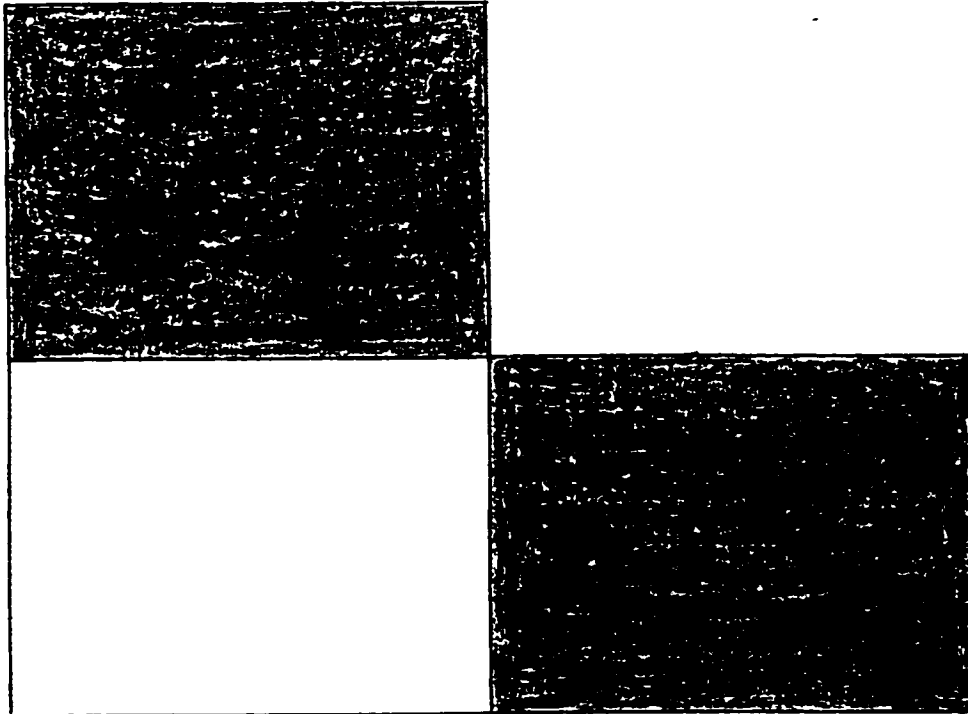
Appendix A

Block sample and block tasks (1-10)
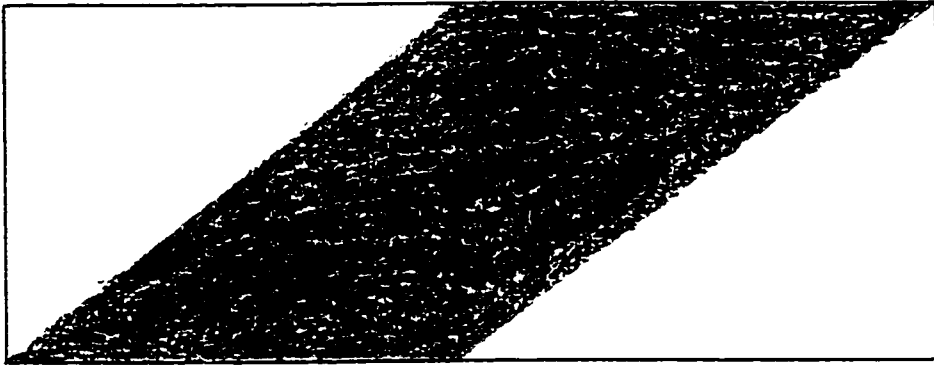
Appendix B

