Imitation as a Learning Strategy and Associations with Teachers' Social Cognitive Skills during Sibling Teaching

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ABSTRACT

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Siblings' imitation as a learning strategy and associations with social-cognitive skills was investigated during a teaching session in 60 siblings dyads (*M* age older siblings = 75.9 mos; *M* age younger siblings = 49.4 mos). The data consisted of videotaped sibling teaching sessions collected at home or school; the older sibling teacher was taught how to construct a tractor by a research assistant and then had to teach their younger sibling. Using videotapes and transcripts, the coders identified the sequences of imitation and then coded the type of imitation (verbal, nonverbal, spontaneous, deferred), responses (i.e., correction, positive/neutral, negative, not attending, off-task), and functions (i.e., clarification, agreement, disagreement, off task) of imitation. The teaching sessions were also rated for degree of learner involvement and task completion. The coding scheme was adapted from Howe, Rosciszewska, and Persram (2017) and Howe and Leach (in preparation). To measure teachers' social-cognitive skills (i.e., second-order false-belief, interpretive understanding), different scenarios were enacted (Astington, Pelletier, & Homer, 2002; Howe, Recchia, Della Porta, & Funamoto, 2012). Five main sets of findings were apparent. First, the findings revealed that learners employed more nonverbal imitation in comparison to verbal imitation. In contrast, teachers employed no verbal imitation and only little nonverbal imitation. Learners' imitated spontaneously after the teacher performed an action or said a word. Second, for the teaching responses, teachers employed more positive/neutral and corrective responses

than not-attending and off-task responses to learners' imitation. Third, during the construction task, learner's involvement during the teaching session was positively and significantly associated with their use of verbal and nonverbal imitation. Fourth, learners used more clarification and agreement than disagreement functions while imitating. However, task completion was not significantly correlated with learners' imitation. Fifth, teachers' social-cognitive skills were not significantly correlated with learners' imitation, learner involvement or task completion. Findings are discussed in relation to the literature on siblings' imitation and teaching, theories on teaching, siblings' cognitive skills and the social functions of imitation.

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Introduction

Teaching can be defined as a didactic exchange of information from a knowledgeable individual to a less knowledgeable one (Ashley & Tomasello, 1998; Howe, Della Porta, Recchia, Funamoto, & Ross 2015; Howe, Ross, & Recchia, 2011). In this process both the teacher and the learner build on their knowledge (Rogoff, 1998). Theorists such as Piaget (1962) and Vygotsky (1978) argued that children learn by interacting with other children, which, in turn, facilitates their social and cognitive development. Children's interactions with other children, especially siblings, helps them learn about other people's views, opinions, and knowledge (McGoldrick, Preto, & Carter, 2015).

Children's use of guidance, scaffolding, and description are some ways that children teach their siblings and peers (Azmitia & Hesser, 1993; Howe et al., 2012; Howe & Recchia, 2009). These strategies require cognitive skills (i.e., to understand the other person's views - that is, theory of mind) to be able to monitor the learner's behaviours and to choose the appropriate strategies for the learner (Perner, Ruffman, & Leekman, 1994). Given that siblings have intimate relationships and a long, co-constructed history together, they may be more skilled at understanding their sibling's degree of knowledge and when to use the appropriate teaching strategy. A number of studies showed benefits of using learner-centered strategies for the learner (i.e., scaffolding, guiding the learner, and providing explanations) and actively involving the learner in the process of teaching compared to teacher-centred strategies (i.e., demonstration, direct teaching, and help that may not involve the learner because the teacher is more controlling; Howe et al., 2012; Howe & Recchia, 2009). However, less work has been done on the use of imitation as a learning strategy in sibling teaching. Although some studies have investigated imitation during ongoing naturalistic interactions (Abramovitch, Corter, & Lando, 1979;

Abramovitch, Corter, & Pepler, 1980; Howe et al, 2017), fewer studies have examined imitation as a learning strategy during teaching tasks (e.g., Azmitia & Hesser, 1993). Imitation may be seen as a learner-centered strategy because the teacher allows the learner to be involved directly (e.g., by telling them to imitate their actions, words or behaviours) or indirectly (e.g., by allowing opportunities for the learner to imitate their actions and responding positively with praise as to encourage involvement in the task). Research showed that younger siblings look forward to identifying and affiliating with their older siblings by imitating their actions (Dunn, 1983). Further, Barr and Hayne (2003) found that imitation between siblings helps children to learn about their environment and could also facilitate children's understanding of other people's perspectives and views. Nonetheless, few research studies have looked at imitation as a learning strategy during sibling teaching.

In an effort to add to the limited literature on imitation as a learning strategy, this study will consider how imitation is used as a learning and its association with teachers' social-cognitive measures during the context of sibling teaching. Two unique features of this study will add to the literature: first, by examining the use of imitation as a learning strategy in the sibling relationship context; and second, by considering associations of learner's imitation with the teacher's social-cognitive skills. In the sections that follow, first, the definition of teaching will be provided. Second, comparisons between peer teaching and sibling teaching, and factors influencing sibling teaching will be discussed. Third, social cognitive measures (theory of mind, specifically, second-order false-belief and interpretive understanding) and associations with sibling teaching and imitation will be discussed. Finally, the definition of imitation will be provided as well as the types of imitation, theories on imitation, and social and cognitive functions of children's imitation. This research will enhance our understanding of sibling teaching and learning and the use of different methods such as imitation.

Children's Teaching

Explanations of teaching have evolved from theoretical and developmental backgrounds including cognitive, social, and behavioural domains (LeBlanc & Bearison, 2004; Ziv & Frye, 2004). Although there are several definitions of teaching, a definition that relates to this study and the direct forms of teaching is that teaching is the transfer of knowledge from a knowledgeable child to a less knowledgeable one (Ashley & Tomasello, 1998; Strauss, Ziv, & Stein, 2002). While some researchers do not include intentionality in their definition of teaching, Strauss and colleagues (2002) state that teaching includes the intention to cause learning to happen, which is related to understanding other people's minds (i.e., theory of mind). This definition implies that teaching and learning happen in a social context (LeBlanc & Bearison, 2004).

According to Strauss et al. (2002), teaching is a natural universal cognitive activity that appears early in life and that does not require any intentional instruction or teaching by adults for children to learn how teach. The seven main characteristics of teaching as a natural cognitive activity are the following. The first characteristic is that teaching requires a theory of mind (i.e., understanding others' views, opinions and perspectives) so as to be effective. Second, every human being has taught themselves and has been taught by others, whether inside the home or outside in society (e.g., school, workplace, and in the street; Strauss et al., 2002). Third, teaching is extremely complex because it requires the teacher to know when to teach, and when and what knowledge is missing (Strauss et al., 2002). The teacher must also consider other people's emotions and motivation before starting to teach, which makes it extremely complex (Strauss & Ziv, 2004). Fourth, while one can only notice the visible part of teaching (i.e., what the teacher requests, what kinds of methods they use), there is an invisible part to teaching, such as the

teacher's intentions, inferences, and mental processes that they use to teach (Strauss et al., 2002). Fifth, teaching requires special forms of social interaction. Unlike other social interactions (e.g., collaboration, conversations, arguments), the teacher must recognize the intention (or goal) of the social activity. The goal of teaching is to enhance the learner's knowledge. Sixth, even though teaching is universal, the skill is acquired without informal instruction and all human beings apparently know how to teach. Finally, even children as young as age three know how to teach because teaching is a natural cognitive activity. While Strauss and colleagues (2002) considered teaching as a natural aspect of cognition, it could be argued that young children learn from others how to teach by modelling teaching behaviours, techniques, and strategies. In other words, teaching may not be innate but rather children learn how to teach by observing and then copying other adults' teaching techniques or strategies. Nonetheless, Strauss and colleagues (2002) made an important contribution to the literature by identifying the major characteristics of teaching.

Considerable research has been conducted in the field of learning and teaching and how children engage in learning and teaching (Palincsar, 1998). Influential theories on the development of children's teaching and learning will be reviewed next.

Theories on the Development of Children's Learning and Teaching

The original accounts about learning stemmed from behaviourists such as Thorndike (1906, as cited in Palincsar, 1998) who identified one method of teaching called direct instruction teaching, which is defined as the teacher's active role in teaching, maintaining control of the learner, sequence, and content of the lesson. Then, moving away from behaviourist accounts to social and cognitive perspectives, Piaget (1962) advanced the socio-cognitive theory of learning, and Vygotsky (1978) developed the sociocultural theory of learning and teaching (Palincsar, 1998). Rogoff (1993; 1998) extended Vygotsky's (1978) ideas on collaborative learning between

partners (especially the Zone of Proximal Development) to identify the guided participation method for learning and teaching. Finally, Bandura's Social Learning Theory focused on how people learn by observing, imitating and learning from others through the social, cognitive and behavioural influences (Bandura, 1969, 1997). These foundational and important theories will be reviewed to understand the nature of learning, teaching and their complexity.

Direct instruction. In Thorndike's view (1906 as cited in Palincsar, 1998), direct instruction was considered necessary because it was the teacher's responsibility to teach the learner new skills (e.g., by using instructional procedures such as demonstration, modelling, and reinforcement). This reflected the behaviourist approach of teaching to acquire new behaviours by stating the factual content. However, the way the learner acquires the knowledge (i.e., how the learner constructs knowledge individually in a dialogue with others) is not considered in direct instruction.

Thorndike (Bruner, 1990; as cited in Palincsar, 1998) was criticized for not considering cognitive and social perspectives of teaching and learning, Piaget and Vygotsky developed more extensive perspectives for learning from social-constructivist perspectives by considering the cognitive and the social domains in their understanding of children's teaching and learning (Palincsar, 1998). They both focused on how children learn from peers, however, Piaget (1962) focused mainly on the cognitive aspect of how children build new knowledge, while Vygotsky (1978) emphasized the importance of social interactions of children in teaching and learning.

Socio-cognitive conflict theory. Piaget (1962) developed a theoretical framework explaining how children learn and teach their peers (Palincsar, 1998). His socio-cognitive conflict theory entails that children improve intellectually by having cognitive conflicts (Perret-Clermont, 1980).

Piaget (1962) suggested that when a learner's existing knowledge is contradicted by a peer, this in turn, leads to the rise of disequilibrium, which promotes the learner to question their belief and try out new information and ideas. Therefore, this disequilibrium forces children to move beyond their level of understanding and acquire new ideas. Piaget (as cited in Palincsar, 1998) believed that children learned more and advanced cognitively when interacting with their peers compared with interacting with adults or when alone. For example, when children were actively engaged in problem solving, they obtained more knowledge from their peers than when working alone (Palincsar, 1998). Even though Piaget advanced the perspective of learning by focusing on how children learn to solve problems by having cognitive conflicts, he did not focus on the social dimension of how children learn by cooperation and social interactions with their peers (Carpendale & Lewis, 2004). In contrast, Vygotsky emphasized the collaborative and social nature of teaching and learning.

Vygotsky's social-constructivism theory. After Piaget's expansion of the perspective of teaching and learning, Vygotsky (1978) added the social dimension, which is essential to teaching and learning. Vygotsky (1978) emphasized the importance of dyadic interaction in teaching by introducing the idea of the Zone of Proximal Development. The child learns better when the teacher matches the learner's level of development, which is the distance between the actual level of the child's knowledge and their potential level of knowledge. The teacher provides guidance and cooperation according to the learner's level of development (LeBlanc & Bearison, 2004). Therefore, both the teacher and the learner participate in the shared bidirectional activity of teaching and learning (LeBlanc & Bearison, 2004; Strauss & Ziv, 2004).

The teacher's role is to guide the learner to initiate questions, respond, and solve problems, while discussing them with peers. The learner must also self-regulate and ask for explanations,

justifications, or make objections to what the teacher mentions. All these arguments point to the Social Constructivist Theory of Learning that emphasizes the collaborative nature of learning and encourages interactions between children (Palincsar, 1998). Following from the work of Vygotsky, Rogoff (1993, 1998) emphasized the essential benefits of learning in collaboration.

Guided participation. Similar to Vygotsky's theory of social-constructivism, Rogoff (1993; 1998) focused on guided participation in cultural activities by children and caregivers. Rogoff (1993) defined guided participation as a child's participating in culturally-structured activity with guidance, support, and arguments challenging the learner from a more skilled partner. This definition stressed the importance of how children learn practices of their community. Additionally, it emphasizes the importance of guidance to support the learner to complete the activity rather than through the use of direct instruction. This also stresses participation as a shared endeavour-like, side-by-side arrangement of activities, which both partners develop by sharing their cultural practices and knowledge. The children in this case may use cultural tools and interventions such as literacy, mathematics, computer skills, and mnemonic skills. Similar to Rogoff's theory, Bandura (1997) stated that children and people learn by observation others and different factors influences their observations and imitation.

Social Learning Theory. Bandura's Social Learning Theory states that people learn from other people by observing, imitating, and modeling behaviours (Bandura, 1969). Bandura's theory not only focuses on the social factors of imitating, but also includes the behavioural and cognitive factors that influences observational learning including memory. In addition, Bandura explored how different processes influence modeling including attention (i.e., a person needs to recognize the model's behaviour in order to imitate or observe it), retention (i.e., a person needs long-term memory to retain and recall the model's behaviour later on), reproduction (i.e., a person reproduces the same behaviour), and motivation (i.e., a person

imitates for a reason of the past, for imagined incentives, or by seeing and recalling the reinforced model).

From the work of these theorists, research studies have investigated the importance of social and cognitive processes of teaching (Strauss et al., 2002). The social-constructive theories of Vygotsky and Rogoff are the most important for the present study of all the theories discussed, because they emphasize the importance of the collaborative nature of learning and teaching. Thus, both the teacher and learner are active in the process of teaching. Bandura's social learning theory is also relevant to this study because it emphasizes the importance of learning from observing, imitating, and modelling other people's behaviours (Bandura, 1969, 1997). Further, Bandura's theory not only included social processes that influences modeling and observing behaviours, but also motivational and cognitive factors. In the following sections, the age at which children start to teach other children has interested researchers and their understanding of the intentionality of teaching and learning outcomes will be covered (Ashley & Tomasello, 1998). In addition, the role of the learner in the teaching process and their understanding, involvement, and strategies they use to learn will be considered in this study.

The Emergence of Teaching Behaviours in Children

From early on, children have the capacity to teach other children (Ashley & Tomasello, 1998). Ashley and Tomasello (1998) showed how 2-year-olds were not successful in completing tasks on their own or with adults' instruction (e.g., complete puzzles), and therefore, they were unable to teach other children. However, 3-year-olds— after they had some interaction with knowledgeable teachers— were able to teach other children and to complete tasks successfully. Although 3-year-olds are able to teach other children (e.g., by demonstrating attempts to teach younger children), older children (aged 5 and older) better understand the intentions of teaching

(e.g., use different strategies to suit the learner including verbal explanations and demonstration), which is supported by other studies (Davis-Unger & Carlson, 2008; Ziv & Frye, 2004).

Strauss et al. (2002) focused on how children understand and recognize the intentionality of teaching. The researchers found that 3-year-olds failed to understand that teaching others did not always involve successful learning. In addition, 3-year-olds mainly focused on successful outcomes to define teaching. However, 5-year-olds succeeded in their judgement and intentions of teaching while distinguishing it from learning. These findings imply that older children (e.g., aged 5) have the ability to understand the intentions of teaching (Carpendale & Lewis, 2004; Ziv & Frye, 2004; Ziv, Solomon, & Frye, 2008), for example, they understand teaching does not always produce successful outcomes. In other words, 5-year-olds understood that teaching could lead to partial understanding and giving partially correct responses on the part of the learner (which is supported by other research, e.g., Carpendale & Chandler, 1996; Carpendale & Lewis, 2004; Davis-Unger & Carlson, 2008). In addition, they understood the relation between teaching and learning, and the learner's behaviour and their acquired knowledge (Strauss et al., 2002). The strategies that 5-year-olds employed during the game included more verbal explanations regarding the game rules, due to the fact that they assumed that procedural knowledge (i.e., how to do the game) would follow after the explanation. Therefore, this shows that 5-year-olds have a more advanced level of cognitive development (i.e., they understand the intention behind teaching and learning) than 3-year-olds (Strauss et al., 2002).

