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# Mother-child Planning: Microgenetic Changes in Maternal Instruction Behaviors as a Function of Task Goals

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# Mother-Child Planning: Microgenetic Changes in Maternal Instruction as a Function of Task Goals

by

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# DEDICATION

*This thesis is dedicated to my children, Frank, Joshua, and Noah. Without their continued love and support, I would not have had the fortitude to keep pushing forward. Also, to Dr. Susan Perez for her constant encouragement, guidance, and reassurance. Lastly, to Dr. Rebecca Marcon for not allowing me to give up on my academic dreams. May God bless you and keep you.*

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# ABSTRACT

This study examined microgenetic changes in mother-child behaviors while they collaborated on a cognitive task that involved planning shopping routes around a table model of a grocery store across 4 trials. Sixty- eight mother-child dyads were randomly assigned to two conditions in which the goals of the task differed. In the experimental condition (n = 32) mothers were encouraged to help their child prepare for a solitary posttest and the dyad was informed they would be timed. In the control condition (n = 36), dyads were simply asked to work together. Research suggests that maternal instruction is most effective when matched to the child's learning needs. While working with children on a collaborative planning task, it was expected that mothers would change their level or style of instruction as they became more aware of the child's skill at the task. Specifically, mothers were expected to decrease their level of support behaviors and control across trials. For children, it was expected that they would become more engaged and more responsible for task completion across trials. Results suggested that as mothers and children became familiar with the task, mothers decreased their use of instructional behaviors. Also, that mothers in the experimental condition used more controlling behaviors across trials. Patterns of association emerged between mother's control behaviors and child uncooperative behaviors, as did mother's support behaviors and child engagement behaviors. These results suggest that mother-child behaviors may exhibit change due to factors other than the goals of the task itself, such as intersubjectivity (a shared understanding of the task at hand) and shared responsibility, which in turn may be influenced by shared social history (the extensive prior experience that the partners have had with one another in a social- historical context). *Keywords:* children, dyad, intersubjectivity, mothers, planning, sharing responsibility

# Mother-Child Planning: Microgenetic Changes in Maternal Instructional Behaviors as a Function of Task Goals

This study examined mother-child collaborative planning in relation to the goal or purpose of the task across several trials of a planning task. Two main questions were investigated: 1) Do mother-child behaviors during cognitive interactions change across several trials of a planning task? Specifically, do mothers decrease their level of support and instruction and do children increase their task involvement and responsibility as the dyad becomes more familiar with the task?; and 2) Does the purpose or the goal of a planning task influence patterns and changes of mother-child cognitive interactions?

This research is based on the theoretical and empirical foundation provided by a sociocultural approach to cognitive development that considers social interaction between children and more skilled partners a mechanism for intellectual growth (Gauvain, 2001; Rogoff, 1990; Smith, Landry, & Swank, 2000; Vygotsky, 1978), particularly in the development of higher order or complex cognitive skills like problem solving and planning. Planning is a complex cognitive skill that develops gradually over childhood. Planning requires the anticipation, delineation, and organization of future-oriented actions toward achieving a goal (Gauvain, 2001; Gauvain & Perez, 2008; Perez & Gauvain, 2005; Rogoff, 1990). In early childhood, individualized, collaborative interactions between children and skilled partners, mainly parents, provide the experiences through which these competencies develop (Gauvain, 2005; Mulvaney, McCartney, Bub, & Marshall, 2006; Rogoff, 1990). Of particular importance are the collaborative interactions that take place in early childhood between mothers and children, as historically, mothers have been and continue to be the primary caregivers of young children and therefore have more opportunities to engage in collaborative learning (Gauvain, 2001; Gauvain & Perez, 2008; Hustedt, 2015; Perez & Gauvain, 2005; Rogoff, 1990; Vygotsky, 1978). Research and theory suggest that for these collaborations to be effective, mothers must pitch their instruction just beyond the child's current level of ability but within the range of their potential ability; in other words, within what Vygotsky (1978) called the child's *zone of proximal development (ZPD),* (Carr & Pike, 2012). To clarify, the ZPD reflects the distance between what a child can achieve when working independently and what the child can achieve while receiving guidance from a more skilled partner. To achieve this, research has demonstrated that the more skilled partner may engage in *scaffolding,* which can be described as supporting children's cognitive development by providing a framework or structure for children during problem solving that is continually adjusted over the course of cognitive interaction as children's competence increases and learning needs change (Mulvaney et al., 2006; van de Pol, Volman, & Beishuizen, 2011; Wood, Bruner, & Ross, 1976). Alternatively, these cognitive interactions can be described by Rogoff's (1990) concept of *guided participation*, which goes beyond focusing on the role of the instructor to also recognizing the role of the child as an active participant and contributor to the learning process. The following sections will discuss the sociocultural approach to cognitive development as applied to the development of planning in the social context.

**Cognitive Development in the Context of Social Interactions**

The sociocultural approach to cognitive development suggests that social interaction plays a fundamental role in children's cognitive development. According to Vygotsky, participation in the social world organizes and provides meaning for individual human action and development. It is theorized that the origins, or foundational components for children's later independent functioning (e.g., planning on their own, problem solving, daily living activities) are linked to learning opportunities within the social context. In a broad social context, learning can be facilitated through casual (e.g., mealtime, running errands with a parent, unstructured playtime) as well as intentional (e.g., structured learning activities such as homework, reading a book together, learning how to use a tool) social interactions involving two or more individuals across a variety of domains (Hustedt, 2015; Miller, 2011; Vygotsky, 1978;). Children's experiences in the family, with peers and within the community directly affect cognitive development through the opportunities, support (guidance or instruction from a more skilled partner), and constraints (boundaries or limitations due to the nature of the activity) that they exert on children's learning and thinking, beginning in infancy and extending into adolescence. In other words, the social world provides the child with *cognitive opportunities*-opportunities that originate in and are maintained through the contributions and goals of the participants- that encourage and support learning and growth (Gauvain, 2001). Cognitive development, then, involves changes in how children participate in the activities offered by a culture as these changes are facilitated by learning in the social context, (Gauvain, 2001; Miller, 2011; Rogoff, 1990). Several theoretical concepts have been discussed in the literature regarding the processes involved in cognitive development in the social context including intersubjectivity, Vygotsky's zone of proximal development (ZPD), scaffolding, and Rogoff's guided participation, which are discussed below.

**Intersubjectivity**. A fundamental characteristic of these cognitive opportunities related to children's learning is *intersubjectivity,* a term that is used to describe the process of jointly constructing and sharing meaning among individuals (Gauvain, 2001; Gauvain, 2005; Rogoff, 1990; Vygotsky, 1978). Intersubjectivity can be broadly defined as a shared understanding of the task at hand (Kermani and Brenner, 2000). More specifically, Miller (2011) describes this process as a shared understanding, based on a common focus of attention, and a common goal, between a child and a more competent person during collaborative problem solving. Also, in accordance with Mulvaney et al., (2006) language is the primary mechanism through which this shared understanding is conveyed. Therefore, intersubjectivity involves cognitive, social, and emotional interchange between individuals through which the type of interaction that fosters the development of cognitive skills in the social context may then take place (Gauvain, 2001). The role of intersubjectivity in cognitive interactions and learning opportunities for children is demonstrated in research conducted by Gauvain and Rogoff (1989). They examined mother-child collaborative planning of routes through a model grocery store among five- and nine-year-old children. Their results demonstrated that the ability for the cognitive partners to achieve a joint understanding of the task definition and goal (intersubjectivity) during collaborative problem solving, was positively correlated with higher *cognitive gains* – improvement in task performance resulting from an increase in ability or skill, for children. In comparing individual posttest results, the children in dyads with higher levels of shared responsibility were more likely to plan in advance and produce more efficient routes than children in dyads with lower levels of shared responsibility. Also, the dyads who exhibited higher levels of shared responsibility were more likely to discuss the goals of the task, show concern with planning the most efficient route, and show a more equal division of labor, thus indicative of intersubjectivity.

In early childhood, learning in the social context primarily takes place within the family context and more specifically during cognitive interactions between mothers and children. Mothers and children are unique cognitive partners whose interactions and intersubjectivity are influenced by their *shared social history*, that is, the extensive prior experience that the partners have had with one another in a social-historical context. Thus, parent-child interactions on cognitive tasks may reflect several things, including the demands of the task itself, the child's competency at the task, and other characteristics of both mothers and children. For example, Eisenberg and colleagues (2010) examined the influence of children's effortful control (EC) on mother's teaching strategies. In their study, children's EC was assessed at 18, 30, and 42 months using adult reports and a behavioral measure. In addition, they also examined mother's verbal teaching strategies during a mother-child collaboration involving a difficult puzzle task. Their results showed evidence of concurrent relations between children's EC and mothers' teaching strategies and predictive relations across time, in that EC consistently predicted maternal teaching strategies. These results suggest that the level of children's EC may influence mother's teaching activities across time, thus indicative of possible effects of shared social history. Also, it is possible that some maternal characteristics (e.g., level of patience, temperament) may increase or reduce mother's responsiveness to their child's level of EC, which in turn may exert an influence on how mothers adjust their teaching strategies. Furthermore, in a study conducted by Perez and Gauvain (2009), their results indicated that mothers' instructional approaches during a joint planning task with their children were influenced by their perceptions of children's temperamental characteristics (e.g., emotional intensity) even though children generally did not display these characteristics during the joint planning activity. To conclude, the afore mentioned studies support the notion that both intersubjectivity and shared social history exert an influence on mother- child behaviors during joint- cognitive activities.