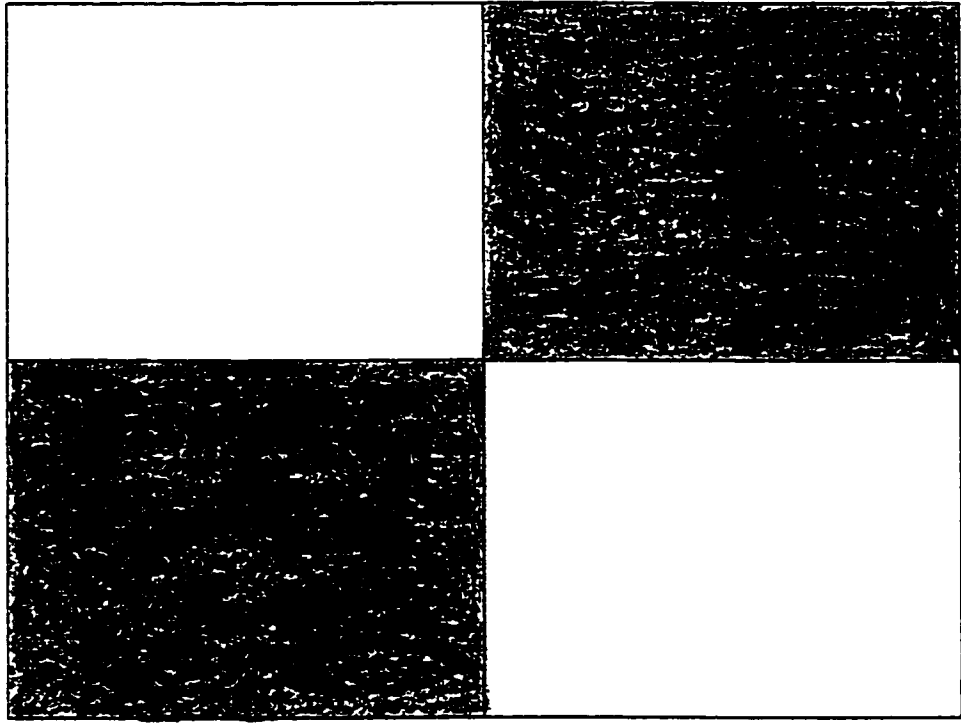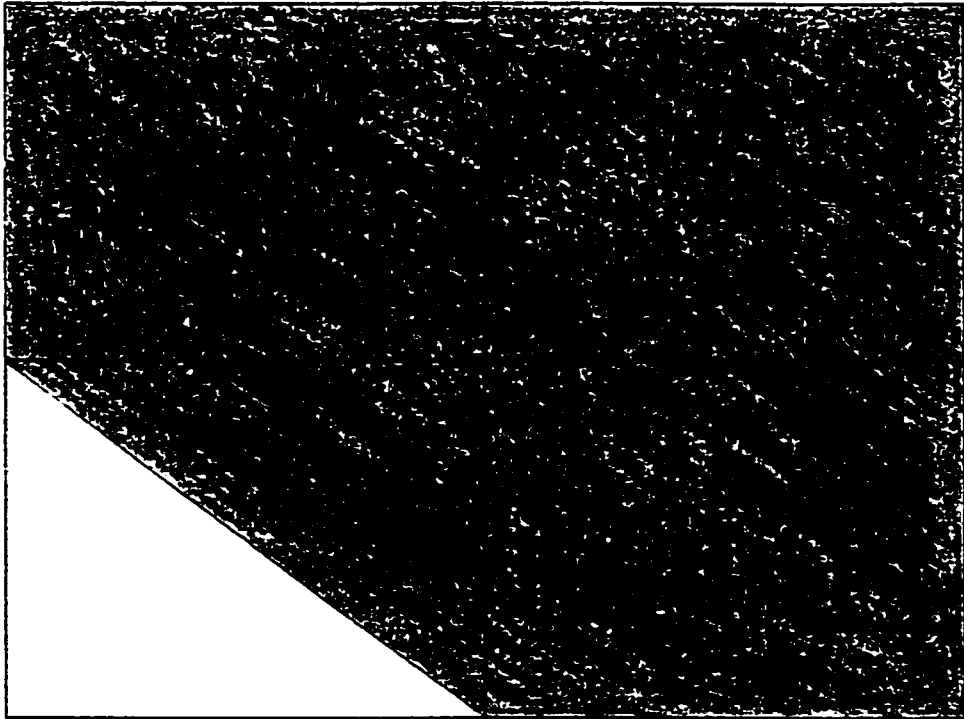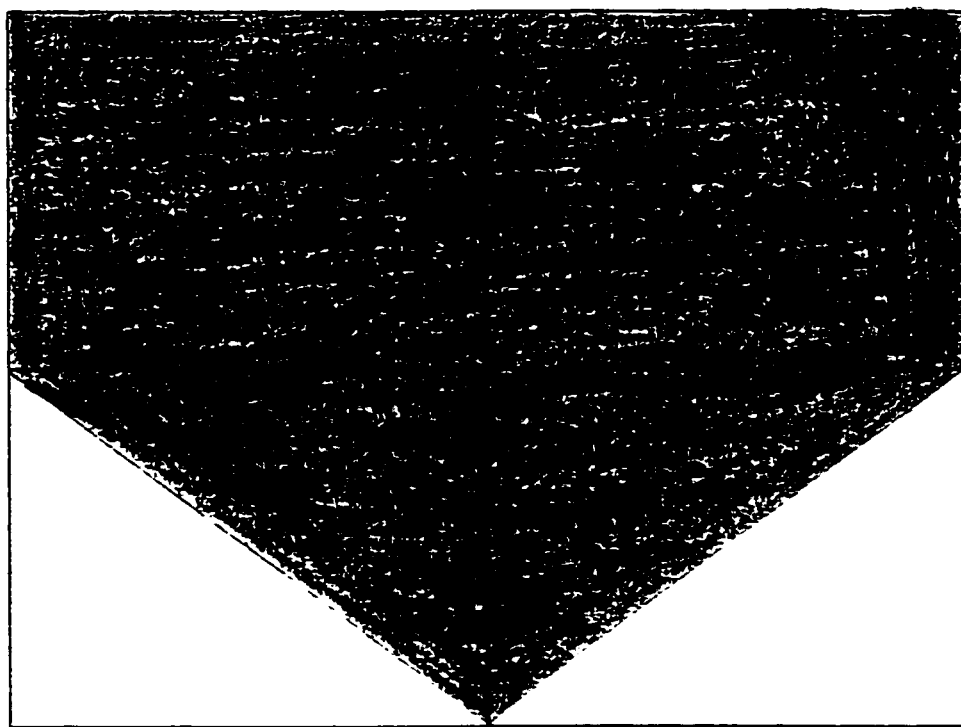