While these studies looked at children's understanding of teaching, more studies need to consider the specific strategies that siblings use, their association with social-cognitive skills, and children's learning, which are addressed in the following sections.

Sibling Teaching

Why focus on sibling teaching? The majority of individuals (about 80%) in Europe and the United States grow up with siblings (Kreider & Ellis, 2011; Statistics Canada, 2011). Sibling relationships are long lasting, intimate and are characterized by positive and negative experiences (Dunn, 2002; Howe et al., 2011). Moreover, two major features stand out in sibling relationships: reciprocal interactions and complementary interactions (Dunn, 1983). Reciprocal behaviour allows siblings to understand each other and share interests as in play and conflict (i.e., equal, returned, and mutual interactions, which are evident in friendships). In contrast, complementary behaviour between the two siblings exists because usually the older sibling takes the lead and the younger follows, as in teacher and learner interactions (Dunn, 1983).

Siblings' unique interactions with siblings are defined by four major characteristics. First, siblings' relations are characterized by a great range of affect (e.g., negative, positive, ambivalent affect; Dunn, 2002; Howe et al., 2011). This makes it difficult for children to ignore their siblings unlike friendship relationships, which are voluntary and generally positive. Second, siblings spend a great deal of time together (Dunn, 2002). This translates into intimate bonds due to the fact that siblings construct a shared history in early childhood, and this helps to facilitate their emotional and intellectual abilities (e.g., in play, disagreements, teaching; Howe et al., 2011). Third, there is a great range of individual differences in the affective quality of sibling relationships, which makes it a unique context to study and it is linked to children's interactions (Dunn, 2002; Howe et al., 2011). For example, siblings, due to their intimate relationship, may demonstrate a unique dynamic of both cooperation and conflict behaviours. Finally, there are important nonshared environmental factors that affect siblings' relationships, such as parental treatment (Howe et al., 2011). In brief, sibling relationships are long-lasting and intimate, and children learn from their siblings in different contexts such as in play and teaching. Siblings'

intimate and long-lasting bonds offer them many advantages for learning and teaching, which is why this unique context will be investigated in the current study.

Azmitia and Hesser (1993) investigated the effect of peers and siblings on children's cognitive development during teaching. The participants included 64 triads, whose ages included 7-year-old learners and 9-year-old sibling and peer teachers. The teachers (i.e., older siblings and peers) were trained to master unstructured building and teaching tasks, and then two days later they taught the learners (i.e., younger siblings). The results indicated that younger siblings were more attentive to their older sibling teachers and they imitated the same steps to build more than with peer teachers. In addition, younger siblings directed more questions to their older sibling teacher than to the peer teacher. Learners were more active and involved in building when they were taught by siblings than by peers. The sibling learners demanded more explanations from older siblings than from peers. Furthermore, learners taught by siblings completed the task (building a windmill) more successfully than when taught by peers. These findings emphasize the major differences between sibling and peer teaching, in addition to the effectiveness of the older sibling teachers. It also highlights how younger sibling learners are more comfortable in asking their older sibling teachers to offer more clarifications than asking peer teachers.

Researchers have investigated the role of the sibling learner in the teaching process (e.g., Howe, Della Porta, Recchia, & Ross, 2016). Howe and colleagues (2016) examined, in a longitudinal study, sibling-directed teaching and the different strategies and characteristics associated with sibling teaching and learning over the preschool years. They examined naturalistic sibling teaching, when the siblings were 2- and 4-years-old, and when they were 4- and 6-years-old. Further, they examined how birth order differences could impact the teaching strategies and the learner's responses, when they controlled for the teacher's age. The siblings were observed for six 90-minute sessions at home and they were allowed to play with their own

toys. The results showed that the learners were active in the process of teaching, in which they asked questions, demonstrated understanding, and were involved. These findings were supported by other research studies because teaching and learning are bidirectional processes (e.g., Palincsar, 1998; Howe et al., 2009, 2015). Further, Howe et al. (2016) found that second-born learners were more involved in the tasks at time two as compared to time one, which might perhaps be due to their increased cognitive development (i.e., theory of mind). This shows the changing relationship with their older sibling as the younger sibling became more engaged in reciprocal interactions during teaching, and the siblings' increased understanding of the bidirectional process of teaching between the learner and the teacher. This finding adds more insight about the dynamics of the sibling relationship because as younger siblings grow up (age 4), they become more involved and active in the teaching and learning process. This increased learner involvement might be due to their improved cognitive skills to be able to adjust to older siblings' teaching styles and to take the perspective of others' views, opinions and knowledge.

Other studies have found similar patterns showing that learners become more involved in the process of teaching as they grow older (Howe et al., 2009, 2015). Moreover, Howe and colleagues (2015) reported that younger sibling learners were actively involved in the teaching process and they did not reject the teaching attempts by their older sibling teachers, who assumed the role of teachers. Moreover, the type of strategies the teachers used affected the learners' responses and their degree of involvement. When the teachers used strategies of direct instruction, planning, clarification, positive feedback, and ignoring, the learners were more involved compared to when teachers just did not respond to the learner's requests (e.g., teacher gives up on the learner's pronunciation). For example, when the teachers provided relevant

information, and taught them the steps needed to complete a task, the learners became more involved and focused on the teacher's explanations.

While these results illustrate the importance of studying sibling teaching and how younger siblings consider their older siblings as more effective models and teachers than peers, more research studies need to explore this unique context of sibling teaching. Siblings' intimate and long-lasting relationship might influence their learning from one another since they share the same environment and have a co-constructed a history of shared experiences. In the following section, other factors will be explained to show their significant influence on sibling teaching. In addition, the learner's involvement, knowledge, and role in the teaching process will be explored.

The effects of age, age gap, and gender on sibling teaching. Sibling teaching is affected partially by factors of age. Older siblings are seen as more responsible and conscientious than younger siblings (McGoldrick et al., 2015), therefore they are seen as good teachers because they feel more responsible and capable of teaching their younger siblings (Cicirelli, 1972). Howe and colleagues (2012) found that older siblings used more verbal (i.e., instruction, help), nonverbal (i.e., pointing) and physical demonstrations in a construction task because it required more steps to complete the task than in a self-directed task (e.g., puzzle). A second factor that influences teaching is the age gap between the teacher and the learner. For example, when the age gap between siblings is larger, the older sibling may act as an authority figure (e.g., more like an adult; Cicirelli, 1972; Klein, Feldman, & Zarur, 2002; Recchia, Howe, & Alexander, 2009). When the age gap is small, the teacher might encourage or assist the learner in copying their actions or words to accomplish a task. In contrast, with a large age gap, the teacher might not involve the learner in the process of teaching nor encourage them to imitate.

While some research studies show no effect of gender on sibling teaching (e.g., Azmitia, 1988; Azmitia & Hesser, 1993; Howe et al., 2012), other studies report that the gender match between siblings may influence their teaching. For example, girls were more effective in teaching younger female siblings and they used more teaching strategies (i.e., explanations, descriptions, and provided definitions of the concepts compared to teaching younger brothers; Cicirelli, 1972, 1975). Depending on the siblings' gender, the teacher might employ different strategies (e.g., female teachers might use more explanations in comparison to male teachers). In addition, the learner might ask more questions, ask for more explanations and become more involved in the process of teaching with a female sibling teacher.

The factors of age, age gap and gender may be associated with the cognitive processes (i.e., theory of mind) and teaching strategies that children use to teach their siblings (e.g., demonstration, guidance, and verbal instruction). The effect of these variables on the learner has received less attention in the literature, which warrants further investigation given the bidirectional nature of this activity.

Associations between Children's Social-Cognitive Skills and Sibling Teaching

Theory of mind. Theory of mind is defined as a child's ability to understand that other people have different perspectives, thoughts, and point of views that are separate from their own (Davis-Unger & Carlson, 2008). Children develop a theory of mind at around age three to four years, when they begin to understand that other people's views are different from their views (Davis-Unger & Carlson, 2008). However, even 2-year-old children have some knowledge of false belief (Davis-Unger & Carlson, 2008). The false-belief task is based on the understanding that an individual's belief or representation about the world may contrast with reality (Wellman, 1993; as cited in Davis-Unger & Carlson, 2008). An example of a typical false belief scenario could be the Location false belief scenario (Wimmer & Perner, 1983). In the Location false

belief task, children are presented with two puppets (Ernie and Bert) who are playing with a ball. Bert puts the ball in a blue box and leaves. Meantime, Ernie removed the ball from the blue box, and played with it, and then he puts it in the red box. When Bert returned, the children were asked a false belief question ("Bert wants to play with the ball some more. Where does Bert think the ball is?"), and the reality question, ("where is the ball really?"). In order to pass the false belief task, children are required to answer both questions correctly (e.g., Fail = 0; Pass = 1). While 3-year-old children acquire false belief understanding, older children develop the more advanced cognitive skills of second-order false-belief and interpretative understanding.

Older children develop second-order false-belief, which is defined as a teacher's understanding of whether the learner understands the perspective explained to them or fails to understand it (Howe et al., 2012). In other words, the teacher has to attribute the belief of a person to another's thoughts (Perner & Wimmer, 1985). Thus, second-order false belief understanding is related to what people think about other's thoughts.

Children, who are between 6-and 8-years-old also develop interpretative understanding (Howe et al., 2012). This cognitive skill is relevant to teaching because it allows children to understand that different people can arrive at the same conclusion by using the same information but in different ways (Carpendale & Chandler, 1996; Carpendale & Lewis, 2004). This means that children, who have interpretative understanding, will understand that teaching could be ambiguous at times. Further, they have the ability to explain the relevant steps to the learner using proper strategies so the steps are understandable. Therefore, successful teaching appears to require the teacher have more advanced social-cognitive skills so as to help the learner gain new understanding about the task.

In fact, research has shown an association between theory of mind and teaching (Strauss et al., 2002). A child, who demonstrates theory of mind, recognizes the need for teaching and the

knowledge gap between the teacher and the learner (Strauss et al., 2002). The child appreciates the goals and intentions of teaching that cause learning to occur (Davis-Unger & Carlson, 2008; Strauss et al., 2002). Furthermore, a child demonstrating theory of mind is able to consider the knowledge and emotional and motivational state of the learner. When the learner finds the task difficult, the teacher, by using their theory of mind skills, is able to alter the strategies of teaching to help the learner succeed at the task (Strauss et al., 2002).

In conclusion, studies (e.g., Davis-Unger & Carlson, 2008; Strauss et al., 2002) showed the importance of studying children's knowledge and understanding of the concept of teaching and their recognition of the knowledge difference between a teacher and a learner. However, little attention is paid to the role of the learner in the teaching process (e.g., Strauss et al., 2002) and their use of imitation as a learning strategy during sibling teaching. For example, a teacher, who has advanced cognitive skills and knowledge (i.e., second-order false-belief), might understand that teaching is a bidirectional process that involves both the teacher and the learner. Thus, teachers might involve learners during building. The learner, who has advanced social cognitive abilities (e.g., theory of mind) might accept the teacher's explanations and imitate their actions, words and behaviours, in order to learn how to complete a task successfully (e.g., the learner has a goal and intention that leads him/her to copy the teacher's behaviour).Yet, few studies (e.g., Howe et al., 2012) have addressed the learner's responses to the teaching, their understanding of the role of the teacher, and perspective on the different tasks.

Siblings' use of teaching strategies including learner-centered strategies, teacher-centered strategies, and imitation as a learning strategy will be considered in the following sections.

Learner-centered and teacher-centered strategies and social cognitive skills. Factors that contribute to teaching include strategies that siblings use to teach one another, specifically,

learner-centered strategies, teacher-centered strategies, and imitation as a learning strategy. Concerning learner- and teacher-centered strategies, a study by Howe et al. (2012) examined siblings' use of teaching strategies in two different tasks and the association of these strategies with social-cognitive skills. The sample included 63 sibling dyads between 4- and 6-years-old. The research assistant gave instructions to older siblings on how to complete two tasks (i.e., a tractor construction task and a tangrams puzzle matching task) in order to teach their younger siblings. The results showed that older sibling teachers were consistent in their approach to teaching (e.g., learner-centered or teacher-centered approach) across the two tasks, yet they used somewhat different techniques in each task. For example, in the construction task, the teachers employed more learner-centered strategies (e.g., helping, scaffolding, guidance, providing descriptions) to help the learner complete the task successfully, because the task included more unfamiliar steps to complete than the tanagrams task (puzzle matching). However, in the tanagrams task, once the learner completed the first tanagram, he/she figured out the information and how to complete the task. In the tanagrams task, teachers used more verbal attention strategies to point out the correct shape or piece. Moreover, teachers employed encouraging statements to motivate the learner to complete the more difficult tanagrams. These findings were consistent with other research studies that demonstrate older siblings' understanding of which strategy to use to fit the learner's knowledge (Howe et al., 2015; Howe et al., 2012; Rogoff, 1990, 1998). Similarly, Azmitia (1988) showed the benefits of collaboration, which is part of learner-centered strategies; collaboration leads to greater learning than solitary work for preschoolers.

Concerning the links between social-cognitive skills and teaching and learning methods, Howe et al. (2012) found that there were positive associations between social cognitive skills (i.e., second-order false-belief and interpretative understanding) and the teacher-directed task

(i.e., tractor building) and teaching strategies (e.g., verbal attention, help). Further, Howe et al. found that direct instruction was associated with second-order false belief and encouragement with interpretative understanding. However, this study did not investigate the association between the learner's behaviours (e.g., understanding, asking questions, challenging the teacher) during the teaching session and either the learner or the teacher's social-cognitive skills (second-order false-belief and interpretative understanding).

Even though these strategies are crucial to be considered in the literature on sibling teaching, few studies have investigated the importance of imitation on learning during sibling teaching, although there is some indication in the literature of the importance of this behavior. Studies have documented the benefits of imitation as a learning strategy (e.g., Barr & Hayne, 1999; Over & Gattis, 2010), in which children can learn new behaviours by employing imitation. It could be argued that imitation is a type of learner-centered strategy because it actively involves the learner, who takes responsibility for learning when he/she imitates the teacher's behavior. Thus, research on how imitation may be an effective learning strategy with both cognitive and social functions (e.g., to learn about the world and others) will be addressed in a following section.

Imitation as a Learning Strategy

Scholars and theorists differ in their definition of imitation to include social, cultural, and cognitive perspectives (Nielsen, 2012; Nielsen & Blank, 2011). For our purposes, imitation is defined as a process that involves the reproduction of an observed behaviour using the same actions that were observed, with an understanding of the intentions behind the behaviour (Nielsen, 2012). According to Nielsen (2012), imitation has cultural and social functions that help children learn behaviours from people rapidly by copying behaviours and skills (e.g., how to use tools) that are needed in their lives.

Further, children imitate actions, words, or behaviours that adults perform even when they appear purposeless, which has been labelled as over-imitation (Nielsen, 2012; Nielsen & Blank, 2011). Not only does over-imitation improve children's understanding and knowledge about their culture, but also it helps them learn about actions, words, and sentences. Researchers have investigated the types of behaviours that children use to imitate others in their environment (Barr & Hayne, 1999; Over & Carpenter, 2012; Over & Gattis, 2010). Further, researchers have studied children's use of imitative behaviours during naturalistic ongoing sibling interactions (e.g., Abramovitch et al., 1979; Abramovitch et al., 1980; Howe et al., 2017). However, few studies addressed how siblings use imitation during teaching contexts. The sibling context provides a foundation for considering imitation during teaching contexts because it might reveal the cognitive and social functions of imitation, and the association between learner imitation and the teacher's cognitive abilities (e.g., theory of mind).

Children might learn from their peers or other children during play. However, for the present study, sibling imitation will only be considered in a teaching context. Few studies have considered how teachers might involve the learners during the teaching session and how learners might take this opportunity to employ spontaneous imitation. For example, some teachers might involve learners to build or complete a puzzle with them, which in turn, provides some opportunities for learners to imitate. The present study will consider learner involvement in the task.