**Vygotsky's ZPD.** Vygotsky describes the ZPD as the distance between a child's actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable others (Miller, 2011; Vygotsky, 1978). In other words, a more competent person collaborates with a child to help them move from where they are now to where they can be with help. The more skilled adult builds on the competencies the child already has and presents activities supporting a level of competence slightly beyond where the child is now. Thus, effective collaborative learning within a child's ZPD requires intersubjectivity as it involves a shared understanding, based on a common focus of attention and a common goal between a child and a more competent person. It is also important to know that in Vygotsky's original work (1978) the ZPD is offered as a dynamic alternative to the models of individual ability used in conventional psychological testing. Instead of assessing what an individual child can do unaided, he proposed assessing what an individual is capable of with the help of an adult or peer. He recognized that although children may have reached similar levels of conceptual development, they might differ in their readiness to achieve a higher level of understanding, and such differences may be revealed by offering children structured help (Fernández, Wegerif, Mercer, & Rojas-Drummond, 2015). This structured help, or provision of guidance within the child's ZPD has been referred to as scaffolding (van de Pol et al., 2011; Wood et al., 1976).

**Scaffolding.** Wood et al., (1976) introduced the notion of scaffolding as a metaphor for the way an expert tutor, such as a parent, can support a young child's progress and achievement through a relatively difficult task (Fernández, et al., 2015). The metaphor of scaffolding, borrowed from construction work, refers to assistance which enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond the child's unassisted efforts (van de Pol et al., 2011; Wood et al., 1976;). Scaffolding ideally involves a variety of verbal and nonverbal means of assistance, including recruiting the child's interest, drawing attention to important aspects of the task, maintaining task-related behaviors and demonstrating solutions (Husted, 2015; Wood et al., 1976). Contingency, dependence on the fulfillment of a condition, is viewed as a key feature in the process of scaffolding. Also, it must be emphasized that the child's behavior affects the adult's behavior as much as the adult's behaviors affects the child's (Eisenberg et al., 2010; Erickson et al., 2013; Gauvain & Perez, 2008; Miller, 2011; Mulvaney et al., 2006; Silinskas et al., 2015). From their seminal article on scaffolding, Wood and colleagues (1976), found that the nature of a task, or task goals, had an effect on both tutor and tutee behaviors. In their study, the children (age 3-5 years) were initially allowed to engage in five minutes of free time imaginative play involving a set of wooden blocks. After their time was up, the children were then instructed to build a pyramid with their wooden blocks. However, due to a shift in the goals of the task, some of the children (4 years of age) appeared to have difficulty in following the specific instructions given by the researcher. Thus, resulting in a change or shift in subsequent instructions given by the researcher. Wood and colleagues (1976) noted that although the researcher had been given a fixed set of tutorial rules, there were adjustments that had to be made in accordance with changes in child behaviors resulting from changes in the goals of the task.

Wood and colleagues describe effective scaffolding as the process whereby mothers' instruction is contingent on the child's performance. Thus, when the task is beyond the child's current level of ability, help is increased, reducing task complexity which allows the child to focus on what is within their capability (Carr & Pike, 2012; Wood et al., 1978). According to Rogoff, (1990) and Gauvain, (2001) this could also be described as *sensitive responding.* During such collaborations, as the child's competency for the task grows and the mother gradually reduces her help, the child is able to perform more and more of the task independently (Smith et al., 2000). This process is referred to as *contingent shifting* as it involves the mother altering the level of specificity of her level of instruction in a manner that is dependent on the previous success or failure of the child (Carr & Pike, 2012; Wood, 1980). Through contingent shifting, the parent regulates the child's progress through the task by controlling elements that are beyond the child's current capabilities but gradually transferring responsibility as the child's knowledge and understanding of the task are increased (Carr & Pike, 2012; van de Pol et al., 2011). This is an essential aspect, as successful scaffolding largely depends on the degree to which children are able to assume responsibility for the task being taught (Gauvain & Rogoff, 1989; Mulvaney et al., 2006).

**Rogoff's Guided Participation.** As mentioned earlier, in order to account for the child's active role in cognitive development through social interaction, and to emphasize other social arrangements that contribute to cognitive development, Rogoff (1990) introduced the notion of guided participation (Gauvain, 2001). Through guided participation, cognitive changes result as children participate as active learners alongside a more experienced partner. According to Rogoff (1996) and Gauvain (2001) over the course of participation, as a child's roles and responsibility in joint action change, the child's understanding of the task also changes. In this view, the child is not just a learner, per se, but they are a full participant. More specifically, a participant that is characterized by individual and developmentally related skills, interests, resources, and so forth. Guided participation involves children and their caregivers in the collaborative processes of (1) building bridges from children's present understanding and skills to reach new understanding and skills and (2) arranging and structuring children's participation in activities, with dynamic shifts over development in children's responsibility. Similar to the ZPD, underlying the processes of guided participation is intersubjectivity. However, during guided participation, intersubjectivity not only contributes to learning in social interactions, but also results from these interactions in that the dyads' shared understanding of the task at hand increases as they collaborate (Miller, 2001). As mentioned previously, intersubjectivity is influenced by shared social history, which in turn is influenced by child characteristics and mothers' perceptions of children's learning needs, all of which may be influenced by the goals of the task. Lastly, from Gauvain (2001), for Rogoff, the process of guided participation shifts the level of psychological analysis away from the individual child per se toward the child's changing participation in organized social activity (e.g., an increase in responsibilities involving planning). Thus, cognitive development in the context of social interactions may be influenced in a bidirectional manner through which these factors play a role. This study will focus on these cognitive collaboration processes while mothers and children work together on tasks that involve planning. The following sections will discuss planning, its development, and the role of the social context.

**The Development of Planning**

From infancy to adulthood, planning plays a vital role in every aspect of our lives as it involves future oriented actions that take place in a step-by step process that ultimately end when a goal has been achieved. It is understandable that with age children will be given more responsibility in the regulation of their own activities, a process that relies heavily on the ability to plan (Gauvain, 2001; Gauvain & Perez, 2008; Kopp, 1997). Also, as children get older, the ability to plan becomes more important as they are expected to assume more responsibility for regulating their own behavior, specifically in the context of formal schooling (Perez & Gauvain, 2005; Perez & Gauvain, 2009). Through numerous studies on children's ability to plan, researchers have been able to examine the relationship of planning and individual functioning across a variety of domains where problem-solving is necessary for development. More specifically, these studies looked at children's planning skills in the context of cognitive, emotional, and social development (Cai, Georgiou, Wen, & Das, 2016; Gauvain & Perez, 2005;

Gauvain & Perez, 2008; Gauvain & Rogoff,1989; Perez & Gauvain, 2005; Perez & Gauvain, 2009). Thus, planning is a vital aspect of children's ability to organize and participate in complex activities on their own and with others. More broadly, planning is essential for mature cognitive and social functioning across a variety of domains (Gauvain, 2001; Perez & Gauvain, 2009**).**

Planning is a complex cognitive skill that involves biological components such as the physical development and maturation of the prefrontal cortex, as well as environmental components such as learning opportunities in the social context, across multiple domains. Furthermore, it is an aspect of executive functioning that involves working memory and inhibitory control, and daily life functioning (e.g., the influence of social context such as participating in common household chores and personal hygiene care) that enables children to anticipate, arrange, and carry out multistep goal-directed actions (Albert & Steinberg, 2011; Gauvain & Perez, 2008). Planning can also be defined as a process of devising, coordinating, and performing actions aimed at achieving a goal while simultaneously monitoring the effectiveness of the actions for reaching the goal (Gauvain & Rogoff, 1989).

