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**YOUNG CHILDREN'S COLLABORATIVE STRATEGIES WHEN  
DRAWING ON THE COMPUTER WITH FRIENDS AND  
ACQUAINTANCES**

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**by**

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# **YOUNG CHILDREN'S COLLABORATIVE STRATEGIES WHEN DRAWING ON THE COMPUTER WITH FRIENDS AND ACQUAINTANCES**

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The processes and patterns of collaborative strategies used by children when drawing on the computer with friends and acquaintances were investigated in a case study. The participants were five-and-six-year-old children and the study took place in their home settings. The data collection methods consisted of interviews, observations, audio recordings, video recordings, drawing artifacts, and screen capture. The analysis began with the selection of collaborative episodes, followed by the application of two theoretical frameworks, those of two play theorists Garvey (1990) and Vygotsky (1978) as analytical lenses through which to interpret those episodes. The young children in this study used four levels of collaborative strategies, listed from the simplest to the most complex: 1) division of labor, 2) pretend language use, 3) coherence and elaboration of pretend frames, 4) action games. The findings revealed a striking contrast between the collaboration of friendship pairs and acquaintance pairs. The friendship pairs exhibited a total number of 32 episodes while the acquaintance pairs engaged in only three episodes.

The acquaintance pairs applied only the strategy of pretend language use while the friendship pairs used three other more collaborative strategies and their use of collaborative strategies showed unique paths of progression. Furthermore, the acquaintance pairs exhibited mostly uncooperative and uncollaborative behaviors, which were manifested in three major forms: 1) unengaged behavior, 2) over-reliance on the researcher's technical support, and 3) disagreement and critique. Informed by these findings, five major points are discussed: 1) Friendship matters; 2) Young children have the ability to collaborate; 3) Pretend play serves as a starting point for collaboration; 4) Collaborative strategies progress as the collaboration proceeds; and 5) Computers can play a supportive role in collaboration for young children.

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## **Chapter 1: Introduction**

Computers have become increasingly prevalent in the lives of young children. Today children under six spend an average of two hours on screen media, including TV, videos, computers, and video games; equivalent to the average amount of time of outdoor play. According to one report in 2003, 30 percent of children use computers daily and 10 percent even own one in their own bedroom (Rideout, Vandewater, & Wartella, 2003). As computers have become essential in the lives of children, and embedded in their everyday activities through play-related applications (Facer, Furlong, Furlong, & Sutherland, 2003), our knowledge regarding computer use for very young children needs to be expanded.

In recent years, the literature on computer use in education has increased substantially. Yet despite the growing body of literature about young children's computer use, very little is known regarding very young children's experiences around the computer. Furthermore, most of the literature still focuses on older children or adults, thereby providing insufficient knowledge of young children's experiences around the computer (Buckingham, 2004; Lomangino, Nicholson, & Sulzby, 1999; Wang & Ching, 2003). The current study is a response to this gap and the need for more empirically based data that enable educational professionals to formulate theories and better understand young children's interactions around the computer. The current study thus examines the collaborative interaction of very young children around the computer.

Understanding the nature of very young children's collaboration around the computer is essential for three reasons. First, collaborative use of the computer has been proclaimed by NAEYC's position statement (1996) regarding technology as a necessary



piece of technology instruction. For instance, the developmentally appropriate practice of technology on educational software lies on whether it affords opportunities for collaboration, play, learning, and creativity. Second, based on previous studies, the position statement also reported children's preference of working with peers around the computer rather than working alone. Finally, as technology transforms the lives and communications of young children, the patterns of collaboration observed in research studies up to this point may be altered.

## **OVERVIEW OF THE EXISTING LITERATURE**

Although few studies have examined the collaborative computer use of very young children, a fairly large body of literature has been written related to collaborative computer-supported writing (Chung & Walsh, 2006; Fisher, 1993; Jones, 2002; Lomangino, et al., 1999; Vass, 2002; Vass, Littleton, Miell, & Jones, 2008a). A few of these studies have pointed out the significance of friendship in collaborative writing (Jones, 2002; Vass, 2002). The current study follows up on this assertion. Some of the studies have identified certain discourse features and patterns (Chung & Walsh, 2006; Fisher, 1993; Kumpulainen, 1996; Vass, et al., 2008a). Related to both the issue of friendship and discourse, two studies examined the collaborative writing process specifically. The study of Chung and Walsh (2006) provided an in-depth analysis of the change of discourse and collaborative patterns within the collaborative process. The study of Lomangino et al. (1999) addressed the social negotiation of status and unfolded hierarchies in the collaborative process of writing.

Among the few studies that have investigated very young children and their computer use, most have examined either practical computer use at home; preferences based on gender (Facer, et al., 2003; Facer, Sutherland, Furlong, & Furlong, 2001;

Fromme, 2003); or facilitation of computer use based on intended developmental gains and technological proficiency (Brooker & Siraj-Blatchford, 2002; Hyun, 2005; Mitchell & Dunbar, 2006; Stephen & Plowman, 2003). The study of Lomangino et al. (1999), described hierarchies among peers, whereas Hyun's (2005) study looked at peer dynamics among kindergartners, specifically the positive effect of peers on learning outcomes regarding technology proficiency. The findings revealed that children collaborated well with peers with similar interests.

Like the collaborative writing literature, the few available studies pertaining to young children and computers have focused on children's discourse features leading to the learning inquiry of computers and e-games (Hyun & Davis, 2005; Kenner, Ruby, Jessel, Gregory, & Arju, 2008; Roberts, Djonov, & Torr, 2008). Others have discussed teachers' pedagogy ranging from a hands-off approach to guided intervention (Haughland, 1999; Plowman & Stephen, 2005). Several studies have examined specific actions they observed in young children while collaborating around the computer. These collaborative actions included negotiating turns, assisting others by pointing or providing verbal explanations, and collectively discussing and deciding where to click (Escobedo, 1992; Heft & Swaminathan, 2002; Plowman & Stephen, 2005; Roberts, et al., 2008; Shahrinin & Butterworth, 2001; Wang & Ching, 2003). Escobedo's (1992) study, in particular, is directly relevant to the current study because she explored children's play-related behaviors and language while using computer graphics software. All of these studies, along with others, have indicated that many play behaviors, especially spontaneous pretend play behaviors, occur during collaborative computer use for young children (Brooker & Siraj-Blatchford, 2002; Escobedo, 1992; Labbo, 1996; Sandvig, 2006). However, none of these studies have scrutinized the collaboration in terms of how the collaboration took place and evolved as a process.

## **SIGNIFICANCE OF THE STUDY AND THE PROPOSED RESEARCH QUESTION**

Previous studies have revealed some important aspects of collaboration, including peer dynamics, discourse features, and pretend play language and actions. However, the intricate collaborative process in terms of how it emerges, forms, and expands around the computer for young children, and the interconnections between collaboration, friendship, and play remain unexplored. Furthermore, prior studies related to the collaborative process have looked specifically at the collaborative writing process. In addition, as previously noted, literature that relates to young children and computers is still underdeveloped. Therefore, the current study addressed the following question: How do young children use collaborative strategies while drawing on the computer with friends and acquaintances?

The current study drew on four areas of literature including the literature related to friendship, pretend play, language, and collaborative learning. Although the literature of pretend play may be unrelated to young children's collaboration around the computer, it provides valuable insight into how play language and actions contribute to their collaborative experiences. The findings of the current study thus contribute to the current literature in three main ways. First, the findings that relate to the connection between friendship and collaboration will aid in ascertaining the benefit of friendship in the collaboration process. Second, this study views children's collaboration as a spontaneous strategy. Identifying very young children's collaborative strategies that reflect pretend play and analyzing their discourse features during the collaboration process will help increase our limited understanding of children's collaborative experiences around the computer, and in turn contribute to the formulation of theories about this process. Finally, the findings of the current study will bridge the literature between pretend play

and collaborative learning, further enriching our knowledge about young children's collaborative experiences around the computer.

## **DEFINITION OF KEY TERMS**

Three terms, including play, discourse, and collaboration, require additional explanation of their definitions for the current study because each phenomenon can be interpreted in numerous ways.

### **Play**

Play in the current study is conceptualized as one possible angle from which to comprehend collaboration and the manifestation of children's collaboration. In this study, play is defined as pretend or make-believe, using verbal or non-verbal expression. In terms of verbal communication, Garvey (1990) theorizes that young children signal each other to enter pretend or pretend frames, thereby collaborating. For example, if a child holding a doll tells the doll that it is time to go to bed and then puts her doll in the dollhouse bed. In Garvey's term, the child "transforms" herself as a mother, the doll as her baby, the dollhouse as their house. She proposed four types of pretend play talk, which will be described in more details. The current study reveals play in a wide variety of forms. In terms of other aspects of pretend play including non-verbal expression and game, the lens of Vygotsky (1978) is added to supplement Garvey (1990) and further explains children's play and their collaboration. While Garvey (1990) and Vygotsky (1978) both use language signals to interpret children's pretend play, Vygotsky (1978) explains that when children imagine a stick to be a horse, they cognitively separate this thought from their immediate perception of the stick. Thus, for children in play situations, the stick is no longer a stick but rather a horse. He also points out that during game play, children encounter situations when the rules of the game conflict with what they desire to

do at that moment. Learning to submit to the rules of the game in spite of their immediate wishes demonstrates their self discipline and leads to even greater pleasure. Vygotsky (1978) also highlights the process of collaborating with the an adult or more capable peers as the essential path to mediate and lead to advanced development or cognitive growth.

The current study selects the theoretical frameworks outlined by play theorists Garvey (1990) and Vygotsky (1978). The rationale for selecting Garvey (1990) bases on her concept of transformation of object coincides with the transformation of computer graphic evidenced by Escobedo (1992). The study chooses the framework of Vygostky (1978) because both pretend play and the relational roles children take on during the collaboration process can be analyzed through his theoretical lens.

### **Discourse**

Johnstone (2008, p. 3) defines discourse as the set of “knowledge” and “expectation” about how things are routinely done. Discourse is shaped by what people have previously said or implied, and one’s response to an existing situation is colored by one’s prior experience. For example, when the phrase “ once upon a time” is used, the listener expects a story to follow. She further explains, “ Discourse is shaped by expectation created by familiar discourse, and new instances of discourse help to shape our expectations about what future discourse will be like and how it should be interpreted” (Johnstone, 2008, p.16) Thus, participants expect to use and respond to particular sets of communicative strategies when facing relevant situations. Such strategies may include “sounds, words and phrases, structural formulas, styles, communicative situations and activities, text-types and narrative plots” (Johnstone, 2008, p.162). “Discourse” in the current study refers to a body of knowledge, especially certain

verbal expressions and communication in particular situations. Familiarity with these words, narrative, or communication style enables participants to interpret unexpected comments or actions and supports discussion between or amongst themselves. This definition of discourse reflects how deeply children's initial verbal exchange influences their later collaborative dialogue. This concept is explained further in the findings section, where children's collaborative dialogue is illustrated and offered as examples of discourse in order to demonstrate and analyze their collaborative strategies.

### **Collaboration**

The current study defines collaboration as negotiation of shared understanding, as proposed by Crook's (1994, 1995, 1998) work. Two components are involved in the negotiation of shared understanding: 1) creation of shared references, and 2) formation of mutual understanding based on shared references. The essential element of the negotiation of shared understanding lies in the creation of shared references. Both an actual object and an abstract idea can be considered a shared reference. Once the shared reference initiates the collaboration process, the collaborators build up the complexity of their understandings from the shared reference and form their distinct collaborative experience. In order to develop the negotiation of shared understanding, participants need to have collective input rather than individual input. In other words, both parties are required to participate and contribute to the making of such shared understanding.

For example, if a child selects a pirate ship on the middle of the ocean as the background of a picture, proposes a pirate play theme, and starts acting and talking like a pirate; and then the other child adds content to enrich the theme and becomes involved in by acting likewise; the two of them create shared references. If this shared reference becomes the starting point of a narrative that they constantly return to and build upon,

then the process of building their story becomes a process of the formation of mutual understanding. The scenario described above demonstrates one possibility for children's collaboration. On the other hand, if we consider a similar scenario in which one child proposes the idea of a pirate theme, but the child's peer simply listens and responds only with a smile and no additional input, the episode would not be a collaborative one. Likewise, if one child proposes a pretend frame, but the other shows no interest in participating in the frame, or even make contrasting comments to shift communication, it would not be considered a collaborative episode.

## **Chapter 2: Literature Review**

### **OUTLINE**

The four intertwined social components of young children's collaborative strategies when drawing on the computer with friends and acquaintances include: friendship, pretend play, language, and collaboration. This review of the literature is divided into four sections accordingly. The first section introduces friendship as a significant factor that shapes young children's collaborative interaction in play situations and influences academic performance. Following that is an introduction of computers as a powerful medium that affords opportunities for collectively building an imaginary play world. In the pretend play section, two theoretical lenses are offered to describe the approach to children's play relevant to this study. The language section critically examines features of language use and discourse features that foster collaboration. The review of literature ends with a section on collaboration that integrates the discussions of these four components and explains how they informed my study design.

### **FRIENDSHIP AND PEER CULTURE IN PLAY**

In order to ascertain the relationships between friendship, language, and collaboration, an understanding of the operation of friendships is necessary, and earlier work provides this foundation. The work of Corsaro (1985) as well as the work of Howes and her colleagues (1992) specifically provides fundamental knowledge of children's friendships and peer relationships in play. Exploring children's world of play, Corsaro (1985) articulated children's conception of friendship and interpreted children's use of play as a means of acquiring social knowledge about interacting and communicating with others. Participating in play provides a path for them to construct their own social world through which they learn to deal with conflict, problems, and concerns. Corsaro (1985)



proposed that children learn how to relate to one another through routine social practice. His work shows that children's peer relationships may either be supportive as they interpret shared experience or they may be used to establish social status and dominate play. Corsaro's discovery of themes in spontaneous play as a reflection of the shared concerns of peer culture can also help explain the collaborative structure by which children organized their experience in the current study.

This section introduces definitions of friendship in play situations. These definitions of "friend" were incorporated into the research design and were the basis for identifying participants as friendship pairs. It then moves on to Corsaro's (1985) view of children's play routines that nurture collaboration, followed by a discussion of the findings of my pilot study. Although we did not find any dominance interactions in the pilot study, this section presents Corsaro's ideas on the use of language to establish social status and discusses other studies that support his view. The section proceeds to explore the significance of children's friendship including the role of friendship as one of determining factors in collaborative work. Because boys and girls approach friendship differently and take part in different activities, this section also includes a discussion of gender difference in collaborative patterns and the creation of a gendered gaming culture.

### **Defining friendship in a role play situation**

From Corsaro's (1985) work, we see that children use the title "friend" to include or exclude peers from the play group. Friends and playmates are almost interchangeable; friends are defined as frequent playmates. Children can either mention friendship to indicate explicitly that they are friends because they play together or deny the existence of friendship to avoid playing with a peer. References to friendship are used for gaining access, and protecting shared activities from intruders.

Howes and her colleagues also found that young children's friendships are closely linked to pretend play (Howes, et al., 1992). Added to Corsaro's definition, children's friendship is more than just a playmate relationship. Young children who define themselves as friends share similarity in interests and show compatibility of play styles. Their pretend play reveals itself to be more highly coordinated, harmonious, and longer in comparison to that of acquaintances. They provide two techniques of identifying friendship utilized by the current study: behavior and sociometric techniques. Shared positive affect is considered as one behavior criteria. "Sociometric techniques" refers to children nominating each other as friends. Both studies, Corsaro (1985) and Howes et al. (1992) indicate that children will explicitly mention who their friends are. Additionally, enjoyment of participation in extended play activities can be a good indicator of friendship. Therefore, putting together the criteria of Corsaro as well as Howes and her colleagues, the criteria for defining a pair of children as friend in this study were as follows: 1) Children have been regular playmates for an extended period of time; and 2) They independently nominate each other as friends.

### **Collaboration in the pilot study**

The children in my pilot study exhibited behaviors consistent with the underlying structure and recurrent play routines described by Corsaro (1985), including humor and recurrent danger rescue scenarios. The most frequent strategy that children adopted for collaboration during the pilot shared drawing experience with computer software was to establish humor to create excitement for the group. This finding supports Corsaro's (1985) view on humor as a form of predictable routine in pretend play in nursery settings. In examining children's social relationships and their concept of friendship in play situations, Corsaro (1985) theorized the underlying structure of children's spontaneous

play and behavior routines in peer culture. According to Corsaro, one such underlying structure of children's spontaneous play reflects their shared concerns of anxiety and fear. These recurrent danger-rescue themes go through three steps: recognition of the danger, escaping the danger cooperatively, and the shared feeling of relief after the removal of danger. Children cooperatively communicate and come up with creative solutions or tactics for coping with tension. Corsaro also described many forms of humor, including spontaneous group glee, jokes, and riddles that frequently occur as predictable routines. Group glee refers to spontaneous group laughter and giggles that are less complex than jokes and riddles.

### ***Establishment of humor***

In the pilot study, children created numerous jokes based on repetition of words and sounds and creative language. For example, children repeated the words from the computer audio feature to create humor. This resembled the group glee described by Corsaro (1985). Repetition of words that sounded strange later evolved into naming of onscreen objects. For example, children misused language purposely to make a joke, such as the use of "catepilloo" to describe the worm on the screen (Line 24, June 24, 2007). The misuse of language also became a bridge to build solidarity. For example, children whispered funny made-up words to each other.

### ***Building shared fear***

The other strategy children used in order to collaborate in this shared drawing experience was to build shared fear of an onscreen object, displaying an interaction that resembled Corsaro's (1985) predictable play routines. Children built shared fear by claiming that objects shown on the screen would bite. Like the three steps of the danger-rescue scenario described by Corsaro, children resolved their shared fear around the

computer with the removal of danger by claiming that being friends with the onscreen objects would prevent them from being bitten; this calmed their anxiety and fear.

### **Establishment of social status**

Because my pilot study only recruited friendship sets that supported collaboration, it may not represent the general population of children who use computers. Thus this current study investigated peer dynamics of both friendship and acquaintance pairs to provide a more comprehensive picture of children's social interactions around computers. While supportive friendships facilitate collaboration by establishing humor and shared fear, as discussed previously, peer relations can also serve as a double-edged sword to hinder collaboration by creating social status and dominating joint play scenarios. Corsaro (1985) asserted that children with higher social status exert control over peers by using language to establish social hierarchy. Within each playgroup, children arrange or negotiate themselves into two categories: superordinate and subordinate players. The language use of superordinate players with higher social status is distinctive from that of subordinate players. Superordinate players use language to gain control of play episodes, whereas subordinate players usually follow or act upon commands from superordinate players.

Corsaro (1985, p. 80) identified ten categories of language use: imperatives, informative statements, requests for permission, requests for joint action, answers, informative requests, directive questions, tag questions, greetings, and baby talk.

The language that superordinate players use to gain control over subordinate players includes imperatives, directive questions, requests for joint action, and informative statements. Corsaro (1985) defined imperatives as direct orders or commands. Directive questions, similar to imperatives, function as indirect orders with

the tone of a question. Requests for joint action are suggestions for joint activities usually proposed by superordinate players. Informative statements consist of relevant knowledge that sets the scene. In contrast, when subordinate players intersect with superordinate players, they make requests for permission and give answers. Requests for permission are questions asked to enter play. Answers are responses to the directive questions previously described, where subordinate players are positioned to explain themselves. Children within the same status use four additional forms of language: information requests, tag questions, greetings, and baby talk. Information requests and tag questions are questions clarifying and confirming the ongoing play scene. Greetings are peer acknowledgment, and baby talk is a distortion of pronunciation with a high pitched voice. For this study, Corsaro's work has provided a framework with which to examine children's verbal exchanges and peer dynamics in the shared drawing experience using computer art software.

### **Establishment of social status in collaborative computer-related activities**

Studies that investigate children's interaction in collaborative computer-related activities support the proposition that language is used to establish social status in technologically rich environments (Lomangino, et al., 1999; Roberts, et al., 2008). In the work of Lomangina, Nicholson, and Sulzby (1999), children's social status determined negotiation of turns and contribution of the composition content in computer supported collaborative composition activities. Children with more power successfully negotiated a higher social status and maintained control. They exhibited dominance behaviors, including directing others and evaluating input from peers by placing others in a defensive position to explain themselves, whereas children with lower social status were required to assert their turns and defended themselves when their input was assessed by

children with higher social status. The work of Robert, Djonov, and Torr (2008) showed both communal engagement, classified as collaboration, as well as combative and controlling engagement while children interacted with the literacy e-game, *I Spy*. They noted that boys engaged in combative and controlling interaction. The combative and controlling behaviors involved both physical and verbal engagement like shouting commands and battling for mouse control.

### **The role of friendship in academic collaborative tasks**

Unlike the studies discussed previously, the three studies in this section identify friendship as a determinant of academic performance and view friendship as one significant social component that influences the success of collaborative tasks. These studies, all of which investigated children's language use and interaction in collaborative activities, emphasized the cognitive function of language and judged children's collaboration in terms of the quality of academic collaborative tasks rather than focusing on collaboration and hierarchy. The following paragraphs describe the findings of several studies that support the importance of friendship in collaborative tasks, followed by a third study that raises questions about the role of friendship.

Several studies have examined the impact of friendship by adopting the same method of grouping children into two separate sets, friend and non-friend pairs, and comparing the pairs' maneuvering of collaborative tasks in term of outcomes and collaborative processes (Azmitia & Montgomery, 1993; Jones, 2002; Kutnick & Kington, 2005; Miell & MacDonald, 2000; Vass, 2002). Three of these studies confirm the beneficial effect of friendship in collaborative tasks (Jones, 2002; Miell & MacDonald, 2000; Vass, 2002). Two studies yield mixed results. The former three studies dealt with more open-ended and creative tasks such as writing or musical composition tasks,

whereas the latter two studies examined cognitive tasks and scientific reasoning. The experimental study of Jones (2002) examined the literate language exchange in the process of writing for 7- and 8-year-old children. In the study, Jones defined literate language as the use of metacognitive and metalinguistic language. The following examples of word choice reveal metacognitive and metalinguistic language: “Let’s read,” or “I think this goes here.” Jones also defined friendship as mutual reciprocation of equal partnership. The study revealed that friendship and non-friendship dyads underwent distinctive collaborative processes. Friendship dyads negotiated more and elicited a statistically significant wider variety of literate language. These findings evidenced more collaboration. Conversely, non-friend dyads generated more directive use of language. The study concludes that friendship is one vital variable influencing the social context of collaboration.

Vass (2002) also examined the nature of talk and creative writing but used a different methodological approach, qualitative case study. The findings revealed that friend and non-friend pairs engaged in different collaborative patterns and demonstrated distinctive discourse patterns in poem writing. The fundamental differences lay in the process of content generation and reflection. Three strategies utilized by friendship pairs that mediated and supported the productivity of creative writing included: repetition, acting, and reciting. The friends talked more frequently to generate and plan content. For example, while brainstorming ideas, the friends built and refined ideas cumulatively with free associations. Ideas were repeated and revised. The acting out of ideas was another feature distinguishing friendship pairs from acquaintance pairs. The third strategy of reciting occurred naturally toward the end as the pair informed each other of their work. In contrast, acquaintances negotiated their collaborative role, and this tended to cause dispute and hinder them from extending each other’s ideas. Therefore, both studies

shared similar findings that friends, in comparison to non-friends, evidenced more collaborative language and interaction.

Miell and MacDonald (2000) explored the effect of friendship in musical composition for middle school children aged 11-12 years old. The friendship pairs outscored non-friend pairs considerably. The success of their verbal and musical communication pattern was characterized by extending and elaborating from previously proposed ideas.

In contrast to the previous three studies, the experimental study of Azmita and Montgomery (1993) and quasi-experimental study of Kutnick and Kingston (2005) did not reveal the significant effect of friendship. Azmita and Montgomery (1993) investigated the association between friendship and scientific reasoning. The effect of friendship became evident only in more difficult tasks. They argued that friends reflected more during conflicts produced by such tasks. The conflicts generated more productive discussions thereby optimizing cognitive gain. The study of Kutnick and Kingston (2005) investigating the quality of reciprocity as a crucial element nurturing cognitive enhancement showed mixed results. Participant children were grouped into three female and three male friendship pairs as well as three female and three male acquaintance pairs. The results showed that female friendship pairs outperformed other groups, followed by male or female acquaintance pairs. Male friendship pairs performed at the poorest level. The finding that girls perform better with friends and boys perform better with acquaintances shows that in addition to friendship, other factors such as gender issues need to be taken into consideration (Kutnick & Kingston, 2005).



### **Gendered perception of friendship**

The previous discussion shows that gender constitutes part of the social environment of collaborative tasks. This section explores associations of friendship, gender, and computer use by young children and illustrates gendered perceptions of friendship. Because the current study is not designed to test the effect of gender in children's social dynamics, the following paragraph briefly describes boys' and girls' views on friendship and the social activities in which they participate with friends simply to provide a broad context for the discussion.

Boys and girls identify their friends differently and undertake different social activities. Boys' shared interest in being active has a direct link with the games they play with their friends. Pulling from the empirical interview data from Kutnick and Knighton (2005) regarding different perceptions of friendship, we see that boys emphasized participating in action-related activities together whereas girls focused on personal qualities such as "kindness and loyalty" (Kutnick & Knighton, 2005, p. 531). They also undertook different activities. School collaboration was excluded in male's friendship but girls tended to include it. In other words, female friends, compared to male friends, were engaged more often in school related discussions. For boys, friends usually emerged from neighbors close to home rather than school. Playing video games, for example, is a home-based activity allowing boys to interact actively. Unlike boys' interest in action-packed play, girls' activities with friends mainly included talking and building relationships (Kutnick & Knighton, 2005; Fromme, 2003). When viewing children's collaboration in shared drawing experiences around the computer in home settings as in the current study, the findings from the two studies above indicate that boys compared to girls in general have more shared history and experiences playing with their friends in front of the computer.

### **The computer as a tool to achieve social ends**

Even though the previous section shows that boys are more likely to have a head start on collaborative experiences with friends playing action-related computer games than girls, one study found that a group of kindergarten girls worked well in establishment of social ties around the computer while creating photo journals. As previously discussed, female friends talk and strengthen their relationship. Through the expression of emotions and thought, writing photo journals served as an attractive and effective collaborative tool within their existing friendship network (Ching, Wang, Shih, & Kedem, 2006).

Despite the difference in the socialization styles of boys and girls, the computer helps both genders to establish social ties. The next two paragraphs introduce several studies demonstrating substantial evidence that children use computers or computer-related activities to achieve social ends (Facer, et al., 2001; Fromme, 2003; Sandvig, 2006; Wang & Ching, 2003). The study of Wang and Ching (2003) revealed that in a first-grade computer classroom rules were bent for children to enjoy playing and watching the game as a group. For example, classroom rules dictated that the two players sitting on two chairs in front of the computer were legitimate players at the computer center. The study documented however that multiple mobile players violated the classroom rules to participate in the game. Their study showed that the computer space was socially negotiated as a place where classroom rules were bent and unofficial players could join in to share the group norm of having fun together and strengthening friendship ties.

Congruent with the finding of Wang and Ching (2003), Sandvig's (2006) study, which will be described later in more detail, conceptualized children's computer use in an informal public computer center as purely related to their social motive of mediating

more social interaction. Despite having the Internet at home, children were still attracted to the public computer center and perceived it as another location to socialize. As reported by the children themselves, their enjoyment in a public informal setting resulted from the opportunity to collaborate for a communicative purpose through computer use. Children also found creative ways to collaborate; they modified computer activities designed for a single player into one where they shared the computer. For example, one person would control the mouse while the other maneuvered the keyboard. In agreement with the findings discussed above, the work of Thomas and Brown (2007) took the concept of social ties further by considering the online gaming experience. The shared history of collectively defeating one enemy as an online team brought intimate friendship to online players.