Types of imitation for learning. Barr, Dowden, and Hayne (1996) documented two types of imitation that children use to learn effectively. First, spontaneous imitation (or immediate imitation) is defined as a child's repetition of a behaviour, sound, or action within a short period of time. For example, a child can repeat a word that he/she heard from an adult within few seconds. The second type of imitation is deferred imitation, which is defined as repeating a

behaviour, sound, or action at a later time (Barr et al., 1996). This type of imitation requires declarative memory because children have to remember the behaviour, and therefore, use it at a later time (e.g., some minutes, hours or days later; Meltzoff, 2011). Meltzoff (2011) found that 6-week-old infants can imitate actions after a 24-hour delay. For both types of imitation, children's imitative acts may include verbal and nonverbal behaviours. Thus, it is important to consider the different types of imitation because depending on children's developmental age and understanding, they might use different types of imitation and imitate different nonverbal and verbal behaviours. In the following section, theories on children's development of imitation will be discussed, especially Meltzoff's (2011) Like-Me-Theory and Piaget's (1962) stages of the development of imitation. These theories provide a guide for studying sibling imitation.

Theories and stages of the development of imitation. According to the Meltzoff's (2011) Like-Me Theory, newborn children employ imitation to make connections between the self and others. Further, imitation has social cues and functions, and children use imitation to recognize and identify with others, and thus, imitation serves as a social identity function (Meltzoff, 2011). Consequently, children's imitation is not general, but rather it is specific to the social act and function shown to them (Meltzoff, 2011). While this theory stated how children imitate others in their environment, it failed to identify the different cognitive processes and types of imitation that children develop at different stages. Piaget (1962) identified six stages for the development of imitation in children.

Piaget's (1962) six stages for the development of imitation outlined the different ages at which children develop imitation, the different types of imitation, and examples of children's imitation (see Piaget (1962) for full description of the six stages, which will not be discussed in detail here). In short, Piaget (1962) stated that children begin to employ deferred imitation

between the ages of 18 months to two years. This is due to the fact that children can form an internal depiction of objects and events, as well as mental manipulations and mental representation. For example, a child scolds her doll for something she had been scolded for – imitating the same behaviour.

Even though Piaget's stages of children's development of imitation laid the foundation for promoting research in this domain, other researchers have not always replicated his sequence of stages. Unlike what Piaget predicted, researchers reported that infants as early as 6-weeks can perform deferred imitative acts (Meltzoff, 2011; Over & Carpenter, 2012; Over & Gattis, 2010). Further, Piaget argued that infants develop imitation in a continuous sequence; however, researchers argue that children acquire imitation from early on and they continue to imitate complex behaviours as they grow older (e.g., Barr & Hayne, 1999; Over & Carpenter, 2012). Thus, the Like-Me-Theory is the most relevant theory as it takes into consideration how infants imitate others in terms of the social function of imitation, such as learning, fulfilling goals, identifying with others, and recognizing their identity. This relates to the current study because of the social context of sibling teaching, in which siblings have an intimate and long-lasting relationship, which might influence their use of imitation to learn from one another. In the following section, recent research studies on the use of imitation as a learning strategy between siblings, in terms of the social and cognitive functions of imitation will be discussed.

Social functions of imitation. Imitation plays a key role in sustaining interaction and maintaining culturally relevant behaviours including language (Nielsen, Simcock, & Jenkins 2008). Masur and Rodemaker (1999) found that imitation occurred frequently between mothers and infants. Mothers were matching their children's behaviours and children's imitation increased when their mothers copied their actions. Furthermore, verbal imitation increased in the second year of life because children acquired better language skills. For example, Eckerman and

Didow (1996) reported that after the emergence of imitative behaviours, children (over 16-, 20-, 24-, 28- and 32- months) increased their use of verbal imitation behaviors to achieve coordinated actions during play with other toddlers. Furthermore, speech increased within four months after the emergence of the imitative behaviours. Thus, children's imitative behaviours were associated with social experiences and helped in achieving coordinated action during play (e.g., games).

Therefore, imitation serves a social purpose to match with the partner's behaviour, as well as building one's identity and communicating culturally appropriate behaviours. Nielsen and Blank (2011) found similar findings that children imitated adults faithfully in copying irrelevant actions, because imitation is based on shared experiences with others to foster affiliation and to build rapport. Although these studies showed the benefits of the social context in learning from imitation, they have not addressed how the social context of the sibling relationship may influence imitation as a learning strategy. In the following section, the cognitive functions will be discussed to show the value of imitation as a learning strategy.

Cognitive functions of imitation. Imitation also serves as a valuable learning tool about people and objects as children develop their cognitive abilities (Over & Gattis, 2010); these authors argued that imitation is a powerful learning mechanism based on intentions and cognitive mechanisms. Their study investigated whether verbal imitation was based on the cognitive understanding of the speaker. The participants included 20 children, aged 3- to 11-years-old, in which the children were presented with five grammatically correct sentences and five ungrammatical sentences. The results showed that children were more likely to copy and use the grammatically correct sentences as opposed to the ungrammatical ones. Furthermore, children were more likely to copy and alter sentences with ungrammatical repetitions into a grammatically correct form. When the researchers tested for the intentionality of imitation, they found that children were more likely to copy the intentional human voice than the frog voice

(mechanical device) although both recordings used the same ungrammatical sentences. These findings demonstrated that children attribute an intention to the human model more than the mechanical device. While this study showed that cognitive functions (i.e., intention, understanding, knowledge of language) play a key role in children's imitation, it did not consider children's use of imitation as a learning strategy. Further, the researchers did not specify the cognitive mechanisms involved in learning and teaching via imitation. Perhaps, children's use of social-cognitive skills, such as theory of mind (i.e., second-order false-belief), and interpretative understanding, may play an important role in their use of imitative behaviours. A teacher, who has a theory of mind abilities might involve the learner during the teaching session and provide appropriate responses to learners' imitation. Similarly, a learner, who has advanced cognitive skills (e.g., second-order false-belief), might employ imitation to learn a new behaviour, action, or word.

Given these findings on the essential role of imitation as a learning strategy, its social and cognitive benefits, the following section will discuss the present study on the role of imitation as a learning strategy during sibling teaching and associations with the teacher's social-cognitive skills.

The Present Study

The aim of this current study was to extend the literature on imitation as a learning strategy during the context of sibling teaching, and its association with teachers' (i.e., older siblings) social-cognitive abilities (i.e., second-order false belief understanding and interpretative understanding). As described below, the current study will build on a previous study on sibling teaching (Howe et al., 2012) and investigates how siblings spontaneously use imitation. The teachers' (i.e., older siblings) responses to the learners' (i.e., younger siblings) use of imitation (e.g., positive/neutral responses, negative response, correction response, not attending response)

will be addressed in this study. Further, this study will only investigate the teacher's social-cognitive abilities (i.e., second-order false belief, and interpretative understanding) and associations with imitation. The special feature of this study is the context of sibling teaching and learner imitation – which adds to the existing literature. Previous research studies (e.g., Masur & Rodemaker, 1999; Nielsen & Blank, 2011) provided literature on the effects of imitation as a learning strategy between siblings (e.g., Barr & Hayne, 2003); however, these authors have not examined how imitation could be employed by learners in a detailed way during a teaching context.

The present study will use a previously collected data set by Howe et al. (2012) that examined associations between sibling teaching style, learner responses to teaching, and the teacher's social cognitive skills. The participants' included 60 sibling dyads with a mean age for older siblings of 6.3 years and 4.1 years for younger siblings. The older sibling was asked to teach the younger sibling how to build a tractor. In addition, the teacher's social cognitive skills were measured, specifically second-order false-belief task and interpretative understanding. More specifically, during two teaching sessions (teacher-directed tractor building and self-directed tanagrams tasks), Howe et al. (2012) investigated teachers' (i.e., older and younger first-born siblings) teaching strategies (i.e., learner-centered strategies of scaffolding, guiding, describing and teacher-centered strategies where the learner is involved less because the teacher is more controlling). In addition, the learners' behaviours (e.g., responses to being taught) were assessed. Howe et al. (2012) revealed associations between teaching strategies (i.e., learner-centered strategies and teacher-centered strategies) and the teachers' social-cognitive skills. Based on these findings, the present study will extend these findings by investigating how learners (i.e., younger siblings) employ verbal and nonverbal imitation during a teacher-directed

session (i.e., building a tractor). Additionally, this study will investigate the degree of the learner's involvement in the teaching task and their use of imitation, as well as the teacher's responses (e.g., positive/neutral, negative) to the learner's use of imitation. The research questions for this thesis are as follows:

1. These questions refer to the frequency of imitative behaviour during the teaching session.

(a) How often do learners employ verbal and nonverbal imitation?

(b) How often learners use spontaneous and deferred imitation during the teacher-directed task?

(c) What are the teachers' responses to learners' imitative behaviour and what types of responses were employed more frequently?

(d) What is the association between learner involvement in the task and the frequency of imitation?

(e) What is the association between the rating scale of task completion and the learners' imitation?

(f) When learners imitate, what are the functions of their imitation?

2. What are the associations between the teacher's (i.e., older sibling) social-cognitive skills (e.g., second-order false-belief and interpretative understanding) and the learner's imitation?

Descriptive information: Effects of age, age gap and gender. The first set of analysis will address of the effects of age, age gap, and gender on sibling teaching and its association with imitation as a learning strategy. These will be first assessed by the descriptive statistics. Researchers found that siblings use imitation to learn about their environment (Barr & Hayne,

2003). Whereas we know that the frequency of imitation increases as siblings develop and children understand that imitation is intentional (e.g., Eckerman & Didow, 1996; Over & Gattis, 2010), few studies have been conducted on the frequency of imitation for learners (i.e., younger siblings), which will be investigated in the present study. Researchers found that a smaller age gap between siblings was associated with teachers (i.e., older siblings) who allow learners (i.e., younger siblings) to be involved in the teaching/learning process, by greater use of encouraging statements (e.g., positive comments, praise), and demonstrations (e.g., showing the steps of the building to the learner; Cicirelli, 1972; Klein et al., 2002; Howe et al., 2012; Recchia et al., 2009). Given these findings, it may be that with a small age gap, the teacher will involve learners in the building task. However, with a larger age gap, the teacher may not involve the learner in the task of building, because they are doing the building themselves. Finally, previous studies showed that the gender match between siblings influences children's teaching (Howe et al., 2012; Klein et al., 2002). For example, when older female siblings taught their younger female siblings, the older female sibling teacher provided more explanations and description for their younger female sibling (Cicirelli, 1972, 1975). Thus, if there is gender match between siblings, learners would use imitation in a similar manner (e.g., to copy words, actions or behaviours) than in mixed-gender dyads.

Research question 1: Imitation as a learning strategy. Concerning questions 1a and 1b, specifically imitation as a learning strategy and the types of imitation that the learner employs, researchers found that imitation is an effective learning strategy (e.g., Over & Gattis, 2010). However, few studies have been done on the use of imitation as a learning strategy during the sibling teaching context. Further, researchers have identified two types of imitation, specifically spontaneous and deferred imitation (Barr et al., 1996). Children employed these two types of imitation from early on (around 6 weeks for deferred imitation), and from birth for spontaneous

imitation (Meltzoff, 2011). Further, nonverbal imitation was employed from early on, in which children repeated behaviours and actions; however, children employed more verbal imitation as their language skills developed (Barr & Hayne, 1999; Over & Gattis, 2010). Given these findings of children's use of types of imitation, it was predicted to address question 1a, learners might use more verbal and nonverbal imitation due to the nature of the task of building in order to complete it successfully. To address question 1b, it was expected that learners might employ more spontaneous than deferred imitation due to the nature of the task to build a tractor. This might be due to the fact that the tractor task requires more immediate actions, and therefore, learners might employ more spontaneous than deferred imitation. To address question 1c, specifically teachers' responses to the learners' use of imitation (i.e., their understanding of the different ways that learners use to learn how to build a tractor), a prediction was made that teachers might employ more positive/neutral responses and correction responses to the learner's use of imitation than negative responses, off-task and not attending responses (Howe et al., 2012). To address question 1d about the degree of learner involvement, considering that teachers have more sophisticated cognitive skills, a prediction was made that the more learner involvement, the more frequent the learner imitation. When teachers allow learners to be involved, there are more opportunities to imitate and this might be associated with the teachers' understanding and social-cognitive skills (Howe et al., 2012). To address question 1e about the frequency of task completion, a prediction was made in which the higher the rating on task completion, the more the learner would employ imitation. However, the lower the rating scales on the task completion, the lower the learner's frequency of imitation. Finally, for question 1f, an exploratory analysis was conducted to find out what are the functions of learner imitation during the teaching task.

Research question 2: Imitation as a learning strategy and the teacher's social cognitive skills. The final question focused on comparing the associations between the use of

imitation as a learning strategy and the teacher's social-cognitive skills. Researchers found that older siblings, who had a better understanding of second-order false-belief, understood the intention of teaching and the use of appropriate tools and methods for different tasks compared to younger siblings (Davis-Unger & Carlson, 2008; Howe et al., 2012; Strauss et al., 2002). Further, Howe et al. (2012) found that these two cognitive skills (i.e., second-order false-belief and interpretative understanding) were associated positively in the tractor task with teaching strategies (e.g., verbal attention, help); direct instruction was associated with second-order false belief and encouragement with interpretative understanding. Given these findings, it was hypothesized that teacher's interpretative understanding might be significantly positively associated with learner imitation. It was also expected that teachers' second-order false-belief might be significantly positively associated with learners' imitation. Teachers with more advanced social cognitive skills would understand that when learners imitated the steps of construction that they were more likely to complete the task. Due to the fact that the current study will use the data from Howe et al., (2012), this study will only investigate the teacher's (i.e., older sibling) social-cognitive abilities (i.e., second-order false belief, and interpretative understanding) and not the learner's social-cognitive abilities.

Method

Participants

The participants of this study included 60 sibling dyads, specifically 15 female-female, 15 male-male, 14 female-male, and 16 male-female pairs. The mean age of the teachers (i.e., older siblings) was 6.3 years (*SD* = 12.02 months) and 4.1 years (*SD* = 9.84 months) for the learners (i.e., younger siblings). The mean age difference between the teachers and the learners was 2.1 years (*SD* = 9.26 months). According to the parents' reports of their job descriptions, the

participants were from middle class families, and from different educational and ethnic backgrounds. As reported in the Howe et al. (2012), the children's families lived in a large urban bilingual (French and English) city that had a population of 3,000,000 people. The tasks were performed in English because the children spoke English fluently. Finally, before conducting any observations, the parents signed a written consent and children also gave verbal assent. Ethical approval for the study was obtained from the Office of Research, Concordia University (see Appendix A).

Procedure

The siblings were visited at home (58%), the university lab (27%), or in a daycare center (15%). The participants were given materials (e.g., large magnets) to play with for the warm-up session to establish rapport with the research assistant (RA). Next, a teaching task (i.e., building a tractor from a construction set) was privately introduced to the teacher (i.e., older sibling). During this time, the learner was asked to perform another task with a second RA who was not related to the teaching session (e.g., colour a picture). The rapport and teaching instruction sessions were completed in two sessions one after the other, and they were videotaped by the RA. Specifically, g in the first session, the RA explained to the teacher how to construct the tractor. In the second session, the RA asked the older sibling teacher to teach their younger sibling how to construct the tractor. The RA explained and demonstrated to the teacher how to build a tractor using 20 pieces of different size blocks (see Figure 1 for a picture of the tractor). Then the RA reviewed the steps with the teacher and asked the teacher to construct the tractor. After that, the teacher was asked to teach the learner (i.e., younger sibling) how to construct the tractor. The 60 dyads completed the tractor teaching session. For the social-cognitive skills, the older siblings were individually and privately assessed using two counterbalanced tasks: second-

order false-belief understanding (Astington et al., 2002), and interpretive understanding of knowledge (Carpendale & Chandler, 1996).