**Biological and environmental influences.** Children's advancement in planning skills over time is likely to result from a combination of biological or maturational processes as well as environmental process, such as learning in the social context. Successful planning involves higher order cognitive control processes such as self-regulatory control, resistance to peer influence, impulse control, and future orientation. These processes develop over time during childhood as a result of maturation of the prefrontal cortex (Albert and Steinberg, 2011; Cai et al., 2016; Crone & Steinbeis, 2017; Moriguchi & Hiraki, 2013; Perez & Gauvain, 2009). Previous research suggests that planning emerges early in childhood and has a protracted developmental course reflecting changes in the prefrontal cortex (Gauvain, 2001; Johnson, 2005;

Perez & Gauvain, 2009). Rudimentary planning ability is first displayed through intentional *means-end behavior* during infancy at about 7 or 8 months of age as infants begin to solve simple problems involving completion of one intermediate step prior to achievement of a goal (e.g., removing a covering from a toy then reaching for and grasping the toy (Willatts, 1984; 1997; 1999). Similar behavior in infants was first documented by Piaget (1953) while examining infants' sequence of actions to retrieve a toy. Although at the time, Piaget did not consider the infants' behavior indicative of planning, he viewed the onset of means-end behavior as dependent on two important achievements, both of which appear to involve planful behavior. The first being maturation in that the development of new cognitive structures would enable infants to set up goals and produce goal-directed behavior. The second being the acquisition of knowledge, through experience, about means-end relations that specifies how to manipulate intermediaries to accomplish a desired result (e.g., removing a cover rather than striking it). Piaget (1953) suggested that such achievements come about gradually and as a consequence of infants' exploration of the world through perception and action. Thus, in essence suggestive of biological and environmental factors playing a role in the development of planning.

In further exploration of this notion, Lockman and Pick (1984) conducted an experiment involving two groups of toddlers, ages 12 and 18 months, and their mothers. In their study, mothers and toddlers stood together behind a long low partition- a short wall, with a starting point away from the midline. The mother was instructed to step over the partition calling the child to come to her. While not being able to step over the partition, the child had to go around. The older toddlers consistently chose the shortest route, whereas the 12 month-old toddlers did not. Similarly, while examining planning and route efficiency in three and a half to five and a half year-old children, Wellman, Fabricius, and Sophian (1985) found that five-year-old children, in comparison to the younger children, evidenced the ability to plan ahead based on their avoidance of backtracking. In another study that examined age differences in strategic planning (10 to 30 years old), Albert and Steinberg (2011) found that performance on a standard measure of strategic planning and problem solving, such as the Tower of London task (Shallice, 1982) continues to improve well into late adolescence and early adulthood. Taken together, these findings support the notion that the development of planning skills relies, at least in part, on maturation of the brain. However, in support of Piaget's (1953) notion, subsequent research has also demonstrated the importance of the social context for the development of planning skills, more specifically, children's learning, or experiences that result from everyday social interactions.

Existing research shows that children's development of planning in early childhood benefits from social interaction. In early childhood, most everyday planning opportunities take place within the social context through collaborative learning. More specifically, the casual social interactions that take place between children and their family members such as helping out with meal preparation and other household chores, as well as casual playtime (Gauvain, 2001). Although children may not be planning on their own at this time, Gauvain (2001) suggests that such experiences, whether they involve learning via verbal communication or observation, may lead to a formative base for the development of planning skills, therefore providing them with the necessary foundation for successful planning on their own. As children begin to approach middle childhood and transition to formal schooling, they are most likely faced with planning and problem solving opportunities on their own, in the absence of a partner.

Such interactions, or collaborative learning opportunities, are most effective when the more skilled partner assumes the more difficult components of planning and modeling of planning behaviors for children (Gauvain, 2001; Perez & Gauvain, 2005; Perez & Gauvain, 2009; Radziszewska & Rogoff, 1991; Rogoff, 1990). More importantly, after examining studies on children's collaborative learning in the social context, Gauvain (2001) found that *sharing responsibility* during joint planning seems to have a greater effect on children's ability to develop more effective plans later on their own (Gauvain & Rogoff, 1989). Similar results were found in a previous study conducted by Radziszewska and Gauvain (1988) in which they examined the effects of collaboration with an adult or a peer on children's independent errand planning. On the independent posttest, children from adult-child dyads showed more efficient plans than the children from the peer dyads. After further examination of the differences within and between the dyads, Radziszewska and Gauvain (1988) found that the extent of joint decision making was positively correlated to individual posttest performance for both groups, yet children from the adult-child dyad shared responsibility to a greater degree than those from the peer dyad group, thus supporting the importance of sharing responsibility during joint problem solving for children's learning. In a subsequent study that examined the influence of guided participation in planning imaginary errands with skilled adult or peer partners, Radziszewska and Rogoff (1991) reported similar results. In their study, nine-year-old children collaborated with novice peers, peers trained in errand planning, or untrained adults. The planning task was similar to that of Radziszewska and Gauvain (1988) in that dyads were given an errand list of five items and the stores where the items could be found. The dyads were instructed to coordinate their errands in the most efficient route possible, while starting and ending at the same location. As measured by their posttest scores on route length, children from the adult-child dyad exhibited greater cognitive gain compared to children in the other dyads.  Further examination between the dyad groups revealed that children in the parent-child dyad received more guidance than children in the other dyads and were more involved in joint-decision making. Also, the adult partners provided more explanation and more strategy statements, as well as more skilled problem solving and more guided participation. These findings further support the view that sharing responsibility during collaborative problem solving may lead to higher cognitive gains for children.

In addition, children learn more from these collaborations when parents are aware of and able to respond to children's learning needs. For example, Hustedt (2015) conducted a study examining relationships between maternal scaffolding and 4-year-old Head Start children's own later scaffolding behaviors. Mother-child dyads were given two puzzle tasks to complete, one easy task (Cootie) and one difficult task (Wonder Box). During the Wonder Box task, dyads were more successful in solving the puzzle when mothers reduced their number of verbal directions and increased their number of physical directives in the form of modeling. In turn, children whose mothers were able to adjust their instruction, verbally and physically, in response to their child's level of understanding were more likely to use effective scaffolding with another individual during a posttest. These findings also lend further support to Wood et al (1976) in that during these type collaborations, the physical aspects of scaffolding such as organizing puzzle pieces, may be oriented to particular tasks where planning is involved (Hammond, Müller, Carpendale, Bibok, & Liebermann-Finestone, 2012). These early childhood collaborations provide children with opportunities to develop the foundational components (e.g., setting goals, monitoring progress, and staying on task) of planning that are necessary for successful navigation of future opportunities through which cognitive and social development may take place (Gauvain, 2001). Thus, the level of difficulty as well as mothers' perceptions of child's understanding may influence these type parent-child collaborations. In addition, another area of influence on parent-child collaborations may be the goals of the task itself. Overall, the development of children's planning skills benefit from collaborative interactions across a variety of domains and tasks.

**Effects of task goals on collaborative planning.** During collaborative planning tasks, children's opportunities for cognitive gain may also be influenced by the goals of the planning task itself, as mentioned earlier from Perez and Gauvain (2009). In their study, they randomly assigned dyads to either an explicit goal condition or a no-explicit goal condition involving a maze solving task. Their results showed that both qualitative and quantitative change in maternal instruction may be facilitated by the goals of the task itself. They found that when provided with a goal that emphasized accuracy and learning, dyads engaged in more effective planning strategies, which in turn enhanced child learning. This was evidenced by individual posttest scores, as the children from the explicit-goal group were more likely to devise a plan before attempting to solve the maze. Thus, suggesting that patterns of collaboration may emerge as a result of the task goal itself, and in turn enhance children's opportunities to participate in and learn from the collaboration (Perez & Gauvain, 2009). Similarly, Sun and Rao (2012) found that during informal problem-solving interactions, mothers' instructional behaviors may have been influenced by the goals of the task. In their study, mothers and their five-year-olds were asked to work together on two problem-solving tasks, a puzzle and a math worksheet. The mothers in this study exhibited more indirect strategies during collaboration to complete the math worksheet, in which the goal may have been accuracy, as this was perceived as a learning opportunity. Whereas there were greater displays of direct strategies during collaboration to complete the puzzle, as this may have been perceived as a fun opportunity. From the afore mentioned studies, it is suggested that effective collaborative planning may stem from an emphasis on accuracy and learning. However, in both studies mother-child collaborations were only assessed during one trial per task. Therefore, examining mother-child planning across several trials, using the *microgenetic method*, may provide a better understanding as to how and why mothers adjust their instruction as a function of task goals. Thus, allowing researchers to identify specific characteristics of maternal instruction that lead to greater child cognitive gains during these interactions.

## Studying Children's Learning Opportunities in Social Context

**The microgenetic method.** The studies reviewed here have suggested that the process of cognitive development in social context can be measured using a moment-to-moment method, referred to as as the *microgenetic method*. The microgenetic method allows researchers to better understand possible mechanisms involved in the underlying processes that take place during these changes in cognitive development (Miller, 2011). Historically, developmental psychology has concentrated on methodologies that indirectly assess changes in cognitive development in that they concentrate on static states or measurements after a stimulus has been presented or a task has been completed (Flynn, Pine & Lewis, 2007; Siegler & Crowley, 1991). Although these methodologies are effective for indicating that change has taken place, they are unable to explain how these changes occurred (Flynn et al., 2007). The microgenetic method, a direct means for studying cognitive development, allows researchers to establish that change has occurred, as well as allowing the researcher to examine the process of change as it is occurring (Flynn & Siegler, 2007). Siegler and Crowley (1991) note that the microgenetic approach can reveal the steps and circumstances that precede a change in cognitive development, the change itself, and the generalization of the change beyond its initial context or goal activity. For example, in a joint problem solving task where a mother-child dyad worked to solve a different maze across a series of trials, the researcher was able to examine the underlying processes the dyad used to solve the mazes.