This major section has presented friendship and gender as two intersecting factors that may contribute to distinct forms of collaborative interactions around computers. From the preceding discussion, we know that children can either collaborate supportively or establish social status through the use of language in computer-related activities. Because of a gendered perception of friendship, boys more than girls appear to immerse themselves in action-related play experiences at home with friends around the computer. Girls, on the other hand, work well collaboratively in certain formats like the photo journal. However, regardless of gender differences, children show a strong social motive around computers, and collaborative computer use serves to cement friendship.

### **PRETEND PLAY**

Pretend play opens up an intriguing social context for collaboration among young children while they share the computer. Based on my pilot study (described in the appendix), the majority of children's collaborative interaction and verbal exchange

centered on pretend play talk. Therefore, this study applied existing literature including the theoretical frameworks of Garvey (1990) and Vygotsky (1978) to an examination of pretend play in order to comprehend children's interaction around the computer. This major section is divided into two subsections: 1) how virtual reality mediates pretend play opportunities, and 2) the role of pretend play in collaboration. The first part emphasizes that virtual reality generates an environment for pretend play. The second part highlights two theoretical frameworks of pretend play that support the role of pretend play in collaborative social dynamics. Theoretical constructs of pretend play from these two frameworks were crucial as measures for children's collaboration during their shared drawing experience using the computer in the current study.

### **How virtual reality mediates pretend play opportunities**

As computers have made their way into early childhood classrooms, children have found opportunities for shared enjoyment in the computer corner (Mitchell & Dunbar, 2006; Plowman & Stephen, 2005). Much of the shared enjoyment is initiated by children's play behaviors, especially spontaneous pretend play around computer activities (Brooker & Siraj-Blatchford, 2002; Escobedo, 1992; Labbo, 1996; Sandvig, 2006). In a shared drawing experiences using computer art software, the onscreen drawing presents a shared imaginary play environment. The computer is a powerful medium for pretend play and offers unlimited opportunities limited only by the players' imaginations. The term "affordance" refers not only to the objective features of the software but also to the unlimited possibilities with which players can experiment (Buckingham, 2004; Facer, et al., 2003; Wallace, 2004). The next two paragraphs provide evidence of pretend play opportunities afforded by the computer.

The power of virtual reality lies in its capacity to bridge physical and virtual worlds. The world afforded by a computer's virtual reality creates rich contexts for pretend play. Take video game play as an example: Because modern technology, such as wii, embraces the intuitive nature of motion control, the players are able to transform into the main character of the game. In the Tomb Raider series, for example, the players literally become Lara Croft and are immersed in the actions of the Tomb Raider adventure. Gee (2003) referenced to this as "embodied action" (p. 68).

In virtual reality, children treat onscreen subjects as if they were real. In the work of Brooker and Siraj-Blatchford (2002), children grabbed onscreen food objects from the screen as a part of group pretend play and treated these onscreen objects as if they were real. Sandvig (2006) reported similar findings in his two-year ethnographic study of children using the Internet at a subsidized public access computer center. He observed that children would sit near their friends and enter chat rooms at the same time and would take on new imaginary identities, frequently with adult leadership titles such as executives or bank managers. Sandvig coined the term "identity play" to describe this behavior (p.942). These findings show that virtual reality affords a unique pretend play environment.

### **The role of pretend play in collaboration**

Garvey (1990) and Vygotsky (1978) have presented two relevant theoretical frameworks of pretend play and collaboration among children. The theoretical choice of this study leading to these frameworks is described along with studies illustrating these theoretical constructs in practice. These frameworks also highlight the link between pretend play and learning, particularly focusing on abstract thinking and cognitive advancement.

Vygotsky's (1978) framework establishes the concept that children's play contributes to learning. Vygotsky theorized that the social aspects of play and collaboration with peers are a significant part of learning. Vygotsky proclaimed that a higher psychological function that leads to a new form of human behavior emerges from the complex mediation process of language. Within an indirect mediated process, the use of language in the thinking process operates as a sign or tool. When language is used to symbolically transfer meaning, we no longer associate our thinking and action with the direct stimulus and response process. We undergo reconstruction in that the mediation of language liberates our minds and qualitatively transforms the psychological operation. Language begins as an external aid operating as a tool, and gradually becomes self-generated, operating as a sign. According to Vygotsky (1978), these reconstruction processes first originate interpersonally and then transition to an intrapersonal level. Once that operation becomes internally oriented as part of our mental function, language then becomes a tool of thinking. As we acquire meaning through this tool, it provides a structure in our minds directly related to our social and cultural experiences. We thus internalize language as a social and cultural tool used to think and learn.

Vygotsky (1978, p. 86) illustrated his idea by asking us to imagine that a stick represents a horse in play. The application of the word "horse" in the role play means "horse" itself; children have accepted the word "horse" and internalized the word by forming a picture of the horse when saying that word. In play Vygotsky explained that the stick object becomes a pivot for the meaning of horse. Viewing learning as a social and cultural process with the emphasis on dialogue between peers, Vygotsky introduced the Zone of Proximal Development (ZPD) to conceptualize the role of play as a means for children to reach advanced thinking. Vygotsky defined ZPD as "the distance between the actual developmental level as determined by independent problem solving and the

level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). Over time as children internalize higher mental functions, they will develop the capability to problem solve independently. Play awakens learning opportunities while children interact and cooperate with others. In play children usually perform beyond their natural capacity through their dialogue with others. Play is therefore a means of advancing their development; through play, children reach their ZPD.

Extending Vygotsky’s socio-cultural perspective that learning is mediated in the context of interaction with more knowledgeable others, to a technologically rich environment, studies like those of Hyun (2005) and Kenner et al (2008) provide evidence that Vygotsky’s framework can be applied in a technologically rich environment. Findings of both studies demonstrate that collaborative engagement with a more competent adult or peer allows children to enter their ZPD and expand their knowledge in this environment. The commonality between the two studies is that they both examine the computer skills of very young children of preschool and kindergarten age. Hyun’s (2005) study showed statistically significant improvement in kindergartners with the help of peers. In addition, Hyun’s study revealed that children with a shared interest worked very well together and exhibited Vygotsky’s notion of peer-teaching behaviors. The study of Kenner et al. (2008) demonstrated the use of native language linguistic and cultural resources by young children when undertaking computer activities with their grandmothers. In their study the Bengali grandmother patiently supported her granddaughter by prompting her with questions using English vocabulary words inserted into the Bengali linguistic structure. These two articles demonstrate that two people with a close relationship can support each other and create synergy.

The study of Yeatman and Reifel (1992), though unrelated to young children's computer use, demonstrates that spontaneous play may support learning in home settings. This study revealed that sibling play between two young sisters actually provides spontaneous learning opportunities. Through play situations the younger sister's early literacy skills began to emerge and progress. In addition to the acquisition of early literacy skills, processes that illustrate the link between play and learning include learning to spell, labeling colors, acquiring social rules, and forming a narrative based on family stories are. The study also clarified a key principle of play: "Play does not necessary lead to learning. What play appears to do is to provide a frame in which learning can take place." (Yeatman & Reifel, 1992, p. 154)

Similar to Vygotsky's (1978) framework, Garvey's (1970) theoretical framework also examined young children's use of pretend play language. Frost, Wortham, and Reifel explained Garvey's (1990) notion of a play frame that children use to signal to others non-present realities, or the imaginary world. Garvey theorized that the use of children's communicative play language during pretend play creates a shared "as if" world. The cognitive ability of switching between these two worlds leads to abstract thinking. She identified five types of play language: preparatory talk, explicit directions for pretend, within pretend talk, negation of pretend, and play signals. The first tool, preparatory talk, refers to the language used to initiate play. Simple phrases such as "let's play" request that peers prepare for enacting roles in certain play frames. In the case of peers with a shared history or longtime friends, children may jump right into play frames without the use of preparatory talk. The second tool, explicit directions for pretend, consists of nine types of transformation. The first three transformations deal with transformation of self, of others, and of joint roles. For example, children can suggest roles for others or themselves in play frames. Transformations of action for self, others, and joint actions are



the next three of Garvey's transformations. Next, transformation of object refers to an object's change of meaning distinct from its real-life representation. This is followed by transformation of environment, which refers to the change in meaning of the setting where the children are playing. The last transformation is the transformation of nothing to something. Children display this play behavior when no actual play objects are present.

The third tool, within pretend talk or enactment talk, occurs when children speak in a manner that befits the characters in the roles they are enacting. For example, when children pretend to be Harry Potter, they may use the same words Harry uses to cast a spell. The fourth tool is negation of pretend. Negation of pretend happens when children reject the current play frame they are in or intend to step out of that frame. Children can also suggest a different play frame that they desire to enter. The last tool, play signaling, refers to a variety of verbal or non-verbal communicative signs ranging from high-pitched tones to winks to alert their peers of their pretend play mode.

Two studies, though not analyzed through the lens of Garvey or focused on pretend play language, provide empirical evidence to amplify how the terms of transformation can take place in children's play (Escobedo, 1992; Labbo, 1996). Both of these studies focused on the computer graphics children had made and investigated children's thought and language as mediated by children's symbol-making through computers. The work of Escobedo (1992) examined language episodes and computer graphics to identify children's play and non-play behaviors. She determined that children's meaningful play behaviors exhibited in computer graphics consisted of the transformation of objects. The transformations fit different categories including constructive, imaginary, pretense, language play, humor and problem solving. Labbo (1996) came to the same conclusion, finding that object transformation, make-believe transformation, and humor occurred among children in the process of symbol making and

writing on the computer in early childhood classrooms. Additionally, individual and collaborative construction coexist in these play behaviors. To describe children fluidly moving in and out of multiple roles as set designers, directors, narrators, and actors, Labbo (1996) used the metaphor of the computer screen as a stage. For setting the stage as set designers, children created and organized the drawings on the screen using tools available from the software to represent fragments of dramatic play scenarios. Then they directed and carried out the actions by moving the item on the screen while simultaneously portraying the action verbally. Their work provided ample evidence of transformation compatible with the transformation described by Garvey.

The virtual reality of the computer provides means for children to socially immerse themselves in imaginative pretend play. Based on the frameworks of Garvey (1990), and Vygotsky (1978) regarding the significant role of children's pretend play in collaboration, we can expect that children in a shared drawing activity can collaboratively build play frames. Collaboration with peers can also assist children in approaching their ZPD and reaching more complex levels of thinking (Vygotsky, 1978). Therefore, while interacting with peers during pretend play in shared drawing experiences on the computer, more competent children can help their peers to think in more complex ways. In addition, in view of the play frames children collaboratively build while using computers, Vygotsky's pivot and Garvey's transformations help us recognize children's collaborative pretend play frames.

## **LANGUAGE**

Certain collaborative interactions can only take place through language. Viewing children's collaborative interaction through the angle of language, this major section presents two major frameworks, Fisher's (1993) cumulative talk and Johnstone's (2008)

prior discourse. Regardless of their difference in terminology, they share the common characteristics of repetitive and elaborative language use, which both contribute to collaboration. Fisher's cumulative talk and Johnstone's prior discourse describe repetitive and elaborative language features that mark collaboration among children. Children recognize patterns that they repeat. Repetition creates coherence within the current conversation and with the previous discussion. Reusing certain structures reinforces the patterns. Elaboration requires that children extend the previous utterance and also advance in their shared effort toward a common goal.

This major section includes empirical evidence, from additional studies as well as my pilot, of children demonstrating repetitive and elaborative language use for collaboration in theory as well as in practice. This section concludes with an examination of the change of language over time as collaboration proceeds.

### **Studies that support the association between repetitive and elaborative language use and collaboration**

Research from fields as diverse as linguistics and education have substantiated the relationship between repetitive language use and collaboration. In the field of education, Fisher (1993) observed young children's talk in computer-supported collaborative writing tasks and classified three language categories: 1) disputational talk; 2) cumulative talk; and 3) exploratory talk. Disputational talk refers to conflicting counter-suggestions that lead to no resolution. Cumulative talk means the participants add onto accepted opinion. Exploratory talk refers to the accepted agreement of a final joint decision resulting from the process of conflict, in which original ideas are challenged and counterchallenged with explicit reasoning. According to Fisher, exploratory talk is the only language category that has educational benefit and indicates knowledge expansion.

Cumulative talk is particularly useful for the current study because it is characterized by repetitive and elaborative language. The other two categories, while less frequent in my pilot, are included as they may provide useful labels for situations that could occur such as disagreements or children's attempts to learn from each other about the computer software in their shared drawing experiences using the computer.

Two additional studies have elaborated on Fisher's basic categories of repetitive and elaborative language use and found contradictory evidence regarding cumulative language use. Rather than finding language use to be a rare event, the authors reported that children use cumulative talk frequently as part of the creative process during the negotiation of shared understanding and generation of creative ideas through chaotic process (Kumpulainen, 1996; Vass, Littleton, Miell, & Jones, 2008b). Kumpulainen (1996) defines the term "information exchange" to describe the negotiation of understanding. He revealed quantitatively that it was the most frequently occurring verbal language. Although the term "informational exchange" sounds like simple factual sharing, he found that children frequently used language that drew from the previous utterances of peers.

Extending from the previous study, Vass et al. (2008) described a form of repetitive and elaborative language in which children interrupted each other during the creative process, using chaotic and messy communication. She described the children's ideas as going in all directions like ripples that spread when a stone is thrown into water. Nevertheless, within this rich, intensive, but mutual reciprocation, children elaborated from each other's ideas through free association. With no clear thinking path in their discussions, children's ideas were refined and built on top of one another via brainstorming of creative alternatives. These findings are applicable for the current study

because both poem writing and shared drawing experiences can be considered open-ended tasks.

Stemming from the linguistics field, Johnstone's (2008) concept of prior discourse adds a particularly analytical perspective on language use. She proposed that in any social encounter, prior discourse is drawn upon and adopted to build a new discourse. Naturally, we carry with us a set of expectations from our previous experience and apply them to the current situation. These sets of expectations accumulate from our experience and include "sounds, words and phrases, structural formulas, styles, communicative situations and activities, text-types and narrative plots" (Johnstone, 2008, p.162). We re-use these past communicative strategies, forms, or structures and adopt them in our own new contexts when relevant situations occur. In my pilot, the grammatical structure served as a formula with which children extended previous conversations in more sophisticated ways.

**Incidences of repetitive and elaborative language use in the pilot study:  
Application of prior discourse**

In my pilot study, I adopted Johnstone's concept of prior discourse to label one of the strategies that children applied to create collaboration in their shared computer experience. Prior discourse in my pilot referred to children drawing from their own prior discourse, or building on the prior discourse of their peers. In one particular group, the repetition of grammatical structures from the prior discourse was readily apparent. Like the previous strategies such as shared fear, the use of prior discourse was carried out along with the pretend play created by what was visually shown on the screen. The establishment of a fantasy frame was significant in involving everyone's imagination and encouraging them to think collectively. The repetition of prior discourse built coherence

across utterances. The following example illustrates the coherence created by the group through repeating and extending the prior discourse.

There were several instances in which children repeated the structures their peers had used. In one instance this occurred when it was Nathan's turn to draw. After he had chosen the background of the Jurassic period, Gina commented, "Teapot teapot. They are having a tea party" (Line 28 August 9, 2007). When I asked both of them, "They are having a tea party?" (Line 30 August 9, 2007), Nathan replied with a smile and giggled, "With fire in it to drink" (Line 31 August 9, 2007). Then as Nathan added more fire illustrations into the picture, Gina continued to comment but started jumping up and down and shouted, "The fish is in the fire! The elephant is in the fire!" (Line 36-37 August 9, 2007). Hearing the comment from his peer, Nathan looked at the picture he had made and replied, "Now the helicopter is in the fire" (Line 38 August 9, 2007). Gina then said, " Helicopters are coming to the fire party where they drink fire" (Line 45 August 9, 2007).

The dialogue described above indicated that the utterances of both Nathan and Gina were shaped by each other's prior discourse. Nathan was following the fantasy frame of tea party evoked by Gina but twisted that tea party fantasy frame by adding "with fire in it to drink" (Line 31 August 9, 2007). Nathan's utterance, "Now the helicopter is in the fire" (Line 38 August 9, 2007) was repeating Gina's grammatical structure and building up his own discourse from hers. Through the use of repetition, Nathan was signaling that he not only actively listened but also understood Gina's fascination with fire and agreed to follow that fantasy plot. Gina extended the meaning of her tea party idea, and the evolution of the fire party was clearly shaped by Nathan's previous comment about fire.

Congruent with Johnstone's application of prior discourse, reusing the same grammatical structure recognizably established communicative forms in this shared drawing experience using the computer. Along with the fantasy frames, which can be called a fantasy genre children were familiar with from their pretend play, the children made conscious choices to repeat and extend the prior discourse. Looking at the structure of "[something] in the fire" and Gina's comment at the end, "Helicopters are coming to the fire party where they drink fire" (Line 43 August 9, 2007), these two examples demonstrate that prior discourses can be adapted to new contexts, and the extension of the prior discourse sets a new context for future dialogue.

### **The change of language over time as collaboration proceeds**

Fisher (1993) and Johnstone (2008) pioneered the social significance of language use. Subsequent studies identified the developmental progression in selecting these categories as the collaboration proceeds. Studies by Chung and Walsh (2006) and Hyun and Davis (2005) provided evidence the language changed and demonstrated that children can gradually become more collaborative. The work of Hyun and Davis (2005) applied Fisher's categories to the dialogue of kindergartners and examined the characteristics of language that led to learning inquiry about a computer mapping software. The in-depth qualitative analysis of this study revealed the benefit of both cumulative and exploratory talk. Although exploratory talk was helpful for understanding verbal exchange in young children's collaborative computer-related talk, it required some alteration. Key findings showed that children's dialogue evolved from cumulative talk to exploratory talk. This study explained that cumulative talk occurred at the very beginning stage of the collaboration process, whereas exploratory talk took place after the children became more familiar with software features. Once the children had developed

confidence in using the new technology tool, their dialogues then evolved to use exploratory talk relating to problem solving for their map project as a group (Hyun & Davis, 2005).

The study of Chung and Walsh (2006) took the novel approach of using discourse analysis as an analytical tool to examine the change of language. Their study expanded on previous understanding by looking at the changes in the roles and attitudes of kindergartners' and first graders' collaboration over time and the construction of space in the joint-story writing process. Children showed a shift from independent to more integrative styles. They also graduated from asymmetrical toward more symmetrical relationships. The children's use of pronouns reflected their changing attitudes. As children developed a more collaborative attitude, they switched from using the pronoun "I" to saying "we," and used the inclusive imperative "Let's." The less competent children changed their roles from observing to active involvement. They also participated in a more joint decision-making process toward the end of the collaborative process. Furthermore, the less competent children changed their roles from observer to active participant.

The above discussion describes the studies of Fisher, Johnstone, and others that associate repetitive and elaborative language use with collaboration. My pilot has also illustrated that children repeat and extend the original ideas of their peers. The two studies that demonstrate the change in language use over time informed the current study and led me to look for differences in verbal exchanges as the collaboration proceeded as well as any change from self-exploratory to more collaborative dialogue.



## **COLLABORATION**

The previous section indicates that repetitive and elaborative language provides evidence of collaboration. This section defines and breaks down the collaborative process in more concrete terms that provide criteria for identifying and documenting the emergence and progression of collaboration. This section begins by identifying collaborative behaviors described in developmental theories and evidenced in previous studies related to young preschoolers' use of technology in early childhood settings. A discussion of early evidence and underlying skills for collaboration then follows. Next, it introduces fundamental knowledge of collaboration from various theoretical perspectives and literature on cooperative and collaborative learning. These theoretical overviews lay the foundation for defining collaboration in this research. The definition of “negotiation of shared understanding” was chosen for this current study to identify crucial elements of collaborative episodes.

### **Developmental theories and computer mediated collaborative interactions for young children**

Children aged four to seven, as in this study, are in a developmental stage where they move from independent explorations to becoming more cooperative and showing initiative to interact with others. In Parten's (1990) developmental progression of children's social development in group play, children of ages four to six will start to show cooperative play behaviors. Cooperative play behavior is marked by common goals that are negotiated by group members. For example, a group of children can negotiate to build a castle together. Taking this a step further, collaboration marks social development that is valuable for cognitive growth. Collaborative behaviors are beyond the scope of Parten's theory; however, the presence of common goals helps define collaborative behavior.

Collaboration manifests itself in a variety of forms for young children around computers. Children as young as preschool-aged have demonstrated that they can share the computer by negotiating turns, assisting each other by providing verbal explanation, and collectively deciding where to click by discussion (Brooker & Siraj-Blatchford, 2002; Heft & Swaminathan, 2002; Plowman & Stephen, 2005; Shahrimin & Butterworth, 2001). Nevertheless, identifying collaborative engagement of young children around computers requires further exploration of theories to adequately explain where the collaboration process begins, forms, and flourishes.

### **Early evidence of collaboration and prerequisites of collaborative learning**

Verba's (1994) study pinpointed the evidence of collaborative interaction among very young children and identified three common collaborative patterns in three age groups (13-17 month, 1.5-2-year-olds, and 2-4-year-olds) to demonstrate the ability of young children to collaborate. These patterns include observation-elaboration, co-construction, and guided activity. In the observation-elaboration mode, one child's activity serves as a model and the other child imitates, modifies, or extends the observed activity. In co-construction mode, both parties coordinate and develop shared meaning to reach a common objective. The guided mode shows that one party acts as a tutor who takes control to lead and monitor the other party. Drawing from the study of Verba and others, Ding and Flynn (2000) have discussed certain underlying cognitive abilities that are prerequisites for successful collaboration to take place: intersubjectivity, communication, planning, and inhibition. Intersubjectivity refers to one's capacity to decenter from one's own mind, take another's perspective, and then reach mutual agreement another. Children require communication competence to give clear messages and interpret another's intentions. Children must also be engaged in thinking ahead of the

steps needed to obtain the common goal. As for inhibition, children in a more advanced position are required to hold back their actions, thus allowing the other party to take part in collaborative activities.

### **Theoretical perspective of collaborative learning**

Collaboration has been studied and conceptualized from various theoretical approaches. From the Neo-Piagetian socio-constructive perspective, individual progress is supported by socio-cognitive conflict and collaboration with others who disagree or argue in order to reach a conflict resolution (Dillenbourg, Baker, Blaye, & O'Malley, 1996). This perspective asserts that the cognitive conflict that arises while working collaboratively leads to superior performance in comparison to working individually. From the socio-cultural perspective, influenced by Vygotsky (1978), collaboration involves a more asymmetrical relationship such as expert and novice, in which more capable others bridge new ideas with prior knowledge for novice partners (Rogoff, 1990). Rooted in Vygotsky's (1978) perspective, an experimental study conducted by Palincsar and Brown (1984) developed an instructional procedure, reciprocal teaching, in which novice students were guided and given feedback by expert teachers regarding their strategies for reading texts. Students in the treatment group demonstrated substantial progress. Intertwined with the socio-cultural perspective, the situated learning perspective by Lave and Wenger (1991) describes collaboration based on an apprenticeship model that requires active participation in the community. A novice starts on the periphery, progressing from observation to imitation to full participation. Studies of computer supported collaborative learning place emphasis on building online community (Lave & Wenger, 1991; Littleton & Hakkinen, 1999; Makitalo-Siegl, 2008). These studies have provided empirical evidence that while novices actively involved and observed the

skilled practice with the expert in shared activity. Participation itself is what allows novices to reach new understanding. A series of studies conducted by Scardemelia and Bereiter (1994, 2006) have also exemplified online communities as environments where real-life professionals have contributed their expertise to novices by participating in the discussion forum. For instance, after reading the postings about dinosaurs from Grade 3 students, university students extended the knowledge of the geological timeline into the discussion. Subsequently, biologists built on that knowledge by explaining the concept of the food chain.

### **Definition of collaboration for the current study**

Most of the literature on both cooperative and collaborative learning provides fundamental definitions of collaboration. Even though the current study focuses mainly on collaboration rather than task completion; the task orientation or goal-orientation of these studies still have their relevance to the current study. This body of literature defines collaboration as a situation in which students participate in coordinated joint effort to accomplish a common goal (Cohen, 1994; Dillenbourg, 1990; D. W. Johnson & Johnson, 1991; Littleton & Hakkinen, 1999). The literature has also highlighted the benefit of providing an instructional structure for cooperative endeavors, in comparison with competition and individual pursuits, in promoting desired performance and learning outcomes (R. T. Johnson, Johnson, & Stanne, 1985; Light, Littleton, Messer, & Joiner, 1994).

Recently, the focus has shifted from learning outcomes to the collaboration process. Collaboration is then viewed as a means of negotiating a shared conception in the learning process. This perspective has limited usefulness for the current study but does provide a conceptual foundation for more relevant work mentioned later. The

following study demonstrates that the process of collaboration involves understanding and developing a shared conception of a problem. Roschelle and Teasley (1993) analyzed 15-year-old collaborative dyads using computer simulation of physics concepts and defining collaboration as developing joint problem space. They represented the negotiation process of collaborative problem solving as a progression of three steps: 1) accepting, 2) monitoring, and 3) repairing. In their study, the progression began when both partners accepted each other's interpretations. Then, at least one recognized a gap in the other's interpretation. After that, both partners reduced disagreement through discussion (Roschelle & Teasley, 1993).

Taking the perspective of shared conception, the definition of collaboration for the current study is "the negotiation of shared understanding," and is adopted from Crook's (1994) work, described below. This concept is also in line with the previously described term, "intersubjectivity." In the current study, the negotiation of shared understanding commenced after children started articulating their thoughts to communicate with their partners. As children explained their drawings and offered comments to each other, they interactively engaged in each other's ideas. Thus, negotiation of shared understanding serves as a criterion to help us identify collaboration.

### **Collaboration of young children involving computers**

The existing literature on computer-based activities provides various frameworks that connect the constructs of pretend play and language use involving computers. Of these frameworks, the most relevant one for the current study is that proposed by Crook (1994, 1995, 1998) to explicate the negotiation of shared understanding in the collaborative process involving computers. Instead of examining the experiences of older students in fully developed subject matters such as physics or online forums, Crook based

his work on empirical evidence by observing young children's face-to-face collaborative interactions at various computer-based tasks in primary school classrooms with earlier-grade pupils. Crook emphasized that both parties were required to actively create and elaborate on a shared understanding. As negotiation of shared understanding was actively pursued by both collaborators, a collaborative experience would emerge. Crook mentioned that collaborators might encounter obstacles. For example, the suggestions may be rejected or challenged. Collaborators also need to deal with asymmetrical interactions in which one party may contribute much more than the other because of more expertise.

Crook (1994, 1995, 1998) argued that in the process of building shared understanding, shared resources determine the quality of collaboration. Computers, for example, are considered as resources that empower children's collaborative interactions because they enable vivid and active manipulation. Crook referred to the resources as shared references or shared objects. In computer-supported collaborative writing, a shared reference can be a sentence read on the computer. It can also be abstract such as an idea or a joint decision made in the past. Crook (1995, 1998) specifically referred to two situations ,which naturally facilitate shared understanding and mediate young children's collaboration: concrete play materials and narratives. Narratives are the most relevant for this study. He exemplified narrative in scripted pretence as a strong shared reference to build shared understanding, because the narrative in a play situation provides continuity for collaboration. The accumulation of mutual understanding based on shared references can create platforms that cultivate the emergence of subsequent collaboration. Crook (1998) also pointed out the importance of the sense of intimacy that results from the collaborative experience. Pre-established friendship plays a significant role in achieving this sense of intimacy.

Extending from Crook's (1994) work, studies of online collaborative learning have also referred to the concept of shared reference as an effective tool for the negotiation of shared understanding (Suthers, 2006; Makitalo-Siegl, 2008). Makitalo-Siegl (2008) explored the collaborative process of a small group framing a research question. Their shared references included resources such as book knowledge and shared history of the group process. Computer-mediated external representations or objects including "model, simulation, and visualization" (Suthers, 2006, p.327) can also be shared references.

### **Applying Crook's framework to identify collaborative episodes**

As described above, the negotiation of shared understanding as proposed by Crook (1994, 1995, 1998) were applied in order to identify collaborative episodes. Drawing from his work, the following elements regarding negotiation of shared understanding were applied to identify collaborative episodes for the current study: 1) creation of shared a reference, and 2) formation of a mutual understanding based on shared references. The narrative of pretend play can be exemplified as a shared reference (Crook, 1994, 1995, 1998). The creation of a shared reference marks their distinctive memory for collaborators. As collaborators build up these shared references as common ground, their collaborative interaction may evolve to a more advanced level. After collaborative episodes were identified, theories of play were applied for analysis.