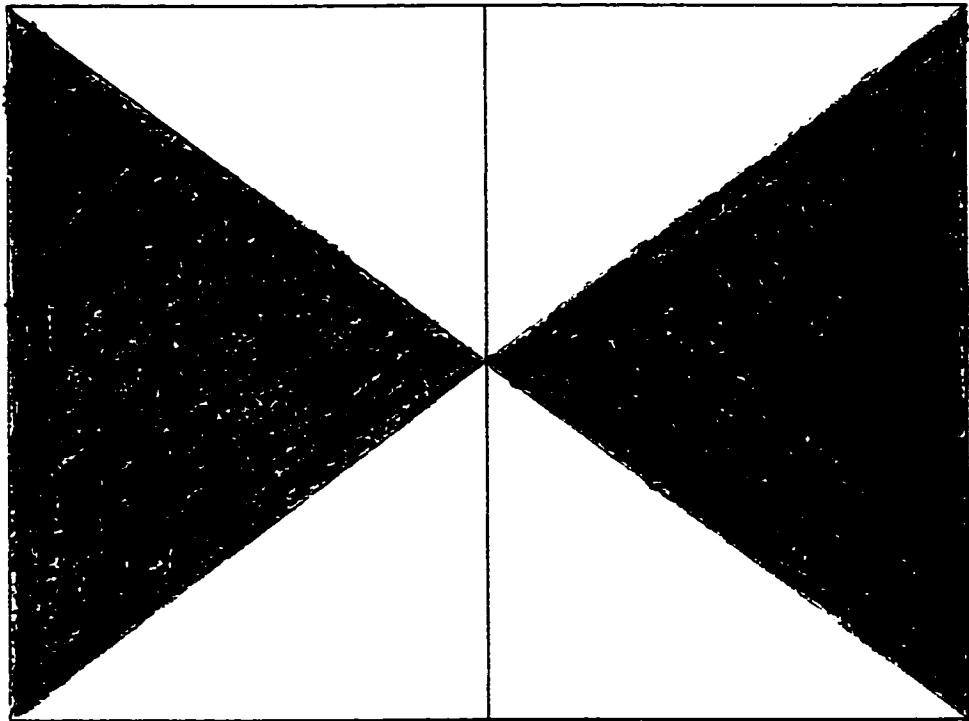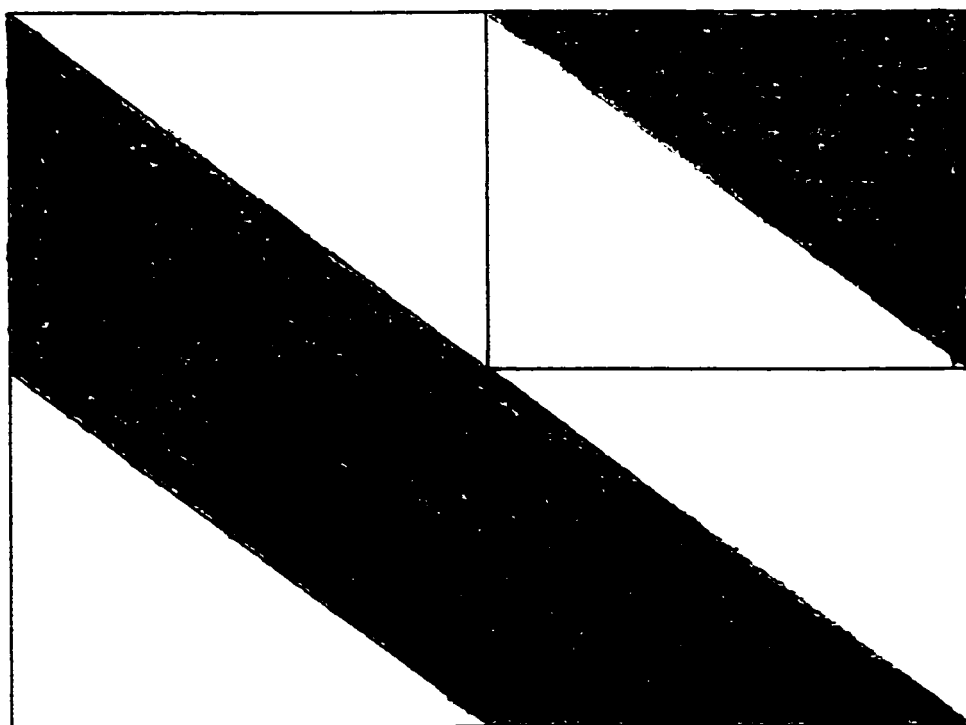Letter to school director