Applying the microgenetic method to the study of maternal instructional behaviors has the potential to provide valuable evidence for instruction that is conducive to cognitive growth and development via learning in the social context. Therefore, the current study examined microgenetic changes in mother's instruction and planning strategies as a function of task goals across four trials, as well as the influence of affect across trials. From a review of the existing literature, it is clear that changes in maternal instruction take place during dyadic interactions. However, it is less clear as to how and why these changes may take place. The microgenetic method was applied in an attempt to identify possible underlying mechanisms associated with these changes in the quality and quantity of mothers' instruction and planning strategies, that is, to identify changes in maternal instruction that may have resulted from bidirectional/contingent processes.

**The Present Study**

Maternal instruction plays an integral role in children's cognitive development outcomes. Existing literature on learning in the social context suggests that effective collaborative learning within the mother-child dyad is positively associated with children's cognitive and social development. (Conner & Cross, 2003; Eisenberg et al., 2010; Gauvain, 2006; Gauvain & Perez, 2005; Hustedt, 2015; Mulvaney et al., 2006; Obradivic, Yousafzai, Finch, & Rasheed, 2016; O'Conner & McCartney, 2007; Perez & Gauvain, 2009; Raby, Roisman, Fraley, & Simpson, 2015). Also, maternal instruction may be influenced by numerous factors, thus not always resulting in cognitive gains for children, during mother-child collaborative interactions. The aim of this study was to examine whether adjustment in maternal instruction across trials differed according to the goals of the task, explicit vs non-explicit. In the explicit goal condition, dyads were told to work together and that they were being timed, thus implying that they should work quickly, whereas in the non-explicit goal condition dyads were just told to work together.

***Research hypothesis 1.*** Based on previous research examining mother-child collaborative planning, mother-child cognitive interactions were expected to exhibit change across trials. As the dyad became more familiar with the task, mothers would adjust their scaffolding in that there would be a decrease in their instruction, and level of support. Simultaneously, in an opposite fashion, as mothers adjusted their scaffolding, children would increase their cooperation as well as participation and responsibility for task completion. For mothers who adjusted their instruction based on their child's learning needs, there would be an increase in *transfer of responsibility* across the four trials. In other words, the child would have completed the task with little to no instruction or maternal guidance during the final trial.

***Research hypothesis 2.*** Based on previous research changes or adjustments in maternal instruction across trials were expected to be influenced by the goals of the task. In this study, there were two conditions. In the experimental condition, mothers and children were given instructions that were meant to resemble everyday cognitive interactions, such as when mothers help children with homework in the midst of a busy schedule. As such, mother-child dyads in the explicit (experimental group) condition were told to work together in devising the shortest route, that they would be timed, and that children would be given a posttest to assess how much they learned during the interaction. Thus, in this condition, the dyad was required to work efficiently while preparing their child for a posttest. For dyads in the non-explicit (control group) condition, dyads were simply asked to work together in devising the shortest route. Therefore, it was expected that mothers in the experimental group, because of greater levels of concern with time constraint and posttest preparation, would engage in more control behaviors, in addition to more instruction and overall planning strategies than mothers in the control group. In addition, it was expected that child responsibility for task completion and child engagement would increase across trials to a greater extent in the experimental group than in the control group.

***Research hypothesis 3.*** Based on previous research examining children's posttest performance on planning tasks after completing a joint planning activity with an adult, children's posttest performance was expected to differ between groups. Children in the experimental group would exhibit greater use of planning strategies and more efficient routes. Whereas children in the control group would still show improvement, but exhibit fewer planning strategies and less efficient routes.

***Exploratory analysis.*** Also explored were the relationships between mother-child behaviors during joint planning tasks and whether these associations differed within and across trials.

## Method

### Participants

The current study was a secondary analysis of an archival data set.[1] The sample included 68 first-grade children (37 girls) and their mothers recruited from five elementary schools in Southern California. The average age of the children was 6 years, 5 months (*SD* = 4 months). The sample of children was ethnically diverse and representative of the community with 41.2% European American, 14% Latino American, 16.2% African American, 1.5% Asian American, 23.6% biracial or biethnic, and 11.8% other- three or more ethnicities. The average age of the

[1] Upon confirmation from the university's IRB, approval was not necessary given the archival nature of the data.

mothers was 37 years 22 months (*SD* = 6 years 1 month). Mothers completed an average of 15 years of education (*SD* = 2.51) and 50% of mothers worked full-time, 20.6% worked part-time, and 29.4% were currently unemployed but looking for work. All children resided with their mothers. The mean number of children in a family, including the target child, was 2.5 with a range from 1 to 6 children. The median annual household income was $50,000– $59,999 with a range from less than $15,999 to $100,000 or more. Based on the Hollingshead Two Factor Index of Social Position (Hollingshead, 1975), which, depending on marital status, takes into consideration family income as well as occupation and education of either the single parent or both mothers and fathers to determine socioeconomic status (SES), the majority of the sample was middle class.

**Planning Task Materials**

The planning task, developed by Gauvain and Rogoff (1989), consisted of a 24 x 28 in. (61 x 71 cm.) game board that was set up to resemble a grocery store. The lay-out included an entrance and 3-D two-sided card board walls on which 160 grocery items were displayed. The grocery items were represented by colored pictures and photographs of grocery products that were pasted onto the cardboard walls. The grocery items were grouped into 14 grocery categories. Pictures of shopping baskets and a cash register were near the doorway in one corner of the store, as was a figurine, representative of the shopper.

**Design and Procedure**

Mothers and children visited the university laboratory on one occasion, receiving $20.00 for compensation. Before the visits, the sample was randomly divided into two goal conditions: a condition that had a goal that emphasized speed, and learning, referred to as the explicit-goal condition (n=32) and a condition in which the dyad was just asked to work together, referred to as the no explicit-goal condition (36). During the laboratory visit, children first participated in an individual problem-solving pretest, then dyads participated in a joint problem solving activity, and afterwards the children participated in an individual problem-solving posttest, all involving a planning task. In the pretest, children were given a list of three grocery items and instructed to find the items in the store using the shortest route possible without backtracking. The list items were represented by duplicates of the pictures used in the grocery store, pasted to 2-in. (5.1cm.) square cards. As each item was presented, the experimenter requested identification. Also, the children were instructed that the shopper's (a figurine) trips must always begin and end at the front of the store by the cash register, and that the shopper could not fly or jump over the aisles. During the mother–child interaction, instructions differed in the two conditions. In the explicit-goal condition mother-child dyads were instructed to work together and devise the shortest route possible, and that they were being timed. Also, they were told that the researchers were interested in how mothers teach their children to solve problems such as these, and that their child would be given a posttest. In the no-explicit-goal condition, mother-child dyads were simply instructed to work together to devise the shortest route possible. Dyads were given a 5-item grocery list in the form of individual picture cards, and in random order at the beginning of each trial, for a total of four trials, but that they did not have to get the items in the order that they were first presented. Both groups were also instructed to say aloud the name of the item once they found it during their shopping trip. The participants were videotaped.

**Coding and Reliabilities**

The videotapes were coded for planning strategies, mothers' instructional behaviors and specific interaction behaviors exhibited by mothers and children. Videotapes were transcribed and all verbal utterances were labeled accordingly (e. g., verbal directives, suggestions, reminders, planning strategies). Coding for transcripts was conducted across all four trials. To ascertain reliability, two independent coders were compared using Cohen's *k*, which showed

20% overlap. Coding for the *child responsibility for the task* global code was conducted across all four trials and was rated on a scale of 1 (mostly mom) to 5 (mostly child). Average ratings, across the trials were calculated. To ascertain reliability for the global code, three independent coders overlapped on 20% of the videotapes and effective reliability estimate ($R_{est} = .86$) was calculated (see Rosenthal & Rosnow, 1991). For reliability values and descriptions for *mother interaction behaviors* see Table 1. For *child interaction behaviors* see Table 2.

***Performance variables***. Looking time (the time the child spends looking at the store before they move the shopper into the store), consisted of a four point Likert scale. Scores ranged from 1 to 4: 1- no search before entering the store, 2- only scans one or two aisles before entering, 3- scans only about one half the store before entering, and 4- scans all of the grocery store (even if a brief scan). Route length was measured (in cm). As the shopper proceeds through the store, a line depicted the route taken was drawn on the map. When an item was retrieved, the coder placed a number in the box (on the map) in the place the item was retrieved. This number was to indicate the sequence in which the items were gotten (e.g., the first item retrieved was to have a 1 in the box). When tracing the route coders were only to include walking that got the shopper somewhere. Back and forth fidgeting in the same path that did not seem thoughtful, was not to be recorded. Because the performance codes were not subjective and were based on readily observable information, reliabilities were not necessary.