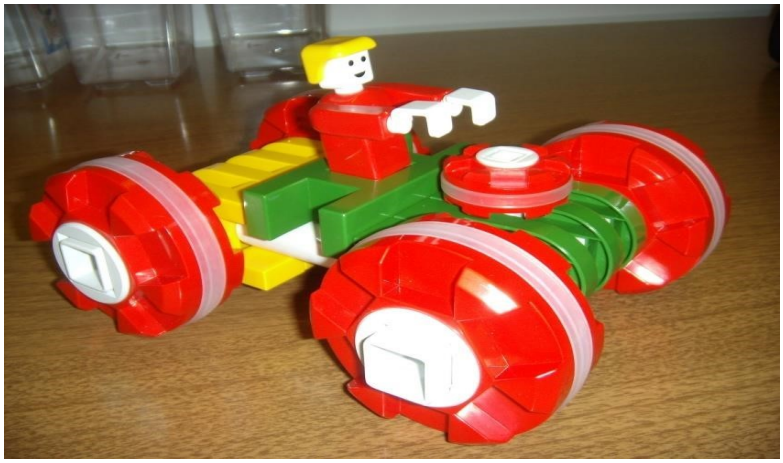

Figure 1. The tractor building task that the children performed during the teaching sessions.

Measures

Tractor task. For the tractor task, the teacher was shown how to build the tractor that contained twenty pieces including: two long white rectangular tubes, four green and four yellow A-shaped pieces, two shorter thinner white tubes (for connecting the two axles holding the wheels), four large red wheels, one green H-piece (the seat), a driver, one small steering wheel and one small white tube in which to place the steering wheel, and some small miscellaneous pieces for decoration.

The RA followed a consistent set of instructions to teach the older sibling teacher how to construct the tractor.

- First, the RA told the teacher to take the long white rectangular tubes, which are for each axle of the tractor.
- Second, the RA showed the A-shaped pieces to the teacher and told him/her to choose one colour and not to mix the colours of green or yellow (e.g., for

demonstration the RA chose the yellow pieces and the teacher chose the green pieces).

- Third, in this case, the teacher had four green A-shape pieces and was told to just slide them onto the middle of the tube (one after the other). The RA emphasized that the four A-shaped pieces had to be facing the same direction so they create a slot for the two connectors.
- Fourth, when the teacher finished one side of the tractor, the RA instructed the teacher to be sure the A-shaped pieces were in the middle of the long white tube so as to leave some space for the wheels on the ends.
- Fifth, the RA showed the teacher where to put the wheels, which was on each end of the two long white tubes.
- Sixth, the RA showed the teacher the shorter thinner white tubes and told the teacher to flip over his/her piece (i.e., half side of the tractor). When the teacher flipped his/her piece, the RA showed the teacher a little slot in the bottom of the tractor pieces and instructed the teacher to stick the short thinner white tubes straight out perpendicular to the axle. Then the teacher put one of the axle pieces (i.e., half the tractor) and the other half of the tractor together so that both lined up with the slot showing on each piece.
- Seventh, the RA showed the teacher how to attach both pieces (i.e., two halves of the tractor) by connecting them with the two white thin tubes.
- Eighth, the RA demonstrated to the teacher how to put a seat (i.e., H-shaped piece) right in the middle over the short white tubes so the H-piece was sitting on

the connectors; this was where the driver sits. The seat just slides in the middle of the connectors and it did not snap on.

- Ninth, the teacher was shown where to put the driver, which was in the middle of the H-shaped piece (by pushing the driver in the middle space of the H). The driver's arms had to be put up so that he/she can hold the steering wheel.
- Tenth, the RA showed the teacher how to attach the small wheel to the small white tube, which made a steering wheel and to stick it through the hole in front of the driver.
- Last, there were some very small extra pieces that the teacher could stick onto the tractor as decorations. When the RA finished teaching the teacher how to construct the tractor, she asked the teacher to do it another time by himself/herself. After that the teacher was asked to teach the learner how to build a tractor.

Imitation. In the present study, to assess the learner's (i.e., younger sibling) use of imitation, five categories were coded based on a coding scheme adapted from Howe et al. (2017) and also Howe and Leach (in preparation) to study imitation during play (see Appendix B for more details on the coding scheme). The imitation categories included: (a) the person who initiates the imitation (e.g., the learner or the teacher), (b) type of imitation (e.g., verbal or nonverbal, and spontaneous or deferred), (c) the gender of the learner and teacher (i.e., boy or girl), (d) the teacher's responses to the learner's imitation (e.g., positive/neutral, negative, not attending, correction, off task), and (e) the function of the imitation (e.g., disagreement, agreement, off-task, clarification). After each session was coded for the imitation codes, two ratings were made of the session (see Appendix B): (a) task completion rating (i.e., a rating scale ranging from one, where the teacher is not able to construct or complete the tractor successfully,

to five, where the teacher and learner build the tractor independently and successfully without RA assistance), and (b) the learner's involvement in the task rating (i.e., a rating scale from one, where the teacher does not allow the learner to join in the building, to five, where the learner is actively engaged in building during the entire interval).

Social-cognitive skills. Appendix C and D included the actual tests that the children were asked to perform and Appendix E included the detailed instructions and descriptions of the two social-cognitive measures used in this study. The second-order false belief test measured how the teacher attributes the belief of the learner that is separate from their own belief using two scenarios adapted from Astington et al. (2002). The scores ranged from 0-to-1. Similarly, for interpretative understanding children's understanding of how two people can provide different answers about ambiguous situations was measured using two scenarios as seen in Appendix E.

Reliability

For the interrater reliability checks of the use of imitation by the teacher and the learner, 22 % (N = 13 dyads of siblings) of the sibling teaching sessions were assessed by the author and a naïve coder in order to obtain consistent results. Disagreements between the author and the naïve coder were resolved by discussion to arrive at a consensus regarding the coding. When the consensus could not be achieved or if there were questions about the coding, Dr. Howe was consulted and asked to view the sequence of imitation to establish consensus with the two coders. For verbal imitation, reliability for the different scores was calculated using Cohen's *Kappa*; (a) the type of imitation in terms of verbal, spontaneous imitation or deferred imitation = .92; (b) teacher responses to the learners' imitation for verbal imitation = .74 ; and (c) functions of learner's verbal imitation = .80. For nonverbal imitation, reliability for the different scores was calculated using Cohen's *Kappa* (a) the type of imitation in terms of nonverbal, spontaneous

imitation or deferred imitation = .92; and (b) the teacher's responses to the learner's imitation for nonverbal imitation = .75.

Reliability for the two rating scales of task completion and learner involvement was calculated using *Interclass Correlation Measures* using two-way random consistency agreement type for the following scores: (a) task completion, *ICC* (2,2) = .81 (average measures); and (b) learner involvement *ICC* (2,2) = .90 (average measures).

For the social cognitive measures, as reported in Howe et al. (2012), 20-25% (*N* = 13 to 16 sibling dyads) of the older sibling's second-order false-belief and interpretive understanding was scored for interrater reliability using Cohen's *Kappa*: second-order false-belief = .92; interpretive understanding = .86.

Results

Descriptive Information

The descriptive statistics regarding all the variables of the study are included in this section. Means, standard deviations, proportion scores for some variables, percentages for some variables, and range of scores for the variables are provided in Tables 1 to 4 at the end of the Results section. The range of scores was calculated and reported to show the difference between the highest and lowest scores for the different variables. The data included raw scores and proportion scores for the different variables. For example, concerning verbal imitation, the proportion score was calculated as the frequency of verbal imitation divided by the frequency of verbal imitation plus nonverbal imitation (see Table 2). Proportion scores were calculated for teacher responses for both verbal and nonverbal imitation types for all five responses (i.e., correction, off-task, and positive/neutral, negative, not-attending). For example, the proportion score for correction responses was calculated by dividing the number of correction responses by the total of all responses. Finally, proportion scores were calculated for the function of verbal

imitation, for example by dividing the clarification function of verbal imitation by the total of all functions for the verbal imitation sequences (i.e., clarification, agreement, disagreement, off-task).

The means, standard deviations and range of scores for the overall verbal and nonverbal imitation, learners' imitation, the teachers' responses to the imitation, teachers' social cognitive measures, and functions of verbal imitation are reported in Table 1. The range of learner nonverbal imitation scores varied during the teaching session (from 0 to 16). Furthermore, the raw scores (and not proportion scores) of the teachers' responses are reported in Table 1. During the coding phase, the variables of positive responses were collapsed with neutral responses due to the difficulty of distinguishing between these two types of responses. Additionally, the functions of imitation for each sequence were only included for verbal imitation due the difficulty of distinguishing the functions for nonverbal imitation. Descriptive statistics of the task completion and learners' involvement in the task are reported in Table 3. Given the high ratings on task completion, it is apparent that most dyads completed the task successfully, without any help from adults. However, the full range of scores on learner involvement indicates a varied range of responses from low involvement in the task to high engagement in the construction of the tractor. Finally, these conclusions are also apparent in Table 4 that shows the frequency and percentages of each subcategory in the two rating scales of task completion and learner involvement.

Furthermore, since some variables did not occur frequently, they were dropped from the analyses (i.e., teacher negative responses, not-attending responses, and off-task responses to learner imitation). This was done because some variables were never coded, only coded once or a fewer than 5 instances, and thus including them in the different statistical tests might skew the

results. It is important to note that variables were excluded if they had zero in on of the verbal or nonverbal types of imitation because including them might skew the results. It is essential to note that spontaneous and deferred imitations were not analysed separately because deferred imitation occurred very infrequently in comparison to spontaneous imitation for both verbal and nonverbal imitation. Thus, spontaneous and deferred imitation codes were collapsed into one score for either nonverbal or verbal imitation. Further, types of imitations (i.e., verbal and nonverbal) were explored in the different analyses to further investigate the main effect between imitation and the variables.

Age, Age Gap, Gender, and Imitation

Pearson correlations were completed between the factor of age (i.e., the teacher's age and the learner's age) and imitation (i.e., verbal and nonverbal) in order to determine the associations between these variables. These correlations were conducted to determine if there are any associations between siblings' age and age-gap that might influence their use of verbal and nonverbal imitation, and if there are associations, they will be controlled for in the different statistical tests. The results showed, as seen in Table 5, the teacher's age was significantly correlated with positive/neutral teacher responses for nonverbal imitations, interpretative understanding, second-order false-belief, task completion and learner involvement. The learner's age was significantly correlated with nonverbal imitation, teacher positive/neutral responses for nonverbal imitation and learner involvement. Therefore, the age factor for the teacher and learner was controlled for in the different statistical tests.

Considering the age gap factor, Pearson correlations revealed no significant correlations between the age gap variable and verbal imitation nor was the age gap factor correlated with

nonverbal imitation (see Table 5). However, the age gap factor was correlated with teacher positive/neutral responses for nonverbal imitation and interpretive understanding.

Finally, a series of one-way ANOVAs were conducted to compare gender with the use of imitation by the learner, in which the independent variable was the gender (of the learner) and the dependent variable was imitation. The findings showed that there were no significant differences between the frequency of nonverbal imitation and the gender of the *learner,* $F(1, 58) = 1.46$, $p > 0.05$. Additionally, there were no significant differences between the frequency of verbal imitation and the gender of the *learner,* $F(1, 58) = 0.17$, $p > 0.05$. The results also showed no significant differences between dyadic gender composition and the frequency of nonverbal imitation, $F(3, 56) = 1.29$, $p > 0.05$. Similarly, there was no significant difference between gender composition and the frequency of verbal imitation, $F(3, 56) = 0.87$, $p > 0.05$. Therefore, the following analyses did not control for this variable.

Question 1: Imitation as a learning and teaching strategy

Frequency of verbal and nonverbal imitation by the learner. Question 1a tested the question of whether learners engaged in more imitation and if so, what kind of imitation. The predictions included that learners would employ verbal and nonverbal imitation in equal manner due to the nature of the task. The significant results for the *post-hoc* tests were assessed including the Bonferroni correction.

A one-way repeated measures ANOVA was conducted to compare the types of imitation engaged in by the learner (verbal, nonverbal imitation). The repeated measures ANOVA included the role (learner) as independent variable and the frequency of imitation (verbal or nonverbal) as the dependent variable. A significant main effect of imitation was observed, $F(1, 55) = 15.64$, $p < 0.05$, $\eta^2 = 0.22$. As seen in Table 6, the pairwise comparisons showed a main

effect for imitation types, in which learners employed more nonverbal imitation than verbal imitation. The means and standard errors are based on proportion scores of the data.

Types of imitation (spontaneous and deferred) and the learner's role. To test the hypothesis 1b concerning the frequency of spontaneous and deferred imitation, a one-way repeated measures ANOVA was conducted. Learner role was the independent variable and type of imitation was the dependent variable. The prediction made for this hypothesis included that learners would employ more spontaneous than deferred imitation due to the nature of the task to build a tractor. However, given the low frequency of deferred imitation in comparison to spontaneous imitation, this question was not analysed. By looking at the data from Table 1, learners employed more spontaneous than deferred verbal and nonverbal imitation.

Teachers' responses to learners' use of imitation. The purpose of this analysis for hypothesis 1c was to determine how teachers responded to the learners' imitation. The hypothesis predicted that teachers' responses to the learners' use of imitation would include positive/neutral responses and correction responses to the learner's use of imitation. However, fewer teachers might employ negative responses, ignoring responses, and not attending responses to the learner's use of imitation.

An exploratory repeated measures ANOVA was conducted, including a 2 (type of imitation: verbal, nonverbal) for the independent variable by 2 (responses: positive/neutral, correction) for the dependent variable. A significant main effect of types of imitation (i.e., for both verbal and nonverbal) imitation was evident, $F(1, 31) = 29.54$, $p < 0.05$, $\eta^2 = 0.48$. The pairwise comparisons shows that teachers employed more positive/neutral responses than correction responses (see Table 6).

A significant interaction of type of imitation (i.e., verbal and nonverbal imitation) and teacher responses was found, $F(1, 31) = 23.04$, $p < 0.05$, $\eta^2 = 0.43$ (*dfs* adjusted using Greenhouse-Geisser estimate). The pairwise comparisons as seen in near the bottom of Table 6 indicated teachers used significantly more correction responses for nonverbal imitation than verbal imitation. In contrast, teachers employed significantly more positive/neutral responses for learners' use of verbal imitation than nonverbal imitation.

Learner involvement and the frequency of imitation. To test the hypothesis of question 1d, about the degree of learner involvement and its association with the frequency of imitation, a partial correlation was conducted controlling for the age (i.e., teacher and learner) factors. After controlling for these factors, the results showed strong positive correlations between the two variables. Overall, as seen in Table 7, the results showed a positive significant relationship between the learner's involvement and the frequency of both verbal and nonverbal imitation. The more the learners were involved in the task of building a tractor, the more they imitated using verbal and nonverbal imitation. Therefore, the hypothesis was supported.

Task completion and learner imitations. To test the hypothesis of question 1e about the frequency of imitation and task completion, a prediction was made in which the higher the rating on task completion, the more the learner would imitate verbally and nonverbally. In contrast, the lower the rating scales on the task completion, the fewer instances of learner imitation both verbally and nonverbally. Partial correlations were conducted controlling for the teacher's age. The results showed no significant correlations between task completion and learners' verbal and nonverbal imitation (see Table 7). Therefore, the predictions were not supported for both hypotheses.

Functions of imitation for the learner. An exploratory analysis was conducted to explore the types of functions that learners used for verbal imitation. Although no predictions were made, a list of the possible functions were included in the method section (i.e., clarifications, agreement, disagreement, off-task). A one-way repeated measures ANOVA was conducted to explore the different types of functions for imitation. The results showed a significant main effect of function of imitation, $F(1.946, 93.403) = 19.21$, $p < 0.01$, $\eta^2 = 0.29$ (*dfs* adjusted using Greenhouse-Geisser estimate). The clarification function for imitation was employed significantly more than the agreement and disagreement functions during verbal imitation sequences (see Table 6).