Date, 2001

A qui de droit,

Je suis une étudiante à la Maîtrise en Étude de l'Enfance (M.A. Child Study) dans le département d'Éducation de l'Université Concordia. Je suis présentement en rédaction de thèse sous la direction de Dr. Nina Howe. Mon projet de thèse concerne les relations entres frères et sœurs. Plus particulièrement, je m'intéresse au phénomène d'enseignement entre un enfant et son frère ou sa sœur plus jeune. Ma question d'intérêt est la suivante: les frères et sœurs aînés peuvent-ils adapter leurs stratégies d'enseignement envers leurs cadets lors de tâches plus ou moins difficiles?

Mon projet a été défendu, et j'ai obtenu l'approbation de mon comité de thèse ainsi que du Comité d'Éthique du département d'Éducation de l'Université Concordia pour le réaliser. Je suis présentement à la recherche d'enfants âgés de sept et huit ans (garçons et filles) ayant un frère ou une sœur plus jeune (pas moins de quatre ans). Mes observations des se dérouleraient au domicile des participants et en dehors des heures de classe. Serait-il possible que je contacte les parents des élèves de ces âges qui fréquentent votre établissement afin de les recruter pour mon étude? Ceci se déroulerait de façon écrite et la distribution des lettres aux enfants pourrait se faire en classe.

Je vous remercie pour votre temps et votre collaboration, si vous désirez me contacter, je vous invite à le faire au numéro suivant: (***) ***-****. Si le projet vous intéresse, il me fera un plaisir de vous rencontrer pour répondre à vos questions.

Marie-Hélène Brody

M.A. Child Study,
Département d'Éducation
Université Concordia
Montréal.

Appendix C

Parent letter and permission form

Date 2001

Chers parents,

Je suis une étudiante à la Maîtrise en Étude de l'Enfance (M.A. Child Study) dans le département d'Éducation de l'Université Concordia. Je suis présentement en rédaction de thèse sous la direction de Dr. Nina Howe. Mon projet de thèse concerne les relations entre frères et sœurs. Plus particulièrement, je m'intéresse au phénomène d'enseignement entre un enfant et son frère ou sa sœur plus jeune. Ma question d'intérêt est la suivante: les frères et sœurs aînés peuvent-ils adapter leurs stratégies d'enseignement envers leurs cadets lors de tâches plus ou moins difficiles? Les tâches ici consistent à reproduire, avec des blocs de bois à manipuler, huit dessins sur cartons allant d'un niveau de difficulté moindre à plus élevé.