**Data reduction for mother-child interaction codes.** For each individual code, proportions were calculated out of all of the planning related behaviors and utterances coded. Based on prior research involving similar codes (Perez & Gauvain, 2005), the number of interaction variables to reflect the overall patterns of behaviors exhibited by mothers and children, was reduced. Based on the conceptual relations among the variables) as well as the intraclass correlations (ICC), composite variables were created by summing across the proportion scores for all codes in a composite. For mother's behaviors, the following variables were combined. Verbal directives, physical directives, and task evaluation to reflect a Control scale (ICC = .87, $p < .001$). Advanced planning, provides context, task management, item, route, and sequencing were combined to reflect a Strategy scale (ICC = .89, $p < .001$). Reminders and encouraging responsibility were combined to reflect a Support scale (ICC = .83, $p < .001$). For child behaviors advanced planning, provides context, task management, item, route, and strategy to reflect a Strategy scale (ICC = .73, $p < .001$). Suggestions, reminders, task evaluation, and responsiveness were combined to reflect an Engagement scale (ICC = .73, $p < .001$). Bids for independence, ignoring, and refusals were combined to reflect an Uncooperative scale (ICC = .76, $p < .001$).

## Results

Means and standard deviations of all mother and child planning behaviors are presented in Table 3. Two separate repeated measures ANOVA's were conducted for mother's behaviors and children's behaviors, with planning behaviors as the within subjects factor and condition as the between subjects factor.

### Mother Behaviors

Although there was no main effect for condition, $F$ (2, 65) = 2.077, $\eta^2 = .060$, $p = .134$, results showed a within subjects main effect, $F$ (9, 58) = 4.514, $\eta^2 = .412$, $p < .01$. Univariate results indicated significant within subjects effects for mothers' strategy, $F$ (3, 198) = 5.36, $\eta^2 = .08$, $p < .01$, and support behaviors, $F$ (3, 198) = 15.32, $\eta^2 = .19$, $p = < .001$. The within subjects by condition interaction also approached significance $F$ (6, 198 = 1.990, $\eta^2 = .236$, $p =.057$. Univariate results indicated a significant interaction for mothers' control behaviors, $F$ (3, 198) = 3.51, $\eta^2 = .05$, $p < .05$.

Pairwise comparisons of the means were examined. As hypothesized, total means for mothers' control, support, and strategy behaviors across trials decreased, with the exception of mothers' strategy behaviors from trial one to trial two overall and in the control group. Also, as hypothesized, there was an increase in mothers'control behaviors in the experimental group during trial four (see Table 3 for means).  For mothers' control behaviors, although they did not differ significantly across any of the trials, there was an interaction effect for condition, consistent with the second hypothesis. Examination of the means for the interaction indicated that mothers in the control group exhibited an initial increase in control behaviors from trial one to trial two, but then exhibited a steady decrease from trials two, three and four, consistent with the first hypothesis. Mothers in the experimental group exhibited a decrease in control behaviors across trials one, two, and three, consistent with the first hypothesis. Also, for mothers in this group, there was an increase in mother's control behaviors in trial four, which was consistent with the second hypothesis. (see Figure 1).

For mothers' support behaviors, support was highest in trial one, and total means decreased steadily across trials, as predicted in hypothesis one. Trial four was lowest and differed significantly from all other trials.

For mothers' strategy behaviors, as expected, total means increased from trial one to trial two, but then decreased across remaining trials, and was lowest in trial four. Although trial one did not differ significantly from any other trials, trial two and trial three differed significantly from trial four. This was consistent with the first hypothesis. However, since there was a decrease beyond trial two and no difference between the two groups, these findings were inconsistent with the second hypothesis.

**Child Behaviors**

A repeated measures ANOVA with child's behaviors as the within subjects factor and condition as the between subjects factor was conducted. Although there was no main effect for condition, $F$ (2, 65) = .254, $\eta^2$ = .008, $p$ = .78, results showed a within subjects main effect, $F$ (9, 58) = 6.809, $\eta^2$ = .514, $p$ < .001. Univariate results indicated within subjects effects for child engagement, $F$ (3, 198) = 10.45, $\eta^2$= .14, $p$ < .001, and uncooperative, $F$ (3, 198) = 6.922, $\eta^2$ = .10, $p$ < .001. Thus, these findings were inconsistent with the second hypothesis in that there were no main effects for condition as well as no within subjects effect by condition interaction.

Pairwise comparisons of the means showed that inconsistent with the first hypothesis, while there were no significant differences in child engagement across trials one, two, or three, there was a significant decrease in these behaviors in trial four. In comparison with all other trials, engagement was lowest in trial four (see table 4 for means). For child uncooperative behaviors, although trial one was highest, there was no significant change from trials one and two. However, consistent with the first hypothesis, trials three and four showed a significant decrease from trial one.

**Child Responsibility**

For the child responsibility variable, a repeated measures ANOVA with child responsibility as the within subjects factor and condition as the between subjects factor was conducted. Although there was no main effect for condition, $F$ (3, 64) = .324, $\eta^2$ = .015, $p$ = .81, results showed a within subjects main effect for responsibility, $F$ (3, 198) = 3.63, η2 = .052, $p$ < .05. Thus, these findings were inconsistent with the second hypothesis, there were no effects for condition.

Pairwise comparisons of the means showed that there were significant differences within subjects across trials, as expected (see table 4 for means). There was an unexpected decrease in child responsibility between trial one and two, that was significant, but did not differ beyond that.

**Relations between Mother and Child Behaviors**

Given that there were no main effects of condition, all further analyses control for condition rather than examine associations separately by condition. To test for relations between mother and child behaviors and child responsibility across trials, partial correlations that controlled for condition were conducted. These relations are presented in Table 5.

**Mothers' strategy behaviors in relation to child behaviors.** There were no associations in any trial between mother and child strategy use. Mothers who used more strategies had children who were more engaged in the task, though relations were only significant for trials two and four. Mothers who used more strategies had children who were more cooperative, though relations were only significant for trial three. Mothers who used more strategies had children who were less responsible for the task, though the relationship was only significant for trial one and marginally significant for trial three.

**Mothers' control behaviors in relation to child behaviors.** Mothers who used more control behaviors had children who used less strategy behaviors, though only significant in trial three. Mothers who used more control behaviors in trial three had children who were more engaged in the task, however the direction of associations changed in trial four with children being less engaged in the task. Mothers who used more control behaviors had children who were less cooperative. Mothers who used more control behaviors in trial one and four had children who were less responsible for the task, though only significant in trial one. However, the direction of associations was different but significant in trial two with children being more responsible for task completion.

**Mothers support behaviors.** There were no significant associations between mother use of support behaviors and child strategy behaviors in any trial. Mothers who used more support had children who were more engaged, though only significant in trials one and two, and marginally significant in trial three. There were no significant associations with mother support behaviors and child uncooperative behaviors in any trial. There were no significant associations with mother support behaviors and child responsibility in any trial.

Overall, mothers who used more strategy behaviors had children who were more engaged, but showed less responsibility across trials. For mothers who used more control behaviors, their children used fewer strategy behaviors across trials and were less cooperative. Conversely, these children were more engaged across all trials, except in the last trial. Mothers who provided more support behaviors had children who were more engaged across all trials.

## Relations with Performance

To examine relations between mother and child planning behaviors across trials and child posttest performance, partial correlations that controlled for condition and pretest scores were conducted. These correlations are reported in Tables 6 and 7. In general, mothers who used more strategies during the interaction had children who spent more time looking at the grocery store and engaged in a more extensive search during the posttest. These variables were specifically related in trials one and three. On the contrary, mothers who were more supportive during the interaction had children who engaged in a less extensive search during the posttest. These variables were specifically related in trials one, two, and four. Also, children who engaged in higher levels of responsibility during the interaction spent less time looking in the grocery store, as well as a decrease in visual search, specifically during the first trial. These children also produced more efficient routes in the posttest, though only marginally significant for trial four. However, there were no significant relations with mother’s behaviors and route distance. There were no relations between mother's control behaviors and children's posttest performance. Similarly, there were no relations between children's strategy, engagement, or uncooperative behaviors with posttest performance.

## Discussion

This study examined microgenetic changes in mother-child behaviors during cognitive interaction in the context of planning, as a function of task goals. Overall, mother-child cognitive interactions changed across trials and contingent patterns of behavior emerged. As expected, mothers' control and support behaviors decreased across trials, as did children's uncooperative behaviors. However, there was a decrease in use of strategies for both mothers and children, as well as children's engagement behaviors and responsibility across trials, which was not expected. Also, with the exception of mother's control behaviors, the goals of the task did not have a significant influence on mother-child behaviors.