In this study, the criteria for identifying collaborative episodes points to the negotiation of shared understanding as the result of the collective input of both parties for the shared reference. The creation of a shared reference can be broadly or narrowly defined. The children in this study were not given a specific collaborative goal; rather, they were asked to sit next to one peer to draw together by taking turns and were

encouraged to assist each other. When one party initiated an idea by verbalizing and the other party built on the idea afterward, then that part of the language exchange was selected. The collaborative episodes required both parties to participate in contributing to the idea. The second criteria, formation of a shared understanding based on the shared reference, refers to the accumulated common knowledge within the evolving collaborative process. When children revisited a shared reference in a later episode and expanded it, the accumulated knowledge became more complex. At the same time, they created new shared references each time they worked together.



## **Chapter 3: Methodology**

### **INTRODUCTION**

This chapter addresses the research design employed to investigate the question: How do young children use collaborative strategies when drawing at the computer with friends and acquaintances? This explanation of the research design covers five factors: 1) case study methodology, 2) participants, 3) data collection procedure and the research protocol, 4) data analysis process, and 5) trustworthiness.

### **CASE STUDY METHODOLOGY**

Merriam's (1998, p. 19) definition of case study provides the basis for the research design of this study: "A case study design is employed to gain an in-depth understanding of the situation and meaning for those involved." "How" and "why" research questions which explore contemporary phenomena also lead to case study design (Yin, 2009). The current study employs a case study design to gain a deeper understanding of young children's collaborative strategies when drawing at the computer. Case study is adopted because this inquiry allows me to investigate a contemporary phenomenon of collaboration in young children's computer drawing experience in a real life context. In this study, friendship is considered a significant part of children's social context, and this impacts their collaborative strategies. Rather than confirming specific variables and the end product, this case study design reflects an interest in scrutinizing the dynamics of the process (Merriam, 1998; Yin, 2009).

The case for this study is the phenomenon of collaboration, particularly the dyadic collaboration of very young children. The current case study also has an interpretive nature in that existing theories from the fields of play and collaborative learning are drawn on in order to adequately explain children's collaborative strategies (Merriam,

1998). As the pilot study and existing studies have shown, friendship and the use of play may significantly influence children's collaboration. In this case study, a computer-based activity provides the backdrop for an exploration of the collaborative strategies of children who relate to each other either as friends or acquaintances.

## **PARTICIPANTS**

Four pairs of children including two friendship pairs and two acquaintance pairs aged five and six were recruited as participants. The two friendship pairs consisted of one female pair and one male pair. Likewise, the two acquaintance pairs consisted of one female pair and one male pair. It should be noted, however, gender was not the focus of the current study. All participants were informally recruited through acquaintances and friends at my church. Children in friendship pairs were determined either by self-identification or their parents, based on how frequently they played with each other. Children also needed to refer to each other as friends and to have been playmates for over 3 months. The children in the acquaintance pairs had only met once a week in the children's program at church or at occasional social events.

Two short interviews were conducted to ascertain the friendship and acquaintance status. One parent of each child was asked the following open-ended questions:

1. How long have (name of your child) and (name of other child) known each other?
2. How long have they been playmates?
3. How often do they play with each other?
4. Would you consider them to be friends or acquaintances? Why?

All children were separately asked the following open-ended questions:

1. Are you friends?
2. Why do you think you are friends? (Researcher encouraged children to elaborate if they responded with answers such as, “I don’t know.”)

The following paragraphs briefly describe the four pairs based on the interview data and my understanding of the children in the church primary program. The first friendship pair is Grace and Summer, both girls. At the time of the study, Grace was six and Summer just turned five. Both of them are Caucasian and outgoing. Grace is the eldest of three children; she has a younger sister and a baby brother. O is also the eldest of three, with siblings close in age to those of Grace. Grace and Summer have known each other and been playmates for slightly over three years, and see each other twice a week. They referred to each other as friends. Summer mentioned two reasons while Grace responded with only one answer. Both Grace and Summer mentioned being nice to each other as the reason why they were friends. Another reason Summer mentioned was playing together. Both of them were unaware of the Kid pix software.

The second friendship pair is Matt and William. At the time of the study, both of them were Caucasian five-year-old boys. William is the eldest of three children in his family and so is Matt. Like the first friendship pair, they and their siblings play with each other when the two families meet. They met each other two and half years ago and have been playmates since. Matt and William frequently sit next to each other in the primary program. In addition to church contact, they get together twice a month. In response to why they were friends, response indicated they played together. William offered a more detailed explanation of why they were friends. In addition to playing together, William mentioned laughing. William also mentioned they share a common interest in sports and superheros. Neither Matt nor William was aware of the software.

In comparison to the responses of the friendship pairs, the answers from the children in the acquaintance pairs were much shorter. The first acquaintance pair is Peter and Scott. Both of them are Caucasian. At the time of the study, they were five-year-old boys. Peter and Scott have known each other over three years. Peter has a twin brother and two younger sisters. Scott has an older brother and a younger sister. When asked if Scott was his friend, Peter responded no. Scott referred to Peter as his friend based on the reason that they knew each other. In this pair, Scott was familiar with the software by using it at school, but Peter had never used the software.

The second acquaintance pair is Abby and Kristin. Both Abby and Kristin were six-year-old girls. Kristin is the only girl from her family. She is a mixed-race child, part Caucasian and part Filipino. Kristin has six brothers and five of them are older than her. Kristin's mother mentioned that she gets along with boys very well but does not have many chances to play with other girls, so they were pleased to have the opportunity for Kristin to spend some time at Abby's house. Abby is a Caucasian girl with Canadian heritage. She is the oldest girl in her family with two younger sisters. Both Abby and Kristin have attended several group events such as birthday parties together, and Kristin attended Abby's birthday party once, but they have never played with each other just by themselves. When asked if they were friends, Abby responded that they were getting to know each other. Kristin referred to Abby as her friend at the interview.

#### **DATA COLLECTION PROCEDURE ( RESEARCH PROTOCOL)**

The participants were asked to take part in a shared drawing experience using computer art software. The researcher provided two tutoring sessions for children who were not familiar with the Kid pix Deluxe software. The protocol for the tutoring session is included below. All the pairs were provided tutoring sessions. None of the children

from the friendship pairs were familiar with the software. In the first acquaintance pair of Peter and Scott, Scott had experience with the software at his school. As for the other acquaintance pair of Abby and Kristin, even though none of them had experience with this particular software, they both had previous experience with similar art software.

The protocol for the tutoring sessions included a contingency plan, and the explanation of icons did not necessarily follow the same sequence as presented below. When the children indicated an interest in an icon other than the one I was describing, I followed their lead. In between explanations of the various icons, the children were free to explore the icons on their own. After I had saved the completed computer drawings they made for practice each time, I proceeded with the explanations.



Researcher: Please sit down. Let's look at this drawing software on this computer. You can take turns with the mouse.

#### Drawing

Researcher: First, let's start with drawing [ pointing at the drawing icon] you can click on the pink pencil. If you click on the green splash on the bottom left; it will give you a choice to pick a color. What color would you like? [ wait for their response] Next to the green splash, do you see a pencil, chalk, crayon or marker ? [ wait for their response] Which one would you like to use? [ wait for children to click on one of that tool] Ok...you pick\_\_\_\_. You can start drawing using \_\_\_\_\_. [ wait for the child to draw some marks] On the right, you can also click on any of these shapes. Click one shape and click on where you want the shape to be.[ wait for the child to put some shapes into the picture and save their work afterward]

#### Eraser//undo guy

Researcher: Now you just made a fun picture. Now can you draw a circle for me? [wait for the child to finish] Ok. Now let's try to erase the circle. Click on the eraser [point] On the bottom, you can choose mini eraser to erase parts of your picture. The big eraser clears the whole picture. What would you pick, the mini eraser or big eraser? [wait for their response and depending on their choice] let's erase (some part of )your picture. Now (some part of ) your picture is gone.

#### Undo guy

Researcher: Let's say after you erase it, you want your old picture back. You can click on the undo guy and it will put your picture the way it was. The undo guy does a lot of things, not just putting your picture the way it was. If you click on this undo guy, he will say and sing something interesting. Let's click on it and see what it tells us.

#### Fire hose

Researcher: If you want to start your picture all over, then you click on the fire hose to wash your screen. You can take turns to draw and use eraser, undo guy, or fire hose. [ allow them to take turn and explore for several minutes]

#### Paint

Researcher: Let's try something else now. Let's paint [point to the icon]. Look, some tools come up on the bottom. What would like to choose, paintbrush or spray can? [point and wait for response]

1) They click on the paintbrush

Researcher: Ok. You pick paint brush On the right, you see this purple splash and colorful shapes with stars, Let's click on both of them and see what kind of paint tool you got [wait for the response] Do you see any thing you like to put in your picture?

2) they choose spray can..

Researcher: Now let's see what we got here. Here you can see the triangle, square and circle, you will find lots of things that shape like triangle, squares and circles. Would you like to put those shapes into your picture? You click the shape and click on the screen where you want those shapes to be. Do you see the picture of a caterpillar? Let's click on the caterpillar and see what we got. You can find interesting things such as bugs, fishes, and butterflies to put in your picture. [wait for them to explore and save both of the pictures]

#### Paint bucket

Researcher: Are you ready to try something else? Let's try paint bucket [point to the icon] Do you see three buckets on the bottom? You can fill with just one color, you can blend the color, or you can have different colors with patterns. Let's click on all three of them and pick which one you like on the right [wait for their response and save their picture at the end]

### Mixer

Researcher: Are you ready to try other tools? Let's use paint bucket to fill the whole screen and then we can try this mixer tool. You can click the mixer [point to the icon] to twist your pictures together. Do you see two mixers on the bottom? The big mixer will twist the whole picture with one click. The small mixers twist just some of your picture. You click on the mix effect on the right and then click on the screen.

Now you have seen how to use lots of tool. Let's see what you can do with all of them.

### 2nd visit

#### Background

Researcher: Do you see this little tree here? [point] Click here to add background to your picture. What would you like to choose? You have prehistoric, culture... ( read out the topic for children to choose ) just drag that background to the screen.

#### Rubber stamp

Researcher: Now you pick \_\_\_\_\_for your background. Let's put some stamps to your picture [point]. What topic would you like? (Click on the topic that children choose) Click on the stamp and then click on the screen where you want stamps to be.

#### Sticker

Researcher: Let's pick another background this time and add some stickers to your background. What background would you like to choose this time? I wonder what stickers go with this background. Would you like food, farm, or animals? ( read out the topic for them to choose) Click on the picture and then drag the picture up to the screen. [ allow both of them time to explore and save their work at the end]

#### Animation



Researcher: Are you ready to try something else? Click here to add animations to your picture [point at the animation icon]. You add sticker and animation the same way. Now you can try putting animation in your picture. [allow both of them to explore and save their work at the end]

#### Sound

Researcher: You can choose what music you like to go with your picture. Click on the picture, it will play the music for you.

#### Text box

Researcher: You can click on the text box to write [point] Let's try putting some words into your picture.

#### Grab tool

Researcher: You can click on the grab tool to cut your picture. Can you draw a circle for me? You hold the button and drag the scissor around. Then you click on the trashcan to throw it away, or you can move it around. [allow both of them a few minutes to explore grab tool]

### **DATA COLLECTION AND DATA RECORDING**

Prior to the observations, an informal interview with one parent of each child took place. An informal interview with the participant children themselves was also carried out confirming their friendship (or relationship). Interviews lasted approximately 10 minutes prior to the first observation. During the observation, five main methods were adopted, including observations, audio recordings, video recordings, drawing artifacts, and screen capture. During the observations, the children's conversations were tape-recorded. The children's audio-recorded conversations were later transcribed selectively to include collaborative episodes and segments that I considered related to collaborative

strategies. The drawings they created using the computer art software were saved on the computer. Prior to the shared drawing experience, I explained to each pair of children that they would use a computer to draw together. Each child would have a turn, and the other one needed to wait until that person had finished a turn. I considered myself a participant observer because I was involved in the conversation when the children requested assistance, initiated questions, or involved me in their discussions.

Seven observations were conducted including the tutoring sessions for each pair except the Matt William pair. Each observation lasted approximately 40 to 55 minutes. For the Matt William pair, five observations were conducted and the last two observations only lasted approximately 30 minutes due to unexpected circumstances; Matt and William at the time were more eager to play with some other toys because Matt's family was relocating for employment and the children wanted to spend time working together on a puzzle Matt had given to William. For the other pairs, some observations were shortened due to unexpected interruptions. The data collection took place from December 2009 to April 2010. All observations took place in the home settings of the participants.

#### **DATA ANALYSIS PROCESS**

Even though the data analysis process is presented in step-by-step fashion, the complex data analysis process did not occur sequentially. As data was reviewed and compared, sometimes the category of a collaborative strategy was renamed. Likewise, reconsidering various parts of the data sometimes led to a change of focus. Ongoing data analysis began with the data collection process. At the end of transcription, preliminary identifications of the collaborative strategies in each episode and theories that could be

selected to explain the data were compiled. The data analysis involved three major phases.

**Phase 1: Identify collaborative episodes and evidence of what supports or hinders collaboration**

The literature defines collaboration as negotiation of shared understanding and identifies collaborative episodes by shared references between the participants. The collective effort of using shared references guided my search for collaborative episodes. When both parties provided input and contributed to the idea, that part of the verbal and non-verbal communication was selected for transcription. The collaborative episodes were identified based on the video recordings, audio recordings, field notes, and screen captures, which were all reviewed repeatedly to capture the verbal and non-verbal strategies in episodes that facilitated collaboration. Then the transcription of the language used and non-verbal cues that led to collaboration were further examined. The field notes were then expanded. If the researcher did not identify any collaborative episodes from the entire observation, certain parts that demonstrated the children's unengaged behavior and language use would be selected to portray the situation. Transcribed episodes were then inserted into tables with empty spaces in the right column for coding. The drawing artifacts were also chosen to provide illustrations for the content. The following provide an example of collaborative episode from the William and Matt pair.

Matt's turn

Matt started asking me where he can find anything related to sports. I looked under sticker to look for any sported related pictures for Matt. After I put several pictures up. Matt pulled up the background of Antarctica.

Matt: there is snow in the ocean and ice so you can't go on the jet ski. Aawww!!! I am stuck !!! Somebody help me!!! ( using different pitch voice and longer sound looking at William)—both laugh you see

William: [smile] A!!!!I am going to run into Matt's trophy!! [ use the same pitch--both laugh picture of trophy next to the jet sky]

Matt: Y..[continue laughing] she is going to eat me—[continue the same pitch]

William: I am going to run into something [unrecognizable] to death...[continue the same pitch]  
(Dec 23 09, Matt William pair session 2)

This transcript shows the negotiation of shared understanding as a collaborative process for the Matt and William pair. Matt used an Antarctica background as the shared reference to propose a pretend frame and act out a conflict event. William joined in that negotiation of shared understanding and collaborated with the proposed pretend frame by acting out a similar event. When identifying collaborative episodes for phase one analysis, it became apparent that there were non-collaborative interactions as well. The following dialogue provides a contrasting example of one non-collaborative episode. It occurred in session 5 for the Abby and Kristin pair while it was Abby's turn. Abby put a pirate ship in the background and started to put one pirate inside.

Abby: This guy [the pirate beside the mermaid]

Kristin: But you already got//

Abby: IT'S OK..[raised her voice a little bit] I am going to put him right there...I want him that big.. ok [put the pirate in]

Kristin:[Kristin got her hand on the mouse] I can do I can do I can do it [Abby quickly put her hands on the mouse again from Kristin and whole body shook...Kristin pulled back]

Kristin: try it....with...the..little [unrecognizable]

Abby: I want to do a few more pirates [ wanted to put more pirates in]

Kristin: No....[ ]..mermaid? [pointing]

Abby: LA.....[As Kristin tried to point, Abby made certain sounds] [ Kristin then lean back]

Kristin: Mermaids? MAAa[ certain sound]

Abby: There..now there are pirates jumping hurting her [ looked closely]

Kristin: Now we need 1.2 ...2 mermaids

Abby: I don't need 2 mermaids...that's the pirates trying to hurt mermaids..the MERMAID [ stressed the last word since only one mermaid showed in her picture]

Kristin: I want to show you one...I want to show you one [ put her hand on the mouse]//

Abby: I am going to do one myself[ raised up her voice again and hold her mouse still] [ Kristin then put her hand back]

(March 05 10, the Abby Kristin pair session 5)

The above episode demonstrates a great disparity from the collaborative episode previously described. In the absence of a shared understanding like that of Matt and William, Abby and Kristin did not share a common ground that would enable them to share the computer for a common goal. While Kristin made several attempts to join in by proposing to handle the mouse, Abby's resistance to Kristin to and her insistence on doing the drawing herself illustrated their conflict over the mouse and their differing opinions, which together prevented shared understanding. Because few collaborative episodes occurred for the acquaintance pairs, it became essential to collect evidence of behaviors that hindered their collaboration. These behaviors will be described and analyzed in phase four.

## **Phase 2: Select the framework that adequately explains collaborative episodes**

The existing literature of play provides helpful perspectives from both Vygotsky (1978), and Garvey (1990). These two explanations of collaborative episodes were selected to analyze language use. Garvey's perspective was chosen to provide coding for the data. Then Vygotsky's framework enabled me to theorize and explain the different roles the children took in the collaborative process. Within the process of coding, certain categories were modified to fit the data. The following table lists the codes that Garvey (1990) originally proposed and the new modified codes created to present the data collected for the current study.

Table 1: A list of Garvey's original codes and the new modified codes

Garvey's codes	Examples
Preparatory talk	Let's play
Explicit direction of pretend	

Transformation of self	Pretend I am Harry Potter
Transformation of other	You be the superman
Transformation of joint roles	Let's be firefighters
Transformation of action for self	I need to put this up to put off the fire
Transformation of action for other	Pretend you broke your legs
Transformation of joint actions	Let's pretend we fly like superman
Transformation of object	Pretend this pen is my magic wand
Transformation of environment	This block area is the place on fire
Transformation of nothing to something	"Want a burger" while holding empty
Added new codes	hands
Transformation of actions for onscreen objects	They are walking to the castle
Transformation of roles for onscreen objects	"They are her little kids"[pointing to onscreen image of two big mermaids and two small mermaids ]
Enactment	I will carry you out [like a firefighter]
Negation of pretend	I am leaving
Play signal	The change of voice to signal pretend

**Phase 3: Identify and compare patterns of collaborative strategies for each pair over time and across pairs**

Guided by the clustering and contrasting analysis technique from Miles and Huberman (1994), collaborative episodes identified by the coded data were examined for commonalities and comparisons. Collaborative episodes showing commonality or contrast were grouped into categories in order to identify patterns. In other words, the

data was first reviewed several times to identify similar patterns or themes of collaborative episodes within each of the pairs over time. Collaborative strategies were listed at the end of each observation transcript in order to reveal whether certain collaborative strategies were used consistently and how they had evolved. Strategies from one friendship pair could then be compared with either another friendship pair or with the two acquaintance pairs, and vice versa.

#### **Phase 4: Label non-collaborative episodes**

Both acquaintance pairs had a rather limited number of collaborative episodes and started showing collaboration only after session 4. The collection of non-collaborative episodes became significant evidence of their path moving from non-collaborative to collaborative. Since the non-collaborative episode hindered collaborations for variety of reasons, the non-collaborative episodes categorized and labeled according to these various reasons.

#### **Phase 5: My role as a researcher**

This section describes my prior experience with several of the participant children, as this may have impacted my engagement with them during the observations. Some of the children had been my students in a primary level church class. This pre-established relationship and my prior role as their teacher was helpful in that it allowed me to communicate more easily and better understand the children. However, this pre-established relationship as their teacher also served as an obstacle in a way that the participant children became accustomed to constantly seeking guidance from me rather than from their peers. This made it difficult for me to establish a clear role as a participant observer to maintain only a low level of participation.

Clearly, my presence and relationship with the participant children impacted on their behavior and their interactions with each other. Three of the children from the two friendship pairs, including William, Matt, and Grace, were my previous students. Among the two acquaintance pairs, I had only taught Abby and Kristin, the two girls in the female acquaintance pair. While the friendship pairs seemed to transition well from the tutoring session to the observation, my plan to transition from an active role in the tutoring session to a more removed position in observation sessions did not work effectively for the acquaintance pairs, especially for the Abby and Kristin pair. I was much more involved with the acquaintance pairs in comparison to the friendship pairs during the observations after the tutoring session. Regardless of these different levels of involvement during the observations, it is important for me as a researcher to characterize my impact as a mediator and facilitator, which may have indirectly contributed to their collaboration flow. I made my effort not to guide their interaction. However, at time, they requested me to participate. As I evaluated my role as a researcher when reviewing the transcripts, several aspects of my involvement caught my attention, including redirecting the pairs back to the joint focus, supporting their turn-taking, and facilitating their joint input. These instances made me rethink the role I played in the children's collaborative process.

### **TRUSTWORTHINESS**

A number of techniques were employed to establish trustworthiness. Trustworthiness was determined by four basic criteria: credibility, transferability, dependability, and conformability.



## **Credibility**

Credibility refers to the truth-values of findings, representing as closely as possible the constructed realities of insiders or participants who are members in the social contexts or settings. Qualitative researchers establish credibility by showing that multiple constructions of reality are adequately represented and that the report rings true or is credible to participants themselves. Four strategies safeguard credibility: prolonged engagement, triangulation, referential adequacy materials, and a reflective journal (Lincoln & Guba, 1985).

### ***Prolonged engagement***

Prolonged engagement requires researchers to spend sufficient time in the context to become “native.” In the process of becoming “native,” they build trust with participants and gradually become accepted as a member of the group they wish to investigate. Researchers also need to spend enough time in the context for themes or patterns to repeat rather than extend (Lincoln & Guba, 1985). In my study, the majority of the participants were my students in a church setting. Therefore, trust was built prior to the study. Sufficient time was spent to assure the collaborative interaction patterns or discourse patterns.

### ***Triangulation***

Lincoln and Guba (1985, p.305) define triangulation as “the use of multiple and different sources, methods, investigators and theories.” The current study has selected multiple sources, methods, and theories to triangulate. First of all, observations took place at various days of the week, while the places where we met were fixed. Although the researcher was the only data collector, three fellow graduate students were involved in the triangulation process. Two of them were asked to identify collaborative episodes for

an approximately five minutes video clip after I had discussed with them the criteria for collaboration. The third graduate student was added to clarify certain utterances in the transcripts. In term of methodological triangulation, the combination of data including the written field notes from the observations, video data collected from the video recording, and the audio recordings; together with the screen captures, and the children's drawing artifacts provided verification of the data. For example, the researchers can use data obtained from the observations to verify the equivalent sets of data from video recordings audio recordings, and the screen captures.

### ***Referential adequacy materials***

Referential adequacy materials are materials that convey thorough and holistic background knowledge of the context and serve to support the researcher's analysis and interpretation (Lincoln & Guba, 1985). For example, in this study, in addition to the field notes obtained from my observations, the transcripts from my audio recordings and the artifacts saved in my computer served as referential adequacy materials to support my understanding of the aspects of children's interaction that indicated their collaborative strategies.

### ***Reflective journal***

This is a diary kept by researchers to record their methodological decisions, interpretations, and insights (Lincoln & Guba, 1985). The transcriptions were completed by examining field notes, video recordings, audio recordings, screen captures, and artifacts; at the same time, I kept a journal that recorded and documented my reflective thoughts of my coding and labels for the children's collaborative strategies, as well as exploration of what might be expected from different theoretical or analytical perspectives, as well as questions.

### ***Peer debriefing***

A debriefer who has a general understanding of the study listens to the researcher about his/her emerging analysis then provides input and suggestions or poses questions that help researcher to refine the researcher's analysis and interpretation. In the current study, the discussion with my committee chair and one other committee member on a regular basis was invaluable, especially dealing with the frustration of analyzing data from the acquaintance pairs since no collaborative episodes were found at all. Through peer debriefing, several alternative were explored, which led to the resolution of my concerns ( Lincoln & Guba, 1985).

### **Transferability**

Transferability is judged in terms of the extent to which researchers provide sufficient descriptive data to make it possible for other researchers to make similar judgments in other contexts. Thick descriptions and purposeful sampling safeguard transferability in naturalistic inquiry (Lincoln & Guba, 1985). In my study, detailed descriptions of how children's verbal and non-verbal exchanges established their collaborative interaction were included in the transcript.

### **Dependability**

Dependability is established by providing the reader with evidence that if the inquiry were replicated with the same or similar respondents, the findings would be repeated. The dependability of qualitative research is safeguarded by an audit trail. "Audit trail" refers to the documentation of the inquiry process, allowing researchers to trace each step they took to conclude and assert their findings (Lincoln & Guba, 1985). The inquiry process for my study was to assign tracking numbers to my original data as well as in my reflective journal to detail the history of how I made sense of the data and

to follow the path of how I established my findings regarding my judgment of children's language use, play behavior, and collaborative actions around the computer.

### **Confirmability**

Confirmability is established by demonstrating that the data, rather than the investigator, are confirmable representations of the respondent's views. Confirmability is also safeguarded by the audit trail. Dependability and confirmability refer to a careful display and examination of what is involved in the process and product so that other researchers can trace the documented sources. The researcher takes the reader step by step through the excerpts of the raw data, emergent themes or categories in the analysis procedure, and process notes including theoretical and methodological memos. When researchers show the analysis procedure that led to their conclusions, they prove that their claims are not merely some convenient stories from their imagination. The audit trail used for confirmability is described previously under the dependability section (Lincoln & Guba, 1985).

## **Chapter 4: Findings**

### **INTRODUCTION**

This analysis was guided by the research question: How do young children use collaborative strategies when drawing on the computer with friends and acquaintances? The purpose of this section is to present the collaborative strategies employed by both friendship pairs and acquaintance pairs, and the emerging process and changes of those collaborative strategies. First of all, remarkable differences were displayed between acquaintance pairs and friendship pairs. Uncooperative and un-collaborative behaviors frequently appeared in the observation data from the acquaintance pairs, whereas a wide variety of collaborative strategies naturally unfolded and flourished from the first session for friendship pairs. Five main collaborative strategies appeared and the current study classified these according to the path of progression from the simplest to the most complex: 1) Cooperative effort or division of labor; 2) Pretend language use; 3) The coherence and elaboration of pretend frames; and 4) Evolution of pretend frame, 5) Action games. A number of sub-categories were also developed under some of these main classifications. The division of labor shown by the Grace Summer pair was considered the simplest form of collaboration. This cooperative effort, although accompanied by pretend play language (the second category), demonstrated a separate responsibility for each individual. The second category is pretend language use; acquaintance pairs and friendship pairs shared this collaborative strategy. As children expanded pretend language use across sessions, the narratives established showed the third collaborative strategy, coherence and elaboration of the pretend frames. Then, children equipped the items and characters shown from the previous pretend frame to create their own action games, generating the last category of collaborative strategy. In terms of the role each child took within the evolution of the collaborative process, the

discussion focuses only on the friendship pairs because only they had enough episodes demonstrating collaboration. For the Grace Summer pair, Grace, who was the older of the two, adopted the scaffolding role continuously for Summer to imitate and follow. As for the Matt William pair, Matt took the scaffolding role at the very beginning but after a couple of sessions Matt and William both took turns in this role.

#### **DIFFERENCES BETWEEN THE ACQUAINTANCE PAIRS AND FRIENDSHIP PAIRS**

The two friendship pairs demonstrated many collaborative episodes and showed a wide variety of collaborative strategies from the beginning, especially the Matt William pair. As will be shown below, collaborative episodes occurred immediately for both friendship pairs. The female friendship pair, the Grace Summer pair, had 6 collaborative episodes in total. The male friendship pair, the Matt William pair, had 17, more than twice as many as the female friendship pair. In contrast, the acquaintance pairs engaged mostly in uncooperative and un-collaborative behaviors. Collaborative episodes occurred only once in the fourth session for the male acquaintance pair, the Peter Scott pair, and lasted only a short time during session 4. Two episodes were identified for the female acquaintance pair, the Abby Kristin pair, during sessions 6 and 7. In other words, it took a rather long time for acquaintances who had no play history to develop collaborative strategies.