Mon projet a été défendu, et j'ai obtenu l'approbation de mon comité de thèse ainsi que du Comité d'Éthique du départment d'Éducation de l'Université Concordia pour le réaliser. Je suis présentement à la recherche d'enfants âgés de sept et huit ans (garçons et filles) ayant un frère ou une sœur plus jeune (pas moins de quatre ans). Mes observations se dérouleraient à votre domicile et la visite durerait une heure tout au plus. Les interactions entre les enfants durant les tâches d'enseignement seraient enregistrées sur vidéo, mais le tout restera confidentiel car je serai la seule à visionner les cassettes, et ce uniquement dans le but d'analyse.

Je vous remercie pour votre temps et votre collaboration, si vous désirez me contacter, je vous invite à le faire au numéro suivant: (***) ***-****. Si le projet vous intéresse, et que vous consentez à ce que vos enfants participent, s'il vous plaît retourner le formulaire de consentement ci-joint, dûment rempli, au professeur. N'oubliez pas d'indiquer votre numéro de téléphone sur le formulaire pour que je puisse vous rejoindre!

Marie-Hélène Brody

M.A. Child Study,
Département d'Éducation
Université Concordia
Montréal.

FORMULAIRE DE CONSENTEMENT POUR PARTICIPER À UN PROJET DE RECHERCHE

Je déclare que je consens à participer au programme de recherche mené par Marie-Hélène Brody et sous la direction de Dr. Nina Howe du département d'Éducation de l'Université Concordia.

A. OBJET

J'ai été informé(e) que l'objet de cette recherche est d'étudier les interactions entre frères et sœurs. Plus particulièrement, cette étude concerne le phénomène d'enseignement entre un enfant et son frère ou sa sœur plus jeune. La question d'intérêt de ce projet est la suivante: les frères et sœurs aînés peuvent-ils adapter leurs stratégies d'enseignement envers leurs cadets lors de tâches plus ou moins difficiles?

B. PROCEDURES

L'étude se déroulera dans votre domicile à une heure convenue. Les interactions entre frères et sœurs seront enregistrées sur video pour en faciliter l'analyse. Les cassettes vidéo seront confidentielles et seulement la recherchiste les visionnera et ce, pour des fins d'analyse uniquement. Les enfants seront installés à une table et joueront avec un jeu de ferme (ex: animaux, grange, arbres) pendant quelques minutes. Pendant ce temps, la mère ou le parent sera demandé de remplir un court questionnaire. Puis, l'aîné sera demandé de suivre la recherchiste dans une autre pièce où il ou elle sera enseigné comment jouer au jeu de blocs. Ses questions seront répondues et toutes explications nécessaires pour comprendre les tâches seront fournies. Lorsque l'aîné aura compris comment faire les dessins avec les blocs, il ou elle sera demandé de retourner dans la pièce avec le plus jeune enfant et d'enseigner à son cadet ou à sa cadette comment faire les jeux. La mère ou le parent pourra rester dans la pièce avec les enfants, mais sera demandé(e) de ne pas intervenir pendant l'enseignement entre les enfants. L'aîné(e) sera également questionné(e) sur la qualité de la relation avec son frère/sa sœur plus jeune. La visite durera tout au plus une heure.

C. CONDITIONS DE PARTICIPATION

- Je comprends que je suis libre de retirer mon consentement et de discontinuer ma participation à n'importe quel moment, et cela sans aucune conséquence négative.
- Je comprends que ma participation dans ce projet est CONFIDENTIELLE (la recherchiste connaîtra mon identité mais sans la divulguer).
- Je comprends que les résultats de cette étude pourraient être publiés. Si cela se produit, seulement des résultats d'ensemble seront publiés et aucun résultat d'enfant en particulier ne sera divulgué.

J'AI SOIGNEUSEMENT ÉTUDIÉ LES INFORMATIONS CI-HAUT ET JE COMPRENDS CE CONTRAT. JE CONSENS LIBREMENT ET ACCEPTE VOLONTAIREMENT À PARTICIPER À CETTE ÉTUDE.

NOM (majuscules) _____

SIGNATURE _____

SIGNATURE DU TÉMOIN_____

DATE _____

Appendix D

Parent questionnaire

Étude sur le phénomène d'enseignement entre frères et sœurs

Marie-Hélène Brody, M. A. Child Study

Université Concordia

Questionnaire à remplir par le parent:

Nom :_____

Date :_____

Famille No. :_____

Nom et âge de l'aîné(e)_____

Nom et âge du (de la) cadet(ette)_____

Ce questionnaire a pour but de recueillir des informations démographiques générales sur la famille des frères et sœurs qui participent à la présente étude sur le phénomène d'enseignement entre frères et sœurs.