Mothers who used more strategy behaviors had children who were more engaged, but showed less responsibility across trials. For mothers who used more control behaviors, their children used fewer strategy behaviors across trials and were less cooperative. Conversely, these children were more engaged across all trials, except in the last trial. Mothers who provided more support behaviors had children who were more engaged across all trials.

For posttest performance, as expected, mother's strategy behaviors were positively related to child looking time and extent of visual search. Conversely, children who engaged in higher levels of responsibility during the interaction, spent less time on looking and they conducted less of a visual search before entering the store during the posttest.  It may be that these children, because of their greater participation and engagement in the mother-child task, had better memory or knowledge of the store layout and therefore did not need to engage in extensive looking or searching for items.

Although there were no differences between groups with mothers' strategy and support behaviors, perhaps mothers in both groups were successful in gauging their child's ZPD. As expected, after the first trial, mother's strategy and support behaviors decreased across trials. This finding supports both Rogoff's (1990) concept of guided participation, and the notion of Vygotsky's (1978) ZPD. In accordance with earlier theory and research (Gauvain, 2001; Rogoff, 1990; Vygotsky,1978), as mothers assist their children in becoming more familiar with the task and task goals, children may require less assistance as well as less instruction from their mothers. For dyads in which mothers were able to effectively gauge their child's learning needs, they were able to adjust their instruction accordingly, thus suggestive of intersubjectivity and sensitive responding, the necessary components of guided participation. Although this finding also supports Wood and colleagues (1976) scaffolding concept in that mothers adjusted their degree of support according to how much help the child needed, mother-child behaviors in this study were more indicative of guided participation (Miller, 2011). Also, for mothers who used more strategy behaviors during the collaborative planning task, their children were more engaged and more cooperative across trials. Similarly, mothers who provided more support had children who were more engaged during the collaborative planning task. These children were also more likely to take on more responsibility for task completion across trials. As expected, after the first trial, as collaboration increased, these children became more involved in the interaction and were more successful in their posttest performance, further indicative of Rogoff's (1990) notion of guided participation. These findings were consistent with earlier results by Gauvain and Rogoff (1989), and Conner and Cross (2003) in that children from dyads who exhibited higher levels of sharing responsibility performed better in subsequent planning tasks. Thus, further supporting the notion of sharing responsibility and how it might influence children's cognitive gain during collaborative problem solving (Perez & Gauvain, 2005; Radziszewska & Rogoff, 1988; Radziszewska & Rogoff, 1991).

Past research supporting the influence of task goals on mother's instructional behaviors was partially supported in that the use of mother control behaviors differed for the two groups across trials (Perez & Gauvain, 2009; Sun & Rao, 2012; Kermani & Brenner, 2000). Results showed that for the experimental group, mother's control behaviors decreased across trials, but then increased unexpectedly in trial four, perhaps in anticipation of the upcoming posttest. Whereas for the control group, there was a slight increase from trial one to trial two, but then a steady decrease for the last two trials. Similarly, in Perez and Gauvain's (2009) study, researchers examined mother-child planning in the context of solving mazes, dyads were assigned to a condition that emphasized either accuracy and learning or simply working together. When provided with a goal that emphasized accuracy and learning, dyads engaged in more effective planning strategies, which influenced child learning as evidenced in the solitary posttest. These results also support the notion that mothers provide more effective scaffolding during cognitive activities that they deem necessary for learning versus one for play, and support the view that mothers' instructional behaviors differ in regards to formal learning and everyday activities (Rogoff, Ellis, & Gardner, 1984; Kermani & Brenner, 2000; Sun & Rao 2012).

Although mothers in the experimental condition did not seem more concerned with the overall goals of the task compared to mothers in the control condition, as was predicted, the condition effect for mother's control behaviors suggests otherwise. Furthermore, the lack of condition effects seems to suggest that mothers in both groups understood their role as teachers despite the different task goals assigned to each group. These findings suggest that mothers adjusted their instruction in ways that met their child's learning needs. It could also be that their usual patterns of parenting contributed more to their cognitive collaborations than the manipulation of task goals. In which case, the dyads shared social history may have influenced mother-child behaviors during their collaboration. The correlations between mother's and children's behaviors seem to support this notion in that mothers who used more control behaviors had children who were less cooperative, thus suggestive of a bidirectional nature and possibly an evocative relationship (Eisenberg et al., 2010; Silinskas et al., 2015). Thus, perhaps the influence of a shared social history instead of the goals of the task as evidenced by Perez and Gauvain (2005) were most important in shaping these mother-child cognitive interactions. Mother-child shared social history not only includes cognitive interactions, but emotional interactions as well. As mentioned earlier, children's effortful control and mother's instructional behaviors may be bidirectional and mothers who anticipate difficult behaviors from their children may actually exert more controlling behaviors in an attempt to stymie these behaviors from their children (Eisenberg et al., 2010; Gauvain & Perez, 2008). In the current study, it may be that the shared social and emotional history of mothers and children exerted an influence on patterns of behaviors during mother-child cognitive interactions, regardless of the goals of the task (Perez & Gauvain, 2005).

Findings showed that children benefited from their cognitive interaction with their mother as evidenced on the posttest. Across groups, regardless of task goals, when mothers used more strategies during the collaborative planning task, their children performed better in the posttest. These children spent more time looking in the grocery store and conducted a more extensive visual search for items before entering the store. These results resemble those found in Gauvain and Rogoff's (1989) original Grocery Task study. In similar studies conducted by Radziszewska and Rogoff (1988; 1991) mothers who used more strategy behaviors during collaborative planning tasks also had children who performed better on posttests. Dyads in these earlier studies were given a map of pretend stores along with a list of errands and were instructed to devise the most efficient route. The results from their studies showed that during the posttest, children whose mothers used more strategy behaviors spent more time exploring the map while devising their route. Thus, these findings lend further support to previous studies on mother-child collaborative planning tasks involving route strategies. In addition, children who were more responsible for task completion during the mother child interaction and mothers who offered more support (i.e., reminders, encouraging responsibility) to children had children that engaged in less looking and less extensive searching during the posttest. It may be that children who were more involved and supported in this involvement during the mother-child task had greater opportunity to become familiar with the store layout and did not need to spend as much time locating the items prior to entering the store during the posttest. This also may have been associated with individual differences in memory, especially visual memory. These results lend further support for findings in Gauvain and Rogoff's (1989) original grocery task and Rogoff's (date) notion of guided participation in that sharing responsibility (i.e., children's active participation) during mother-child collaborations lead to greater cognitive gains, as evidenced in children's solitary posttest performance.

**Limitations**

Limitations of the current study include that it was conducted in the context of a laboratory setting, use of a single manipulation as opposed to a multiple manipulations, lack of shared social history information, and sample size. In this study, dyads knew they were being videotaped. Thus, being in an un-naturalistic setting itself may have exerted an influence on mother-child behaviors during the cognitive interaction. Observation can lead to reactivity to the observation itself, in that being observed could produce behaviors that do not necessarily reflect the mothers' typical behavioral tendencies (Barkley, 1991). Also, using a single manipulation did not provide a strong enough effect to significantly influence mother-child strategy and mother support behaviors between the two groups. Implementing an additional manipulation such as a visual cue (i.e., a stop-watch) or more emphasis on the importance of posttest performance may have increased the salience of the manipulation. In addition to the mother-child planning task, collecting information pertaining to dyads shared social history would be beneficial. Perhaps examining other aspects of the mother-child relationship, such as parenting style, mother's response to child negative emotion, child emotionality and effortful control, would provide a more clear understanding of how their behaviors inform and influence each other during cognitive interactions. Lastly, having a larger sample size would have yielded more power to find group differences.

**Conclusions**

This study adds to the existing literature in a few ways. First, to better understand how mother-child behaviors change during cognitive interactions, the microgenetic method was applied. Instead of measuring mother-child behaviors at only one time point, these behaviors were measured repeatedly over a short period of time, at four time points. Thus, allowing for patterns of change during collaboration to emerge and be examined. In addition, these patterns were examined in two conditions that differed according to task goals. Results from this study supported previous findings that mothers are capable of adjusting their level of instruction to their children's learning needs through guided participation, regardless of task goals. Also, findings suggested that regardless of task goals, shared social history may be an important predictor of these cognitive interactions and children's learning opportunities. Overall, central to

Vygotsky's (1978) Sociocultural theory and Rogoff's concept of guided participation, the findings from this study demonstrate that intersubjectivity and joint responsibility during such cognitive interactions lead to greater learning for children, as evidenced in children's posttest performance. The findings from this study also give insight into the possible effects of shared social history and how patterns of collaboration may be influenced from previous day-to-day mother-child interactions across other contexts. For future research in this area, instead of a single visit microgenetic design, this study could be expanded to include multiple longitudinal time points. In addition to examining mother-child behaviors during a collaborative planning task, mother-child behaviors outside of this setting should be considered and examined. Perhaps collecting data on mother's parenting style, reaction to child's negative emotion, child emotionality, and children's effortful control would provide researchers with a better understanding of how mother-child behaviors inform and influence each other during cognitive interactions when guided participation is taking place.