Both friendship pairs began collaborating from the beginning and their collaboration strategies became more advanced as time went on. The number of episodes and length of collaborative episodes gradually increased, and children negotiated shared understanding by building upon each other's input. Most collaborative episodes were carried out in pretend play forms with frequent use of transformations, as described by Garvey's (1993) terms. Their pretend language use developed to complex narrative forms

and the Matt William pair even invented their own action games. Conversely, the two acquaintance pairs showed frequent un-collaborative behaviors. Their uncooperative and un-collaborative behaviors were revealed in a variety of ways. Disagreement and critiques became the common feature of these un-collaborative behaviors between both acquaintance pairs. However, the acquaintance pairs did have several collaborative teaching moments, and a total of three collaborative episodes did occur for them. While the Peter Scott pair showed frequent unengaged behaviors that existed in the first session and continued throughout all seven sessions, they did collaborate in one episode. For the acquaintance pair, the Abby Kristin, they shifted slowly from uncooperative to collaborative behaviors toward the end. The Abby Kristin pair started with total reliance on me for assistance and progressed to a balance between my assistance and turning to each other for support at the end.

#### **EVIDENCE OF UNCOOPERATIVE AND UN-COLLABORATIVE BEHAVIOR**

Acquaintance pairs spent much of their time involved in uncooperative and un-collaborative behaviors. Limited collaborative episodes for acquaintance pairs revealed that both acquaintance pairs showed lack of interest in negotiating toward a shared understanding. This manifested itself in different forms: 1) unengaged behavior, 2) over-reliance on researcher's technical support, and 3) disagreements and critiques. This does not mean that friendship pairs did not engage in uncooperative and un-collaborative behavior at all. Rather, these behaviors occurred sporadically for friendship pairs but appeared extremely frequently in acquaintance pairs. For example, the friendship pair, the Grace Summer pair, also had unengaged behaviors such as looking through the camera (Feb 8, Grace Summer session 4). The Peter Scott pair, however, frequently exhibited unengaged behavior in four sessions over an extended period of time.

## Unengaged behavior

Unengaged behavior in this study refers to incidences when one party did not attend to what the peer was doing. They did not even have a joint focus on the image on the computer screen. Sometimes the tool the children chose did not allow much opportunity for peer collaboration, for example, when typing. The following field notes describe both Peter's and Scott's unengaged behaviors during their peer's drawing process

Scott wrote all the names of his family's members [while Scott was typing, Peter held audio recording device in the air, then walked to video and played with that. then looked from the back of the computer to view the computer screen...then jumped to the table where the computer was set to the bed...at the end went back to the video and moved underneath the table and pushed the table from underneath (Feb 5 10, Peter Scott session 4)

The transcript below shows Scott's unengaged behavior after Peter was unresponsive to Scott's attempt to understand Peter's drawing.

Peter's turn

Peter picked the marker[ under pink pencil] to draw different lines and shapes.

Peter: Cool! [point at what he did] [Scott laughed as well]

Scott: What is it? [paused for a short while] What are you making? [Peter did not respond to the question]

[Scott continued watching]

[Peter drew a big yellow circle and two rectangles at the bottom of the circle]

Scott: That's too little to me. [J got up and walked towards the video camera]

Peter: That should put a little bit higher [referring to the position of the camera]

After playing with the video camera for a while, J came back and sat next to K again

I→Scott: I think K is trying to fill up the whole thing with yellow

Peter: I am not trying to fill up the whole thing

I: ok

Scott: What are you making?

Peter: Oh! this arm hurts

I: Ok..this arm hurts

Scott fell down to the ground and I pulled him up. Scott got underneath the table

Scott: there is something funny under here

I: Something funny under there?

Peter: What is it? [head down]

Scott made some sound underneath the table. Then he climbed out from the other side of the table and then came back and sat next to Peter again.



Peter: I am done now  
Scott: What is it called?  
Peter named his picture yellow robot  
(March 5 10, Peter Scott session 7)

As defined by Crook (1994, 1995, 1998), negotiation of shared understanding forms the basis of a collaborative episode. Creation of shared reference regarding either an object or a joint idea is one essential element of negotiation of shared understanding. From the episode above, even though Scott initiated the conversation by asking Peter what he was doing several times, Peter did not show any interest in responding to the questions. Therefore, the unattentive behaviors were classified as unengaged behavior as opposed to collaborative interaction.

### **Over-reliance on the researcher**

For all pairs, I provided verbal hints for them to find certain objects, background, or animation. Friendship pairs rarely requested assistance from the researcher. On the contrary, even their body language demonstrated their dependence on each other; the friendship pairs were physically closer and more intimate, leaning on each other's shoulders and having more eye contact. In contrast, children in the acquaintance pairs frequently sought my assistance and interacted with me more than with their peers. The Abby Kristin pair planned out their drawings well, but because objects needed to be adjusted into certain sizes and placed in certain areas, they demanded constant and specific assistances from me. For example, in session 4, Kristin verbally instructed me to put the seashell next to the mermaid as if she is blowing the horn. This reliance disabled them from actively participating in dialogue with their peers.

Kristin's turn

Kristin put a flowerfaries background

Kristin: Where is the mermaid?

I: Animation [ Kristin put one mermaid into her picture]

Kristin→ I: Can you help me...how do you put mermaid in bed and smaller?  
 [pointed at where the bed was]  
 I: Small?  
 Kristin: Small as the bed. ..like that  
 [two mothers were talking about the rare snow that occurred the other day in the kitchen]  
 Abby: Some kids made snowmen but we didn't..that was really fun playing with snow..that was really thin....as thin as...[unrecognizable]  
 Kristin: How do you put it just like her? [ Kristin wanted me to put the unicorn as small as the mermaid]  
 I: The same size?  
 Kristin: Put the sea shell in  
 Kristin: How do you make it the same size as her?  
 I: What do you want?  
 Kristin: I want her to look like as she is blowing it [she put both of her hand around her mouth as if she is blowing something ]  
 Kristin: Yeah! Like that...  
 I: Is that ok?  
 Kristin: How do you make it so it is blowing a horn? [ the pony ]  
 Kristin: How do you take that one away?  
 I: You don't wan that any more?  
 I: You want the same one [B pointed at the seashell next to that mermaid ]  
 maybe not, we have to put it somewhere  
 Kristin put the same seashell next to the pony[the unicorn]  
 Kristin: How do you make it so she is blowing it?  
 Kristin: That went so wrong. I don't like that. I feel like I am a mash potato boy  
 Kristin: How do you get the mermaid? I want mermaid to get that chair.  
 (Feb 27 10, Abby Kristin session 4)

Similar to the previously discussed episode under the category of unengaged behaviors from the Peter Scott pair, the Abby Kristin pair did not communicate with each other directly. Both tried to have conversations with me instead. In terms of negotiation of shared understanding as defined by Crook (1994, 1995, 1998), the criteria of judging collaborative episode for the current study, Kristin did create a shared reference with the researcher, from whom Kristin constantly sought assistance. The making of Kristin's picture relied solely on individual input, and Abby did not participate at all and as a result, no negotiation of shared understanding occurred.

## **Disagreements and critiques**

Frequent disagreement and critique arose in the acquaintance pairs. In contrast, comments from the friendship pairs were constantly full of praise and compliments that encouraged their peers to continue. Although disagreements and critiques did occur among the friendship pairs, when children in the friendship pairs had different opinions they would usually voice their concerns and give concrete suggestions. For the Abby Kristin pair, the disagreements and critiques occurred frequently for the first several sessions. The following shows three examples of two acquaintance pairs, the Abby Kristin pair and the Peter Scott pair, regarding their disagreement and critique. The first example relates to the conflict over mouse control for the Abby Kristin pair. The next two examples, from the Abby Kristin pair and the Peter Scott pair, reflect their disagreement and conflict of opinions.

Abby and Kristin had an issue with mouse control. Starting from the first session, Kristin had a tendency to direct Abby about where to click. Later on, Kristin offered help to Abby by doing the task for her. Her constant request for control of the mouse caused anxiety for Abby. At the first session, Abby made a statement that she wanted to do her drawing by herself. The following occurred in session 5 where it was Abby's turn; Abby put a pirate ship in the background and started put one pirate inside.

Abby: This guy [the pirate beside the mermaid]

Kristin: But you already got//

Abby: IT'S OK..[raised her voice a little bit] I am going to put him right there...I want him that big.. ok [put the pirate in]

Kristin:[Kristin got her hand on the mouse] I can do, I can do, I can do it [Abby quickly put her hands on the mouse again from Kristin and whole body shook...Kristin pulled back]

Kristin: try it....with...the..little [unrecognizable]

Abby: I want to do a few more pirates [ wanted to put more pirates in]

Kristin: No....[ ].mermaid? [pointing]

Abby: LA....[As Kristin tried to point, Abby made certain sounds] [ Kristin then leaned back]

Kristin: Mermaids? MAAa[ certain sound]

Abby: There..now there are pirates jumping hurting her [ looked closely]

Kristin: Now we need 1.2 ...2 mermaids

Abby: I don't need 2 mermaids...that's the pirates trying to hurt mermaids..the MERMAID [ stressed the last word since only one mermaid showed up in her picture]

Kristin: I want to show you one...I want to show you one [ put her hand on the mouse]//

Abby: I am going to do one myself[ raised up her voice again and held her mouse still] [ Kristin then put her hand back]

(March 05 10, the Abby Kristin pair session 5)

The observed behaviors regarding conflict over mouse control closely match the findings of Robert, Djonov, and Torr (2008) in which boys shouted commands and battled for mouse control while playing an e-game. The following two examples illustrate that the disagreement and critique prevented both the Abby Kristin pair and the Peter Scott pair from negotiating their shared understanding. Starting from the Abby Kristin pair, the field notes in the following paragraph show that Kristin was eager to participate in the drawing process of Abby by offering suggestions and help by showing Abby what she could do with the mouse. Part of Abby's constant rejection was due to her anxiety of losing control of the mouse during her turn. This reaction also showed a certain degree of resistance to allowing Kristin to enter into her pretend frames. In another case, Abby also resisted entering into Kristin's pretend frames.

Several instances of conflict occurred in session 3 for the Abby Kristin pair. In this session, Abby made a picture, which she called scary pirates who were trying to hurt her. It was then Kristin's turn. Kristin added an ocean background and started putting two mermaids and bat stamp into the ocean background, when Abby commented, "Bats don't go in water for real" (13 Feb 10, Abby Kristin session 3). Kristin continued adding the vampire, and M continued commenting, "Lots of scary things are going to hurt the mermaid" (13 Feb 10, Abby Kristin session 3). Kristin defended herself after hearing that

comment by putting two ponies into the picture and declaring they could save the mermaid. Then Kristin asked me again where she could find a scary monster. As Kristin put one dinosaur into the picture, Abby repeated her previous comment, “Those scary things are going to hurt those princesses” (13 Feb 10, Abby Kristin session 3). Kristin defended herself again and replied, “No, they are saving it” (13 Feb 10, Abby Kristin session 3). As Kristin continued putting scary objects such as ghosts into her picture, Abby made another comment, “Those ghost are only the air.” Toward the end, Abby repeated her comment about too many scary objects for a third time. After Kristin finished her turn, Abby made another drawing where she put the mermaid in the middle between the shark, pirate, and the alligator. Within this session, most of the verbal exchange centered on their plan for the drawing, requests for my assistance regarding the location of certain objects, and occasional commentary statements from the peers. During Abby’s drawing process, Kristin did not have much input.

Even though Kristin followed the frame Abby originally proposed, that somebody might hurt the mermaid, Abby refused to enter the pretend world of mermaid as princess surrounded by too many scary objects such as a bat, dragon, or ghost. Abby then critiqued and rejected the objects by claiming a reality different from the pretend frame. This resistance prevented them from entering the same pretend frame and extending each other’s ideas like the friendship pairs did. Similar resistance was observed in the Peter Scott pair. The following dialogue contains Peter’s reaction to Scott’s picture. Scott put a space background and used the mixer tool to create some special mixing of visual effects that erased some of the space background.

Peter: What is this color? Yucky

Scott: It is space [smile on his face]

Peter: It is not space any more

Scott: Space is turning into white [zig zag lines and put all of space into white]

I: this is called what?

Peter: Light space...dark space [Scott laughed]  
Peter: That's nothing  
Scott: That's big moon  
Peter: That's not the moon...that's the moon  
Peter: This Mars..this is one of the last planet [pointing]  
Peter: Do ee... EVERYTHING white  
Scott: Mars is going to turn into something..it is a blue planet [zig zag ..turn everything in white]  
Peter: It is actually white  
(21 Dec 09, Peter Scott session 2)

The critique prevented Peter and Scott from negotiating a shared understanding within the frame (Crook, 1994, 1995, 1998). As Scott initiated a pretend frame of space and then added the color of white, Peter reacted negatively to his choice of color. Peter made a further correction by claiming that what Scott drew was not space any more after he had just proposed the space frame. When Scott pointed out that a certain planet was the moon, Peter made a counter-claim that the planet was Mars instead of the moon. Even though Peter recognized the pretend frame Scott proposed, Peter did not participate in elaborating that pretend frame. In the collaborative learning literature, critique or disagreement has been shown to provide a opportunities for collaborators to resolve differences in perspective, thereby reducing the gap and resolving conflict (Dillenbourg, 1996; Roschelle & Teasley, 1993). In the two episodes above, the disagreement and critique disabled collaboration.

#### **ASSISTIVE TEACHING MOMENTS**

Even though the two acquaintance pairs developed only a few collaborative episodes, they did have some collaborative teaching moments in which one child assisted his peer. For the Peter Scott pair, assistive teaching moments occurred randomly. These moments did not last long enough to be episodes. Among the other three pairs, these assistive teaching moments were embedded in the collaborative episode. Two examples

are presented below. One is the Peter Scott pair and involves assistance in finding a letter on the keyboard. The other example comes from the Abby Kristin pair and is related to assistance with the color of the crown for the mermaid and the technical support for taking the crown off from the Abby Kristin pair.

Example 1:

Scott put in text box and attempted to write mommy

Scott: M...I am going to write mommy

Peter: There are 2 m

Scott: I know..and y[ since he already wrote momm]

Peter: Y..y..y..y..[point at the letter y on the keyboard]

(Feb 19 10, Peter Scott session 6)

Example 2:

Kristin put a mermaid, fairy, and dragon into the underwater background and stated that the fairy and dragon were the mermaid's guards

Kristin: I am going to make a crown [ using the pencil to draw a crown for the mermaid]

Abby: I usually see the crowns are yellow

Kristin: I want a crown [picking the drawing tool of yellow color and draw the shape]

Abby: That's BIG....Oh! Oh! Oh! [bursting into laughter] you want to color it?

Kristin: How do you get the crown off?

Abby: Maybe you just click that [pointing], click the scissor I mean click the hand, hold on that, and then click the trashcan

(April 2, 2010, Abby Kristin session 7)

The exchange between Peter and Scott in the first example did not classify as a collaborative episode; the children did not go through the process of negotiating a shared understanding. Instead of both parties participating and contributing to the making of such shared understanding, their interaction showed one-way communication (Crook, 1994, 1995, 1998). Rather, one child needed assistance or initiated a question and then the other child simply provided help. Within these collaborative teaching moments, only one child provided input and made the contribution. Therefore, it was not considered a collective effort. However, this example demonstrated that even though their exchange

did not develop into a collaborative episode, their interaction was collaborative because they assisted their peers naturally in front of the computer. The second example, from the Abby Kristin pair, provides a segment of a collaborative episode. Abby had the highest technical ability among these eight children. Her choice of words for instructing her partner reflected her technical ability. She offered ideas to scaffold her peer regarding the color of the crown and provided technical support immediately after Kristin asked her a question regarding how to take the crown off. Even though her idea for technical support did not solve the problem later on, her immediate assistance encouraged Kristin, who willingly followed her instructions step by step. As discussed previously, however, Kristin usually relied on me for help.

#### **COOPERATIVE EFFORT: DIVISION OF LABOR**

Among these four pairs, cooperative effort, which occurred for the Grace Summer pair across sessions, matched the division of labor proposed by the cooperative learning literature (Cohen, 1994; Dillenbourg, 1990; D. W. Johnson & Johnson, 1991; Littleton & Hakkinen, 1999). Within the collaborative episodes, young children transformed onscreen objects to create shared references in a cooperative manner. Children created opportunities to divide responsibility so that both peers could fully participate and remain socially engaged in the drawing process.

The following example presents the first occurrence of cooperative effort during session 1 for the female friendship pair, the Grace Summer pair. Within this occurrence, the older girl, Grace, drew two girls representing her and her friend, Summer. After realizing one girl on the picture represented her, Summer started pointing at the pattern she preferred for Grace to pick, “NO...a little bit up...up...up.” After scanning through several choices under the paint bucket tool, she pointed at one particular pattern for Grace



to choose. Summer said to Grace, “ I think that one” (Dec 04 09, Grace Summer session 1).

The occurrence above shows that as Summer assigned herself the responsibility of finding the patterns of the clothes she wanted, Summer automatically involved herself by instructing Grace to check out a variety of patterns available from the software. These behaviors were considered a cooperative effort in which Grace and Summer individually completed separate portions of the task to complete the whole task. Within this episode, Grace creatively divided this responsibility in half. Grace created opportunities to share responsibility with Summer so they could work together to complete a drawing titled “friends.” Summer extended that label to “friend of love.” By Grace’s sharing responsibility with her peer, Summer, a sense of affection was created, and their collaboration became a bonding experience.

This division of labor reappeared in session 3, in which Summer assigned responsibility to Grace so that she could socially participate rather than be left out of the drawing process. The following exchange occurred at Grace’s negation point when Grace announced that she would leave and color.

Table 2: The second example of cooperative effort by the Grace Summer pair

<p>Grace wanted her turn but Summer pulled out another background and started over.  Grace: I am going to do some more coloring.[walked away from the computer]  I: Are you going to help out Summer?  Summer: Yes you can.  I→ Summer: You got to hurry up so Grace will have her turn.  Summer: I am giving her helping with me.  Summer→I : How do I go back to the ice cream?  Grace: The ice cream is at the animation.  I: I know where the ice cream is  Summer: It is amazing. Every time we do different things, it is</p>	<p>Negation</p>
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Even though Grace came back because of my request of help for Summer, Summer creatively assigned Grace the responsibility of handling the mouse. Summer handed over the mouse to Grace. Just like the provision of verbal instruction to pick out the pattern of the girl's clothes from their first episode described previously, Summer skillfully pointed at the place where she wanted to place the ice cream cone. Grace became the one who controlled the mouse and carefully listened to Summer's verbal instruction. Within this cooperative effort, Grace would pick funny places that usually made Summer laugh and redirect Grace to a different place. Summer also explained that the placement of the ice cream cone was for decorative purposes. It is noteworthy that Grace also initiated silly language, or a language game, such as "Stinky winky ice cream," in the conversation. In session 3 for the Grace Summer pair, the language game of "stinky winky" something became a routine joke for this partnership. Usually Grace initiated the game by filling in the blank for any object shown with the screen and added preceded by "stinky winky".

For the Grace Summer pair, the older girl, Grace, had an advantage in terms of language and technical ability. The previous examples demonstrate that while Summer had the capacity to perform certain technical tasks, she still assigned responsibility to her peer for the purpose of social participation. In the following transcript, Grace made her picture first, and Summer tried to imitate it. Knowing exactly what Summer wanted, as soon as Summer mentioned her incapacity to carry out what her peer wanted, Grace volunteered technical assistance without any request from Summer. Summer copied the same division of labor format discussed earlier to complete her drawings. This transcript contains two turns including both Grace and Summer.

Table 3: The third example of cooperative effort by the Grace Summer pair

<p>Grace's turn</p> <p>Grace picked the mermaid, unicorn and fairy animation into her screen. When I mentioned that she could add background, Grace decided to put one more mermaid.</p> <p>Grace: I am going to make it smaller...that small [ made the second mermaid smaller sitting on the same rock right next to the enlarged mermaid]</p> <p>I: Let's see what kind of background you like to put.</p> <p>Grace: I want to put an undersea one.</p> <p>I: Do you see the little tree there?</p> <p>I: One more! You want the big mermaid and the small mermaid?</p> <p>Summer: That's her girl? [looking at the two mermaid]</p> <p>Grace: Yeah! that's her little kid.</p> <p>Summer→I: That's her little kid [looked back to me and smiled]</p> <p>Grace then took a long time to pick the undersea background to match the mermaid, unicorn, and the fairy. Summer kept telling her to go down and see more background by pointing at the choices for Grace.</p> <p>Grace named it underwater</p> <p>Summer's turn</p> <p>Summer: Where is the mermaid? I want to do the mermaid.</p> <p>I: It is under animation. [tried to adjust the mouse]</p> <p>Grace→Summer : It is under animation, and the mermaid is right there. [pointing at the animation where Summer needed to click]</p> <p>Grace: Maybe she could...it could be like the whole page. That will be really cool!</p> <p>I: Oh!!! She is making it bigger</p> <p>Grace: I wonder if that is going to be whole page. Next time I am going to make it the whole page.</p> <p>Summer: I can't get it to be on the rock. [ she put one enlarged mermaid but couldn't make the second one exactly the same way as Grace did previously]</p> <p>Grace: I can do it. [ leaned over and grabbed the mouse]</p> <p>I: Use the grabbing tool to put it there.</p> <p>Grace→ Summer: Is that it, Summer?</p> <p>Summer: one more. Two little babies.</p> <p>I: oh! You want to have two little babies</p> <p>Grace: Make it smaller. then..again</p> <p>Summer: Drag it. [ as Grace put another mermaid into the</p>	<p>Verbalize what she would do</p> <p>Interpret peer's picture: 2. t. of role for onscreen objects</p> <p>Summer made the exact same items and picture except a mother mermaid with 2 little kids instead of 1- again Summer gave verbal instruction</p> <p>t. of role for onscreen object</p>
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picture]

Grace→ Summer: Put it....Ok! Is that what you want to be?

Summer: Yeah!

Grace: Let's see.

After that, Summer she redid the two little mermaids. While she was putting the mermaid, Grace crawled away from the computer and sat on the table then crawled back again [10 seconds] to ask Summer if she needed any help. Grace again put in mermaid and unicorn for Summer. While Grace was doing it, Summer also gave verbal instruction.

Summer name her picture the land undersea where the mermaid live with flower was done



Illustration 2: The artifact by Grace labeled underwater

Illustration 3: The artifact by Summer labeled where the mermaid live with flower was done

(Feb 01 10, Grace Summer session 3)

The transcript includes two turns. Grace started her turn first by making a picture of an underwater scene while Summer made the interpretation that the two mermaids on the rock were a mother and her child. When Summer had her turn, due to lack of hand dexterity for mouse control, Summer could not move the smaller mermaid sitting on the rock beside the big mermaid. Grace volunteered to assist. In the exact manner in which Summer had previously given Grace verbal instructions on where to put the ice cream

cone to decorate the castle, Grace and Summer followed the same division of labor of assigning responsibilities. Summer continued to give verbal instructions telling Grace the number of mermaids she needed and asked Grace to drag the mermaid up to the screen. Grace then took the same responsibility of maneuvering the mouse and confirmed with Summer as she finished the task. Whenever Summer needed assistance, Grace would provide help immediately. For example, she pointed out the button where Summer needed to click. In addition, as soon as Grace heard Summer say, "I can't get it to be on the rock," she did it for Summer. She automatically assigned herself the role of helper and instructor without a request from her partner. This demonstrated the children's willingness to provide immediate assistance while sharing the same computer with a peer, especially friends. The role assignment in which Grace maneuvered the mouse and Summer provided verbal instruction exemplifies the concept of division of labor described in the cooperative learning literature (Cohen, 1994; Dillenbourg, 1990; D. W. Johnson & Johnson, 1991; Littleton & Hakkinen, 1999).

#### **PRETEND LANGUAGE USE: ONE COMMONLY-USED COLLABORATIVE STRATEGY**

The young children in this study used one main collaborative strategy, pretend language use. Despite the small number of collaborative episodes from the acquaintance pairs, the collaborative episodes of all four pairs occurred in the form of play with pretend language use. The combination of pretend language with body expression created a common pretend frame through which the children were able to negotiate and build on each other's ideas. Garvey's (1990) framework provided categories with which to code children's pretend language use. Some of Garvey's (1990) categories were modified to fully describe the data in this study. Two new categories were created in Garvey's framework to describe the current data: transformation of action for an onscreen objects

and transformation of roles for an onscreen objects. Transformation of action for an onscreen object refers to the use of a verb to portray the action of that object. Mostly, the children used transformation of action for an onscreen object to explain to their peers what they had drawn. When children added the same character in different sizes, they assigned them relationships such as a mother-and-child relationship. Transformation of roles for onscreen objects became the code to show such an occurrence.

Certain categories occurred much more frequently than others. These frequently used categories centered on transformation of objects and transformation of action for onscreen objects because children needed to explain to their peers what they had drawn and described the action for onscreen objects in order for the peer to understand and enter the pretend frame. The two simple collaborative episodes described here are from the two acquaintance pairs and contain the two most frequently used categories, transformation of objects and transformation of action for onscreen objects. The Abby Kristin pair centered their transformations of object on hot lava related terms such as classifying hot lava with different colors.

Table 4: The Abby Kristin pair's pretend language use as their collaborative strategy

<p>#1  Kristin chose the Jurassic background  Abby: Oh! Jurassic...lava [ eye became wide open]  Kristin: This is going to be scary. [ with smile]  Abby: Lava, I am scared of this one [ Abby altered her tone of voice, lowered her upper body to the table with scared facial expression]  Kristin: I am going to put hot lava on it [turned to Abby with smile]  I: Because of lighting? Woo...  Abby: Lava...you can go to [ after Kristin started using the paint to draw lava]...got up from her chair to go closer to the screen and pointed at one choice for Kristin  Kristin: Fire...lava...this is going to be paint in there...I am</p>	<p>t. of object   t. of object + expression   planning   suggestion...</p>
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trying to get...[spread the paint all over] Abby: Oh! A volcano? [smiled] Kristin: Yep. Abby: That's a funny volcano[ smiled] Kristin: It got a whole bunch of lava [ continued to put red paint all over] Abby: You can click that to fill it [pointing at the spray can] Kristin: There you go..then I need the [ finding different color of pink] Kristin: Is that pink? [shout] Abby: Hehe Kristin & Abby: Pink lava// [overlapped talk- they talked at the same time] Abby: Hehe [burst into laughter] Kristin→Abby: The pink lava is the hottest one. They can be rainbows, but the blue one is really hot because my mommy make ...my grandma had the fire...then I am going to get blue...and it is .shhhhhh....now I am just going to need...blue...fire coming...there you go Kristin: Almost done...I just need.. Kristin→I: Do you have any human here? Kristin continued putting human and animals figure into her picture.	t. of object   t. of object  suggestions    Added descriptions of the t. of object  Categorized different colored hot lava
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Illustration 4: The artifact by Kristin to present different colors of hot lava

(March 20 10, Abby Kristin session 6)

As Kristin created the background, Abby initiated the idea of lava, and then they started negotiating a shared understanding of the hot lava pretend theme. Along with the idea of hot lava, they both cultivated an atmosphere of humor like the Matt William pair, as discussed previously. Instead of setting up a common goal of doing something funny



as the Matt William pair had, the Abby Kristin pair negotiated a shared understanding by claiming the volcano was a funny volcano and the pink hot lava was the hottest. Abby participated in this collaborative process by providing enhancement for the idea of her peer. For example, Abby, being more technically advanced, took on a greater scaffolding role by providing suggestions regarding the tool, based on Kristin's planning.