■■■

1. Nombre d'enfants qui habitent le foyer : _____

2. Date de naissance et sexe de chaque enfant qui habite le foyer:_____

_____

3. État civil du parent:_____

4. Nombre d'années d'études du parent:

_____

5. Occupations de la mère et du père:

_____

■■■
Merci!

Appendix E

Sibling verbatim instructions

Verbatim instructions

1. Introduction and warm-up farm set:

"Bonjour, mon nom est Marie-Hélène, vous c'est quoi vos noms? Venez vous asseoir les enfants, j'ai apporté avec moi un jeu amusant avec lequel vous pourrez jouer pendant que je m'installe avec le vidéo. Je vais vous enregistrer pendant que vous jouez, mais ce sera seulement moi qui va voir les cassettes."

2. Transition:

"OK les amis, maintenant on je vais demander à (nom) de venir avec moi à côté, j'ai un autre jeu fait avec des blocs à te montrer. Ton frère/ sœur peut rester ici et continuer de jouer avec la ferme et les animaux. On va revenir te voir dans quelques minutes, ok? Quand on va revenir, ton frère/ta sœur va t'enseigner comment faire ce nouveau jeu-là ok?"

3. Experimenter teaches older sibling:

"Regardes bien les blocs. Ils sont tous faits pareils: ils ont deux côtés blancs, deux côtés rouges, et deux côtés moitié moitié....tu vois? Ici j'ai des cartons avec des dessins. Le jeu c'est qu'il faut reproduire les dessins qui se trouvent sur les cartons en utilisant les blocks. Tu vois, les cartons ont des numéros de un à dix. Il faut les faire dans l'ordre. Tiens on va commencer par un qui est facile, ok? Il faut bien mélanger les blocs entre chaque dessin pour recommencer à zéro, ok?"

4. Transition, once older sibling knows how to make block designs:

"On va maintenant retourner dans la pièce avec le jeu pour voir ton petit frère/ta petite sœur, ok? Je veux que tu lui enseignes (que tu lui montres) comment faire chaque dessin avec les blocs, dans le même ordre qu'on les a faits. Il faut qu'il (elle) soit capable de les faire tout(e) seul(e) alors il faut que tu essaye de le (la) laisser faire les dessins, ok? Mais tu peux lui enseigner de la manière que tu veux, ok? On y va."

5. Teaching tasks:

"Maintenant on va ranger le jeu de la ferme et on va faire un autre jeu, ok? Maintenant, ton (ta) grand(e) frère/sœur a appris un nouveau jeu et va t'enseigner comment le faire, ok? Allez-y."

6. Questionnaire to older sibling (either after warm-up session or after teaching tasks):

"Bon maintenant, je vais parler un peu avec ton grand frère/ta grande sœur ok? Pendant ce temps-là tu peux jouer un peu avec les jeux, ok? On reviens dans quelques minutes, ça ne sera pas long." "Je veux juste te poser quelques questions sur comment tu t'entends avec ton petit frère/ ta petite sœur, ok?" "Tu vois ici il ya a trois cercle: un gros, un moyen et un petit. Pour chaque chose que je vais te demander, je veux que tu pointes le cercle qui va le mieux avec la question. Le gros cercle veut dire "très souvent ou beaucoup", le moyen cercle veut dire "des fois ou moyen" et le petit cercle veut dire "pas souvent ou un petit peu". Rapelles-toi qu'il n'y a pas de bonnes ou de mauvaises réponses, dis-moi juste comment les choses se passent avec ton frère/ta sœur, ok? S'il y a des questions auxquelles tu ne veux pas répondre parce que tu ne te sens pas confortable, c'est correct tu n'est pas obligé(e) de répondre."

Appendix F

Sibling Behavior and Feelings Questionnaire

Questionnaire pour aîné(e) sur relations
entre frères et sœurs

Nom : _____

Date : _____

Famille No. : _____   Aîné(e) _____

Cadet(ette) _____

Maintenant on va parler de comment tu t'entends avec ton frère/ta sœur (nom). Pour chaque chose que je vais te demander, je veux que tu me montres avec ton doigt si ça arrive souvent, pas souvent ou des fois. Le grand cercle veut dire «très souvent ou beaucoup», le moyen cercle veut dire «des fois ou moyen», et le petit cercle veut dire «pas souvent ou un petit peu». Rapelles-toi qu'il n'y a pas de bonnes ou de mauvaises réponses, dis-moi juste comment les choses se passent avec ton frère/ta sœur, ok?"