Question 2: Associations between Teacher's Social-Cognitive Skills and Learner's Involvement and Task Completion

A series of partial correlations, controlling for teacher's age and the age gap factor (for correlation of interpretive understanding), were conducted to investigate the associations between the teacher's social cognitive skills and the learner's use of imitation. First, it was hypothesized that teachers' interpretative understanding would be significantly associated with learners' imitation. Thus, the more the teachers demonstrated advanced interpretative understanding, the more the learners would employ verbal and nonverbal imitation. Second, teachers with more advanced social cognitive skills would understand that when learners imitated the steps of construction that they were more likely to complete the task. Third, it was expected that teachers' second-order false-belief would be significantly positively associated with learners' imitation. Thus, the more the teachers demonstrated advanced second-order false-belief, the more the learners would employ verbal and nonverbal imitation. The results showed there were no significant correlations between the frequency of learners' verbal and nonverbal

imitation and teachers' social-cognitive skills of interpretative understanding (see Table 7). Additionally, the results showed no significant correlations between second-order false-belief and the learners' use of verbal and nonverbal imitation. Therefore, the first and second hypotheses of the second question were not supported.

In order to assess the third hypothesis of question 2, which predicted an association between teachers' second-order and interpretive understanding skills with learner involvement, partial correlations were conducted controlling for teachers' age, learners' age (for learner involvement) and age gap (for interpretative understanding; see Table 8). First, the learners' involvement was not significantly correlated with both social-cognitive. Second, the task completion rating scale was not significantly correlated with both social-cognitive measures. Thus, the hypothesis was not supported.

Table 1

Descriptive Statistics (Raw Scores) for Imitation by the Learner during Teaching Session for Sibling Dyads

	Learner	
Imitation	*M (SD)*	*Range*
Verbal	2.03(2.31)	0-11
Spontaneous	1.75(2.03)	0-10
Deferred	0.33(0.65)	0-3
Nonverbal	6.05(4.39)	0-16
Spontaneous	4.03(4.33)	0-15
Deferred	0.53(0.91)	0-3
Teacher Responses To Learner's Nonverbal Imitation		
Correction	1.43(1.43)	0-6
Positive/Neutral	3.41(3.56)	0-13
Negative	0.03 (0.18)	0-1
Off task	0.06 (0.51)	0-4
Not attending	1.18 (1.59)	0-8
Teacher Responses To Learner's Verbal Imitation		
Correction	0.33(0.18)	0-1
Positive/Neutral	0.86(0.94)	0-4
Negative	0.01(0.12)	0-1
Off task	0.01(0.12)	0-1
Not attending	0.00(0.00)	0-0
Learners' Functions of Imitation		
Clarification	1.22(1.29)	0-6
Agreement	1.40(2.13)	0-10
Disagreement	0.35(0.68)	0-3
Off-Task	0.15(0.71)	0-5

Teacher Social Cognitive Skills		
Interpretative understanding	0.37 (0.18)	0-1
Second-order false-belief	0.42 (0.42)	0-1

Note. The total number of families included in this study ($N = 60$). Frequencies were reported for imitation, responses, and social-cognitive skills based on the total scores identified in each session. Means and standard deviations were calculated based on these frequencies in each session. Functions of imitations are based on the total number of functions for both learners' and teachers' verbal imitation Teacher social-cognitive skills scores are for interpretative understanding ($N = 58$) and for second-order false-belief ($N = 52$).

Table 2

Proportion of Learner Verbal and Nonverbal Imitation for the Tractor Task

Imitation	*M(SD)*	Range
Verbal Imitation	0.35 (0.28)	0-1
Nonverbal Imitation	0.65(0.28)	0-1

Table 3

Descriptive Information (Raw Scores) for Task Completion of the Tractor Task and the Learner's Involvement in the Tractor Task

Two Rating Scales	*M*(*SD*)	Range
Task Completion	4.67 (0.54)	3-5
Learner Involvement	3.35 (1.38)	1-5

Note. The total number of families included in this study ($N = 60$). Possible ratings ranged from 1 – 5.

Table 4

Frequency and Percentage of Task Completion and Learner Involvement in the Tractor Task

Rating Scales	Frequency	Percent
Task Completion		
Teacher forgets a few steps (rating = 3)	2	3.3
Completed successfully with help from RA (rating = 4)	16	26.7
Completed successfully without help from RA (rating = 5)	42	70.0
Learner Involvement		
No involvement (rating = 1)	10	16.7
Passive attempts to help (rating = 2)	6	10.0
Learner asks to help the teacher (rating = 3)	11	18.3
Engaged for majority of interval (rating = 4)	19	31.7
Actively engaged almost entire interval (rating = 5)	14	23.3

Table 5

Correlations between the Factors of Age and Age Gap with Imitation, Social-Cognitive Measures, and Task Completion

	Age		**Age Gap**
	Teacher	Learner	
	r	*r*	*r*
Learner Imitation			
Verbal	-0.006	-0.10	0.09
Spontaneous	0.04	-0.09	0.16
Deferred	-0.06	0.03	-0.11
Nonverbal	0.43**	0.38**	0.15
Spontaneous	0.35**	0.24	0.21
Deferred	0.10	0.06	0.07
Teacher Responses to Learner's Nonverbal Imitation			
Correction	0.08	0.00	0.10
Positive/Neutral	0.58**	0.45**	0.28*
Teacher Responses To Learner's Verbal Imitation			
Correction	-0.07	-0.06	-0.03
Positive/Neutral	0.01	-0.04	0.04
Teacher's Social Cognitive Skills			
Interpretative understanding	0.43**	0.14	0.43**
Second-order false-belief	0.28*	0.19	0.15
Rating Scales			
Task Completion	0.34**	0.22	0.22

Learner Involvement	0.49**	0.47**	0.14

*$p < 0.05$ ** $p < 0.01$

Table 6

Means and Standard Errors for Imitation Types, Responses to Imitation and the Type of Imitation

Learner Imitation	*M*	*SE*
Verbal	.35	.04
Nonverbal	.65	.04
Teacher Responses For the Main Effect		
Correction	.17	.02
Positive/Neutral	.71	.03
Teacher Responses Based on Imitation Types for the Interaction Effect		
Verbal Imitation		
Correction	.06	.04
Positive/Neutral	.93	.04
Nonverbal Imitation		
Correction	.28	.04
Positive/Neutral	.50	.05
Functions of Imitation		
Clarification	.47	.05
Agreement	.36	.06
Disagreement	.14	.04

Note. $N = 56$ for learner imitation. Means and standard errors are based on the proportion scores of the data. $N = 32$ for teacher responses. Teacher

response means and standard errors are based on the proportion scores and the overall scores of the teacher responses and types of imitation. $N = 49$ for function of imitations. Functions of imitation means and standard errors are based on the proportion scores and the overall scores of learner and teacher verbal imitation.

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Table 7

Partial Correlations Controlling for Learner Age for Learners' Verbal and Nonverbal Imitation with Learner Involvement, Task Completion and the Teachers' Social Cognitive Skills

	Learner Verbal Imitation	Learner Nonverbal Imitation
	r	*r*
Two Rating Scales		
Learner Involvement	0.33*	0.85**
Task Completion	0.03	0.08
Social Cognitive Measures		
Second-Order False-belief	0.12	0.11
Interpretative Understanding	-0.04	0.12

Note. *$p < 0.05$ ** $p < 0.01$. The age factor of the teacher and the learner was controlled for in the learner involvement correlations. The teachers' age was controlled for the task completion correlations. The teachers' age and age gap was controlled for in the social cognitive skills correlations.

Table 8

Partial Correlations of Social Cognitive Skills with Learner Involvement and Task Completion Controlling for Age and Age Gap

	Second-Order False-belief	Interpretive Understanding
Learner Involvement	-0.07	0.02
Task Completion	0.04	-0.07

Note. The learners' age and age gap were controlled for correlations between social-cognitive measures, learner involvement and task completion. Specifically, teacher age was controlled in all correlations, learner age for learner involvement, and age gap for interpretive understanding.

Discussion

The purpose of this study was to examine siblings' use of spontaneous imitation as a learning strategy, which makes a unique contribution to the literature on the teaching and learning context. This study also considered the associations between the teacher's social-cognitive abilities and imitation during the context of sibling teaching. This current study demonstrated that imitation is an effective learning strategy employed by learners. The results of the study add to the literature on understanding the processes of learning including imitation and how learners employ different types of imitation (i.e., verbal and nonverbal) during the context of sibling teaching. Unlike other contexts such as with peers, the sibling teaching context offered learners many advantages including the shared co-constructed history with their older siblings. Learners shared knowledge with teachers because they grew up in the same environment and have the same parents, which allowed learners to be able to become involved in the task of building with their older sibling teachers and to imitate their actions and words. Furthermore, while learners might engage in reciprocal behaviour (i.e., mutual) with their friends, sibling learners have both reciprocal (i.e., mutual) and complementary (i.e., one sibling might take the lead and the other follow) interactions with one another. These unique features might allow learners to imitate their older siblings more than peers, which could be tested in future studies. Finally, since siblings' intimate relationship is characterized by varied affect and interactions with one another (i.e., positive, negative, ambivalent), teachers provided both positive/neutral and corrective responses to encourage learners as they imitated the teaching actions.

Furthermore, the results of this study showed that spontaneous imitation is an effective learning strategy within the sibling teaching context. Learners were not only observant of how teachers built the tractor, but rather learners were also active participants in the process of

teaching. Interesting, the rating scale on learner involvement showed that learners were involved to different degrees. For example, while some learners put together a few pieces with teachers during the session, others were involved the entire session. Learners' participation was guided by teachers' responses throughout the process. This study showed that teachers have a role in guiding learners' imitation by providing learners with appropriate responses including correction and positive/neutral responses (e.g., observing the learners' building, giving comments like 'yeh good, put other pieces' or when the learner said 'two green and two yellow?', the teacher said 'no, pick four green or four yellow'). These responses might have provided some guidance to learners, as well as encouragement to continue to build with their older sibling teachers.

Five main themes evident in the results of the study include the following. First, while it was predicted learners would employ imitation, using different types (i.e., verbal, nonverbal), the results found that learners employed more nonverbal imitation than verbal imitation. Second, the results showed that teachers employed more positive/neutral and correction responses for learners' use of imitation, but this varied according to verbal and nonverbal imitation. Specifically, teachers employed significantly more correction for nonverbal than verbal imitation. However, teachers employed significantly more positive/neutral responses for learners' verbal than nonverbal imitation. Third, as predicted the learner involvement rating scale was positively significantly correlated with learners' verbal and nonverbal imitation. The more learners were involved in the task, the more they imitated teachers' actions verbally and nonverbally. Fourth, the functions of the imitation sequences for the learners mostly included clarification and agreement, whereas, disagreement functions were employed less often than the other functions. Fifth, even though it was predicted that the two social-cognitive measures would

be associated with learners' verbal and nonverbal imitation, learner involvement and task completion, the results were not significant.

The following sections first address the descriptive findings and then a discussion and interpretation of the general findings according to the five themes outlined above will be reported. Afterwards, the limitations of the study, directions for future research, and implications of the findings for parents and early childhood educators will be discussed.

Descriptive Information

The first section of the Discussion focuses on the descriptive variables of age, age gap, and gender and associations with the imitation, learner involvement, task completion, and social-cognitive variables.

Age of the learner and teacher. Concerning the first goal of the study, the teachers' age and learners' age were correlated with several variables. Teacher age was correlated with the following variables: positive/neutral teacher responses for nonverbal imitation, interpretative understanding, second-order false-belief, task completion, and learner involvement. Learner age was correlated with nonverbal imitation, teacher positive/neutral responses for nonverbal imitation, and learner involvement. The older the learner, the more imitation they would employ, specifically more nonverbal imitation. Therefore, the hypothesis that predicted imitation would increase as the age of learner increased was partially supported. The current findings are in line with previous studies showing that older teachers employed different teaching strategies than younger teachers (i.e., Cicirelli, 1972; Howe et al. 2012). The findings also indicate that the older the learner, the more they would be involved in the building of the task and the more older teachers would complete the construction task successfully. In other words, the age factor influenced the teacher's completion of the task and learners' involvement in the building.

Age gap between teacher and learner. The prediction for the age gap indicated that a small age gap would allow the learner to imitate more than a large age gap between siblings. With a large age gap, the teacher may perform the task by himself/herself without involving the learner in the teaching process, because the teacher might think the learner is less knowledgeable about the task and might control the learner's involvement, whereas with a small age gap, the teacher might involve the learner in the task because the teacher might view the learner as knowledgeable as they are. This hypothesis was based on previous studies indicating that a smaller age gap between siblings was associated with learner involvement, teacher use of encouragement, and demonstration (Klein et al., 2002; Howe et al., 2012; Recchia et al., 2009). The hypothesis was not supported because the age gap factor was not correlated with learners' verbal or nonverbal imitation. However, the age gap variable was significantly positively correlated with positive/neutral teacher responses and the teacher's interpretive understanding. This may suggest that the larger the age gap, the more likely teachers would be to employ positive/neutral responses and understand that others may have diverse ways to perform a task or solve a problem. This might show how teachers recognized learners' use of imitation positively as a way to be engaged in the task. In addition, with a large age gap teachers might have improved interpretive understanding, so they can understand whether the learner is building correctly.

Gender findings. Contrary to predictions the gender of the teacher and the learner and the dyadic gender composition were not associated with the siblings' use of both verbal and nonverbal imitation. While some studies showed that the gender match between siblings was associated with more effective teaching and the use of different strategies (Howe et al., 2012; Klein et al., 2002), other studies showed no significant effect of gender on sibling teaching (e.g.,

Azmitia, 1988, Azmitia & Hesse, 1993), which is in accordance with this study. This might indicate that the gender of the teacher and learner did not influence their use of imitation and responses to imitation. For example, a female older teacher might have employed the same correction responses with her male and female younger sibling learner. Different reasons could be attributed to the results including the nature of the task. Older sibling teachers were taught the specific steps on how to build the tractor. Therefore, older sibling teachers employed the same steps that they were taught by the RA. Another reason could be due to the relatively small sample. It could be that a larger sample size of sibling dyads might reveal different results in how male and female older sibling teachers teach their younger sibling learners differently.

In sum, a few of the descriptive variables correlated positively with nonverbal imitation, positive/neutral teacher responses, the two rating scales, and social-cognitive measures. The next sections will discuss the findings of the two main research questions.

Imitation as a Learning Strategy

Associations between verbal and nonverbal imitation and the role of learners. The first major theme (question 1a) looked at the frequency of imitation by the learners and the type of imitation that was being used, specifically verbal imitation and nonverbal imitation. The predictions included that learners would employ verbal and nonverbal imitation in equal manner. The findings relate to the first theme identified earlier in the Discussion. Unlike the predictions, the findings showed that learners were more likely to employ nonverbal imitation than verbal imitation, therefore, they did not employ verbal and nonverbal imitation in similar ways. Concerning nonverbal imitation, learners would imitate the action of the teacher in order to build the tractor successfully. For instance, the teacher put a green A-shape piece on the white axel, and the learner looked at the teacher and imitated the same action immediately. Apparently,

learners used nonverbal imitation as a way to learn the steps of building the tractor, and they may have assumed that the teacher knew the steps of building. Therefore, both teachers and learners worked collaboratively to build the tractor.

This collaboration could be seen clearly in the learner involvement rating, in which learners were involved in the building of the tractor to different degrees. For instance, some learners were involved the entire interval of constructing the tractor, while others were involved for only a few minutes. These findings reflect the work of Rogoff (1993; 1998), who focused on how a more skilled child can help the learner to complete an activity through guidance. This emphasizes the importance of guidance through participation as a shared activity through side-by-side learning. Some siblings during the tractor building practiced this "guided participation" approach, in which some teachers guided the learners through the process of building by correcting their actions, providing different responses to their imitation, and involving them in the task. These findings suggest that imitation might be an effective learning strategy for siblings during teaching session, as argued by others (e.g., Barr et al., 1996; Meltzoff, 2011).