The previous two episodes showed one basic collaborative strategy of pretend language use and contained only transformation of object, in Garvey's (1990) terms. Both the Abby Kristin and the Matt William pairs started with the basic collaborative strategy in their first episode and progressed into more variety and complex forms. The next episode presented another pattern with two codes instead of one. As for the Peter Scott pair and the Grace Summer pair, their collaborative episodes did not involve this transition from single code to the combination of codes. The combination of codes appeared in their first collaborative episode and consisted of both transformation of object as well as the transformation of action for an onscreen object. Transformation of action for an onscreen object revealed the pretend play frame. It was the first collaborative episode for the Peter Scott pair. In that episode, under this basic collaborative strategy, the Peter Scott pair had their first and only episode containing both the transformation of object and transformation of actions for an onscreen object.

Table 5: The Peter Scott pair's pretend language use as their collaborative strategy

Collaborative episode Scott's turn Peter: Alligator...I want to see ..pick these ..bugs[point at the bug stamp..Scott picked that and put that into his picture]... Yikes. Ants in the fire!! They are going to move. [raised voice, jumped from the spot he was sitting and stumbled to his feet with a surprised expression because Scott put those ants on top of the fire stamp] Scott→ Peter: They are going to die [laughed while he talked	suggestion t. of object t. of action for onscreen objects with action  t. of action for onscreen objects
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back to Peter] Peter: [making a pretend scared sound and with whole body shaking ANNN Scott: WATTU [loud voice with rising tone at the end] Peter: WADU[down tone at the end almost ] [both looked at the screen]	ending—they are dead play signal x2
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Illustration 5: The artifact by Scott

(Feb 05 10, Peter Scott session 4)

Pretend language use including transformation of object and transformation of action for onscreen objects, as depicted in the first collaborative episode, served as one main collaborative strategy for the Peter Scott pair. The first collaborative episode, which showed pretend language use containing only transformation of object from the Abby Kristin pair, had a theme but the narrative had not yet been developed. Using this collaborative episode as an example, the image on the screen served as a pretend frame in which the children could imagine and interpret what those images represented. The transcript above presents a simple narrative of the theme that tied neatly with the image. For the first episode, because Scott put the ant over the fire image, Peter verbalized his interpretation of ants in the fire with body expression. Then Scott announced the pretend theme by providing an action verb. The actions of the onscreen objects provided the themes for the pretend frame. The pretend frame aided with these two language tools, and actions allowed Peter and Scott to collaborate using each other's ideas.

The description of those collaborative strategies, as listed in the tables below, depicts the evolving process of collaborative strategies throughout the observations. For

the friendship pairs, the collaborative episodes started at the first session, the tutoring session. The previous pretend theme became a shared reference for the children to add on to or revise in the next sessions. In terms of the number and variety of transformations and pretend play categories, the four tables below demonstrate a great contrast between friendship pairs and the acquaintance pairs. From the table for the Matt William pair and Grace Summer pair, the pretend themes built from the transformation, which centered only on transformation of object or action for an onscreen object and then shifted to a variety of transformations. The table shows the frequent use of transformation of object and transformation of action for onscreen objects. Session 1 and session 2 were tutoring sessions and were excluded from the quantitative data analysis as indicated by the standing of columns #1 and #2 in the table below. As more variety in these transformations occurred, their accumulation allowed the children to act out more complex pretend themes. By contrast, acquaintance pairs showed a few transformations but their pretend frames and themes were not as sophisticated as the ones established by the friendship pairs.

Table 6: Accumulated frequencies of transformations and pretend play codes from each observation for the Matt William pair: The male friendship pair

Session	#1tutoring	#2tutoring	#3	#4	#5
Transformation of object	19	15	6	1	5
Transformation of action for onscreen objects	19	15	23	3	2
Transformation of action for self	19	15	2	8	
Transformation of joint action	19	15	1		4
Transformation of other	19	15	1		

Transformation of environment			3		
Enactment talk			4		5
Negation					1
Play signal			4	3	2
Total	15	17	45	15	19

Table 7: Accumulated frequencies of transformations and pretend play codes from each observation for the Grace Summer pair: the female friendship pair

Session	#1tutoring	#2tutoring	#3	#4	#5	#6	#7
Transformation of object			2		6		14
Transformation of action for onscreen objects			9	6	3		10
Transformation of role for onscreen object			2		2		
Transformation of environment							
Negation							
Play signal				1			
Total	15	17	13	7	11		24

Table 8: Accumulated frequencies of transformations and pretend play codes from each observation for the Peter Scott pair: the male acquaintance pair

Session	#1tutoring	#2tutoring	#3	#4	#5	#6	#7
Transformation. of object				1			
Transformation				2			

of action for onscreen objects							
Play signal				2			
Total			0	5	0	0	0

Table 9: Accumulated frequencies of transformations and pretend play codes from each observation for the Abby Kristin pair: the female acquaintance pair

Session	#1tutoring	#2tutoring	#3	#4	#5	#6	#7
Transformation of object						5	1
Transformation of action for onscreen objects							4
Transformation of role for onscreen objects							4
Total			0	0	0	5	9

### **Involvement of both parties as part of a narrative under a pretend frame**

The previous section exemplified pretend language use as one commonly used collaborative process, centering on transformation of object and transformation of action for onscreen objects to build up simple narratives. It also mapped the commonality and provided an overview of pretend language use across pairs. After the narrative became more complicated, the plot centered on the explanations of different actions of onscreen objects. For example, the transformation of object allowed young children to associate certain pretend play themes with the activity, but the complexity of the narrative largely relied on the detailed actions of those characters under that theme. This section presents another layer beyond that discussed in the last section, in that several collaborative episodes revealed that the children brought two realities together. They built a link between real life and the pretend theme through their drawing. Just as children acted

during role-play in Garvey's (1990) work, some children in the current study involved themselves as part of the narrative under the pretend frame. This only occurred in the friendship pairs.

The following transcript occurred in session 3 for the female friendship pair, Grace Summer pair, which the actions of the characters and the connection with the realities including the young children made up the main plot. Even though under the pretend theme many ladies were walking to the castle, Grace's utterance "lots of lady in our town" encouraged Summer's collaborative input for negotiating the shared understanding.

Table 10: The involvement of both parties from the Grace Summer pair as part of the narrative

Summer stilled kept her castle background and picked stamp Summer: Where is that lady again? [going down] Grace: ...[unrecognizable] alligator	Language game
Grace: Alligator waligator..stinky wingky alligator [Summer laughed immediately and looked at me]	Language game
Summer: I am trying to find a girl that I had last time Grace: Stinky wingky alligator [repeated loudly several Summer: [put the lady on top of the present but unable to do so] I: let me see! Summer: Not right there! I want it on the present! Grace: I can do it! [ tried to grab the mouse] I: I don't why the computer is like that. Maybe computer has some problems. Grace: The stinky.. winky computer? [ Summer burst into laughter]	Language game
Grace: A lady in the carriage! [seeing that Summer put the lady stamp in the carriage] Grace: Oh! I bet she would be trapped out in the gate! [As Summer put the lady stamp around the gate] Grace: Trapped [ as Summer put more lady stamps on the track connecting to the gate] trapped! Maybe she can put more ladies ...like walking. Grace: [looking at the picture] Your ladies are kind of crazy!..	t. of action for onscreen objects t. of action for onscreen objects t. of action for onscreen objects  t. of object

<p>Ladies....Ok! That's really funny!</p> <p>Grace: [shouts] There are tons of ladies in our towns.</p> <p>Summer: That's because they are going to the castle. [smile]</p> <p>Grace: Oh! I got it! I know what I am making for my picture.</p> <p>Yay! [several times] with one arm in the air</p> <p>Summer: Alligator! [looking at the stamp]</p> <p>Grace: Stinky winky alligator! [Summer laughed ] Stinky stupid alligator! Stinky winky alligator! [chanted loudly]</p> <p>Grace: [Summer put lots of lady stamps on top of the fences]</p> <p>Oh! They are walking on the fence!</p> <p>Grace→Summer: Are they walking on the fence to the castle or to the present?</p> <p>Summer: They are walking the fence to the castle. [ laughed and giggled]</p> <p>Grace: They are never going to walk to the castle....</p> <p>NO...NEVER EVER EVER EVER EVER EVER</p> <p>Summer: See if I can try it now?</p> <p>Grace: I can try it.</p> <p>Summer: NO!</p> <p>Grace: OK! I get it!</p> <p>Summer: I know where to put it... up on the sky [put the lady stamp]</p> <p>Grace: May be you can put one holding on the balloon</p> <p>Summer: They are taking them to the castle so they can take them to all the girls there</p> <p>Summer named it castle of ladies</p>	<p>t. of action onscreen object</p> <p>language game</p> <p>t. of action for onscreen objects</p> <p>t. of action for onscreen objects x2</p> <p>t. of action for onscreen object</p> <p>wanted to put the lady stamp on top of the sticker</p> <p>t. of action for onscreen objects</p> <p>suggestion –t. of action for onscreen objects</p>
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Illustration 6: The artifact by Summer labeled castle of ladies

(Feb 1 10, Grace Summer session 3)

As Grace mentioned “lots of ladies in our town,” it helped Summer place herself as part of the town with the castle both in the pretend frame and in real life. This pretend

frame was established mainly through transformations of action for onscreen objects. This statement stimulated Summer to provide a rationale as to why the ladies appeared in the town. Summer responded that all of these ladies were heading to the castle. Grace continued to propose different questions for Summer such as whether the ladies walked on the fence to the castle or on the present at the gate. Grace's descriptions of Summer's pictures and her questions allowed both of them to immerse themselves in both the pretend and the real worlds of which they were a part. Grace scaffolded Summer so that Summer entered the pretend frame that she had created. The older child, Grace, directly crafted the character of the ladies and their action of walking in Summer's narrative of the pretend frame of a castle, even though it was Summer's turn.

A similar collaborative strategy involving both parties into the narrative was acted out by the other friendship pair, the Matt William pair. The Matt William pair also made connections between their drawing and their own reality. Their involvement in the pretend theme, however, was not limited to interplay between that frame and reality. Rather, both Matt and William had parts to play in the narrative and both of them acted out their roles as though they were doing a role-play. The following excerpt depicts them as the main characters of their narrative.

Table 11: The involvement of both parties from the Matt William pair as part of the narrative

<p>Matt's turn</p> <p>Matt started asking me where he can find anything related to sports. I looked under sticker to look for any sported related pictures for J. After I put several pictures up. Matt pulled up the background of Antarctica.</p> <p>Matt: there is snow in the ocean and ice so you can't go on the jet ski. Aawww!!! I am stuck !!! Somebody help me!!! ( using different pitch voice and longer sound looking at William)— both laugh</p>	<p>Describe an imaginary or pretend theme of troubled events</p> <p>Matt t. of environment with a simple story plot + enactment talk + play signal</p> <p>Enactment talk</p>
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<p>William: [smile] A!!!!I am going to run into Matt's trophy!! [use the same pitch--both laughed at picture of trophy next to the jet sky]</p> <p>Matt: Y..[continue laughing] she is going to eat me—[continue the same pitch]</p> <p>William: I am going to run into something [unrecognizable] to death...[continue the same pitch]</p>	<p>+play signal</p> <p>Enactment talk +play signal</p> <p>Enactment talk+ play signal</p>
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Illustration 7: The artifact by J labeled my name is number-one-no-browncrap-nobody knows –my-name-crap

(Dec 23 09, DJ session 2)

The above excerpt shows that Matt and William mainly used enactment talk and the play signal of using a certain pitch of voice to collaborate within the common pretend frame. Matt and William acted out the roles of the two athletes who appeared in the drawing. When it was Matt's turn to draw he initiated the pretend frame by describing a pretend situation in which he got stuck in the ocean and could not get into the jet ski. Matt proposed the pretend frame starting with the background he had drawn and then created events. He actually created two events. In the first event, he got stuck in the ocean and could not get into jet sky. When Matt pointed out which character he had adopted, William adopted the other character with the skateboard. He also proposed the common frame of a problem event, stating that he needed help because he would run into Matt's trophy. Running into Matt's trophy allowed William to make a connection with the common pretend frame proposed by Matt. Matt then created a second problem event in

which somebody was trying to eat him. After that Matt made a slight change in the pretend frame by switching from calling for help to enacting a fatal situation; William caught on to the switch and altered his narrative accordingly. With the simple play signal of using a certain pitch, Matt and William demonstrated their quick adaptation of shifting from one to another related frame to create a plot. Within this collaborative process, Matt successfully created a common pretend frame at the start to involve both parties as part of the narrative. Matt filled the scaffolding role throughout the process. William chose to be more of a follower and supporter. While William proposed his own narrative, his problem event was largely influenced by Matt's previous event under the common pretend frame that William had proposed.

Although children used a variety of these six transformations to involve themselves as part of the narrative, certain transcripts showed the children actually acting out their narrative accordingly. The next two collaborative episodes demonstrate that the Matt William pair specifically pointed out their joint actions within the narrative without role-playing a character. They also participated in the same pretend acts as children would do in pretend play. Some episodes involved the use of pronouns such as "We" or "Us," representing their unspoken consensus. The following excerpt shows an example of involving both parties with the use of pronoun. The action first appeared in the drawing, which laid a foundation for the idea to extend into their collaborative real-life play. The first excerpt took place when Matt mixed up the whole background with the pencil tool and then applied mixing tool.

Table 12: The involvement of both parties as part of the narrative from the Matt William pair with the collaborative action

Matt started a new picture and picked a Halloween background...( Wow....-both of them) William: That looks like a ghost	t. of object
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<p>Matt started using pencil and zig zag all over the place</p> <p>William: Green all over the place?</p> <p>Matt: Yes! I make the whole picture green and mix it up with the little mixer and see what that does 23:24</p> <p>William: What? [ with surprising sound turning his hand and both of them smile] maybe it mix up the bat</p> <p>Matt: It mixes up everything and the whole world</p> <p>William: Us, too?</p> <p>Matt: Yes...I am going to get mixed [ with different pitch and smile]</p> <p>Matt &amp; William: NOOOOO [ William closed his eyes and then opened up to look at Matt]</p>	<p>tell peer ahead of time what he is going to do</p> <p>bat-t. action of onscreen objects t. of environment t. of joint action t. of action for self +play signal Enactment talk Action+ play signal</p>
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Illustration 8: The artifact by Matt starting from the Halloween background to the last picture representing the idea that everything got mixed up in the whole world including Matt and William

(Dec 31 09, Matt William session 3)

The idea of shouting "No!" as a collaborative action developed gradually. The origin of their collaborative action was a mixed-up drawing of the whole world. Then their decision to be part of the world prepared them for their collaborative action. The excerpt above reveals that at the beginning the children were just mixing up the drawing. William proposed the idea of mixing up the bat and mixing up the whole world. Then William asked Matt, "Us, too?" This question immediately involved both parties as part of the narrative under the common pretend frame of mixing up the whole world. Both of them immersed themselves in the action of getting mixed. As soon as Matt introduced the idea that they would get mixed, William then shouted out as if he had gotten mixed and Matt joined in. When they shouted "no" together their collaborative action began.

Within this collaborative episode, while J still took the scaffolding role for Matt, Matt's use of pronouns as a question was the catalyst for their collaborative action. While following the same pretend frame proposed by Matt, William started to take more initiative and slowly took on a role similar to Matt's scaffolding role. In terms of collaborative action, it is noteworthy to consider the close link between the collaborative actions in session 3 and the pretend theme initially presented in session 1. The majority of verbally proposed collaborative actions in the narrative for the Matt William pair related to burning to death or dying. The initial hot lava pretend theme in session 1 had a long lasting impact for the Matt and William pair. Their actions related to the hot lava theme were all associated with burning, dying, or burning to death. The following excerpt shows that both Matt and William pretended to get burned.

Table 13: The involvement of both parties as part of the narrative from the Matt William pair with another collaborative action

<p>Matt put one background and put lighting stamp and later on use paint bucket and pick one pattern which they call it fire and started putting lighting stamps all over</p> <p>Matt: That even hurt</p> <p>William: Yeah!...they will say My Gosh and die!!</p> <p>Matt: Oh!! Fish fish fish..AH!!![shout] Ouchwee!!! Ouch!! Oh! BUUZBA WEE ..I KNWNAA that now[ Shout with high pitch voice...as if he was fish crying for help and pretending to be burned]</p> <p>William: Help!! I am a baby...change my diaper [both laughed and smile]</p> <p>Matt: [put one of his finger the screen of fire pattern and quickly removed his finger from the screen leaving both of his arm in the air then shout then use another hand to cover] AOOOH!!!</p> <p>William: [do the same action touching the screen as if something burned his finger and shake his head] Ouch! Ouch!!! Ouch!!! bumps!!! Again[ with sound]</p>	<p>t. of action for onscreen objects</p> <p>Play signal//Enactment talk</p> <p>Enactment talk</p> <p>t. of object//Enactment +action</p> <p>t. of object//Enactment +action</p>
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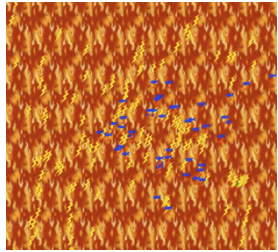


Illustration 9: The artifact by Matt representing the idea of fishes getting burned by fire

(Jan 12 10, Matt William session 5)

At the beginning of the excerpt, Matt started the pretend frame by commenting on the pain from the fires. William elaborated by stating what fishes would say and commenting that they would die. Then Matt's high-pitched voice sent a clear signal that he was acting as a dying fish that got burned. Then William, instead of crying like a dying fish, transformed himself into a baby crying out for help. William pretended to be a baby crying for a diaper change. When Matt touched the screen with his finger and quickly jumped back pretending his fingers were burned and shouted, "AOOOH!" J had basically transformed the object fire on the screen into a pretend reality and burned his finger by touching the screen. Matt's interaction incorporated him into the scene under the pretend frame they created. After that, William joined in this action of touching the screen and pretending to get burned. As this negotiation of shared understanding was established by William's joint action, these pretend acts turned into collaborative actions. Again Matt took a scaffolding role involving William as part of the narrative of the pretend frame from the beginning. William also made considerable input by adding onto Matt's comments. While William seemed to get off track a little by switching from a fish to a baby, Matt quickly signaled with his physical burning actions for William to enter back into the previous shared pretend frame they had both begun. William, again, picked

up the follower and support role rapidly by acting out the same action in an exaggerated manner with sound effects.

The above discussion describes pretend language use as one of the basic collaborative strategies, and it is categorized by various patterns. At the beginning stage, one pattern began strictly with the transformation of object. Another pattern started with a combination of transformation of object and transformation of actions for onscreen objects. Then the patterns became more complicated. While children utilized pretend language as a collaborative strategy, the involvement of both parties as part of the narrative under the pretend frame was one sub-category that represented a more complicated collaborative strategy used by friendship pairs in general, and in this case used by the Grace Summer pair and the Matt William pairs. They created a mixed reality connected with the pretend frame on the screen to enter into collaboration. The Matt William pair even had collaborative actions that continued through different sessions and were coherent with the pretend frame adopted in the first session.

#### **COHERENCE AND ELABORATION OF PREVIOUS PRETEND FRAMES: REPETITIVE AND ELABORATIVE LANGUAGE FOR THE GRACE SUMMER PAIR**

This section presents a more advanced level of collaborative strategy than the commonly used ones reported above. This strategy, which occurred only in the friendship pairs, demonstrated coherence and elaboration of pretend frames. The coherence and elaboration of pretend frames arose when pretend frames across sessions linked with each other as a series of pretend frames. These series of pretend frames were characterized with repetitive and elaborative language use. Consistent with findings of previous studies including Fisher (1993), Johnstone (2008), and other studies (Kumpulainen, 1996; Vass, et al., 2008b), the repetitive and elaborative nature of language use occurred in the current study when the children, who had a shared play history, participated in

collaborative tasks over time. The coherence of the pretend play frame was grounded in and evolved from the simple pretend language use but further complicated the simple pretend language collaborative strategies. As one party initiated a pretend frame, the other created a similar pretend frame in turn to add more details to the pretend frame previously created by their peers. At the beginning session, children of both friendship pairs adopted their peer's pretend frame and revised or enriched it. In the Grace Summer pair, Grace was a year and a half older than Summer. Grace was developmentally much more advanced than Summer. Grace had a greater influence on Summer's drawing process than vice versa. Grace scaffolded Summer by guiding and assisting her throughout her drawing processes. The Grace Summer pair had more episodes showing coherence of the pretend frame, while the Matt William pair showed both coherence and elaboration of the pretend frame. Matt and William were around the same age and seemed to take turns scaffolding each other. Therefore, Matt might take the leading role at the beginning to start a creative idea while William picked up in the middle and Matt ended up becoming the follower.

The coherence and elaboration of pretend frames originated from the tutoring session, session 1. The two instances described below are taken from the Grace Summer pair from the tutoring session, in which they had just started exploring and learning the software. Even though these instances occurred in the tutoring session and therefore did not count as the collaborative episodes, the two drawing processes became the starting point of one common frame as the result of the negotiation of shared understanding.

It was Grace's turn and while learning about the different stamps, Grace initiated a pretend frame by making a narrative for each object she added, and provided a detailed description of how the objects related to each other. For example, at the beginning while she added the stamps of fairies, rainbow, trees, and flowers, she declared, "The fairies

are making the rainbow. Rainbow here is another one. Inside the rainbow, there are some trees underneath. This is going to be flower growing on top.” Then she concluded, “This is going to be magic.” As she added more stamps such as butterflies and bunnies, she started giggling and said, “I am so excited!” As I asked Grace to label her picture, she responded assertively and immediately and provide the reasoning for the name, “ The forest of magic. ‘Cause the bunnies...they made their own rules. These trees....they are blue....they are magic trees. There is magic.” As Grace finished her turn, Summer began her turn. Summer picked the same stamps that Grace had chosen before and gave them similar labels, “Every one of these is fairy’s magic.” When Summer added different stamps to her picture, Grace continuously offered suggestions as well as praises. For example, Grace made comments such as “ My goodness,” “So pretty,” or “This is going to be a cool picture” to express her thought about Summer’s picture. In terms of suggestions, Grace asked Summer, “Are you going to try the rainbow?” She would then offer assistance by instructing Summer on every step of where to find the rainbow stamp: “Go down...there it is....right there....so pretty.” Even towards the end when I asked Summer to label her picture, Grace offered one possible label for her. Summer looked at Grace with a smile, and then started putting different words together: “Fairies have magic ....fairies are magic...the fairy’s magic is very pretty. The fairy’s magic is pretty. That’s what it is going to be called.”



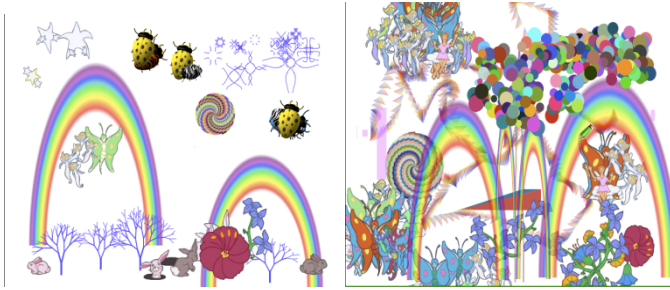


Illustration 10: The artifact by Grace labeled the forest of magic

Illustration 11: The artifact by Summer labeled the fairy's magic is pretty

(Dec 04 09, Grace and Summer session 1 tutoring)

At the beginning, Grace generated her pretend frame from all the objects she had added to the screen. Her pretend frame consisted of a narrative she invented using some of the objects including fairies, trees, butterflies, and bunnies. Grace announced her pretend frame as the forest of magic at the end as she finished her detailed description of their magic powers and their connections with each other. The coherence of the pretend frame related to magic built a foundation for Grace and Summer. Grace's magic narrative made a major contribution to Summer's picture. Following the pretend frame Grace had created, Summer chose almost identical objects to form her picture. Throughout the process, Grace initiated conversation and acted as a more competent other who was scaffolding Summer. Grace took the initiative to lead the conversation by providing ideas, suggestions, and assistance. Summer seemed willingly to accept every suggestion that Grace proposed. As Grace proposed the name at the end, "magic of fairies," for Summer's picture, Summer continued to elaborate Grace's idea but revised her suggestion by incorporating her own idea. Then the phrase, "magic of fairies," was extended to a sentence.

The next two episodes provide additional examples of coherence of the pretend frame across sessions. One of the two episodes has been discussed above to exemplify

the cooperative effort, and was selected again here to illustrate the coherence and elaboration of previous pretend frames within the same session and across sessions. The episode below demonstrates that Summer continued the pretend frame that Grace had already established within the same session. This frame of underwater mermaid family emerged when Grace placed an enlarged mermaid on the screen and added one next to her but changed her into a smaller size. Summer drew the connection between these two mermaids by bestowing them with a mother-and-daughter relationship. In Summer's turn, Summer followed the exact theme by creating the same mermaid family with one mother and two baby mermaids. The second episode shows the coherence of magic as well as the mermaid pretend frame that later resulted in the magical mermaid family pretend frame.