On va faire un exemple en premier :
a) Est-ce que tu aimes la crème glacée?   _____
b) Est-ce que tu aimes le brocoli?   _____
c) Est-ce que tu dessines?   _____

_____

1. Est-ce que tu aimes bien ton frère/ta sœur (beaucoup, moyen ou un petit peu)? (1) _____

2. Est-ce que tu fait des choses avec ton frère/ta sœur (très souvent, des fois, pas souvent)? (4) _____

3. Est-ce que tu racontes des choses qui sont importantes pour toi à ton frère/ta sœur (très souvent, des fois, pas souvent)? (2) _____

4. Est-ce que tu agaces ton frère/ta sœur de façon méchante (très souvent, des fois, pas souvent)? (3) _____

5. Est-ce que tu prends soin de ton frère/ta sœur (très souvent, des fois, pas souvent)? (5) _____

6. Est-ce que tu réconfortes ton frère/ta sœur quand ses sentiments sont blessés (très souvent, des fois, pas souvent)? (2) _____

7. Est-ce que tu confies tes secrets à ton frère/ta sœur (très souvent, des fois, pas souvent)? (2) _____

8. Est-ce que tu dis quoi faire à ton frère/ta sœur (très souvent, des fois, pas souvent)? (3) _____

9. Est-ce que tu essayerais d'aider ton frère/ta sœur si il/elle avait besoin d'aide (beaucoup, moyen ou un petit peu)? (2) _____

10. Est-ce que tu penses que ton frère/ta sœur est super (beaucoup, moyen ou un petit peu)? (1) _____

11. Est-ce que tu t'occupes de ton frère/ta sœur (très souvent, des fois, pas souvent)? (5) _____

12. Est-ce que tu te chicanes avec ton frère/ta sœur (très souvent, des fois, pas souvent)? (3) _____

13. Est-ce que tu remontes le moral de ton frère/ta sœur quand il/elle se sent triste (très souvent, des fois, pas souvent)? (2) _____

14. Est-ce que tu prends la défense de ton frère/ta sœur quand il/elle a des problèmes avec d'autres enfants (très souvent, des fois, pas souvent)? (4) _____

15. Est-ce que tu partages tes choses avec ton frère/ta sœur (très souvent, des fois, pas souvent)? (4) _____

16. Est-ce que tu te soucies (te préoccupes) de ton frère/ta sœur (très souvent, des fois, pas souvent)? (1) _____

17. Est-ce que tu provoques la dispute avec ton frère/ta sœur (très souvent, des fois, pas souvent)? (3) _____

18. Est-ce que ton frère/ta sœur est spécial(e) pour toi (beaucoup, moyen ou un petit peu)? (1) _____

19. Est-ce que tu aimes ton frère/ta sœur (beaucoup, moyen ou un petit peu)? (1) _____

20. Est-ce que tu veilles sur ton frère/ta sœur (très souvent, des fois, pas souvent)? (5) _____

Échelles:

1= Sentiments positifs

2= Intimité

3= Conflits

4= Camaraderie

5= Soutien

Appendix G

Coding scheme

SIBLING TEACHING CODING SCHEME

(adaptation of Koester & Bueche, 1980; Kermani & Janes, 2001)

NB: The following codes are not mutually exclusive and therefore can be concurrently identified. Each time the following behaviors are identified during the viewing of the sibling teaching sessions, please make a mark for the appropriate code. If you want, you can manipulate the blocks and the cards to make it easier to visualise what's going on in the tapes. When the sibs start working on card #1, that's when coding of card #1 begins.

- <u>Modeling/physical demonstration</u> = teacher physically demonstrates to learner how to do the task while learner watches (e.g., teacher shows learner how to place blocks correctly on drawing). For a code to be PD, teacher has to place the block(s) or **do the task for the learner.** Code PD for each block placed by teacher.

    > **NB:** To determine whether level of physical control is higher or lower, tabulate number of incidences of PD found in the entire teaching session and write this number down. I will later determine the cutoff point for higher and lower levels of physical control based on an average measure of the sample for this code.