Additionally, siblings' reciprocal (returned exchanges of collaboration) interactions and complementary (imitation) interactions may contribute to the learner's imitation of nonverbal actions (Dunn, 1983). An example of siblings' reciprocal interaction may be their collaboration in building the tractor. For example, a learner asked the teacher a question, "what are we building", and the teacher answered, "we're making a tractor", thus clarifying to the learner the nature of the task. In this example, the teacher provided an explanation to the learner based on their question. Since siblings share many common experiences, language, and knowledge, these kinds of reciprocal interactions may help them understand each other and have the courage to ask questions, negotiate during play, disagree with one another, and share their opinions. Without

this mutual and equal type of exchange, younger siblings may not ask questions and negotiate with their older siblings.

Learners also employed verbal imitation during the teaching session, for instance learners repeated a few words or sentences that were previously mentioned by teachers. For example, when the teacher said "like a steam pipe here," the learner said "I wanna do that. The steam pipe." The low frequency of verbal imitation, perhaps has to do with the nature of the task that requires little verbal communication between siblings. That is, given that the task was formal, the teacher was taught how to assemble the 20 pieces of the tractor in a specific manner and then the learner was instructed to follow the steps of the older sibling's teaching. Additionally, since the tractor task did not include play or free building in which older siblings constructed their own creation, there was little need for the teacher to engage in verbal explanations for the learner to verbally imitate so as to understand the steps of a free building construction.

The second question explored the types of spontaneous and deferred imitation and is discussed in the next section.

Associations between spontaneous and deferred imitation and the learner's role. The second hypothesis, 1b of the first question, asked how imitation was used as a learning strategy and how learners employed different types of imitation, specifically spontaneous and deferred imitation. It was predicted that learners would employ more spontaneous than deferred imitation due to the nature of the task, which requires constructing a tractor in immediate time and not at some later point in time. The hypothesis was supported; however, given the low frequency of deferred imitation and that learners employed spontaneous imitation most of the time, statistical comparisons were not performed. As seen in Table 1 and as expected, learners used more

spontaneous verbal and nonverbal imitation during the construction task. Perhaps the nature of the task of constructing a tractor did not allow learners to employ deferred imitation, because it demanded more immediate action to build and therefore prompted spontaneous rather than deferred imitation. For example, a teacher put a short tube into the side of the tractor, the learner looked at the teacher and immediately put the other short tube into the tractor. Some learners occasionally employed deferred imitation, an example of deferred imitation was when the teacher put two wheels into the white tube (axle of tractor), the learner observed the teacher and after a while (more than 10 seconds passed) performed the same action. Barr and colleagues (1996) found that children employed deferred imitation as early as 6-weeks-old during ongoing interactions with adults, and children imitated actions after a 24-hour delay. Thus, it is assumed that the siblings in the present study were capable of engaging in both deferred imitation as well as spontaneous imitation. However, in the present study, it may be that learners engaged in more spontaneous imitation given the nature and constraints imposed by the task of constructing the tractor.

The next section discusses the teachers' responses to learners' imitation. These responses included mostly positive/neutral responses and correction responses.

Teacher responses to learners' use of verbal and nonverbal imitation. The second major theme (question 1c) examined teacher responses to learners' use of verbal and nonverbal imitation. The findings represent the second overall theme as indicated earlier in the Discussion. As predicted, the results showed that overall teachers were more likely to use positive/neutral than correction responses, thus partially supporting the hypothesis, whereas not attending, negative and off-task responses were not analysed due to very low frequencies. As discussed below, teacher responses also varied according to learners' verbal and nonverbal imitation.

Different influencing factors could have contributed to the teachers' overall positive/neutral and correction responses for imitation. First, the results of teachers' overall use of more positive/neutral and correction responses to total imitation (i.e., verbal plus nonverbal), could be a characteristic of their relationship. It could be that teachers had learned that using positive/neutral and corrective responses is an effective way to teach and to encourage learners to complete a task. In addition, many siblings have a positive relationship, in which they understand each other and share experiences with one another (Dunn, 2002; Howe et al., 2011). When teachers share a positive and intimate relationship with their siblings, they may have used more positive/neutral and correction responses. Unlike friendship relationships, sibling relationships have a great range of affect (e.g., negative, positive), in addition to a range of individual differences (Dunn, 2002; Howe et al., 2011). While some friendship and peer relationships might not continue for a long time, sibling relationships are long-lasting relationship, which might have allowed teachers to have more practice in providing positive/neutral and correction responses. Additionally, siblings' understanding of each other and their shared knowledge might encourage the learner to follow and model the steps of the teacher. For example, when a teacher took a long white tube, the learner looked at him and took the same tube. This may show the learner's trust of the teacher without asking questions or without needing the teacher's verbal explanations. Similar findings were seen in a study, in which younger siblings were more attentive to their older siblings and imitated the same steps to build compared to being taught by older peers (Azmitia & Hesser, 1993).

Further, teachers' use of the two main responses (positive/neutral, correction) could indicate their understanding of learners' level of knowledge and what type of responses to use with them in order to build the tractor together. This finding may be reflected in the work of

Vygotsky (1978) on the Zone of Proximal Development construct, which suggests that teachers understand the level of learners' knowledge and try to transfer the knowledge to them by helping them by scaffolding (this is reflected in other studies including Abuhatoum et al., 2016; Ziv & Frye, 2004; Ziv et al., 2008). Additionally, in a study by Strauss et al. (2002), older teachers understood the intention behind teaching, which is not to always require successful outcomes. This could relate to the present findings regarding the correction responses, because teachers understood the need to correct learners' imitation both verbally and nonverbally. For example, a teacher corrected the learner's direction and placement of an A-shape piece by taking out one piece and showing the learner how to place the other three pieces in the same direction. This may also relate to the teacher's intention to help the learner acquire new knowledge about how to build the tractor successfully. However, in some families the teacher did not complete the tractor building successfully but they still corrected the learner's imitation to help them learn. Teachers may have understood the appropriate responses to use to encourage the learner to be involved and to join in building the task by responding positively or correcting the learner's imitation. Finally, this could show that teachers understood the intention behind teaching and the goal of teaching is to transfer knowledge to the learners.

Interestingly teachers responded differently depending on the type of imitation that learners employed. It could be that teachers provided more correction responses to learners' nonverbal imitation because of the nature of the task that required little explanation and more physical demonstration. That is, teachers did not need to provide explanations to guide the learner through the tractor task, but rather they provided correction by showing learners how to perform the task by moving pieces. For example, when the learner put the wheel in the middle of the white tube instead of the side, the teacher corrected the learner by showing him how to put it

on the side of the white tube. During nonverbal imitation, learners imitated teachers' actions on how to construct a tractor. Teachers observed learners' steps and provided correction if a step was performed incorrectly. Thus, teachers' corrective responses provided guidance to learners by correcting their actions during building. It might also show that teachers are attentive to learners' imitation of the same actions, and thus teachers are not ignoring learners during the process. In contrast, teachers might have used more positive/neutral responses to learners' verbal imitations to encourage the learners to be involved in the task and to build the tractor with them. For example, when the teacher said "I like the big tractor tires", the learner mentioned "and there is the little tractor tires", and after that the teacher looked at the learner's piece and continued the conversation. In another example, when the teacher said "you want yellow or green?", the learner said "green", and teacher said "ok, so you take all four of these." During verbal imitation, learners imitated teachers' words that are related to building the tractor. Furthermore, teachers' positive/neutral responses encouraged and reinforced learners to imitate teachers' words, which are related to building the tractor. Teachers positive responses continued the communication with learners during the teaching session. Furthermore, the different teacher responses based on the type of imitation (i.e., verbal and nonverbal) might demonstrate their understanding of what type of responses to use to each type of imitation. In a study by Howe et al. (2012) teachers employed different teaching strategies based on a self-guided compared to a teacher-directed task. These findings are in accordance with the current study because they show teachers adjusted what type of responses to use to respond to different types of learners' imitation.

In sum, overall teachers employed more positive/neutral and correction responses, but responded in different ways to verbal and nonverbal imitation. There may be a number of possible explanations, but siblings' relationship, knowledge of one another, and possibly the

nature of the task might have contributed to the pattern of findings. The nature of the task required less communication because teachers built the tractor and learners observed them and performed the same actions. For example, some teachers corrected learners without using verbal explanation but they employed physical demonstration to correct learners' steps. Therefore, teachers employed more correction responses in nonverbal than verbal imitation. Learners' involvement in the construction task and its association with verbal and nonverbal imitation will be discussed in the next section.

Learner involvement and the frequency of imitation. The third major theme of the findings (question 1d) predicted that the more learners were involved in the task of constructing a tractor, the more they would imitate verbally and nonverbally. The results showed that the rating of learner involvement was significantly positively correlated with the frequency of verbal and nonverbal imitation. However, as seen in Table 4, learner involvement during the teaching session varied, for instance some learners were not involved, while others were involved for the entire session of teaching. For example, a learner put the four A-shaped pieces on the long white tube, after looking at the teacher and then continued to put on other pieces during the entire session. This might reflect the learners' understanding of teaching, which is to be part of the teaching session by asking questions, being involved and following the teacher's directions, offering help for the teacher, and perhaps disagreeing with the teacher, but this speculation needs to be studied in a future study. Furthermore, learner's imitation and involvement might relate to their motivation level. According to Bandura's Social Learning Theory, if children are not interested in imitating or observing a model, they will not retain or reproduce the same behaviour (Bandura, 1997). Reproducing a behaviour or action could depend on the outcome or the incentives (Bandura, 1969, 1997). Thus, in the present study learners might have imitated and

were involved for various motivational reasons including praise. For example, a learner showed her part of the tractor to her mother, saying: “mommy, mommy look what I made”.

Given this, there may be different influencing factors to explain the associations between learner involvement and the frequency of imitation (i.e., verbal and nonverbal). Some of these explanations could include teacher and learner understanding of teaching and the process of transferring information, the collaborative process between siblings, and social functions of imitation. Not only does teaching requires learner involvement, it also requires completing the task successfully. Thus, the task completion and its association with verbal and nonverbal imitation will be examined next.

Task completion and learner’s imitations. The predictions of the fifth part of the first question (1e) were not supported, which stated that the higher the rating on task completion, the more learners would engage in verbal and nonverbal imitation. In contrast, the lower the task completion rating, the fewer instances of learner imitation. The results showed no significant correlations between the rating of task completion and learners’ use of verbal and nonverbal imitation. As seen in Table 4, most teachers and learners completed the task successfully. There could be a ‘ceiling effect’, because the rating scale scores ranged between 3-to-5 points. While some teachers asked for help from the research assistant to complete the task successfully, most did not. For example, one teacher asked the research assistant for help by saying: “we forgot to attach the tractor” and the research assistant reminded the teacher how to attach the two parts of the tractor by asking the teacher questions to provide some hints to help her remember. However, the majority of teachers did not ask for help and completed the task successfully, which suggests that the task was at a developmentally appropriate level for the children.

Interestingly, in the present study, learners copied teachers even when teachers forgot some of the steps of building the tractor. For example, when one teacher forgot where to put the short white tube connecter and put it horizontally rather than vertically, the learner imitated by putting the connector horizontally. This might show how imitation did not vary or increase with the higher task completion ratings. In other words, teachers' successful completion of the task did not relate to learners' imitation because learners imitated whether the task was completed successfully or not. According to Bandura (1997), learners imitate teachers by observing and then imitating the same actions. Bandura found that children learn for various social, cognitive, and behavioural reasons. Therefore, younger sibling learners might imitate for various reasons including social experiences or to identify and affiliate with their older sibling teachers. Similarly, Masur and Rodemaker (1999) found that when mothers matched children's behaviours, children's imitation increased. The reasons that children imitate may relate to the functions of imitation, which are discussed next.

Functions of imitation for the learner. The fourth theme regarding the findings of this study (question 1f) investigated the functions of verbal imitation. A significant main effect of function was found and the most frequent function of verbal imitation appeared to be clarification, which was followed by agreement; both clarification and agreement occurred significantly more than disagreement. Clarification was used to pose or answer a question in order to clarify the process of construction. For example, when a teacher asked: "is he holding my nose?" the learner answered: "no! he's holding the steering wheel." Learners also used agreement to confirm or agree on a statement or action.

The verbal interaction between siblings may make it easier for learners to clarify or agree about the steps of construction. For example, when the teacher said: "do it this way, like this",

the learner disagreed and then clarified by saying: “no! it’s this way.” These results are in accordance with another study, in which learners were active in the process of teaching with their older siblings by asking questions, demonstrating understanding, and being involved (Howe et al., in press). This might show how younger siblings might view their older sibling teacher as more knowledgeable, yet be comfortable enough to ask them questions, to clarify information and agree or disagree with them. Additionally, the reciprocal behaviour between siblings could allow learners to share with each other and to ask questions (Dunn, 1983). For example, when the teacher mentioned “we are making a tractor”, the learner said “what, are we making a tractor?”. The learner’s question here was to clarify the goal of the task and to question what the teacher said. Therefore, the social interaction and reciprocal behaviour between the siblings might allow learners to employ more clarification and agreement than disagreement functions. Yet, it could also be argued that the special relationship between the siblings allowed learners sometimes to employ disagreement functions. In other words, learners might be more comfortable to disagree with their older sibling teachers than other peers because of the intimate relationship between siblings and their shared knowledge (Dunn, 2002; Howe et al., 2011), although this speculation must be tested.

A final influencing factor might be related to the social functions of imitation. For instance, the function of imitation for learners may be to associate, identify or relate with their older siblings and to share with them in the building of a tractor. A study by Nielsen and Blank (2011) is in accordance with the above results, in which children copied irrelevant actions of adults because of their shared experiences.

Given these findings, there may be various reasons to explain the functions of imitation, as discussed above. The next section will discuss the question of the correlations between

teachers' social-cognitive skills and learner imitation (i.e., verbal and nonverbal imitation), learner involvement, and task completion.

Question 2: Teacher social-cognitive skills and associations with learner imitation, learner involvement, and task completion. The fifth and final major theme of the findings of the study was related to teachers' social-cognitive skills (i.e., interpretative understanding and second-order false belief) and associations with learner imitation, learner involvement, and task completion. The hypotheses of the second question were not supported. Although teachers' interpretative understanding of different people and how to arrive at similar conclusions was significantly associated with sibling teaching (Howe et al., 2012), in the current study there were no significant associations between interpretative understanding, second-order false-belief, and learners' verbal and nonverbal imitation.

Even though it was predicted that the teachers would understand the learner's perspective and involve learners in the process of teaching, the findings showed no relation between these variables. It could be that the two tests that were used to measure teachers' social-cognitive skills did not directly assess how teachers understand learners' use of imitation or how teachers might encourage learners to imitate or how they might complete the task successfully. Since teacher understanding of imitation was not measured directly, it makes it difficult to assume it relates to imitation. It could be that measuring cognitive skills such as memory, planning and language are more related to imitation than social-cognitive skills such as theory of mind, which need to be explored in future research studies. Perhaps, researchers might measure cognitive skills (i.e., skills relating to processing information or memory), rather than or in addition to social-cognitive skills (i.e., skills that relate to how people apply, process or store information about other people and social events). First, children's memory might influence their

use of spontaneous and deferred imitation. For example, children might imitate an action or word right after the teacher performs it or at a later time depending on their memory skills. Second, measuring how children plan to teach and apply the steps that they learned might be related to imitation. For example, researchers could look at how teachers apply steps they learned from the research assistant or how they plan their teaching using actions or words to help the learner understand. Finally, the use of language could reveal teachers' understanding and knowledge as well as learners' understanding and how they imitate certain words. Perhaps, learners' social-cognitive abilities may influence their imitation, because learners might imitate language and actions that seem correct to them.