Table 14: Coherence of the previous mermaid pretend frames from the Grace Summer pair

<p>Grace's turn</p> <p>Grace picked the mermaid, unicorn, and fairy animation into her screen. When I mentioned that she could add background, Grace decided to put one more mermaid.</p> <p>Grace: I am going to make it smaller...that small [ made the second mermaid smaller sitting on the same rock right next to the enlarged mermaid]</p> <p>I: Let's see what kind of background you like to put.</p> <p>Grace: I want to put an undersea one.</p> <p>I: Do you see the little tree there?</p> <p>I: One more! You want the big mermaid and the small mermaid?</p> <p>Summer: That's her girl? [looking at the two mermaid]</p> <p>Grace: Yeah! That's her little kid.</p> <p>Summer→I: That's her little kid [looked back to me and smiled]</p> <p>Grace then took a long time to pick the undersea background to match the mermaid, unicorn and the fairy. Summer kept telling her to go down and see more background by pointing at the choices for Grace.</p> <p>Grace named it underwater</p>	<p>Verbalize what she would do</p>       <p>Interpret peer's picture: 2. t. of role for onscreen objects</p>
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<p>Summer's turn</p> <p>Summer: Where is the mermaid? I want to do the mermaid.</p> <p>I: It is under animation. [tried to adjust the mouse]</p> <p>Grace→Summer : It is under animation and the mermaid is right there. [pointing at the animation where Summer needed to click]</p> <p>Grace: Maybe she could...it could be like the whole page. That will be really cool!</p> <p>I: Oh!!! She is making it bigger</p> <p>Grace: I wonder if that is going to be whole page. Next time I am going to make it the whole page.</p> <p>Summer: I can't get it to be on the rock. [ she put one enlarged mermaid but couldn't make the second one exactly the same way as Grace did previously]</p> <p>Grace: I can do it. [ leaned over and grabbed the mouse]</p> <p>I: Use the grabbing tool to put it there.</p> <p>Grace→ Summer: Is that it, Summer?</p> <p>Summer: one more. Two little babies.</p> <p>I: oh! You want to have two little babies</p> <p>Grace: Make it smaller. then..again</p> <p>Summer: Drag it. [ as Grace put another mermaid into the picture]</p> <p>Grace→ Summer: Put it....Ok! Is that what you want to be?</p> <p>Summer: Yeah!</p> <p>Grace: Let's see.</p> <p>After that, Summer she redid the two little mermaids. While she was putting the mermaid, Grace crawled away from the computer and sat on the table then crawled back again [10 seconds] to ask Summer if she need any help. Grace put in again mermaid and unicorn for Summer. While Grace was doing it, Summer also gave verbal instruction.</p> <p>Summer name her picture the land undersea where the mermaid live with flower was done</p>	<p>Summer made the exact same items and picture except a mother mermaid with 2 little kids instead of 1- again Summer gave verbal instruction</p> <p>t. of role for onscreen object</p>
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Illustration 12: The artifact by Grace labeled underwater

Illustration 13: The artifact by Summer labeled the land undersea where the mermaid live with flower was done

(Feb 01 10, Grace Summer session 3)

<p>#2Grace's turn[ At the beginning of Grace's turn-Summer mentioned that : My legs are hurting I am going to do some exercise...and then come back quickly after she discovered that Grace enlarged the mermaid]</p> <p>Grace put several mermaids[ one of them was bigger than the rest of them] in and then put some sparkles all over with the ocean floor background</p> <p>Summer: She looks like she is floating</p> <p>A: This is the mom..she just had....how many kids? She just has 6 kids</p> <p>Summer: 6.. but there are 7 mermaids cause I am counting[counting]</p> <p>Grace: She had 6 kids</p> <p>Summer: I know</p> <p>Grace: This is the magic octopus switch that tell them the mean witch is coming [ put one colorful circle beside each mermaid]</p> <p>I: That's the octopus switch?..What does the octopus do?</p> <p>Grace: It catches the big mermaids</p> <p>I: catch the big mermaids?</p> <p>Grace: This one has that.. this one has this...she has one</p> <p>I: So everybody has one</p> <p>Summer: This one and this one...[point]</p> <p>Grace: It is hers...</p> <p>Summer: This one didn't get [pointing]</p> <p>Grace→ Summer: Which one didn't I give?</p> <p>Summer: This one..</p> <p>Summer: This sparkle is making me dizzy...round and round</p>	<p>A shared reference: one mom with 6 kids- selecting 2 items for the mother and 6 kids</p> <p>t. of action for onscreen object 2. t. of role for onscreen object [relationship]</p> <p>t. of object</p> <p>t. of action for onscreen object</p> <p>Paying attention to details</p>
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<p>and round</p> <p>I: Oh! This is going to be the last picture</p> <p>Grace: We both got to do one</p> <p>Summer: They are slinking [ Grace put some colorful lines on each mermaid]</p> <p>Summer: I need to do some exercise my legs hurt still</p> <p>Grace: She has a little rainbow[ she put a rainbow for one of the mermaid]</p> <p>I: Cool</p> <p>Summer:[came back] Oh! My goodness..that looks pretty.</p> <p>Summer: Do you want me to stop it for you?[attempted to grab the mouse]</p> <p>Grace: No</p> <p>Grace: All of them have something except this one, the one has the rainbow...she has bubbles</p> <p>Summer: How about this for this girl...this for this girl..this for this girl..this for this girl...this for this girl [point at one mermaid and what things they can go along with]</p> <p>Grace: I got an idea..you get a tree..you get this [she add one different item for each mermaid]..you get this..this is just like</p> <p>Summer: To see if the witch is coming?</p> <p>Grace: It is a mirror that somebody drop</p> <p>Grace: She has this flower....</p> <p>Summer: She doesn't have the flower [point at one particular mermaid]</p> <p>Grace: Oh! Yeah! She doesn't</p> <p>I: How are you going to call your picture?</p> <p>Grace: The magical mermaids</p> <p>I: Oh! The magical mermaids</p> <p>Summer: I like that</p> <p>Summer: I like that..but everytime you laugh at me from doing names..they not funny I just haven't think ..Grace..I Like that when you call every time you laugh at me for doing my name...it is not...I just haven't figure out what names</p> <p>Grace: ...[unrecognizable] Cause I just like the good names</p> <p>Grace: This mermaid is name Eden, that one is Isabel, that one Alicia, that one is Ayla, that one is Talia, and that one is</p> <p>I: Grace is thinking</p> <p>Summer: Do you want me to think of a name for you?</p> <p>Grace: sure</p> <p>I: Sure</p> <p>Summer: Alidia?</p> <p>Grace: OK...and the mom's name is Jenifer..No..that's Jennifer</p>	<p>t. of object</p> <p>encouragement</p> <p>Paying attention for each one</p> <p>2. t. of object</p> <p>Praise</p> <p>Express their feeling</p>
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Summer: Ok..this one is Alidia [smile]	
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Illustration 14: The artifact by Grace

(Feb 15 10, Grace Summer session 5)

The two transcripts above reveal that Summer initiated the idea in Grace's turn and that Summer's pretend theme followed their previous choice of theme. The narrative of this pretend frame in this episode embedded major aspects from the previous pretend themes. For example, the magic theme from the first session was expanded with further details. Each mermaid possessed one magical item such as a rainbow, bubble, or mirror, and these were used for different functions. The theme of a mother and child mermaid from session 3 reappeared and also expanded in number. In other words, the shared references to the mermaid family and magic demonstrated coherence. While Grace was assigning one magical item to each mermaid, Summer was watching to ensure that Grace was giving one to each mermaid. For example, Summer reminded Grace that one mermaid did not have the flower and told Grace to add that.

The narrative of this magical mermaid pretend frame was coherent with previous pretend frames and became more elaborated. However, the girls did not introduce a variety of new ideas to develop a more complex structure of narrative as compared to the narrative in session 1 when Grace had taken the same role of leading their conversation. Grace seemed to lose consistency in her own narrative, making it difficult for Summer to

follow. For example, at the beginning of the transcript Grace claimed that the power of the magic octopus switch was to tell the mermaid that the mean witch was coming. When I asked about it again, Grace gave me a different answer. Then when Grace explained the function of the same magic switch one more time, it became a mirror that somebody dropped. This inconsistency made it difficult for the peers to build on their previous dialogue. Their discussion centered on clarification of the details rather than the narrative.

#### **COHERENCE AND ELABORATION OF PREVIOUS PRETEND FRAMES: REPETITIVE AND ELABORATIVE LANGUAGE FOR THE MATT WILLIAM PAIR**

##### **1) Pretend language use: Identification of the hot lava pretend frame**

The pretend frames displayed by the friendship pairs were coherent. The previous section presented the coherence and elaboration of the previous pretend frames created by the Grace Summer pair. Similar to the Grace Summer pair, the Matt William pair's pretend frames across sessions were closely linked and the later frames were extensions of previous ones. The pretense that originated in session 1 when they received tutoring is included in the discussion, while not counted as a collaborative episode, did become the origin of the pretend frames that was subsequently expanded upon and that developed into collaborative episodes in later sessions. In other words, even though the hot lava concept was excluded from the quantitative data analysis, the qualitative data provided the basis for a narrative used for advanced stage of collaboration. Not only were the pretend frames coherent and elaborated but also the Matt William pair eventually launched two action games from the pretend frame. The Matt William pair's collaborative strategies followed a progression: 1) pretend language use: identification of themes for the pretend frame; 2) coherence and elaboration of the pretend frames: repetitive and elaborative narrative; and 3) evolution of the pretend frames: the action

game. Starting from session one, a shared reference originated with the hot lava. Then the accumulation of mutual understanding based on shared references began to build from hot lava as Matt and William added related ideas with different narratives. In other words, the pretend frame originated with hot lava and then several additional pretend frames evolved in the following sessions such as fire, burning, and death. The repetitive and elaborative language used illustrates coherence and evolution of the pretend frames.

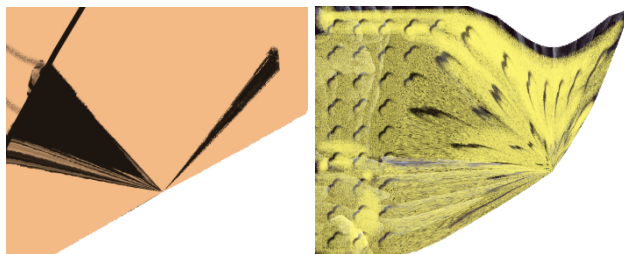


Illustration 15: The artifact by Matt originally presented as hot lava

Illustration 16: The artifact by William to represent hot lava

(Dec 17 09, Matt William session 1 tutoring)

In session 1, while the boys were receiving tutoring, Matt used the mixing tool to create a picture. Then he said, “Now it got hot lava”. He accompanied his words with actions by blowing toward the onscreen “lava” image. Afterward, he declared again, “That’s like hot lava. Do you want to do that?” Matt looked at him with a smile and replied, “Just watch mine.” Then Matt started labeling the onscreen picture with different combinations of words that caused them to giggle such as “babypoopy,” and “babypoopybug.” William called it diaper and explained to me, “There is poop in there.” Then Matt said to William, “ All of us are going to do something funny. You, too. Are you going to do something funny?” William immediately replied, “Oh! Yeah!” Then



when it was his turn, William chose the same mixing tool and made a rather similar picture to the picture Matt had previously created. While William was making his picture, Matt commented, “Oh! Yes! Make a hot lava for it. Mix it. Mix it first. That hot lava. That’s what I am talking about! Yep! Right there. Right there.” Afterward, William labeled his picture “baby hot lava.” As soon as Matt heard the name, he leaned over to William and whispered, “I am going to call it, be stink.” Both of them then burst into laughter.

Based on their verbal and non-verbal exchange that had occurred in session 1, as soon as Matt used pretend language, “That’s like hot lava,” to label his picture with a blowing action, he began negotiating the shared understanding. As William also proposed a different label such as diaper, they negotiated their shared understanding of babypoopybug, then to babypoopy. When he established the pretend frame, he directly asked William to enter the same frame by asking, “Do you want to do that?” William’s reply of “Just watch mine” confirmed that invitation. Matt made another explicit confirmation by claiming two of them were going to do something funny. After Matt set this common goal, he confirmed this goal with William again. These confirmations set the firm foundation for their later collaboration because much of their further collaborative episodes centered on the hot lava related topic.

In terms of the role Matt and William played in this process, both Matt and William took turns filling the scaffolding role. At the beginning, William followed Matt’s lead and participated actively in that pretend. Matt first used pretend language use as well as a blowing action to start the pretend frame of hot lava. Then William followed Matt’s lead and started his own pretending by claiming his own interpretation of the drawing as a diaper. That scaffolded Matt to take the spin and make up a lot of funny words.

Consequently, Matt's proposal of both of them doing something funny showed that Matt took on the scaffolding role and William followed Matt's lead again.

The combination of using pretend language and explicit confirmation of a goal to establish an imaginary world demonstrated the children's capability of spontaneously setting up their own goals even though they were not given any specific task to complete. Because of this creative effort, they unintentionally made their computer experience a playful and collaborative experience. While the current study did not provide a well-defined goal for the children's drawings, children's specified self proposal of common goal was unexpected. This common goal seems to fit with the key component of cooperative play theorized by Parten (1932). This unexpected result showed that the children's spontaneous self-initiated goal of doing something funny did provide sparkle and excitement to their collaborative experience. Parten defines children's cooperative play behavior commonly shown at ages four to six as marked by the presence of a common goal.

Matt established the hot lava pretend frame and invited William to follow that frame at the end of his turn. Similar to the Grace Sumer pair, William followed Matt's pretend themes by making almost identical pictures. As Matt made the comment, "Oh! Yes...make a hot lava for it," he basically spoke for William. It is evident that at the beginning stage, the Grace Summer pair and the Matt William pair had a lot in common in terms of the roles the children played. At the beginning of their interaction, both Grace and Matt initiated ideas. Then they powerfully influenced their peers to follow their lead. Before William made any interpretation for his drawing, Matt acted as a tutor instructing William with praise to use the mixer and claiming that William's picture was hot lava. William seemed readily to accept the name Matt proposed and combined the two ideas of baby and hot lava from the previous episode to name his picture. Based on that name,

Matt thought of another funny name for the picture, “be stink,” which made both of them laughed again. Matt passed that to William through a whisper, which turned into laughter. The Matt William pair not only followed the previous pretend frame, but they had an additional purpose. As previously discussed under the pretend language use section, they also had a specific common goal of making their experience as fun as they possibly could. All the pretend frame narratives of the successive collaborative episodes originated from this first session.

## **2) The coherence and elaboration of the pretend frame: Hot lava embedded narratives**

In session 2 while the two boys were receiving tutoring, Matt started associating fire with hot lava. The coherence of this simple pretend frame in the very first session enabled Matt and William to add more complexity in later sessions. The following description presents a pretend frame that differs lightly from that of session 1; this theme is related to fire and putting different animals in the fire.

In session 2, Matt explored the pain bucket tool and filled part of the screen with a pattern. He shouted, “Fire!” Then he chose the color black to fill up the whole screen with darkness. Matt commented, “That’s awesome. That’s like you already in camp.” He then labeled his picture fire-hunt-no-beans-in-the-fire, which caused both of them burst into laughter. It then became William’s turn. Before William even began, Matt turned to William and asked, “What are you going to do for fire?” William picked the pattern of fire, enlarged it exactly as Matt had previously done, and then picked the animation of flamingo. Matt immediately shouted, “Put flamingo in the fire! Die! Die!” Matt stressed the word “Die!” and that made both of them laugh while looking at the animation at the screen. Then William began putting birds in the fire. Matt continued commenting, “Put the bird in fire. Those are the baby ones. Fire the babies.” Then William started enacting

the movement as if he was one of the baby birds on fire, “Ouch!” As William changed the background, Matt commented again, “Fire the ocean. Yeah!” Then William labeled his picture bean-head-food-fire.

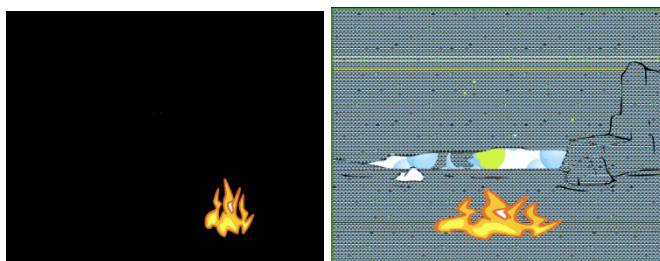


Illustration 17: The artifact by Matt to represent fire

Illustration 18: The artifact by William to represent fire

(Dec 23 09, Matt William session 2 tutoring)

Two new ideas in session two demonstrated both the coherence and the elaboration of the original shared reference to hot lava. Based on my analysis of the occurrence above, the idea of hot lava from session one was coherent with another associated idea, fire. Additionally, putting something in the fire was an elaboration of the original hot lava pretend frame. Matt proposed a question, “What are you going to do for fire?” This question demonstrates that Matt expected William to continue his pretend frame. William accepted Matt’s proposal by putting objects like flamingos, and birds into the fire. The action then turned into “firing the ocean,” in Matt’s words.

In Matt’s turn, he associated his images with a camp fire. In William’s turn, he extended the previous idea of fire. Later on, Matt’s started using verb such as “ Die” or fire to describe the state of those objects. While Matt initiated the pretend frame, William in session 2 started to have his own ideas. For example, the enactment talk of “Ouch” created a sound effect for the pretend frame of a bird in the fire. Garvey’s (1990)

language tools served to categorize the types of language used in collaborative strategies and to mark the consistencies and changes over time. However, Garvey's language tools couldn't explain the role each child played in the process of expanding their collaboration. Vygotsky's (1978) theoretical framework helps to illuminate the role each individual took in the collaborative process and explains changes or growth. In the above episode Matt still played a major scaffolding role for William. As Matt proposed the frame and used certain action verbs, William followed the frame and repeated the same action verbs to describe his picture.

In session 3, the themes moved in different directions. Session 3 contains episodes related to the theme of pirates, hot lava, and vampires. The last theme of a vampire spreading poop evolved into an action game. Regardless of the different pretend themes Matt and William established, these episodes revealed the continuity of repetitive and elaborative language use from the theme of hot lava, including the action verbs of burning or dying. When the pirate theme was introduced in session 3, the idea of burning was elaborated in rich detail. In addition, at the beginning of session 3, the lost key in the ocean outside of the pirate ship was interpreted as the lost key in the hot lava. This interpretation drew a connection between the hot lava and pirate ship themes. The two episodes presented below show the process of building up the connection between hot lava and the pirate ship.

Table 15: The coherence and elaboration of previous hot lava pretend frames

14:07-17:01#1 William chose the pirate ship background again and then use paint brush to one corner of the ship and paint one spot orange, William: This is blood [use orange/red paint and draw a lump on edge of the pirate ship] I→William: “ Those are blood? I see I→William: [ as he put the key stamp into the background] Oh!	t. of object
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<p>The key is gone  William→I: Yes.. in the lava  I→William[point at the ocean]: That's hot lava?  William: Yeah! hot boiling lava...[unrecognizable].I didn't get to draw them..the pirate  I: Do you know where the pirates are?  Matt: You going to draw one...  I: Those are the pirates..That's cool  J→William: You have to make the sword!!! [After looking at William's pirate figure] [William follow his suggestion and added a sword ]  William named his picture  hotlavaonthesailpirateaboradswordwheelsof treasure</p>	<p>t. of object</p> <p>Accept the theme of pirate as the common theme and elaborate it  Name: Build upon the shared reference of hot lava</p>
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<p>Matt's turn 18:52-21:00#2  Matt picked the same background, pirate ship and chose stamp as well  William: Maybe you can be a pirate and you put the key on the treasure chest.( check spelling) J did what D suggested  Matt: [as he put tree stamp] There is tree on it  I: There is tree on the pirate ship...all over the place? [both of them laugh]  William→J: Are you going to call it pirate ship tree all over the place?  William: Truck all over the place now? [as J put truck stamp all over]  Matt: Now how about Dice like they are playing games? [then put dice stamp all over the places]  Matt accidently clicked the undo guys ( Oh! man)...they both burst into laughter  William: Those are out of spaces thing[ looking at some stamps]  Matt: The suns are all over..[ picking the sun stamp and put those all over again]  William: Oh! Yeah! It is burning hot..AAAH!!! It is hot!!!  AAAH! ( boomp!!! making different sound) It is burning my feet!! Oow!! OW!! owh!!! How about you draw the pirates under the sun burning their feet?  Matt: Now I am going to put TV all over the place  William: This will be really funny  Matt: I am going to the....and cut the things down [Matt went to grabbing tool and cut a big piece out]</p>	<p>Follow D's private theme</p> <p>t. of other  t. of action</p> <p>t. of object  t. of environment</p> <p>t. of action of onscreen objects</p> <p>t. of object</p> <p>t. of environment  Enactment talk  t. of suggested action for onscreen objects</p> <p>Encouragement</p>
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William: [with smile] That's awesome He end up using the mixer to mix everything up	
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Illustration 19: The artifact by William to represent the pirate ship in the ocean of hot lava

Illustration 20: The artifact by Matt to represent the various activities on the pirate ship under many suns

(Dec 31 09, Matt William session 3)

The excerpt above shows that the theme of fire in session 2 had evolved into the pirate theme. Nevertheless, William's narrative reflected the coherence of the hot lava pretend frame from the first session. The lost key in the hot boiling lava was embedded as a part of the main pirate theme. In order to stress that theme, William proposed drawing another pirate. Then Matt elaborated on that idea by adding a sword. In Matt's turn, the burning feet of the pirates from resulting from the many suns above the pirate ship demonstrated the elaboration of the hot lava pretend frame. It became a routine that they would spread the same stamp or item all over the screen. These items went from trees, trucks, dice, suns, and TVs. As the children put in different items, these items enhanced the narrative. In other words, the narrative incorporated those items into the pirate ship and the actions of the pirates. For example, dice related to the action of playing games, and the sun related to the action of burning their feet.

In terms of the roles Matt and William played in the above collaborative episode, unlike the previous set roles that Matt usually played, Matt and William this time took

turns in the scaffolding role. While William established the pirate frame, Matt's suggestion of holding a sword encouraged William to make the pirate frame more compelling. In Matt's narrative, William took much more initiative verbalizing his interpretation regarding his peer's picture. Both of them started to add detailed decorations for the pirate theme. It was also the first time William proposed that J imitate him by putting a key in the treasure chest and claimed that Matt could be a pirate. In Matt's turn, William not only suggested the sun burning the feet in the narrative, but he also actively enacted the burning to enrich the pretend frame.

The next episode continued the pretend frame that contained fire and burning but went further to elaborate on different characters with rich details. The following transcript reveals that blood, fire, and hot lava became interchangeable. Both William and Matt scaffolded one another and contributed to each other's ideas. Additionally, the following two episodes show that William and Matt used different characters to illustrate burning.

Table 16: The elaboration of hot lava frames on different characters with rich details

<p>32:02#4  Matt put another underwater scene and chose paint bucket and pick the color red.  Matt: Oh! Oh!  William: Are you ready ? You are going to get dumped. [both of them smile] Get blood on the mermaid..Oh! Yeah! Blood all over it  Matt: Blood in the sky and fall on people's head [ both of them laugh]  William: Oh! Yeah! That will be great..awesome..How about blood on their hair?  Matt: They are dying [using different pitch voice again]  William: Dying! Oh! You fool! [use the same pitch voice -- unrecognizable]  Matt: [point at the mermaid's tail on the picture] Look !! Look! They are touching the ground.. get ...fire</p>	<p>t. of action for onscreen objectsx2</p> <p>t. of object  t. of action for onscreen objects  t. of action for onscreen objects x2+ play signalx2  t. of action for onscreen objects</p>
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<p>William: Feel hot lava [ two of them spoke simultaneously]</p> <p>Matt: NOOOO...!![as if he is getting hurt]</p> <p>Matt: She is like on the cross. and she is just standing there.</p> <p>William: Hey..how about dragon live in hot lava?</p> <p>Matt: Oh! O!</p> <p>William: Woo!! fire!</p> <p>Matt: Now they are going to get AROUND .hot lava, guys [put red paint] hot lava guys</p> <p>William: Got go put it right here...some where[point]</p> <p>Matt: Put fire...they can't even walk</p> <p>William: If they walk, they are going to get dead</p> <p>William: Erase this part and put fire between that part</p> <p>Matt: O~K...[with lengthy rising tone toward the end and follow William's instruction]</p> <p>William: That's enough..then put fire there... their tails will catch on hot boiling fire..Oh!! Yeah!!</p> <p>William: All the things are on the fire?</p> <p>Matt: Put fire all over the place...even the little mermaid are going be on fire</p> <p>Then Matt use little eraser to erase some part of the background..while Matt was doing that, William mentioned, "Is it my turn yet?"...then Matt shout, " PAINT BUKET.</p> <p>William mentioned, " and "Do FIRE". After J picked the fire pattern and filled up the whole screen with fire. As soon as the fire pattern showed on the screen, both of them shout Ya!!!</p> <p>With both of their hands up. As Matt said, " I am burning" with his head swing from right, William replied, " Look! Everyone is in hot lava". At the end, J name it, " Hotlavameraida'sdead"</p> <p>William added, " and fairy's dead". " That's awesome, dude" said William.</p>	<p>fire/hot lava-use interchangeably</p> <p>t. action for onscreen objects</p> <p>Enactment talk</p> <p>t. of action for onscreen objects</p> <p>t. of action for onscreen objects x2</p> <p>instruction</p> <p>t. of action for onscreen objectx2</p> <p>t. of action for onscreen object</p> <p>William request his turn impatiently</p> <p>Shouting victory for the whole screen of fire</p> <p>t. of action for self</p> <p>t. of actions for onscreen objects</p>
<p>William's turn 39:42-40:47#5</p> <p>William picked the picture of snake and enlarged to the whole screen.</p> <p>Matt: It is going to eat me..[smiling at me; sit back at the chair from standing up then put both of her arms around himself and shake his legs] William did not notice</p> <p>Matt: You are going hot lava [ smile]</p>	<p>William continued the previous theme of burning in hot lava</p> <p>t. of action for onscreen objects</p>

<p>William: You want it in hot lava?</p> <p>Matt: Yeah</p> <p>William: All right! Where did you get hot lava?</p> <p>Matt: [leaned toward William and point at paint bucket] Paint paint paint. [whisper]</p> <p>Matt &amp; William: [William picked the fire pattern Matt picked previously and filled up the whole screen with fire] OH!!! [both shout]</p> <p>Matt: He is like he is like ...oh! Look!! Something is covering my face all over [looking at William with smile]</p> <p>William: Everything even in black spot!!! All in fire</p> <p>Matt: OH! No!!!!</p> <p>At the end ...</p> <p>William: Look how old the snake is on hot lava...look fire all over the place</p> <p>Matt: Yes see the dark green43:41...he is supposed to be dark green but now he is light green so that means he is getting dead..HA!!!!HA!!! Nut Nut Nut...we are almost done [looking at me]</p> <p>William call it firesnakegetting poopdragoninhotlavawithsnakewholebodyinfire</p>	<p>ask peer's opinion explicitly</p> <p>Direct instruction where to get hot lava</p> <p>Excitement</p> <p>Enactment talk</p> <p>t. of action of onscreen objects</p> <p>criteria of burning to dead [reasoning]</p> <p>t. of action of onscreen objects</p>
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Illustration 21: The artifact by Matt to represent the mermaid in fire

Illustration 22: The artifact by William to represent the snake in fire

(Dec 31 09, Matt William session 3)

In the excerpt above the children chose a red paint bucket to draw an underwater background. Those patterns, which Matt and William claimed to be blood, covered half of the screen. Then they changed their claim from blood to fire. They decided that the characters were in a fire. The mermaid and fairy were the main characters here. In this

episode Matt and William became further involved in the pretend theme related to fire, rather than hot lava. William became especially excited and interacted with the mermaid and fairy characters. At the beginning, Matt interacted with the character by saying, “You are going to get dumped,” and “ Dying! Oh! You fool!” As one proposed an idea, the other elaborated and added reasoning to extend and support his peer. For instance, as Matt dumped the fire pattern and said, “They are going to get around hot lava guys,” William then commented that they could not even walk. William then added further explanation saying that their tails would catch on hot boiling fire. In William’s turn, the main character changed to a snake in the fire. Matt applied enactment talk to act out the feeling of the snake. Matt also provided reasoning at the end, designating the color of the snake as a criteria for judging that it was dying. These two examples demonstrated that while William and Matt scaffolded and extended each other’s ideas, they had a rather similar scaffolding style to the extent that they followed and directed each other’s ideas easily.

The narrative in session 3 in comparison to session1 and session 2 became more complicated by adding a variety of characters, different actions of the characters including the actions that lead those characters to death, and providing reasoning to examine their death. The reappearance of hot lava and related ideas such as dying or burning in the fire provided coherence. The more complicated narratives, shown through pretend language coding including the enactment and transformation of action for onscreen objects, demonstrated the strategy of elaboration. Toward the end of session 3, the coherence and elaboration of the pretend frame gradually evolved to a different form, a game. The two action-related games represented the evolution that took place starting with Matt and William’s original shared references.

## EVOLUTION OF THE PRETEND FRAME: ACTION GAMES

### Origin of the cutting and pooping game

The previous discussion concentrates on the coherence and elaboration of the pretend frame as one of the collaborative strategies shown in both the friendship pairs, the Grace Summer Pair and the Matt William pair. This section discusses a more complex collaborative strategy, action-related game, which was only enacted in the Matt William pair. These two action-related games derived from William's naming of his drawing, as excerpted and discussed above. William labeled his drawing "fire-snake-getting-poop-dragon-in-hot-lava-with-snake-whole-body-in-fire." This animation illustrated that one vampire came up at the beginning and quickly turned into a bat; then green smoke showed up; and then after the green smoke cleared up, a bat turn back into a vampire at the end. The following pictures show the changes.



Illustration 23: The animation

The invention of this game started with the vampire character created in the previous turn. At that point, their interaction no longer belonged to the pretend frame; they had established a game format. Garvey's coding no longer existed once Matt and William transformed into the character of vampire and imitated the actions of the vampire. The following excerpt reveals the process of developing these two action-related games.