- <u>Negative corrective feedback</u> = **NB: Here either the teacher's tone or attitude has to be aggressive or dominant.** Teacher corrects the learner's response by telling learner (e.g., "Non c'est pas bon, pas comme ça!") or by physically showing learner (e.g., by pointing to the incorrect block; putting hands on the incorrect block; taking the incorrect block away from the design without replacing it correctly; also if learner does design correctly but in the wrong direction and teacher turns block that was wrong in the right direction for learner) that the task is incorrect.

    If teacher says : "Non [corrective feedback], celui-là va de l'autre bord! [hint]"

- <u>Positive corrective feedback</u> = **NB: Here either the teacher's tone or attitude has to be neutral or positive.** Could be verbal or physical. If physical and verbal corrective feedback happen at the same time, code as one. If verbal codes are said in the same breadth, code as one (e.g., Non, non, non, non, noon!!!! = 1 code). If there is a pause between them, code as two. Teacher corrects the learner's response by telling learner (e.g., "Non c'est pas bon, pas comme ça."; "Non, celui-là va de l'autre bord.") or by physically showing learner that the task is incorrect (e.g., by pointing

to the incorrect block; putting hands on the incorrect block; taking the incorrect block away from the design without replacing it correctly; also if learner does the design correctly but in the wrong direction and the teacher turns block that was wrong and puts it in the right direction for learner).

- Explanation/description = teacher provides explanations (i.e., tells learner how game is played, for example that top side of block is important to play the game or that the learner has to reproduce designs on cards with blocks) or descriptions (e.g., blocks are all the same with red sides white sides and sides with half-half). This often happens at the beginning of the teaching sessions when teachers are telling learners about the game. **NB:** To identify a **unit of explanation or description is when teacher changes topic** (e.g., teacher talks about color of blocks, then talks about cards = 2 code units here). If teacher describes (e.g., color of blocks) but intent is to help learner do the task, code as <u>hint</u>. If teacher talks about <u>how game is played</u> = one code.

- Hint/prompt/question = teacher provides suggestions or specific statements to prompt, guide, help along the learner to do the task or the next response (e.g., "Regardes. on dirait une maison"; "Maintenant on fait le numéro huit"; "Rappelles-toi ce que je t'ai dit"; "Regardes bien comment c'est placé"; "Fait-le"; also if learner gets distracted and teacher asks learner to stay on-task; if teacher tells learner to place the blocks over the cards instead of beside to make it easier; if teacher puts hands over three of the four blocks and tells learner to place only one block to start with). If hint is both verbal (e.g., "de l'autre bord") and physical (e.g., turns block) at same time, code as one. <u>Yes code:</u> D'accord?, Regardes. <u>Don't code:</u> ok? nor kid's name because question has to be explicit.

- Praise/reinforcement/encouragement = Any encouragement or reinforcement by teacher to learner (e.g., "C'est bon! Tu l'as eu!"; letting learner know how many cards are left to do; letting learner know that teacher also had difficulty with task; also if learner likes a certain card, teacher can tell learner this card is coming up).

- Checking = This is when teacher checks to see if blocks placed by learner are correct or not. Teacher can do this either just by clearly looking at what learner has done or look and also use hands to pick up blocks and compare blocks and cards underneath

(If each block is picked up by teacher to check, code one check for each block but if teacher checks with one look, code one check). **NB:** Sometimes teacher checks and says learner made a mistake and then teacher changes his/her mind right away and says that learner is correct: code this as checking because teacher still was checking all was well done!

- <u>Arrangement of materials</u> = This is when teacher physically arranges space or materials (cards and blocks) to make the task easier or less confusing for the learner (e.g., teacher takes away unnecessary blocks when learner has to do a task; teacher presents cards that are to be done to learner; teacher takes cards that are already done away from learner; teacher takes blocks off of card once task is done and over with; teacher brings card closer to learner if card is too far for learner to see design better).

Appendix H

Grid for response index of the learner

SIBLING TEACHING

GRID FOR RESPONSE INDEX OF THE LEARNER

Family # _____ Date _____

Teacher _____ Learner _____

Task #	Completion Correct/ Incorrect	Comments
Task 1		
Task 2		
Task 3		
Task 4		
Task 5		
Task 6		
Task 7		
Task 8		
Task 9		
Task 10		

Note. This grid sample includes words for clarity purposes; however, during observations of sibling interactions, no words were used on these sheets.