The results showed that the two social-cognitive measures were also not correlated with learner involvement and task completion. An explanation for the nonsignificant results of learner involvement and social-cognitive measures could be that the social-cognitive skills measured only teachers' skills and not the learners' skills. Measuring learners' interpretive understanding and second-order false-belief may reveal how learners understand their role and the intention behind learning and imitating others. Future studies could compare both teachers' and learners' social-cognitive skills and its relation to imitation. The nonsignificant finding between teachers' social-cognitive skills and task completion may be due to the two social-cognitive measures. It could be that other social-cognitive skills might be related to the task completion. Various reasons may be proposed as contributing to the nonsignificant findings including the type of social-cognitive skills and the lack of a measure for learners' social-cognitive skills.

Limitations

This study provided rich information about the different types of imitation in learning and teaching, however, a few limitations have arisen. First, due to nature of the task, siblings were

observed constructing a tractor, which could limit their social interaction. For example, the task had 20-pieces but some of these pieces were very hard to put together for both the teacher and learner. Therefore, sometimes siblings needed help from the research assistant to place the A-shaped pieces on the white tubes to form the axle. Siblings' use of imitation to learn during play was not observed, which might have provided more information about siblings' reciprocal and bidirectional verbal and nonverbal imitation, because they might create their own scenarios or themes to provide opportunities for imitating one another unlike structured activities where it was mostly the learner imitating the teacher and not vice versa. Therefore, imitation during play might offer older and younger siblings a context to imitate one another. In addition, since the tractor was constructed in one way, using 20 pieces of blocks, the task did allow for much variability or creativity on the part of the teacher or learner.

A second limitation is the lack of measures for learners' social-cognitive skills. Previous studies of Howe et al. (2012) investigated how teachers use social-cognitive skills to understand another person's thoughts and perspectives. However, the learners' social cognitive skills were not measured in the present study. Thus, it was not possible to determine how learners understood the teacher's perspective and ideas about building the tractor or as a knowledgeable instructor so that they could accept the teaching and imitate the steps of construction. Perhaps measuring learners' social-cognitive measures might have revealed their intention and goal for the imitation.

A third limitation is that the sample lacked demographic variability, which could limit the generalizability of the findings. Therefore, a more varied and a larger sample of sibling dyads could benefit future research.

Finally, the taping of the construction task had some limitations, which may have influenced the results. The quality of the videotapes for some families was poor and some videos were dark, others did not include the siblings' faces, or the sound was not very clear. When this happened, the coders with the help of Dr. Howe, looked at the tapes and tried to code them carefully together to arrive at a joint decision about the coding. For example, if the face of the teacher was not visible but the teacher was very attentive and tried to help the learner build, positive/neutral responses were assumed. The videotapes of siblings that were too dark or lacked the proper sound to hear the voices were discarded from the coding process. Therefore, there were some limitations to the nature of the task and how it was coded.

Future Directions

Despite the limitations outlined above, the results of the present study suggest it offered valuable new information about learners' imitation, teachers' responses, the functions of learner imitation, and how teachers involve the learner and complete the task with learners. First, although the social-cognitive skills measured teachers' interpretive understanding and second-order false-belief, future studies could investigate learners' social-cognitive skills and associations with imitation and teaching. Conducting this research, may also identify how learners understand the process of teaching and how they understand and act out their role as learners.

Second, this study did not examine how the different teaching strategies may relate to learners' verbal and nonverbal imitation. Teachers' use of learner-centred strategies may be related to imitation because they involve the learner in the process of teaching, for example by scaffolding, guidance, and help (Howe et al., 2012; Howe & Recchia, 2009). However, teacher-centred strategies (e.g., demonstration, direct teaching as seen in Howe et al., 2012) may be

negatively related to both verbal and nonverbal imitation because such strategies do not involve the learner in the process and teachers usually control the process. Investigating this question may reveal the benefits of imitation for learners as a learning strategy and its relation to other teaching strategies.

Third, spontaneous and deferred types of imitation were collapsed due to the fact that deferred imitation was employed infrequently during this task. Spontaneous and deferred imitation appear early in a child's life; infants imitate spontaneously, and by six weeks of age infants begin to use deferred imitation and imitate at a later time during interactions with adults (Barr et al., 1996). Future studies can explore how siblings use spontaneous and deferred imitation in different contexts such as play in different settings (e.g., at home, school). Conducting such a study may reveal how learners use deferred and spontaneous imitation depending on the context. Perhaps, learners may employ more deferred imitation in the play context because both teachers' and learners' have the freedom to come up with their own ideas or themes and share them and are not constrained by the steps in a specific task.

Fourth, future studies could compare sibling imitation with peer imitation (similar to Azmitia and Hesser, 1993) but instead of providing a structured task a future study could observe younger siblings' play at home with their older siblings and with older peers. For example, a task could be given to one sibling and a peer and the same task or activity could be performed by two siblings, thus a younger sibling could be observed playing with an older sibling and a peer (e.g., farmhouse, kitchen set, dollhouse, doctor set). This study may reveal how the relationship, context, and social interactions between siblings and peers differ in terms of imitation. This may also reveal whether younger siblings imitate more with their older siblings or peers. Finally, this might add to the existing literature on the importance of studying sibling imitation during sibling

teaching and play. During play, siblings might share ideas, argue, negotiate and engage in pretense, which might allow them to use more imitation because siblings are not limited to performing a structured task or activity.

Implications

The findings of the present study illuminate how siblings employ verbal and nonverbal imitation during sibling teaching. Siblings' imitation especially nonverbal occurs early within the sibling context (Barr et al., 1996; Meltzoff, 2011). The knowledge obtained from this study adds to literature on siblings use of imitation during sibling teaching. The information gained can be shared with parents, practitioners, and researchers. The results suggest that learners' use of imitation during teaching is influenced by different factors. Some of these factors include: the type of task and siblings' relationship and intimacy. When parents are aware of these differences, they can encourage siblings to imitate words, actions or behaviors during play and teaching. In addition, when parents learn about the benefits of imitation (e.g., as an effective learning strategy) and the benefits of the social functions of imitation (i.e., affiliation, identifying with siblings), they may encourage siblings to imitate each other during teaching or play. For example, parents might encourage older siblings to teach their younger siblings how to perform tasks or learn additional information in different subjects for school (i.e., memorize terms for a history class). Additionally, parents could guide older siblings in some way to help them use appropriate methods such as scaffolding, demonstrating to learners, providing encouragement, and using appropriate and positive responses to learners' imitation but correcting when needed. This could also be performed during play, in which parents could monitor and guide sibling interaction. For example, parents could participate in play and model appropriate behaviours, actions or words for both older and younger siblings to learn these skills or words. Generally

speaking, siblings use of imitation could occur in many contexts and is not limited to teaching. Researchers can use the information to further investigate the nature of imitation as outlined above.

Conclusion

In conclusion, this study showed that imitation is an implemented learning strategy spontaneously engaged in by the learner during sibling teaching. This adds to literature on understanding the processes of learning during the context of sibling teaching. This study also adds to the literature by looking at the learners' active role by being involved in the teaching session and imitating teachers as well as the teachers' role by providing appropriate responses to learners' imitation. Unlike other relationship contexts, siblings share a co-constructed history and experiences, which they may not share with their peers and friends to the same degree. Siblings' knowledge and shared experiences allowed learners to imitate teachers and to be involved in the teaching session. Additionally, siblings long-lasting and intimate relationship made learners more comfortable to agree, ask clarification questions, and disagree with teachers. While disagreeing or asking questions might be challenging when learners are building with other peers, apparently, they were able to do so with their older siblings perhaps due to their relationship and knowledge of one another. This study demonstrated that teachers have a role in learners' imitation by providing appropriate responses to learners' imitation. Teachers responded differently by correcting and providing positive/neutral responses depending on the type of imitation exhibited by learners. Therefore, the study demonstrated that sibling teaching requires collaboration between both the teacher and learner, in addition to negotiations, elaborations, agreements, and disagreements between both partners, who are performing the task.

Overall, the findings from this study support previous studies showing that imitation is used as an effective learning strategy (Barr et al., 1996). Additionally, this study adds to the literature by revealing how the types of imitation, the degree of learner involvement, task completion, the function and responses to imitation play a role during sibling teaching. Clearly, this study has revealed that siblings' interaction is an important context for learners to imitate and to be involved in the teaching task.

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Appendix A

Ethics of the Study

Concordia UNIVERSITY

CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant: Dr. Nina Howe

Department: Faculty of Arts and Science\Education

Agency: Social Sciences & Humanities Research Council

Title of Project: Sibling Imitation: Facilitating Shared Meanings During Reciprocal (Play) and Complementary (Teaching) Interactions

Certification Number: 30001090

Valid From: April 12, 2017 to: April 11, 2018

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee

Appendix B

Imitation Coding Schemes

SIBLING TEACHING IMITATION CODING SCHEME
June 2017

Modified by: Nina Howe, Sara Matti, & Catherine Bergeron for the Reciprocal-Complementary (R-C) and Montreal Teaching studies (adapted from Howe, Rosciszewska, & Persram (2017) and Nina Howe & Jamie Leach (in preparation) studies on imitation during play.

IMITATION GENERAL RULES
CODING IN BRIEF

1. **Type of Imitation**
    a. Verbal
        i. Spontaneous(VSP) within 10 seconds
        ii. Deferred (VDF): more than 10 seconds
    b. Nonverbal
        i. Spontaneous (NVSP) within 10 seconds
        ii. Deferred (NVDF) more than 10 seconds
2. **Learner or Teacher**
3. **Gender of Learner and Teacher**
4. **Response of the Teacher to the Learner's Imitation**
    a. Positive/Neutral (POS/NEU)
    b. Negative (NEG)
    c. Not Attending (NOT)
    d. Correction (CORR)
    e. Off Task (OFF)
5. **Function of Imitation**
        a. Clarification
        b. Agreement
        c. Disagreement
        d. Off Topic
6. **Task Completion Rating Scale (1-5)**
7. **Learner Involvement Rating Scale (1-5)**

Definition of imitation: Intentional repetition of another person's words or actions; copying

- Non-verbal imitation of action performed by another person. Must be judged as a noncoincidental act.
- Verbal imitation of what another person is saying:
    - Words need not be directed to person
    - The key idea, word, or phrase is repeated (not necessarily verbatim) Example:
        Older Sibling: green piece here
        Focal Child: Green piece

Imitation Codes

The following codes are used in the teaching project coding for imitation in the R-C and Montreal teaching studies. Data were collected in the home and consisted of an older and younger sibling in teaching sessions. For the Montreal teaching study, the older child was taught

how to construct a tractor by an RA and this child had to teach their younger sibling. In the R-C study, the Teacher role was alternated between older and younger sibling.

In order to code imitation accurately, it is necessary to read the transcripts and watch the video. All instances of imitation are to be coded, even if there may be more than one type of imitation instance per conversational turn.

Notes:

- Each sequence of imitation needs to be identified and coded for:
    - **Imitation:** Verbal (spontaneous, deferred) or nonverbal (spontaneous, , deferred).
    - **Learner:** The child who engages in the imitative act.
    - **Response of Teacher (to Learner):** No response/ignore/off topic, not attending, positive (verbal or nonverbal), negative (verbal or nonverbal), correction.
    - **Function of Imitation:** Clarification, Disagreement, Agreement, Off Topic.

CODING RULES: Behaviors not to be coded

- Do not code second constructions if imitation occurred in the first construction. Do not code any talk to RA or parent that is the prompt for imitation.
- "No response" may not necessarily be "ignore." Sometimes the Learner continues speaking, which does not allow the Teacher to respond. Be cautious when interpreting findings.
- Do not code any talk to RA or parent that is the prompt for imitation.
- Do not code speech from/to the RA or parent

Non-Verbal and Verbal Imitation of steps of tractor construction

- Each of the yellow or green A-shaped pieces are counted as individual imitation (e.g., child imitates putting four green A-shaped pieces is counted as four separate imitations)
- The two wheels on each side are considered two separate imitations
- If the Teacher hands a piece to the Learner, do not code as imitation
- If filming begins after the start of teaching and you cannot determine who picked up the long white axle piece first, do not code as imitation.
- "No response" may not necessarily be "ignore." Sometimes the Learner continues speaking, which does not allow the Teacher to respond. Be cautious when interpreting findings.
- If the imitated word is repeated more than once before imitation occurs, code the closest sequence of imitation.
- If the Learner just touches any of the pieces (ex: H-shaped piece) it is not considered imitation
- If a step is repeated a second time, just count the first instance of imitation. Exception: If the Learner has been corrected and redoes the step, it counts as imitation.

Teacher Response

- If the Learner has been corrected by the Teacher and redoes the step successfully, code as second imitation.

- If you cannot see where the Teacher is looking (or their face is not visible), but they seem attentive, code as neutral/positive.

Decoration (after tractor is complete, children could add some small decorative pieces)

- For a decoration attempt to be counted as imitation, the piece must be attached to the tractor.
- Only the first instance of decoration is coded as imitation.

CODING CATEGORIES

1) TYPE OF IMITATION

- Spontaneous or deferred imitation. If imitation occurs within 10 seconds, the imitation will be spontaneous. If imitation occurs after 10 seconds, the imitation is considered deferred.
- If children are off camera or are speaking to the experimenter/parent/another sibling, do not code for imitation.

A) Verbal (V): Imitating what the Teacher is saying. It may be any word(s), phrase(s) and sentence(s). Three kinds of verbal imitation can occur:

i. **Spontaneous imitation (VSP):** Learner imitates Teacher's words within 10 seconds.
Example:
Teacher: The wheels look funny
Learner: Funny? They are funny.

ii. **Deferred imitation (VDF):** Imitation that occurs after a passage of time (= or >10 seconds). Begin counting from the **END** of the statement.
Example:
Teacher: The tunnel is here
At least 10 seconds pass
Learner: Tunnel? Where is the tunnel?

B) Non-Verbal (NV): Imitating action(s) of Teacher. Must be judged as a non-coincidental, intentional and unique act. Two kinds of non-verbal imitation can occur:

i. **Spontaneous imitation (NVSP):** Naturally occurring imitation where there is no request or expectation of imitation by Teacher. Learner spontaneously decides to imitate actions/gestures performed by Teacher.
Example:
Teacher: puts green A piece on white axle
Learner: puts green A piece on white axle immediately after

ii. **Deferred imitation (NVDF):** Imitation that occurs after a passage of time (= or >10 seconds). Begin counting at the END of nonverbal act (i.e., once child lets go of object).
Example:

Teacher: puts green A on white axle
At least 10 seconds pass
Learner: puts green A piece on white axle

2) LEARNER

- Identify which child is the Learner.

3) GENDER

- Specify the gender of both the Learner and the Teacher

4) TEACHER RESPONSE

- Response of the Teacher to the Learner's imitation. This means coding the "third" line of the sequence (Teacher verbalization or action; Learner imitation of Teacher behavior; Teacher *response* to Learner imitation).
- Exception: If the Teacher imitates the Learner, code Learner's response to Teacher's imitation.

A) Positive/Neutral (POS/NEU): Teacher's positive response to the Learner's imitation. Responses can be verbal or nonverbal.

- Positive responses include verbal statement(s) that praise, commend, comment, or reinforce Learner's imitation. They also include nonverbal responses such as hugging, kissing, patting, laughing, giggling, sharing or organizing materials.
- Positive/neutral verbal responses also include those that may or may not be a direct response to actual imitation, but that serve to continue the positive interaction between Teacher and Learner (i.e., serving to continue a game, activity, etc.).
- Other instances of positive/neutral responses include checking to see if the Learner is imitating properly and watching the Learner perform the steps of construction.

Example 1:
Teacher: puts connector in tractor
Learner: puts connector in tractor
Teacher: Yeah, good

Example 2:
Teacher behaviour. Learner imitates behaviour. Teacher is watching or attending but remains silent. Sometimes is a quick glance to check that building is correct.

B) Negative (NEG): Teacher's protest reaction to imitation.

- Responses can be verbal or nonverbal. Verbal responses include statement(s) such as 'No!', 'Don't', 'Stop!', and reprimand/scolding statements such as 'You're not allowed', 'That was bad', 'You shouldn't be doing that', 'What's wrong with you?' etc.
- Nonverbal negative responses include actions such as pushing, hitting, hitting with an object, head shaking, etc.
- Essentially, these responses break the flow of interaction between Teacher and Learner.