Table 17: The origin of the two action games

<p>#6</p> <p>Matt's turn Matt started with enlarged animation of vampire on the center of the screen</p> <p>William: Oh! Yeah!! It will spray poop all over</p> <p>William: Do it all over and it will spray poop all over...oh! yeah! Like that now do the play [telling Matt to play the animation] Let's see how big it is</p> <p>William &amp; Matt: OH!!!! [both of them shouted and laughed]</p> <p>Matt: Poop!! [ both of them laughed]</p> <p>William: He sprays poop. He is a vampire that sprays poop!</p> <p>Matt →I: What does that do? [clicking the T]</p> <p>I: that T...if you click on that T[text tool], you can type</p> <p>William: What are you do? Get fire all over the place...do fire...do fire now</p> <p>Matt: What about...no...not that</p> <p>I: pink? [putting pink fill up the whole screen]</p> <p>Matt: Oh! That!</p> <p>I: Ok</p> <p>William: Mix it</p> <p>Matt: What is behind me? [unrecognizable]</p> <p>William &amp; Matt: Poop [ both of them laughed]</p> <p>William: He likes to spray poop a lot.</p> <p>Matt: Yeah!</p> <p>William:Hey! Hey! Stop it when he sprays poop!</p> <p>William: [ William shout] Stop! [Matt stop the animation ]</p> <p>William &amp; Matt: Oh!! [ both of them shout]</p> <p>William: He sprays poop</p> <p>Matt: Try again!</p> <p>Matt: All right one</p> <p>William &amp; Matt:...Two..three...poop</p> <p>Matt: Oh! I missed..missed</p> <p>Matt: Here we go</p> <p>William: Poop [Matt stopped]</p> <p>Matt &amp; William: Oh! [ both of them laughed]</p> <p>Matt: [pointing at the screen] Look at that...all right</p> <p>William: Do it so the whole thing is covered with poop</p> <p>Matt: Ok..now we are going to go...now what did I do?</p> <p>William: Cut?</p> <p>Then Matt tried to cut pieces out from the pink background</p> <p>Matt: it's raining and then it makes the hot lava gone..fire gone..Oh! My [use the grabbing tool to fill up the area to cut]</p> <p>William: Oh! Man [smile shaking his head]</p> <p>Matt: [looking at William with smile] Should I do it? Should I</p>	<p>t. of object</p> <p>t. of object</p> <p>t. of action for onscreen objects</p> <p>t. of action for onscreen objects</p> <p>sound effect</p>
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<p>do it? [ meaning to press button then the area that was filled up would be gone]</p> <p>William: [burst into laughter] Yes</p> <p>William &amp; Matt: [looking at the picture with laughter] Oh!!!</p> <p>William: Do it like that again!</p> <p>Matt: I am just going to have it ...[unrecognizable] [continue to circle areas to cut]</p> <p>William: throw that into the trash can.</p> <p>William &amp; Matt: Oh!!! [both shout as if they are cheering for the victory]</p> <p>William: Oh! [smile] [after those area were cut]</p> <p>I: You want to move it around?</p> <p>William: [as J continue circling the area to cut] put it on his face [vampire's face- part of cutting out can move around]</p> <p>William &amp; Matt: Oh!!![both shout]-after certain part got cut</p> <p>Matt: Cut the brain out</p> <p>William: Cut the vampire</p> <p>William: Trash</p> <p>Matt: [put two of his index finger on the pad]- as if he was getting ready to press it</p> <p>William: Go! [as William said go, Matt pressed the pad with both of his index finger and then put both of his arm on the air at the end]</p> <p>William: Yeah! We got it!</p>	
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Illustration 24: The artifact by Matt as the starting point of later action games

(Dec 31 09, Matt William session 3)

The above transcript contains two action-related games, the pooping game and the cutting game. The children first used pretend language based on the picture to define the game. After the definition was established, the rules or goals of game followed. The

analysis started with the first game, the pooping game. Influenced by William, Matt explored the animation of the vampire. William applied pretend language to define the game, a spraying poop vampire with sound effect. William actually provided specific verbal instructions to be sure that Matt understood his definition, “Do it all over and it will spray poop all over... Oh! Yeah! Like that now do the play.” Excited with this simple idea of a poop spreading vampire, both William and Matt naturally began voicing the sound effects simultaneously. Both of them coordinated well enough to call out “poop” at the end of the animation to signal the vampire spraying poop.

Following that definition, William provided a different version of the pooping game by telling Matt, “Hey! Hey! Stop it when he sprays poop.” William instructed Matt to click on the stop button to stop the animation representing the vampire spreading poop. After both of them understood the rule, the game automatically began. This rule required players to press the stop button of animation at the right time. The right time was when the smoke coming out between the bats turned to green smoke and the smoke turned into the vampire. After a while, Matt and William discovered a more systematic way to collaborate by counting from one to three to pinpoint the time more precisely. Within this collaborative process of the pooping game, since Matt was the one who maneuvered the mouse, William automatically interpreted Matt’s picture according to his understanding. In this game William became the influential scaffolder who made the evolution for the game possible. William made the major contribution toward the creation of the game while Matt played a more minor role. William’s instructions were clear and easy to follow. As a scaffolder for the pooping game, William demonstrated his scaffolding style by proposing ideas and giving specific instructions.

The above collaborative episode also produced another new game, the cutting game. The pooping game was based on the pretend frame of a vampire spreading poop.

The players were required to stop the animation at exactly the right time to freeze the image of the vampire surrounded with green smoke. The image of the green smoke implied that the vampire was spraying poop. The cutting game originated from the pink background of the vampire. Matt linked the pink background with the hot lava and fire. He defined the game by starting a different narrative plot unrelated to the poop spreading vampire. "It's raining and then it made the hot lava gone...fire gone." His definition and the rules of the game went hand in hand. As soon as Matt finished providing definitions, instead of giving specific instructions, Matt actually demonstrated the cutting game by using the cutting tool to erase the pink color. Both Matt and William quickly adopted each other's ideas. As soon as Matt asked William, "Should I do it? Should I do it?" William supported his peer with full excitement by saying, "Throw that into the trash can." Instead of providing instruction, he proposed questions to William to generate instructions. Each time Matt cut a piece out, both William and Matt shouted for victory. After they had done this several times, it became a routine to accomplish this as a team. "We got it!" from William revealed that while it was Matt's turn, William was heavily involved in this experience and made a fair contribution. Matt took the scaffolding role for the cutting game. Simplicity characterized the game; nevertheless, Matt transformed the simple cutting action into a sports event, both boys shouted for victory as they almost completed their cutting. The scaffolding styles of William's instructions and Matt's questions provided clarity for the pair, whether through verbal instruction or demonstration.

### **Review of action games**

After the Matt William pair created their own games, they played them repeatedly. The following excerpt covers the boys' review of the games including both



the pooping and cutting game they had played before. The two action-related games were developed together while Matt had his turn, but the boys reviewed these two games separately. In this excerpt, we can also observe that both William and Matt were interested in playing the pooping. Since Matt had practiced once already, he seemed to catch the timing much better than William. Under the big umbrella of game-playing as a collaborative strategy, the collaboration during Matt's turn is due to William's support, and the collaboration in the second half of the transcript is based on Matt's assistance.

Table 18: Review of the pooping game

<p>45:48-46:21#7  Matt's turn  Matt used fire hose to start a whole new picture and then put vampire animation in the middle. I was talking about his eyes. William was joking and mentioned may it had poop on it. Matt responded maybe it had hot lava on it. Then he was trying to get rid of all the red background color so he used water hose to wash the whole thing  William: And then do it to spray poop all over it? [Matt put the vampire  William: Oh! Yeah! and it will spray poop  Matt: Play..now.. poop [Matt pressed stop button to play the animation and William had a backward action ]52:40  Matt: [shoke his head] Missed  William: [shout] GO! [as Matt made a second attempt]  Matt: NO...miss...I have to be more tension. One, Two, Three, Go! [ William counted together// Matt stood up instead of sitting down] Miss again  Matt: I don't know how I can do this! [smiled]  William &amp; Matt: [shout] Go!  Matt:[ Matt raised both of his hand on the air for his victory]//  William: Oh!  I: Are you going to save this?  Matt: SAVE IT!! SAVE IT SAVE IT [shout]  William: Call it pooponthevampirewithwhitecreamonpoop [ both of them laughed again]  Matt: How about I call it creamyaligator? [looking at each other and laughed]</p>	
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<p>William: Poop?</p> <p>Matt: Yeah! Creamyaligatorpoop.</p> <p>William's turn</p> <p>William picked the same thing and tried it again with the control mouse. William pressed the button to stop the animation in order to do exactly the same thing that Matt did</p> <p>William: Ah!</p> <p>Matt: Oh! Miss [ disappointed voice]</p> <p>Matt: Push!</p> <p>Matt: Oh! [shoke his head leaning on William] OH! NO! OH! NO! Go!</p> <p>I: Oops! Ok...One more try!</p> <p>Matt → William: NO! Now one more try!54:38 [looking at William]</p> <p>Matt: Now [smaller volume] Now...Now [bigger volume] GO! [shout]</p> <p>Matt: [saw Matt missed again with several attempt] Oh! [William &amp; Matt &amp; I sighed] So close so close</p> <p>Matt: Go [shoke his head]</p> <p>I: Let's do it one last time</p> <p>Matt: Oh! No..MISS MISS MISS</p> <p>William: GOT IT!!</p> <p>Matt: I want to call it...cream...creampoopvampirepoop..that's it</p>	
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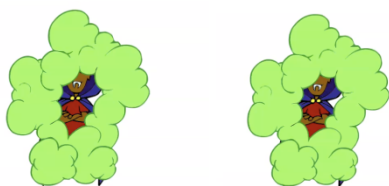


Illustration 25: The artifact by Matt as part of the action game

Illustration 26: The artifact by William as part of the action game

(Dec 31 09, Matt William session 3)

The above transcript covers the review of the pooping game. They both practiced the game to get the timing down perfectly. They encouraged each other like athletes.

They both helped each other determine precisely the right time to press the button. As soon as Matt expressed his frustration at not getting the timing right, the shouting action “Go!” from both of them showed their collective engagement in overcoming the previous failure. After several attempts and misses, Matt finally pressed the button at exactly the right time so that the animation showed the green smoke. In terms of the roles William and Matt played in this collaborative experience, Matt initiated a scaffolding role more than William. In Matt’s turn, while Matt occasionally shouted, “Go!” simultaneously with William, Matt seemed to guide himself verbally without too much assistance from William. For example, he repeated two different procedures to figure out the timing for himself; he would say, “One...two...three...go,” and “Play...now...poop,” to figure out the timing for himself. In William’s turn, William made several failed attempts to push the button at the right time to make the animation show the green smoke. In the exact manner of the scaffolding style William had shown previously, Matt scaffolded William by giving him specific verbal instruction in the tone of a sports coach. For example, in order to help William judge the right time to press the button, Matt counted the timing and verbally instructed his peer by saying, “Now [smaller volume] Now...Now [bigger volume] GO! [shout]” He physically leaned on his peer and provided encouragement to William to give it one more try. When William missed his shot, Matt would speak in a sympathetic tone while shaking his head. He also encouraged William by telling him that he was so close to freezing the image of the green smoke.

After reviewing the games, William provided new input by proposing a funny name that made both of them laugh, “pooponthevampirewithwhitecreamonpoop.” Matt also came up with a name to label his picture, “creamyaligator.” Eventually, Matt took William’s input and named his picture, “creamyaligatorpoop.” The creation of the names including cream-poop-vampire-poop and creamyaligator reflected the continuity of doing

something funny based on the common goal they had agreed on in the first session, making this collaborative experience as playful as possible.

If we look at the past several episodes, we can trace the children's roles through the collaborative process of game-playing and see that William and Matt took turns scaffolding each other and had almost identical scaffolding styles. While one child took a scaffolding role to propose a creative idea, a game in this case, the other automatically became an assistant in carrying out the idea and maintained the team dynamic. Their common scaffolding style included proposing ideas, providing clear and specific instructions, and offering compliments and encouragement.

In session 3, the Matt William pair developed both the pooping game and the cutting game but only replayed the pooping game in the same session. In session 4, they switched their focus and played the cutting game again. In the cutting game, the boys would use the cutting tool to cut out chunks of the picture on the screen and then throw the chunks into the trashcan. They did this until the picture was completely disposed of and the whole screen became white. Instead of just randomly circling an area as in session 3, Matt and William picked the square shape to cut this time. The cutting game started with pulling up a background and then cutting a square piece out to throw into the trashcan. Because the shape that was cut was replaced with white, the cutting game ended with a blank white screen. The following excerpt shows the children collaborating to choose a shape to cut and then dropping it into the trashcan until the whole screen became white. In a very similar manner to the pooping game, Matt and William treated this cutting game like a sports event as well. Their frequent use of the pronoun "we" indicated that they were thinking collectively as a team.

Table 19: The review of the cutting game

<p>Matt's turn</p> <p>At the beginning of the observation, Matt picked a background of music room. He started using grabbing tool to cut.</p> <p>William: Oh! Yeah! Now throw that into the garbage.</p> <p>Matt: No, it is not even done...Oh! [ came closer to the screen]</p> <p>William: I think we got it all [ looking at the screen]</p> <p>Matt: OH!!! What did you do? [looking at William-William accidentally touches the mouse]</p> <p>Matt: Let's do squares then ...</p> <p>William: all right.</p> <p>William: No..we don't want that.... Yeah!!</p> <p>Matt: Yeah! That! [whispered with smile]</p> <p>William: Garbage [loud]</p> <p>Matt &amp; William: OH!!!! [ both shout and smile with whole upper body would suddenly go backward] after Matt cut out one square shape out of the background)</p> <p>Matt: Square</p> <p>William: OH! Yeah! Oh! Yeah! Garbage..Garbage...Garbage</p> <p>Matt &amp; William: OH!![ both shout out immediately after Matt cut one square piece out from the background]</p> <p>William: Oh! Yeah! That's a big enough!</p> <p>Matt: Oh! [even louder]</p> <p>William &amp; Matt: OH! [shout again]</p> <p>William: Try to get the whole thing. Oh! ...OH!</p> <p>Matt: We need this slim [unrecognizable] we forgot</p> <p>William: Now you should do it.</p> <p>Matt: Oh! What are we going to do??? [rising tone at the end looking at William with smile]</p> <p>William: PRESS</p> <p>Matt &amp; William: Oh!![both shout// both lean backward]</p> <p>William: That looks awesome.that it is</p> <p>Matt: Hehehe....[with smile]</p> <p>William: Garbage [looking at the screen]</p> <p>William: Oh! [Matt: Yeah!]</p> <p>William: Yeah!</p> <p>William &amp; Matt: Oh! [Matt cutting one square piece and throwing into garbage]</p> <p>William &amp; Matt: Oh! [cutting another piece again]</p> <p>Matt: Gone</p> <p>William &amp; Matt: Yeah!</p> <p>William: I kind of like it like that.</p>	<p>Continued the game they developed last time- almost like you shout as if you were watching sports...both of them knew as you click the garbage button, one square piece would be cut out from the background. When all the pieces were cut into white, it was the end of the game.</p>
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William: OH! Yeah! Matt: Right there right there [only the small part of square left that had not been cut].. William: I think you got it... Matt: Get back in [ looking more closer] Matt: We need that spot..Woo! I think I GOT IT!! William & Matt: YEAH!!! [Matt with both of his arm in the air representing victory; William raised one of his arm]	
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(Jan 7 10, Matt William session 4)

At the beginning of the transcript, as soon as Matt used the grabbing tool to mark the square to be cut, William knew what would happen next. So William began to shout, “Oh! Yeah! Now throw that into the garbage.” Several times later on, William shouted words such as “Garbage,” “ Press,” or “ Trash” before Matt threw that square into the trashcan. One time Matt even jokingly asked William, “What are we going to do?” This question created another collaborative opportunity for William to shout “Press!” and actively be involved. The frequent use of “we” and “us” shown in bold and underlined in the transcript above quickly boosted the team spirit. As soon as the piece was thrown into the trashcan, both shouted for victory as if they were sports fans cheering for the winning team. This shouting for victory became a routine each time they cut one piece out. The fact that they both shouted out demonstrated their excitement. After they made the whole screen blank, they had successfully completed the game.

In summary, the collaborative strategy in the cutting game started with William’s instructions such as “ Press,” “ Garbage,” or “ Right there,” followed by simultaneous shouting from both William and Matt. The review of the game did not involve any new ideas so neither of the children assumed a scaffolding role. Rather, both William and Matt assumed the role of teammates participating together in the game. In this collaborative cutting game, both William and Matt had one common goal in mind, that of



<p>shout] Oh! You have to be ready!! I think you miss it..</p> <p>Matt: Oh! It is right in his back...right in her back.[William stop and the fire coming out of the dragon is at the back of mermaid].I think you made at that time. Now you want do anything else but don't click!</p> <p>Matt: Pony? [as William put pony in]</p> <p>William: Yeah! Let' put it in the fire, too</p> <p>Matt: Don't push play...don't push play then you mess it up. Put a clown in it...Oh!! the ...[unrecognizable]just get Dead!!</p> <p>Matt: Oh!! Poop!![ As William click the next section, the vampire animation showed..both of them smile]</p> <p>William: How about we do poop at the back?</p> <p>Matt: Oh! Great! I think you miss that.. try again....</p> <p>try again[ William kept playing animation and try to find the right timing for the presence of green smoke which they call poop] William: There we go.</p> <p>Matt: Poop!! Oh!! You miss the poop again!! [hit the desk with his arm]</p> <p>Matt: Go! [William said poop] and OH! The dragon is just about to do that [meaning putting out fire] You have to wait a minute. You have to wait one more minute.</p> <p>William: But Look!! There is a poop in his mouth.[point at mouth of dragon]</p> <p>Matt: [stick his tongue out] Woo!! [both laughed]</p> <p>I: There is a poop, where?</p> <p>Matt: In his mouth</p> <p>William: I put another vampire</p> <p>Matt: Oh! Great!! You can't even get that!</p> <p>Matt: Oh! O!</p> <p>William: Oh! No!</p> <p>Matt: He got poop! The dragon didn't get his fire out!</p> <p>William: Oh! His but is on fire! [both of them laughed]</p> <p>Matt: He is like HuH!!!</p> <p>William: Are you ready? Oh! Man! Miss.</p> <p>William: [point at the screen] Oh! Look! He got poop on his head. [both laughed]</p> <p>Matt: [William made another attempt-both of them shout OH!!!] He got he got so shooted. [x2] [meaning the vampire got lots of fire shooted from the dragon]</p> <p>William: [made another attempt] Are you ready?</p> <p>William &amp; Matt: one said stop. one said poop</p>	<p>theme into the game they developed</p> <p>instruction</p> <p>t. of action for onscreen object</p> <p>shared reference of vampire as poop</p> <p>t of action for onscreen object</p> <p>t. of action for onscreen object instruction again</p> <p>t. of object</p> <p>disgusted expression</p> <p>t. of action for onscreen objectx3</p> <p>Enactment talk</p> <p>Get into the game</p> <p>t. of action for onscreen object</p> <p>t. of action for onscreen object</p> <p>Comment for the game</p>
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Matt: Oh! I think you miss the fire.[smile] SHUHHHHH!!!

Matt: You can't even do the fire and poop. SHUHHH

After that, William started putting stamp on different places. He put on top of dragon's wings and commented that there was fire on the wing of dragon.

AT the end, Matt whisper [after you finish your turn, we will run upstairs...]

I then said to them if they do not wish to continue, they do not have to. Then William quickly finished his turn and called his drawing cheecheebubleeadgodon...



Illustration 27: The artifact by Matt

(Jan 12 10, Matt William session 5)

In this collaborative episode, Matt and William played the pooping game several times. Viewing their verbal exchange in this episode alone, they seemed to relive several episodes from previous sections all at once. For example, putting objects in the fire and telling them to die were part of the narrative that had occurred in the first couple of sessions. However, the fire here in this episode was not simply a pattern inserted into the screen from the background or paint pattern tool. Rather, putting the mermaid in the fire in this case required William to coordinate the stopping time of two different animations including the animation of the dragon as well as the vampire. The end result was that it appeared that the dragon started the fire while the vampire spread poop. That was why Matt reminded William not to click play; otherwise he would mess up the picture.

Even though it was William's turn, it was Matt who initiated that idea, and Matt not only initiated the idea but also instructed William during the game. As soon as the animation item showed on the screen, Matt said, "Oh!! Poop!!" and William immediately knew Matt was referring to the animation of the vampire and responded, "How about we do poop at the back?" At that moment, both of them smiled and then they replayed the pooping game. Like the previous stopping game, William needed to stop the animation when the vampire pooped. William frequently missed the right timing. Similarly, Matt acted as a coach as well as a fan frustrated with William's judgment of timing. He hit the table with his arm when William missed the timing to stop the animation. While both of them strived to achieve the right time for the pooping vampire, Matt pointed out that the dragon was about to exhale fire. Matt also gave William another specific command instructing William to wait for one more minute. Even though Matt kept telling William that he missed again and again, it did not seem to bother William. Even though William kept missing the timing to stop the animation, William turned his mistakes into humor. His descriptions of the animation combined the elements of game play with pretend language use. The descriptions of "There is a poop in his mouth," and "His butt is on fire," allowed Matt to elaborate on the pretend theme and transition back to participating in the game. For example, by responding to the statement, "His butt is on fire," Matt enacted the reaction of the vampire by saying, "He is like Huh!" This humor manifested itself in the combination of the collaborative strategy of game play and pretend language use. While Matt in this episode appeared to be the scaffolder instructing William for the right timing of the animation, William's humor demonstrated his role of scaffolding by taking this collaborative experiences to a different level equipped with two collaborative strategies of game play and pretend language use. His humor also corresponded with the goal they had made in session 1.

## SUMMARY

In sum, the study identified and categorized four collaborative strategies from these four pairs. Among these collaborative strategies, notable differences arose between friendship pairs and acquaintance pairs. Each pair also developed their own unique styles of collaborative strategies. Despite their uniqueness, commonality was apparent. The collaborative strategies also grew in complexity. The following tables visually presents all collaborative strategies described in previous sections, lists which strategies were used by which pairs; and the growth of collaborative strategies.

Table 21: Four levels of progression of collaborative strategies from all four pairs

Progression	Collaborative strategies	
Level 1	1. Cooperative effort: division of labor	The Grace Summer pair
Level 2	2. Pretend language use	All pairs
	2a. Pretend language use: involvement of both parties as part of narrative	Friendship pairs: The Grace Summer pair, The Matt William pair
Level 3	3. Coherence and elaboration of pretend frame: repetitive and elaborative narrative	Friendship pairs: The Grace Summer pair, The Matt William pair
Level 4	4.Evolution of pretend frame: Game 4a.Origin of the stopping and cutting game 4b.Review of game 4c.Combination of game and pretend language use	The Matt William pair

Table 22: Simplified four levels of progression of collaborative strategies from all four pairs by check lists

Collaborative strategies	Level 1	Level 2	Level 3	Level 4
The Peter Scott pair		√		
The Abby Kristin pair		√		
The Grace Summer pair	√	√	√	

The Matt William pair		√	√	√
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Friendship pairs and acquaintance pairs displayed different paths to collaboration. The acquaintance pairs showed frequent uncollaborative behaviors including unengagement, over-reliance on the researcher, fighting for mouse control, disagreement and critique. It took them a long time for both acquaintance pairs to start developing collaborative strategies of pretend language use. However, both acquaintance pairs had some collaborative teaching moments and they applied one main collaborative strategy, pretend language use. The collaborative strategy of pretend language use was common for all pairs. However, even though the friendship pairs applied the same collaborative strategy of pretend language use, their pretend language use contained more complex structures and their transformations in the episodes showed more variety in Garvey's (1990) terms. A sub-category of pretend language use was used to label this kind of collaborative strategy: involvement of both parties as part of narrative. Both friendship pairs started with the basic collaborative strategy just like the acquaintance pairs but their collaboration was more varied and grew more complex as the sessions continued.

The commonality of collaborative strategies between the two friendship pairs included pretend language use and the coherence and elaboration of the pretend frame. Based on the pretend language use from the early sessions, the children continued their peers' previous pretend frames, and the collaborative strategies developed to the next level, coherence and elaboration of the pretend frame. The Grace Summer pair manifested their coherence and elaboration of pretend frames by combining the elements of the previous two pretend frames into one. For example, the magical mermaid pretend frame showed coherence and elaboration from the previous themes of magic and mermaids. The Matt William pair demonstrated coherence and elaboration of the pretend

frame by adding a variety of objects and characters into the original frame. Once the pretend language use of “hot lava” appeared from the first session, the children built on the use of hot lava by adding different characters such as pirates, a flamingo, a mermaid, and a snake to establish a wide variety of pretend frames. However, these frames demonstrated continuity by referring back to hot lava. Regardless of the themes of the pretend frames they later created, all of them contained the element of hot lava, fire, or burning to death.

In terms of the roles young children play during their collaborative process, only the friendship pairs showed sufficient data in a collaborative episode for the analysis of the role each child played. Starting with the Grace Summer pair, the collaborative strategy of division of labor was apparent; Summer took the role of providing verbal instructions while A took the role of maneuvering the mouse. Once they began pretend language use and progressed to the coherence and elaboration of the pretend frame, Grace took the scaffolding role due to the advantage of her age. As Grace initiated the pretend frames of magic and the mermaid, Summer followed the same pretend frame and elaborated on them. Grace also contributed to the majority of Summer’s narrative. As for the Matt William pair, at the beginning, Matt took on the scaffolding role similar to the way Grace did, initiating ideas and leading the discussion. Matt’s transformation of hot lava in the first session shaped the theme of their pretend frames for their later collaborative episodes. Then William quickly assumed the role of scaffolding after a couple of sessions. After that, William and Matt took turns to scaffolding each other’s ideas.

Among these four pairs, the Matt William pair presented a complete progression in the growth of collaborative strategies from the simple to complex form: 1) pretend language use; 2) the coherence and elaboration of the pretend frame: repetitive and

elaborative narrative; and 3) the evolution of the pretend frame: game. The pretend language use laid the foundation of the collaboration. The pretend language for the Matt William pair also showed a unique feature of explicit confirmation of a common goal. As their pretend language use of “hot lava” started to form into a narrative and they established a coherent and elaborative pretend frame, repetitive and elaborative narrative embedding “hot lava” or “fire” appeared. Eventually, the objects and characters shown from the previous pretend frames served as the premise for the pooping and cutting games. After the invention of the game, the Matt William pair reviewed the games and simultaneous combination of narrative and game occurred. As the complex form of collaborative strategies such as games developed, they did not supersede the lower level form, pretend language use. They evolved to coexist. Eventually William applied the collaborative strategies combining pretend language use and the game to establish humor to cover his mistakes during the game.

## **Chapter 5: Discussion**

### **INTRODUCTION**

The goal of this study was to explore how young children use collaborative strategies when drawing on the computer with friends and acquaintances. The type of relationship which predicts the quantity and quality of collaborative strategies between acquaintance pairs versus friendship pairs suggests that friendship is a major contributor to collaboration. Friendship is defined in terms of the shared play history of the pair. Their shared play history contributes to their compatibility of play interests and styles. The following discussion addresses various aspects of the findings that demonstrate how that compatibility contributes to collaboration. Additionally, based on the four categories of uncollaborative behavior of the acquaintance pairs, the discussion reflects on teachers' pedagogical role and rationalizes that the occurrence of the four categories was inevitable in the journey of exploring the compatibility of pairs and their eventual collaboration. Moreover, this study reconfirms children's ability to collaborate at an early age. Additionally, the discussion addresses findings of the current study regarding pretend play as a starting point of collaboration and the progression of collaborative strategies as collaboration proceeds. These findings provide new insights that benefit a number of areas of research, including the literature of play, collaborative learning, and computer-supported learning.

Informed by findings from the previous chapter, the discussion chapter interprets and explains findings in relation to the existing literature. First, five major points are discussed based on the findings: 1) Friendship matters; 2) Young children have the ability to collaborate; 3) Pretend play serves as a starting point for collaboration; 4) Collaborative strategies progress as the collaboration proceeds; and 5) Computers can play a role in collaboration for young children. While explaining these five major points,

the areas that are in agreement or contrary to the existing literature will be highlighted and discussed. These five major points will be followed by a discussion of practical implications, and the chapter concludes with the limitations of the study and directions of future research.

#### **FRIENDSHIP MATTERS: THE COMPATIBILITY OF PLAY INTERESTS AND STYLES FOR FRIENDSHIP PAIRS**

Consistent with the findings of Jones (2002), Vass (2002), Azmitia and Montgomery (1993), and Miell (2000), the current study demonstrates the beneficial collaborative outcome that results from friendship. However, other studies such as Kutnick and Kingston (2005) have shown inconsistency of performance for friendship groupings in collaborative tasks. In their study, the participant children were older, in primary school years one to five, in comparison to the younger children aged five and six in the current study. Activities that characterized friendship in the study of Kutnick and Kingston also came from gender-related issues or schooling. Their study argued that differences such as gender or schooling experience also played an important role in either supporting or hindering the children's cognitive performance. In the current study, on the other hand, the collaborative strategies and the progression of collaboration for the friendship pairs including the Grace Summer pair and the Matt William pair followed a similar path. For acquaintance pairs, commonalities of uncooperative and uncollaborative behaviors also surfaced. Therefore, friendship seemed to outweigh gender in the current study.