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APPENDIX A: Tables of results.

Table 1

*Mother Interaction Codes and Reliabilities*

| Code | Cohen's K | Description |
|---|---|---|
| Control (ICC = .87) | | |
| Verbal Directives | .94 | Any verbal statement that tells the other person what to do. May be task or behavior related. |
| Physical Directives | .99 | Any nonverbal actions that direct the behavior of the partner. |
| Task Evaluation | .96 | Statements that evaluate the partner's performance on the task. |
| Strategy (ICC = .89) | | |
| Advanced planning | .80 | Behaviors that reflect a planful approach to the task before beginning the task (e.g., scanning the store before entering). |
| Provides Context | .84 | Comments that link the task to the real world context. |
| Task management | .61 | Statement that focuses on performing or managing the task in a strategic way that meets the goals of the task. |
| Item | .89 | Statement that focuses on getting a specific item or getting the partner to look for items based on a category or location in the store. |
| Route | .90 | Statement that focuses on a direction or route to take. |
| Sequencing | .86 | Statement that focuses on suggesting specific order of two or more items. |
| Support (ICC = .83) | | |
| Reminders | .96 | Any verbal reminder of the task objectives. |
| Encouraging Responsibility | .99 | Statements encouraging the child to work on their own. |

Table 2

*Child Interaction Codes and Reliabilities*

| Codes | Cohen's K | Description |
|---|---|---|
| Strategy (ICC = .73) | | |
| Advanced Planning | .80 | Behaviors that reflect a planful approach to the task before beginning the task. |
| Provides Context | .84 | Comments that link the task to the real world context. |
| Task Management | .61 | Statement that focuses on performing or managing the task in a strategic way that meets the goals of the task. |
| Item | .89 | Statement that focuses on getting a specific item or getting the partner to look for items based on a category or location in the store. |
| Route | .90 | Statement that focuses on a direction or route to take. |
| Sequencing | .86 | Statement that focuses on suggesting specific order of two or more items. |
| Engagement (ICC = .73) | | |
| Suggestions | .81 | Statements that attempt to guide the partner or persuade the partner to do something, but that are not directive. |
| Reminders | .96 | Any verbal reminder of the task objectives. |
| Task Evaluation | .96 | Statements that evaluate the partner's performance on the task. |
| Responsiveness | .99 | Refers to the child's response, both verbal and nonverbal, to parent directives or suggestions. |
| Uncooperative (ICC = .76) | | |
| Independence Bids | .93 | Child's bid for independence in regards to any aspect of the task, and can be verbal or nonverbal. |
| Ignoring | .84 | When the child does not respond to directives or suggestions from the partner. |

| | | |
|---|---|---|
| Refusals | .93 | Child's verbal or nonverbal refusal of mother's directives or suggestions in relation to the task objectives. |

Table 3.

*Means (and Standard Deviations) of Proportions for Dyadic Behaviors across Trials and Conditions*

| | Control | | | | Experimental | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mother | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| Strategy | .055 | .063 | .056 | .044 | .069 | .069 | .072 | .055 | .062 | .066 | .064 | .049 |
| | (.035) | (.034) | (.033) | (.036) | (.037) | (.038) | (.029) | (.024) | (.037) | (.036) | (.032) | (.031) |
| Control | .112 | .122 | .114 | .093 | .119 | .103 | .095 | .111 | .115 | .113 | .105 | .101 |
| | (.047) | (.049) | (.053) | (.039) | (.048 | (.038) | (.049) | (.043) | (.047) | (.045) | (.052) | (.042) |
| Support | .094 | .099 | .082 | .068 | .097 | .083 | .071 | .058 | .095 | .091 | .077 | .063 |
| | (.042) | (.043) | (.037) | (.036) | (.039) | (.035) | (.038) | (.025) | (.041) | (.040) | (.037) | (.032) |
| Child | | | | | | | | | | | | |
| Strategy | .013 | .015 | .013 | .016 | .016 | .020 | .012 | .016 | .014 | .017 | .012 | .016 |
| | (.024) | (.025) | (.023) | (.036) | (.025) | (.043) | (.022) | (.023) | (.024) | (.034) | (.022) | (.030) |
| Engagement | .176 | .194 | .189 | .139 | .197 | .169 | .167 | .141 | .186 | .182 | .179 | .140 |
| | (.068) | (.061) | (.053) | (.056) | (.062) | (.062) | (.057) | (.059) | (.066) | (.063) | (.056) | (.057) |
| Uncooperative | .078 | .063 | .047 | .058 | .085 | .066 | .053 | .058 | .081 | .064 | .050 | .058 |
| | (.054) | (.050) | (.035) | (.047) | (.054) | (.043) | (.049) | (.062) | (.054) | (.046) | (.042) | (.054) |

Table 4

*Means and Standard Deviations for Child Responsibility across Trials and Conditions*

| | Control | | | | Experimental | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Child Responsibility | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| | 3.306 | 3.056 | 3.028 | 3.194 | 3.500 | 3.125 | 3.188 | 3.219 | 3.400 | 3.090 | 3.103 | 3.206 |
| | (1.064) | (.955) | (.654) | (.710) | (.803) | (.609) | (.693) | (.792) | (.949) | (.805) | (.672) | (.744) |

Table 5.

*Within Trial Partial Correlations, Controlling for Condition, between Mother and Child Behaviors*

| | | Mother Behaviors | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Trial 1 | | | Trial 2 | | | Trial 3 | | | Trial 4 | | |
| Child Behaviors | | Strategy | Control | Support | Strategy | Control | Support | Strategy | Control | Support | Strategy | Control | Support |
| Trial 1 | Strategy | -.02 | -.12 | -.10 | | | | | | | | | |
| | Engagement | .14 | .09 | .39** | | | | | | | | | |
| | Uncooperative | -.10 | .32* | -.14 | | | | | | | | | |
| | Responsibility | -.52** | -.25* | .10 | | | | | | | | | |
| Trial 2 | Strategy | | | | -.14 | -.18 | -.17 | | | | | | |
| | Engagement | | | | .27* | .14 | .25* | | | | | | |
| | Uncooperative | | | | -.05 | .18 | .03 | | | | | | |
| | Responsibility | | | | -.09 | .25* | .17 | | | | | | |
| Trial 3 | Strategy | | | | | | | .12 | -.29* | .04 | | | |
| | Engagement | | | | | | | .10 | .29* | .21† | | | |
| | Uncooperative | | | | | | | -.25* | .28* | .00 | | | |
| | Responsibility | | | | | | | -.23† | .00 | .15 | | | |
| Trial 4 | Strategy | | | | | | | | | | .12 | .03 | -.18 |
| | Engagement | | | | | | | | | | .45** | -.22† | .19 |
| | Uncooperative | | | | | | | | | | -.20 | .44** | .00 |
| | Responsibility | | | | | | | | | | -.17 | -.18 | .12 |

*Note*. † p < .10; * p < .05; ** p < .01

Table 6.

*Partial Correlations that Control for Condition and Pretest Scores Between Proportions of Mother Behaviors across Trials, and Posttest Performance*

| | Posttest | | |
|---|---|---|---|
| | Looking Time | Extent of Visual Search | Route distance |
| Mother Strategy | | | |
| Trial 1 | .28* | .24† | -.09 |
| Trial 2 | .18 | .19 | -.07 |
| Trial 3 | .29* | .37** | -.08 |
| Trial 4 | .16 | .08 | -.09 |
| Mother Control | | | |
| Trial 1 | .02 | .16 | .17 |
| Trial 2 | .06 | -.01 | .03 |
| Trial 3 | -.09 | -.02 | .09 |
| Trial 4 | -.05 | .18 | .15 |
| Mother Support | | | |
| Trial 1 | -.18 | -.36** | .00 |
| Trial 2 | -.24† | -.48** | -.02 |
| Trial 3 | -.09 | -.04 | -.14 |
| Trial 4 | -.22† | -.26* | -.09 |

*Note*. † $p < .10$; * $p < .05$; ** $p < .01$

Table 7.

*Partial Correlations that Control for Condition and Pretest Scores Between Proportions of Child Behaviors and Child Responsibility across Trials, and Posttest Performance*

| | Posttest | | |
|---|---|---|---|
| | Looking Time | Extent of Visual Search | Route distance |
| Child Strategy | | | |
| Trial 1 | -.04 | .04 | -.02 |
| Trial 2 | -.11 | -.05 | -.10 |
| Trial 3 | .03 | -.04 | .03 |
| Trial 4 | -.06 | -.02 | -.12 |
| Child Engagement | | | |
| Trial 1 | -.11 | -.13 | -.03 |
| Trial 2 | .23† | -.12 | .07 |
| Trial 3 | .15 | .13 | .02 |
| Trial 4 | .10 | .02 | .09 |
| Child Uncooperative | | | |
| Trial 1 | -.15 | .00 | .08 |
| Trial 2 | -.03 | .02 | -.15 |
| Trial 3 | -.04 | .04 | -.03 |
| Trial 4 | -.08 | .13 | .03 |
| Child Responsibility | | | |
| Trial 1 | -.41** | -.34* | .04 |
| Trial 2 | -.18 | .01 | -.03 |
| Trial 3 | -.14 | -.07 | -.13 |
| Trial 4 | -.12 | -.06 | -.23† |

*Note*. † $p < .10$; * $p < .05$; ** $p < .01$

APPENDIX B: Figure of interaction for mother's control behaviors.