Example:
Teacher: puts green A piece in middle of white axle
Learner: puts green A piece on end of white axle
Teacher: No no!

Example 2(RC-Family 55)
Learner: tries to put on second wheel
Teacher: stops Learner before imitation is complete and takes piece
Teacher: Don't don't!

C) Correction (CORR): Teacher responds to Learner's imitation by correcting them.

- This is differed from the negative response by the physical action that the Teacher performs in order to help the Learner build the tractor correctly.
- Correction response can include moving the object of imitation to show the Learner, telling the Learner how to correct the step, or showing them the proper step again.

Example:
Teacher: puts green A piece in middle of white axle
Learner: puts green A piece on end of white axle
Teacher: No no, push them together /pushes together

Example (Montreal Teaching Family 32)
Teacher: Puts two wheels in each side of tractor
Learner: Puts one wheel on the side
Teacher: Fixes the Learner's wheel by pushing it toward the A-shaped pieces

Example (Montreal Teaching Family 35)
Teacher: puts fourth green A-shaped piece on white long tube
Learner: puts the fourth yellow A-shaped piece on white long tube
Teacher: makes eye contact with Learner and pushes it to the middle

D) Not Attending (NOT): Teacher is not attending to the actions of the Learner but remains on task.

- Examples of this type of response include not looking at Learner imitation because the Teacher is focused on own building or gathering pieces while Learner is imitating their actions.

Example:
Teacher: puts green A piece on white axle
Learner: puts green A piece on white axle
Teacher: does not look up from own building

E) OFF TASK (OFF): Teacher is not attending to the actions of the learner due to a distraction.

- The Teacher is focused on something else such as talking to the RA or mother, playing with other pieces, looking at the time, picking pieces off the floor, etc.

  Example:
  Teacher: puts green A piece on white axle and then turns to RA
  Learner: imitates by putting green A piece on white axle
  Teacher: talking to RA

5)FUNCTION OF IMITATION

- Identify the purpose of imitation contained in each sequence.

A) CLARIFICATION: Imitation to pose and/or answer a question.
Example: Family 10
Teacher: "Is he holding my nose?"
Learner: "No, he's holding the steering wheel"

B) AGREEMENT: Imitation to agree with/ confirm a statement.

Example: RC Family 21
Teacher: Like a steam pipe here
Learner: I wanna do that. The steam pipe.

C) DISAGREEMENT: Imitation to disagree with/ debunk a statement.

Example: **RC Family 21**
Teacher: Okay, I'll do it
Learner: I'll do it!

D) OFF TOPIC: A sequence of 'neutral' interaction between Teacher and Learner that is not relevant to the teaching and cannot be categorized as the other function categories. Examples may include talking into the microphone, making faces at the video recorder, nonsense talk or singing.

6) TASK COMPLETION: Rating Scale of successful completion of constructing the tractor(1-5 rating):

Success of Teaching/building by Teacher and Learner (this rating scale is based on the R-C teaching data study). There is no duration interval for this rating scale because it is based on completing the object successfully due to the high variability of sibling teaching styles. So, assign the rating at the end of the teaching session.

1) The children do not complete the task correctly. The Teacher begins to instruct how to build the tractor but fails to remember the steps needed for the completion (for example, cannot assemble the two sides of the tractor). Or the Learner attempts to help the Teacher by touching the objects but fails to put the pieces together.

2) The children partially complete building the object (i.e., tractor) successfully. The Teacher begins building the tractor correctly but forgets most of the steps to complete the tractor successfully (for example, the Teacher built the two sides of the tractor successfully but forgot the rest of the steps). The Learner may help in attempting to figure out the steps needed to complete the tractor. But both the Learner and the Teacher fail to complete building the tractor correctly.

3) The Teacher remembers most of the steps in building the tractor but forgets a few steps during the teaching session and requires the help of the Research Assistant (RA) and/or the mother (M). The Teacher explains, instructs and demonstrates building for the majority of time (e.g., the Teacher demonstrates building the tractor but forgets where to put the green H-piece, or the Teacher forgets where to put the driver). During the teaching session, the Learner may be involved and engaged in the building but does not know how to build the tractor.

4) The tractor is built successfully with the help of the Research Assistant (RA), the mother (M) or the children figured it out themselves. The Teacher may ask the RA for help to remember how to build the tractor (e.g., where to put the A-pieces, how to attach the two sides of the tractor, or where to put white pieces of blocks). With the help of an adult, the Teacher remembers the steps and completes the instructions for building the tractor successfully. The Learner may be involved in the process of building the tractor with the Teacher.

   EX: Montreal Teaching – Family 30
   Teacher forgets how to attach the two sides of the tractor and where to put white pieces. The RA helps her to figure this out and then she builds it correctly.

5) The Teacher instructs how to build the tractor successfully and independently without the help of any adult. During the teaching session, the Teacher remembers all the steps very well and demonstrates a sense of confidence in teaching the Learner. The Teacher (with or without the help of the Learner) constructs the tractor easily and is able to teach the Learner the steps needed to build the tractor

7) LEARNER INVOLVEMENT: **Rating Scale of Learner involvement (1-5 rating): Adapted from R-C teaching scheme (Howe & Recchia, 2005)**

The rating scale is used to determine the degree that the Learner is involved during the construction of the tractor. There is no duration interval for this rating scale because it is based on the entire building session. So, assign the rating at the end of the teaching session.

1) Teacher does not allow Learner to build (i.e., prohibits Learner from building or touching materials). Or Learner is passive and just watches Teacher build. Learner plays with materials but does not engage in building in any way.

2) Learner engages in (passive) attempts to help (hands object) or begins to build, but does not get very far because Teacher takes over. There may be an example or two of an unsolicited attempt to help or build by the Learner, but the request may be feeble or

unassertive; may be seen as an attempt by the Learner to get involved. Teacher may request Learner involvement, for one or two pieces, but involvement is very brief. For example, Montreal Sibling Teaching, Family 33, Teacher prevents the Learner's attempts from building and does not allow him to build a lot.

3) Learner asks to help or assist (e.g., "do you need this?") in a more active or assertive way. Learner may ask for help or clarification. Teacher requests Learner involvement either explicitly (e.g., "Now you put these parts together.") or implicitly (e.g., gives pieces to Learner) and the Learner engages in active building for short periods but the participation is often choppy. The Learner may also be engaged in taking the tractor apart, but once again in short, choppy segments. The Learner may put one or two pieces together or build for about 5-10 seconds of the interval. EX: Family 43 (Montreal teaching) Learner puts few pieces together for 5-10 seconds and then plays with the pieces and the man, while singing.

4) Teacher requests Learner involvement either explicitly ("now you do this) or implicitly (e.g., "These little pieces go on the wheels like this" and as Teacher demonstrates the Learner begins to build). The Learner is actively engaged in building during the majority of the interval (about 60%) and actively watches most of the time. There may be a short break in the Learner's involvement while the Teacher demonstrates the next step or helps to fix a piece, but there is a clear sense that the break is a short interruption in the Learner's building.

5) The Learner is actively engaged in building during the entire interval (minus a few seconds) either during the demonstration.

Appendix C

Second-order False Belief Task

SECOND-ORDER FALSE BELIEF TASK

Name_____ Grade

Teacher's name_____ Date

JOHN/MARY/GAME

I'm going to tell you a story. Listen carefully, then I'll ask you some questions, OK?

This is a story about John and his sister Mary (*show doll*). John and Mary have a new board game (*show game*). They are playing with it in John's room. Mary says, "Let's put this away and we can play with it after dinner." Mary puts the game in the closet and goes to set the table for dinner. (*move doll under table*)

John stays in his room. Then he decides to play a trick on Mary. He takes the game out of the closet and puts it under his bed. But Mary finishes setting the table and walks by John's door. She sees John hide the game under his bed! John does not see Mary.

After dinner, Mary says to John "I will go and get the game now."

Control questions

Q: Did Mary see John hide the game under his bed? (Yes)

Q: Where does Mary think the game is? (Bed)

First order false belief

Q: Does John think Mary saw him? (No)

Second-order false belief

Q: Where does John think Mary will look for the game? (Closet)

Justification

Why does John think this?

SECOND-ORDER FALSE BELIEF TASK

Name_____ Grade

Teacher's name_____ Date

LISA/MOM/ICE CREAM

Here's another story. Listen carefully, then I'll ask you some questions, OK?

This is a story about Lisa and her mom. This is Lisa (*point to doll*) and this is her mom (*point to doll*). This is a bag of groceries.

Lisa's mom is putting away the groceries just before dinner time. Can we have ice cream for dessert tonight?" asks Lisa. Lisa's mom is going to have ice cream but decides to surprise Lisa. She answers "I'm sorry, Lisa. I forgot to buy ice cream. We'll have to have fruit for dessert instead. Now you go and wash your hands." As Lisa turns to go wash her hands, she notices a carton of ice cream in the grocery bag! "Oh," she thinks, Mom is going to surprise me with ice cream. I will not tell her that I saw it."

Control questions

Q: Did Lisa see the ice cream? (Yes)

Q: What does Lisa think they will have for dessert? (Ice cream)

First order false belief

Q: Does Mom think that Lisa saw the ice cream? (No)

Second-order false belief

Q: What does Mom think Lisa would say they are going to have for dessert? (Fruit)

Justification

Q: Why does she think this?

Appendix D

Interpretive Understanding Task

Now we're gonna play a few games with these four animals – Eric the Elephant, Boris the Bear, Donna the Dog, and Franny the Frog.

Hiding Task

"Now we are going to play another kind of game with Boris and Donna. There is a penny hidden under one of these cards, and they are trying to guess where it is. I will give them a clue about where to look for the penny."

"Okay, Boris and Donna, the clue is; the penny is under the *red* block."

"Boris show us where you think the penny is." [with Donna under the table]

Boris: "I think it's under the small red block." [Boris goes under the table and Donna comes out]

"Now Donna, show us where you think the penny is."

Donna: **"I think it's under the big red block."**

EXPLANATION QUESTIONS:

The experimenter must ensure that the child understands both of the possible locations allowed by the ambiguous message.

> **"I told them that the penny is under the *red* block. Why does Boris think the penny is under the small red block and at the same time Donna think it's under the big red block?"** (Or: Why do they disagree?)

"Does it make sense for Donna to say one thing and Boris to say something else?"

"Why?"

Standard probe if the child is vague: "You said .... Can you tell me more about that?"

PREDICTION QUESTIONS:

"Boris thinks it's under the small red block, and Donna thinks it's under the big red block. Now we will tell Franny that the penny is under the *red* block.

> **"Do you think Franny would say it's under the big red block, the small red block, or would you not know what she would say?"**

If the child takes a position then ask:

"How can you tell what she will think? How are you sure she would think that?

If the child says "I don't know", or is not completely sure then ask:

"Why is it hard to tell what she will think?"

DEVIANT INTERPRETATION:

"Remember we said the penny is under the red block."

> **"Well, Eric says the penny is under the small blue block. Does that make sense?" "Why/Why not?"**

Lexical Ambiguity: ("Pear/Pair", homonym)

> **"Now we are going to play a game with these two puppets, Eric and Franny. Eric and Franny, in this game you both need to wait here for a *pear*."**
>
> "Now Eric, tell us what you are waiting for."
>
> **Eric: "I'm waiting for a pear to eat."** [Show illustration; with Boris under the table. Eric goes under and Boris comes out]

"Okay, Franny, tell us what you are waiting for."

> **Franny: "I'm waiting for a pair of shoes."** [Show illustration]

EXPLANATION QUESTIONS:

> **"I told them to wait for a pear. Why does Eric say he's waiting for one thing and at the same time Franny say she's waiting for another thing?" (**Or: Why do they disagree?)

"Does it make sense for Eric to say one thing and Franny to say something else?"

"Why?"

Standard probe if the child is vague: "You said .... Can you tell me more about that?"

PREDICTION QUESTIONS:

"Eric says he is waiting for a pear to eat and Franny says he is waiting for a pair of shoes. Now we will tell Boris to wait for a pear."

> **"Do you think Boris will say he is waiting for a pair of shoes, a pear to eat, or wouldn't you know what Boris would say?"**

If the child takes a position, ask:

"How can you tell what he would think? How are you sure he would think that?

If the child says "I don't know", or is not completely sure ask:

"Why is it hard to tell what he would think?"

DEVIANT INTERPRETATION:

"Remember that we told them to wait for a pear."

"Well, Donna says she is waiting for a banana. Does that make sense?"

"Why/Why not?"

Appendix E

Instructions for the Social-Cognitive Measures

Second-order false belief. The teacher's ability to understand second-order false beliefs (i.e., the teacher has to attribute the belief of a person to another's thoughts) was previously assessed using two counterbalanced puppet plays (Howe et al., 2012; for more details of the two scenarios adapted from Astington et al., 2002). For example, in one scenario, the RA enacted a story and told the child to listen carefully because he/she would be asked some questions at the end. The RA told the children a story about Lisa and her mother, who had a grocery bag. Lisa asked her mother "can we have ice cream for dessert tonight?" Lisa's mother was going to have ice cream for dinner, but the mother decided to surprise Lisa. The mother deliberately misled Lisa by saying: "we'll have to have fruit for dessert instead. Now you go and wash your hands." As Lisa turned to go wash her hands, she saw the carton of ice cream and thought "mom is going to surprise me with ice cream. I will not tell her that I saw it." However, the mother was mistaken about Lisa's belief, because she did not know that Lisa saw the ice cream as she went to wash her hands.

After this story was read to the children, they were asked several control questions (i.e., "did Lisa see the ice cream?") to ensure that the children understood the story before asking them first-order false-belief questions (i.e., "does Mom think that Lisa saw the ice cream?"). Then children were asked second-order false belief questions (i.e., "what does Mom think Lisa would say they are going to have for dessert?") and finally they were asked to justify their response ("why does she think this?"). If the children did not answer the control questions correctly, the first and second-order belief questions were not asked. In order to consider a child's responses as correct, children had to respond correctly to the second-order false belief task (e.g., "mom thinks Lisa would say fruits"). In addition, the child had to provide a valid justification to what their response such as "because she does not know Lisa saw her" or a valid reasoning to the child

belief such as “Lisa’s mommy wanted to surprise her.” Then, the scores were calculated to find the average across the two scenarios. The scores ranged from 0 to 1.

Interpretative understanding. In order to assess how children, understand and interpret how two people can provide varied answers to ambiguous situations two counterbalanced scenarios from Carpendale and Chandler (1996) were administered. First, the children were presented with a story that involved an ambiguous referential communication task’. The RA presented the children with a penny and said “the penny was hidden under one of these blocks” (i.e., a large red block, a large blue block, or a small red block), without indicating if the block was big or small or its colour. Then, the RA presented two puppets and explained that: “The penny is under the card with a big block,” or “The penny is under the card with a red block” without indicating color or size, respectively. Each puppet was told a different but equally reasonable interpretation of the ambiguous task.

For the second scenario, the children were told a story that involved lexical ambiguity. The RA told the children that two puppets (i.e., Boris and Donna) were “waiting for a pear/pair.” Boris and Donna assumed different meanings for the “pear/pair” task: “a pear to eat” and “a pair of shoes.” Children were asked three types of questions in both scenarios to understand their justification and reasoning for interpretative understanding. First, children were asked explanation questions including “does it make sense for Donna to say one thing and Boris to say something else? Why?” Second, children were asked prediction questions including “do you think Franny [another character introduced in the scenario] would say it's under the big red block, the small red block, or would you not know what she would say?” If a child tried to take a position the RA further questioned the child saying, “how can you tell what she will think? How are you sure she would think that?” Or if a child did not know the RA said, “why is it hard to tell what she will think?” Third, the RA asked the child about deviant interpretations, specifically

"well, Eric says the penny is under the small blue block. Does that make sense? Why and why not?" (see Appendix D for the other scenario).

Children's scores were added for each scenario (one point for each correct response) and the scores ranged from 0 –1(for more information about the calculations see Howe et al., 2012).