Un-cooperative and un-collaborative behaviors among the acquaintance pairs, along with the marked disparity of collaborative strategies between friendship pairs and acquaintance pairs, revealed that friendship made a considerable difference in establishing collaboration. The acquaintance pairs employed mainly the simplest form of



collaborative strategy, pretend language use, to facilitate collaboration. Pretend language use in Garvey's (1990) work centered on two main codes, including transformation of object and transformation of action for onscreen objects. The collaborative strategies of friendship pairs displayed a much richer variety and notable complexity.

While applying the same collaborative strategy of pretend language use, friendship pairs applied much more sophisticated language and a wide variety of codes covering at least six categories defined by Garvey and an additional unique sub-category in which both parties were involved as part of a narrative under pretend frames. This particular collaborative strategy illustrated that friendship pairs quickly picked up both verbal and non-verbal play signals according to Garvey's terms and communicated with each other through the pretend play language they both shared. Another advanced form of collaborative strategy, the coherence and elaboration of a previous pretend frame, was characterized by both friendship pairs, who rapidly picked up the cues and adapted to each other's pretend frames. Extension of the previous pretend frame was made possible only if children desired to immerse themselves in the same pretend frames. This feature displayed continuity and revealed that the children perceived these collaborative experiences as closely linked together rather than as fragmented pieces.

The Matt William pair deserves special attention not just because they developed the most complex collaborative strategy but also because they carried out action games which reflected their similar play styles and common interests. For example, from the interview data of the participants regarding their friendships prior to the observation sessions, William mentioned they were friends because they both liked sports and superheroes. It was then natural that the Matt William pair eventually developed action games simulating the sports events they both enjoyed. Consistent with previous study that described a close connection between young children's friendship and their pretend play,

young children identifying themselves as friends shared similarity in their interests and demonstrated compatibility of play styles (Howes, et al., 1992).

The Matt William pair's compatibility is evidenced by their humor, their creation of two games, and their similar scaffolding styles. The Matt William pair demonstrated their humor by making up funny names. Their idiosyncratic names such as poop-on-the-vampire-with-white-cream-on-poop or creamy-alligator did not make much sense but these funny names truly added a lot of laughter, and made their collaborative experience playful. In terms of game creation, William scaffolded the pooping game while Matt scaffolded the cutting game. Both of these games were action-related, which also mirrored their common interest in sports. Because these two games were tailored to their interests, the games created powerful synergy for the collaborative experience. Commonality also appeared in both William's and Matt's scaffolding and supporting styles. Both of them scaffolded by proposing ideas and providing instructions with clarity. Coupled with the scaffolding, the children supported each other by giving each other praise and compliments.

Conversely, based on the interview data of the acquaintance pairs, children who were acquaintances did not identify each other as friends even though they were friendly to each other. Acquaintance pairs had the disadvantage of no shared play experience. Without prior shared play history, the acquaintance pairs were not familiar with each other's interests, play language, signals, and communication styles. Four categories of uncollaborative behavior took place in contrast to the behavior of the friendship pairs, who had strong desire to participate in each other's experience. These four categories of uncollaborative behavior included: 1) lack of engagement, 2) over-reliance on the researcher, 3) competition for mouse control, and 4) disagreement and critique. The

following paragraphs extend the discussion on unengaged behavior in light of Vygotsky's scaffolding concept.

Most unengaged behaviors involved the Peter Scott pair. Nevertheless, unengaged behaviors occurred in the friendship pairs as well. Children in the friendship pairs, however, employed collaborative strategies to return to a joint focus. For example, in the collaborative episode under the division of labor where Summer was in her turn putting different objects in the castle background, a situation arose when Grace was unengaged and was about to negate. Summer created a collaborative situation, in which she assigned responsibility to her peer.

The unengaged behavior of the Peter Scott pair and over-reliance on the researcher for both acquaintance pairs raised two issues: the role of teachers and optimum pairing. Among these four pairs, the Peter Scott pair theoretically should have been the optimum pair, in that one owned expert knowledge and the other had a rather limited experience of the software. Because of this knowledge gap between children, this pair represented an abundant scaffolding opportunity, creating the ZPD as Vygotsky (1978, p.86) would call it. However, Peter never scaffolded Scott, nor did they even communicate with each other. The current study found that it took at least six sessions for the Peter Scott pair to start their first short-lived collaborative episode. Their lack of desire to participate in each other's experience implied that Peter and Scott might not have been a good pair match for collaboration. The example from the Peter Scott pair highlights the social aspect of collaboration, which teachers need to take into consideration when pairing children up for a collaborative task. Moreover, the experience of the acquaintance pairs, specifically their unengaged behaviors along with their reliance on the researcher, poses questions for the participatory role of the teacher and how much facilitation is required by the teacher to assist children in working together on a joint task.

Successful collaboration entails having sufficient collaborative skills to deal with conflict. Two categories of conflict behavior arose: competition for mouse control, and disagreement and critique. These conflicts are not uncommon behaviors during shared computer usage. This finding parallels the previous work of Robert, Djonov, and Torr (2008) because their work found both communal and combative engagement between boys while playing with the literacy e-game, *I Spy*. Their work reported both physical and verbal engagement like shouting commands and battling for mouse control. This finding indicates that dealing with conflict situations is inevitable for children when working toward eventual collaboration. Prior to participating in this study, the friendship pairs had spent extensive time playing together and already had ample experience working together toward conflict resolution and exploring options for dealing with conflicts similar to those they faced in the course of the observations. The acquaintance pairs, on the other hand, due to an absence of shared play history, spent most of their time together during the study building up strategies for dealing with conflict.

The acquaintance pairs did progress from a rather independent style to a more collaborative style. Two studies by Chung and Walsh (2006) have provided evidence that children can gradually become more collaborative. This progression of collaboration in which children shift from an independent to a more integrative style only matched the collaborative process of both acquaintance pairs in this study, not the friendship pairs. Rather, both friendship pairs were eager to participate in each other's computer experiences and naturally immersed in collaboration immediately from the beginning to the end. The acquaintance pairs demonstrated a gradual change in style from independent to a more integrative style, in contrast to their passive or even resistant approach to enter each other's experiences at the beginning.

## **YOUNG CHILDREN'S ABILITY TO COLLABORATE**

Verba's (1994) study traced children back to early infancy and presented early evidence of young children's collaborative capability in three modes: 1) observation-elaboration, 2) co-construction, and 3) guided activity. However, Ding and Flynn (2000) argued a parallel relationship between the success of collaborative learning and the underlying cognitive ability. These pre-requisite cognitive abilities include the following: intersubjectivity, communication, planning, and inhibition skill. The finding of collaborative strategies such as coherence and elaboration of previous frames and the discussion of the role each child plays during the collaborative process certainly fit with the three modes of collaboration described by Verba. The four pre-requisites were also demonstrated in this study. However, they were mainly exhibited by the friendship pairs, not the acquaintance pairs. This outcome does not imply that the acquaintance pairs did not have sufficient cognitive ability, because the acquaintance pairs might demonstrate those abilities with their friends who have shared play histories. Rather, the social environment cultivated by friendship facilitated certain cognitive abilities that enabled children to collaborate effectively.

## **PRETEND PLAY AS THE STARTING POINT OF YOUNG CHILDRENS' COLLABORATION**

The friendship pairs and acquaintance pairs both appeared to apply play language, specifically pretend language to negotiate shared understanding and thus to establish collaboration. In the current study, evidence of abundant pretend play language used for negotiating shared understanding leading to collaboration provides bridges and connections between the literature on play in young children, the collaborative learning literature, and the literature related to computer use.

This study adopts Crook's (1994, 1995, 1998) concept of negotiation of shared understanding to identify collaborative episodes through the two essential elements: 1)

creation of shared reference, and 2) formation of mutual understanding based on shared references. The theoretical framework of play from Garvey (1990) and Vygotsky (1978) operates along the same lines as Crook's definition. The definitions offered from the field of collaborative learning and from the theoretical framework of play both relate to the creation of intersubjectivity. The pretend frames that children establish become the shared reference that children continue to go back to and build upon. In the collaborative learning literature, children establish intersubjectivity through joint conception in order to work collaboratively (Crook, 1994, 1995, 1998; Roschelle & Teasley, 1993). This study discovered that children establish intersubjectivity through joint conception of pretend frames in order to imagine and play collaboratively. Coupling the frameworks of Garvey (1990) and Vygotsky (1978) allows Garvey's coding to go beyond pretend language use and establishes the use of pretend frames across sessions as a collaborative process. The role each child plays within the collaborative process can also be examined. The findings of this study affirm and extend the previous studies of Escobedo (1992) and Labbo (1996). In the study conducted by Escobedo, play behaviors exhibited while using the computer consisted only of the transformation of object. In the current study, two categories were created to elaborate on Garvey's terms including transformation of action for onscreen objects and transformation of role for onscreen objects. In line with the study of Labbo examining children's symbol making, the computer screen served as a stage or playground where children acted as designers, directors, narrators, and actors for object transformation as well as socio-dramatic play. The Matt William pair in the current study also acted in their own series of play frames related to certain themes and further designed action games tailored to their common interests.

The current study found only rare instances language that served to establish social status. In contrast, several previous studies documented that either in play or in

collaborative computer-related activities children established social status and hierarchy, and children with higher social status dominated and exerted power over children with lower social status (Corsaro, 1985; Lomangino, Nicholson, & Sulzby, 1999; Roberts, Djonov, & Torr, 2008). In the current study, Grace in the Grace Summer pair had a much more advanced language ability; Abby in the Abby Kristin pair had much greater technical ability; and Matt in the Matt William pair had more charisma. All of these traits could have enabled them to establish themselves with higher social status. In fact, the children Grace, Abby, and Matt did not use language such as imperatives to dominate the relationship as described by Corsaro (1985). Rather, they exerted their influence to persuade their partners while acting as scaffolders. While doing so, their peers appeared to eagerly follow the path that the more persuasive children suggested. In the Grace Summer pair, for example, Grace was developmentally advanced because of the age difference. Grace contributed to the majority of Summer's narratives in her turn by providing ideas, suggestions, and assistance. Grace sometimes assisted by asking questions. As Grace proposed, Summer built up her narrative by addressing the questions and comments from Grace. Grace and Matt each used their more advanced skills to craft the narrative to create collaborative opportunities for their partners. For the Matt William pair, Matt proclaimed their topic as hot lava and explicitly asked his peer to do the same in the first collaborative episode.

For the Grace Summer pair, Summer seemed to seek leadership and appeared eager to follow the proposals made by Grace throughout the observation sessions. Grace's subtle but salient influence on the Grace Summer pair's collaboration cannot be denied. Grace used language to exert her influence mainly through the form of commentary, suggestions, and questions. For the Matt William pair, Matt took the strong leadership role in the first couple of sessions and asked questions to assure the common

goal. The the topic of hot lava created lasting influence for the Matt William pair. Therefore, in this study, using language to exert power appeared in the more subtle form of persuasion rather than an expressive form of domination, as proposed by the previous studies.

#### **THE PROGRESSION OF COLLABORATIVE STRATEGIES**

The progression of collaborative strategies can be examined in light of two theoretical perspectives: 1) Vygotsky's (1978) notion of ZPD, 2) the discourse features described by Fisher's (1993) cumulative talk, and Johnstone's (2008) prior discourse. This section will first describe the Matt William pair's evolving and progressive collaborative structure to illustrate Vygotsky's notion of ZPD. Then the collaborative strategies from both friendship pairs will be described to reveal their discourse features. This progression of collaborative strategies built from the basic level of pretend language use, to coherence and elaboration of the pretend frame, to the complex level of action games, revealed that the friendship pairs scaffolded each other in this collaborative process to reach their ZPD (zone of proximal development). The Matt William pair started with the transformation of objects to hot lava, established hot lava-related pretend frames, and then invented the innovative action games. Even though these action games involved merely two simple actions such as figuring out the right timing to pressing the stop button and performing the cutting action and did not seem to represent a more advanced form than the pretend frame, they transformed their drawing experience from telling stories into a new experience, a game experience. In reaching the ZPD, the Matt William pair reconstructed their pretend experience and qualitatively changed the form of their collaborative strategies from pretend to game. Their new collaborative strategy of game matched their common interest of sports. Once the games had been reviewed



several times, the combination of the pretend frames and actions emerged again with the addition of humor. This structure again evolved to a mixture of old and new collaborative strategies.

In addition to Vygotsky's (1978) notion of ZPD, the progression of collaborative strategies can also be examined based on discourse features. This finding regarding the progression of collaborative strategies echoes the findings from previous studies including Fisher's (1993) cumulative talk, Johnstone's (2008) prior discourse, and other studies (Kumpulainen, 1996; Vass, et al., 2008b) and extends the association between repetitive and elaborative language use and collaboration.

The progression of collaborative strategies reflects the connection between repetitive and elaborative language use and collaboration. The two friendship pairs, the Grace Summer pair and Matt William pair, had their own unique paths of progression of collaborative strategies. For the Grace Summer pair, the collaborative strategies evolved from: 1) cooperative effort: division of labor; to 2) simple pretend language use; to 3) coherence and elaboration of pretend frames. In the Matt William pair, the collaborative strategies evolved from: 1) simple pretend language use; to 2) coherence and elaboration of pretend frames; to 3) action games. Even given the different starting trajectory of cooperative effort from the Grace Summer pair and different ending trajectory of action game from the Matt William pair, both the Grace Summer pair and the Matt William pair shared similar progression journeys from simple pretend language use to coherence and elaboration of the pretend frame. For the Grace Summer pair, the themes of magic and a mermaid from previous separate pretend frames later combined into one complex episode. For the Matt William pair, the progression of collaborative strategies went through a change of structure from coherence and elaboration of previous pretend frames to action games. They began with the pretend language use related to hot lava and grew

into coherence and elaboration of the pretend frame of hot lava, followed by the addition of different characters including a pirate, mermaid, snake, and vampire to the narrative. The character of vampire in the animation inspired the Matt William pair to change their collaborative strategy from pretend frames to action games.

In terms of the language used in the collaborative process, the current study extends the findings of previous studies by two aspects: 1) addressing different levels of progression, and 2) addressing the significance of repetitive and elaborative talk, which the existing literature did not identify as critical to collaborative problem solving. This repetitive and elaborative language applied by both friendship pairs started from the simple form, transformation of object, to the more complex form of narrative. The simple narrative slowly expanded to repetitive and elaborative narrative. Finally, the language evolved to game-related language use. This progression from pretend language use to the coherence and elaboration of previous frames seemed to match very closely with the messy but creative brainstorming process in collaborative writing, in which ideas are linked together through free association (Vass et al., 2008). During the negotiation of shared understanding, repetitive and elaborative language occurred as part of the creative process during the generation of creative ideas. According to Fisher (1993), exploratory talk in which a joint conclusion resulted from the challenging of different ideas was considered the type of talk most beneficial for collaborative inquiry. However, the work of Hyun and Davis (2005) did reveal that children's dialogue evolved from cumulative talk to exploratory talk in the collaborative process. Given that pretend play as the starting point for young children's collaboration, its significance in collaborative dialogues can not be over-emphasized especially for very young children, particularly because pretend language use is dominant for children at this age.

## **ROLE OF COMPUTER IN COLLABORATION FOR YOUNG CHILDREN**

Congruent with the previous studies, the virtual realities presented onscreen served as vehicles for the young children, especially the friendship pairs, to mediate pretend play; and thus facilitated the emergence and progression of their collaborative strategies. The creation of two action games would not have been possible without the medium of the computer. Previous studies underline that virtual realities offered by computers afford spontaneous pretend play opportunities (Brooker & Siraj-Blatchford, 2002; Escobedo, 1992; Labbo, 1996; Sandvig, 2006). Shared enjoyment brought by the computer in the early childhood classroom is also documented (Mitchell & Dunbar, 2006; Plowman & Stephen, 2005). Several studies specifically pointed out the creative use of computers to achieve social ends (Facer, et al., 2001; Fromme, 2003; Sandvig, 2006; Wang & Ching, 2003). Other studies demonstrated collaborative engagement, including negotiating turns, providing verbal explanation, and collectively deciding where to click (Brooker & Siraj-Blatchford, 2002; Heft & Swaminathan, 2002; Plowman & Stephen, 2005). These studies provide fundamental knowledge regarding the potential of the computer to serve as a collaborative tool. The current study was based on these studies and demonstrates that the computer does play a role in mediating a pretend frame as well as creating games and thus fostering collaboration for all pairs in the current study. Friendship pairs in the current study certainly have a much stronger social motive for their computer use in comparison to acquaintance pairs.

## **PRACTICAL IMPLICATIONS**

To bring together several practical implications of the issues discussed above and related to the role of teachers, this section covers five aspects: 1) teachers' rationale for pairing children, 2) teachers' involvement with children and their pedagogical insights, 3) pretend and elaborative talk during the collaborative process, 4) the environment that

fosters play and builds friendship, and 5) extension of computer use from a pedagogical tool to collaborative play tool.

### **1) Teachers' rationale for pairing children**

With the understanding that friendship matters and the expectation that children with a play history will negotiate their shared understanding to develop creative and distinct collaborative strategies that reflect their interest in a technologically rich environment, teachers may want to consider children's social relationship and play history before putting children together for a collaborative experience, especially when children will be using the computer together. While theoretically a gap in ability between children might present optimum scaffolding opportunities, children might not show enough compatibility to successfully collaborate. This does not mean that children without any prior play experience cannot be paired up for collaborative activities. Teachers need to have a clear objective and rationale before pairing children and expect that it might take a considerable amount of time for them to actively collaborate.

### **2) Teachers' involvement with children and their pedagogical insights**

This study revealed that friendship pairs collaborate successfully with minimum support from the researcher. This implies that teachers might not need to facilitate collaboration. However, teachers may need to alter their objective when dealing with children who lack a shared play history, and take a more active role. Previous studies suggest different approaches for practitioners regarding their interaction with young children during computer use. Based on Vygotsky's (1978) notion of ZPD (zone of proximal development) for collaborative learning, Haughland (1999) proposed a "hands-off" approach that allows children to freely explore the computer and in which teachers only intervene and offer assistance when children encounter frustrations. In contrast,

Plowman and Stephen (2005) advocate a guided approach in which adults provide explicit guidance aligned with the scaffolding concept. While some ECE teachers may believe that young children using computers should be left alone to freely explore the software, this then leads to the reactive and participatory role of teachers without considering the social factors of the children involved. With an unestablished friendship status between young children, teachers might need to take a proactive and facilitative role to cultivate the social aspect of children's collaborative computer experiences. Four types of un-collaborative behaviors identified in this study include unengaged behavior, overreliance on the researcher's technical support, mouse control, and disagreement and critique. In regards to mouse control and disagreement or critique, teachers may need to take an active role for resolving tension when conflict arises. When engaged behaviors occur continuously over a period of time, the causes of unengaged behaviors would determine teachers' pedagogical decisions. The current study also shows that children's simple collaborative strategies evolved to more complex collaborative strategies, especially for friendship pairs. This finding indicates the importance of documenting changes in the collaborative process. In dealing with children with a shared play history, even though teachers can afford to be less proactive in facilitating collaboration, they still need to take a participatory role to fully comprehend the evolving process of one collaborative strategy. Even though teachers may not have sufficient time to fully document their series of collaborative interactions, teachers can enable children to review and highlight their experiences by asking them questions and making notes to recall their actions and the type of play language exchanged. Collaborative strategies that occurred around the computer, once noted by the teachers, can be rich resources for teachers to then incorporate into other collaborative learning activities. This record also assists

teachers in realizing the progression of their students' collaborative strategies and understanding the basis of their students' ideas.

### **3) Pretend and elaborative talk during the collaborative process**

As discussed previously, pretend play serves as the starting point of collaboration. Teachers can model pretend language to facilitate collaboration. When teachers observe children's pretend language, teachers can then extend that pretend language into a more sophisticated form. This strategy also links with another collaborative strategy, repetitive and elaborative language use. Repetitive and elaborative language use under the collaborative strategy of coherence and elaboration of previous pretend frames reflects Fisher's (1993) cumulative talk and Johnstone's (2008) prior discourse, and closely matches with chaotic but creative brainstorming ideas in the collaborative writing process (Vass et al., 2008). The practical implication of this particular finding is that while teachers may regard exploratory talk as having educational value, they should also recognize that repetitive talk and elaborative talk can lead to collaboration, though this strategy has been undervalued in the existing literature.

### **4) Environment that fosters play and builds friendship**

Consistent with some of the existing research, the current study highlights children's rich collaborative strategies and collaborative processes nourished from the friendship environment and playful pretend language use in home settings. The finding of this study underlines the value of the social and playful environment of a learning experience. The major differences that lie between the friendship pairs and acquaintance pairs are their levels of shared play history. Their shared play history together with their distinct collaborative experience with the art software allows them to develop collaboration that reflects their interests and their goal. While the existing literature

values computer use as a social tool to achieve a social end (Facer, et al., 2001; Fromme, 2003; Sandvig, 2006; Wang & Ching, 2003), as well as a pedagogical tool which teachers should incorporate to facilitate learning objectives or developmental gains (Brooker & Siraj-Blatchford, 2002; Heft & Swaminathan, 2002; Plowman & Stephen, 2005), this study shows substantial evidence that computers can also serve as both social and play tools that enable children to develop games or activities that incorporate the distinct styles of the users. Regardless of how modern the computer is, the findings of this study bring us back to some of the traditional issues regarding friendship or play that have been discussed extensively in the Early Childhood field.

#### **5) Extend computer use from a pedagogical tool to a collaborative play tool**

In the current study, children from the acquaintance pairs relied on the researcher more and exhibited less collaboration in comparison to the friendship pairs. It may be beneficial then for teachers to take more initiative in demonstrating the use of the computer as a play tool with which to negotiate shared understanding in order for children to play together for an extended period of time before the friendship is fully developed. In terms of developing a shared play history, it should be noted that computers are not the only tool contributing to play. Children can utilize non-technological tools to play together as well. If pretend language use is perceived as the starting point for collaboration, then immersing children in pretend play may be a starting point for exploring their common play interests. Nevertheless, the findings of this study reveal that children utilized the computer-generated drawings as a collaborative pretend play tool to generate creative collaborative strategies.

## **LIMITATIONS AND DIRECTIONS OF FUTURE RESEARCH**

The limitations of the current study cover two aspects: 1) scale, and 2) participants. While analysis of the current study has revealed the nature, type, and progression of collaborative strategies for four pairs of children including friendship pairs and acquaintance pairs, this study is still considered a small scale study in exploring the phenomenon of young children's collaboration while engaged with the computer. Therefore, the findings are not generalizable to a large population. With regard to the participants, it needs to be restated that the Matt William pair had only five sessions in total instead of seven sessions like the other three pairs due to one boy's sudden move to Washington, D.C., because even more collaboration may have been possible. Out of these five sessions, the Matt William pair showed the most variety of collaborative strategies in comparison to the other three pairs. Nevertheless, five sessions offsets the comparison to the other pairs, who had seven sessions.

Future research based on the current study can be designed to vary in several ways, including theoretical lens, method, and software choice. Different theoretical perspectives from the ones used in this study can be applied to the data in order to show different layers of collaboration. For example, one could examine the ways that friendship pairs use language to establish their influence and persuade their partners. Without using imperatives, partners might have applied different forms of language to establish their higher social status in a much more subtle manifestation.

Modifying the methodology of the current study could involve the change of participants or the change of the setting. For example, the case study might focus solely on friendship pairs or acquaintance pairs. Because different participant children may reveal different paths and progressions of their collaborative strategies, further case studies may uncover greater diversity of young children's collaborative strategies around



the computer. In a case study of acquaintance pairs only, a teacher could join in the collaborative experience as a facilitator, and the time line could then be extended to fully examine the progression of collaborative strategies. The scope of this research can be extended by carrying out the observations in different settings such as school instead of home. In terms of the software choice, different software such as adventure games could be introduced to see if children's collaborative strategies remain.

## **CONCLUSION**

The current study identifies four different levels of collaborative strategies by exploring the question: How do young children use collaborative strategies when drawing on the computer with friends and acquaintances? These four major collaborative strategies from the simplest to the most complex include: division of labor, pretend language use, coherence and elaboration of pretend frames, action games. Both friendship pairs in the study applied at least three major collaborative strategies, while the acquaintance pairs solely used one collaborative strategy, simple pretend language use. The notable difference between the friendship pairs and acquaintance pairs rests on the social factor, the quality of friendship. Friendship between children in this study is characterized by a shared play history.

The uncollaborative behaviors of the acquaintance pairs leads us to consider teachers' rationales for pairing, their involvement with children to facilitate collaboration, and their pedagogical insights. On the other hand, recognizing that pretend language use was the most commonly used collaborative strategy suggests that pretend language use serves as the starting point of collaboration.

The finding that pretend language use serves as the starting point of collaboration builds bridges between different bodies of literature related to play, collaborative learning

computer use for children. A wide variety of collaborative strategies were observed at different levels for the friendship pairs. These findings indicate the progression of collaborative strategies for both the Grace Summer pair and the Matt William pair. This progression of collaborative strategies shows agreement with Vygotsky's notion of ZPD. In the friendship pairs, children with more ideas or advanced ability acted as scaffolders to guide their peers by means of a collaborative process to carry out their pretend play frames. The boys in the Matt William pair in particular showed similar scaffolding styles. In addition, the most advanced level of collaborative strategy, action games, created by the Matt William pair, reflects their common interest in sports. Their identical scaffolding style and play interest revealed their compatibility.

The analysis of findings for the current study affirms, revises, and extends the existing literature. The complexity and variety of collaborative strategies from both friendship pairs, especially the action game from the Matt William pair, affirm the benefit of friendship in collaboration. Regardless of the small number of collaborative episodes acquaintance pairs displayed, collaboration occurred in all four pairs and this finding indicates very young children's underlying cognitive capability of negotiating intersubjectivity, communication, planning, and inhibition required for collaborative learning when supported by the social environment of friends. The progression of collaborative strategies also parallels Vygotsky's concept of ZPD. However, one finding of the current study regarding repetitive and elaborative language differs from the perspective of the existing literature. Repetitive and elaborative language use belongs to the collaborative strategy of coherence and elaboration of pretend frames, and while previous studies disapprove its benefit for collaborative problem solving, the current study has shown that it does contribute to creative collaboration in a way similar to the collaborative writing process. Finally, the findings of the current study extend the

existing literature in three areas. First, the current study identifies four levels of collaborative strategies through the pretend play perspective and further defines a unique path of progression for these collaborative strategies as a process. Second, the addition of two new codes including transformation of action for onscreen objects and transformation of role for onscreen objects after extends Garvey's (1990) framework regarding pretend play language. Third, the finding of pretend play as the starting point for young children's collaboration reveals the relevance of pretend language and collaboration. The current study bridges the literature of play and collaborative learning and expands our limited existing theoretical knowledge of both play and collaborative learning.

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## **Vita**

Yi Jeng Chen was born in Taiwan in 1974. She entered the University of Southern Queensland in Australia, where she received a Bachelor of Early Childhood Studies Degree (Child Care) in April 1999. In 2001 she began teaching at Jia-Shin kindergarten in Tainan. She then attended the Institute of Education (Early Years) at the University of London and received a Master of Arts degree in Education in 2003. After graduating from the Institute of Education, she returned to Taiwan and worked as a self-employed English tutor. In June 2004, Yi Jeng began coursework toward a Doctoral degree at the University of Texas at Austin. During her Doctoral studies, she served as a short-term summer session data collector and analyst for three months from August to October, 2006. She worked with Dr. Reifel as a teaching assistant for three semesters from the fall of 2008 to the fall of 2009. Her participation in voluntary church service as a teacher for both adults and young children, from 2006 to 2011, has further enriched her teaching experience.

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