Figure 1.

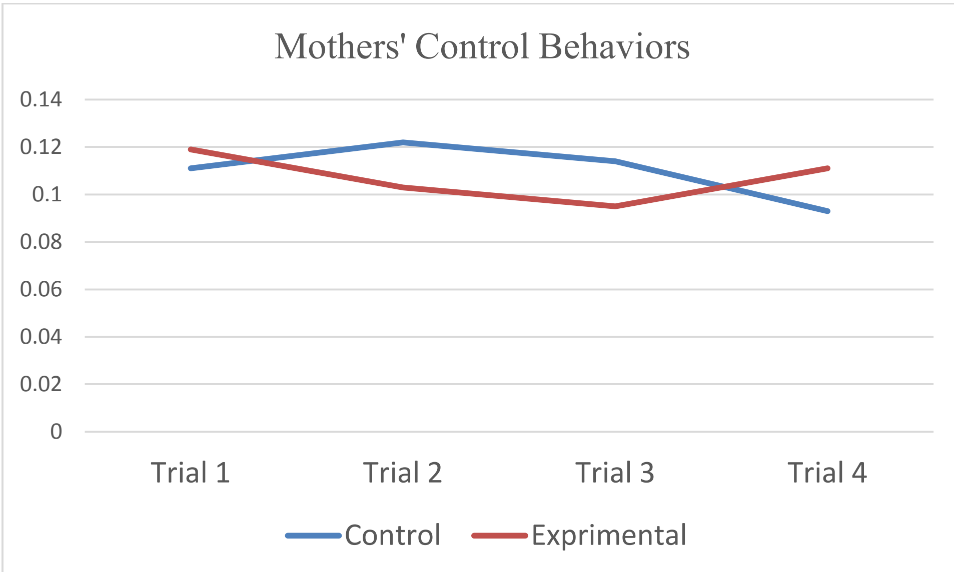


Figure 1. *Mother's control behaviors interaction effect.*

# **Curriculum Vitae**

Candance Wise Gilberstadt

**Career Objectives:** Immediately after graduating with a Master's of Science in Psychological Sciences from the University of North Florida, in August of 2017, I will be attending Albany State University in Albany, Georgia. I will be pursuing a Master's of Social Work degree that will ultimately allow me to practice as a Licensed Clinical Social Worker within the state of Georgia and with those most vulnerable and at-risk for negative developmental outcomes, children from single-mother households.

## **Education:**

M.S. (August 2017) Psychological Sciences, University of North Florida

GPA- 3.61

B.S. (April 2015) Psychology, University of North Florida

GPA- 3.81

A.A. (August 2013) General Studies, Florida State College at Jacksonville

GPA- 3.53

## **Honors and Awards:**

UNF Summa Cum Laude Graduate, 2015

UNF Dean's List Fall 2014

FSCJ Graduate with Honors 2013

FSCJ Dean's List Spring 2013

FSCJ President's List Fall 2012

**Research Experience:**

*Graduate Research Assistant,* University of North Florida with Susan Perez, PhD, (August 2015-August 2017)

Duties: proposed research project; creating behavior codes, establishing reliability using Cohen's k and $R_{est}$, training undergraduate research assistants, entering and analyzing data in SPSS.

*Undergraduate Research Assistant*, University of North Florida, Cognitive Development lab, (August 2014 to August 2015)

Duties: lab director, coordinate participant scheduling, running participants, data management and analysis using SPSS, training research assistants for Susan Perez, PhD.

**Teaching Experience:**

Teaching Assistant, DEP 4060-Applied Developmental Psychology

University of North Florida, Jacksonville Florida, January 2017 to May 2017.
Duties: provide instruction and guidance to undergraduate students in understanding public policy reports, leading class discussion on public policy readings, grading individual assignments through which students demonstrate their understanding and the applicability of public policy reports, assist students in learning how to effectively communicate policy and research to the public and private sector, and assist students in generating briefing reports on societal issues. Supervisor: Rebecca Marcon. PhD.

Full- Time substitute teacher, James Weldon Johnson College Preparatory

Middle School, Jacksonville Florida, August 2013- May 2014.
Duties: provide instruction for grades six through eight, assist main office personnel with administrative/reception duties, assist media specialist with administrative duties, and supervise various activities on campus. Supervisor: Audrey Bamping.

**Relevant Experience:**

Instructor assistant (ages 6 months-3 years) at Episcopal Children's Services, Early Head

Start, Northside location, Jacksonville, Florida, September 2016 to June 2017. Duties: provide nurturing assistance with learning activities, provide nurturing assistance with necessary structured care, chaperone and engage children in developmentally appropriate activities in the classroom and on the playground, and provide assistance with parent drop-off and pick-up. Supervisor: Felicia Bosman. 6 hours weekly.

Mentor and tutor for at-risk youth at Mackenzie Academic Resource Center Countryside Village, Jacksonville, Florida, January 2014- May 2014. Duties: prepare and teach social skills curriculum to middle and high school aged youth, tutor in all academic subjects, lead group physical fitness activities, and chaperone with field trips. Supervisor: Phoebe Lain. 9 hours weekly.

Mentor and tutor for at-risk children at Sulzbacher Center for the Homeless, Jacksonville, Florida, January 2014-May 2014. Duties: provide mentoring and tutoring in all academic subjects for children ages five to 13, read to children under age five, assist with and chaperone holiday functions. Supervisor: Maxine Engram. 3 hours per week.

Mentor and tutor at John Stockton Elementary school, Jacksonville, Florida, August 2001- August 2009. Duties: mentor, provide tutoring in all subjects for children ages five to 11, organize various fundraiser activities, active PTA member, interim crossing guard, room mom for several K-5 classes, and chaperone field trips. Supervisor: Elise Handy. Hours varied, 5-10 weekly.

Volunteer parent at Ortega United Methodist Church Playschool, Jacksonville, Florida, September 1996- April 2003. Duties: assist office personnel with various duties, assist classroom personnel with various duties, assist other parents with various fundraising events, serve on the committee board as an officer, and liaison for playschool faculty and the host church. Supervisor: Candy Solomon. Hours varied, 0-3 weekly.

**Certifications:**

BOSR (Behavioral Observation and Screening) Florida Department of Children and Families, April 2017.

CAAN (Identifying and Reporting Child Abuse and Neglect) Florida Department of Children and Families, April 2017.

CGDR (Child Growth and Development) Florida Department of Children and Families, April 2017.

FACR (Child Care Facility Rules and Regulations) Florida Department of Children and Families, April 2017.

HSAN (Health, Safety, and Nutrition) Florida Department of Children and Families, April 2017.

ITPR (Infant and Toddler Appropriate Practices) Florida Department of Children and Families, April 2017.

UDAP (Understanding Developmentally Appropriate Practices) Florida Department of Children and Families, April 2017.

CITI (Collaborative Institutional Training Initiative) *University of Miami (online)*

Human Subjects Research for Social Sciences, July 2014- current.

**Professional and Honor Societies:**

SRCD (Society for Research in Child Development), December 2016

SRHD (Society for Research and Human Development), February 2016.

CARCAD (Center for Applied Research for Children and Adolescents), September 2015.

GPO (Graduate Psychology Organization), University of North Florida, August 2015

Phi Kappa Phi Honor Society Achieved by top 10% of senior class (all disciplines), March 2015.

**Presentations:**

Perez, S., & Gilberstadt, C.W. (2017, April). Decisions about Resource Allocation in Social Context: Associations with Inhibitory Control and Emotional Competence. Poster session presented at the Society for Research in Child Development Biennial Conference, Austin, Texas.

Perez, S., & Gilberstadt, C.W. (2017, April). Associations between Children's Emotional Competence and Parents' Socialization Efforts: A Multi-Method, Multi-Informant Approach. Poster session presented at the Society for Research in Child Development Biennial Conference, Austin, Texas.

Perez, S., & Gilberstadt, C. W. (2016, April). Relations among Children's Planning, Emotional Self- Regulation, and Maternal Emotion Socialization. Poster session presented at the Showcase of Osprey Advancements in Research and Scholarship, University of North Florida, Jacksonville, Florida.

Perez, S., & Gilberstadt. C. W. (2016, March). Relations among Children's Planning, Emotional Self- Regulation, and Maternal Emotion Socialization. Poster session presented at the Society

for Research and Human Development 20th Biennial Conference, Denver, Colorado.