THE DEVELOPMENT OF COLLABORATIVE SKILLS IN YOUNG CHILDREN

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Doctor of Philosophy

ASTON UNIVERSITY

October 2002

Thesis Summary

This thesis examines young children's early collaborative development when engaged in joint tasks with both a peer and a parent. It begins by examining how the term "collaboration" has been applied and researched in previous literature. As collaboration is found to usually require dialogue, and intersubjectivity is seen as an important component in the construction of both collaboration and dialogue, the ability to construct intersubjectivity is the subject of the rest of the chapter. The chapter concludes by introducing the research questions that underpin the experiments that follow.

A number of experiments are then described. Experiments 1 and 2 investigate age differences in interaction styles and the communication strategies used by similar aged dyads. Experiments 3 and 4 investigate differences due to the age of the child and/or the status of the information giver (either parent or child) in the styles of interaction and the communication strategies used by parent and child dyads. Experiment 5 investigates the benefits of collaborating with a parent; and finally, Experiment 6 examines the collaborative ability of preschoolers.

The thesis identifies a series of skills required for successful collaboration. These include recognition of a joint goal and the need to suppress individual desires, the ability to structure joint interaction, moving from role-based to a negotiating style, and communicative skills, for example, asking for clarification. Other reasons for children's failure in collaborative tasks involve task-related skills, such as the development of spatial terms, and failure to recognise the need for accuracy. The findings support Vygotsky's theory that when working with an adult, children perform at a higher level than when working with a peer. Evidence was also found of parents scaffolding the interaction for their children. However, further research is necessary to establish that such scaffolding skills affect the child's development of collaborative interactive skills.

Key words - Collaboration, interaction, communication style, intersubjectivity, scaffolding

ACKNOWLEDGEMENTS

This thesis is the result of a studentship awarded by the Neuroscience Research Institute, Aston University, Birmingham, to whom I am indebted for financial support.

I am extremely grateful to my supervisor, Dr Roslyn Hill for her guidance and support. Her accessibility and interest in my work has been invaluable, enabling me to gain confidence to develop my own ideas.

I would also like to thank Dr. Barlow Wright for the interest, support and feedback, especially in regards to the first draft that he provided.

I am indebted to all the children and their parents who took part in the experiments in this research, together with their teachers, without whose co-operation this thesis would not have been possible. My thanks are extended to the following schools: St Joseph & St Teresa Primary School, Woodlands; Holy Family RC Junior & Infants School, Stainforth; King Edward Primary School, Thorne; Bessacarr Primary School, Bessacarr; Bentley High Street School, Bentley; and Castle Hill Primary School, Scawthorpe.

I would like to thank, Julie Hepworth, for acting as second marker, and for the helpful discussions which we shared, which helped to clarify a lot of my thinking.

Finally, my gratitude is extended to my husband, John, and my daughter, Helen, for the faith that they have shown in me, and the support that they have given.

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1. CHAPTER ONE

General Introduction

That collaborating with other provides both social and cognitive benefits has been proposed theoretically (Piaget, 1926/59; Vygotsky, 1978; Azmitia & Perlmutter, 1989; Tudge & Winterhoff, 1993) and demonstrated empirically (e.g., Azmitia & Perlmutter, 1989; Doise & Mugny, 1984; Foot & Howe, 1998; Gauvain & Rogoff, 1989; Golbeck, 1998; Mugny & Doise, 1978). However, how the ability to participate in peer collaboration develops has received very little attention. The aim of this thesis is to examine how the ability to collaborate develops and the role that interaction with others may take in its development.

In this thesis, attention is paid to the role of others, particularly adults, in the development of the child's collaborative ability. However, as shown by the literature review in Chapter 2 and by Experiment 5 (Chapter 7), this is not meant to imply that interaction with peers, siblings and/or older or younger children does not assist in the development of these skills or is in any way inferior to adult and child interaction. The decision to examine the role of adult and child interaction was due to the fact that adult and child interaction has been recognised as a contributory factor in the development of a number of cognitive and social skills, with adults providing guided participation (Rogoff, 1990), or scaffolding (Wood, Bruner & Ross, 1976; Wood, Wood & Middleton, 1978), which enables the child to gain success both during and following the interaction (Conner, Knight & Cross, 1997; Ellis & Rogoff, 1982; Gauvain & Rogoff, 1989; Radziszewska & Rogoff, 1988; Rogoff & Gardner, 1984; Saxe, Gearhart & Guberman, 1984; Wood & Middleton, 1975). Scaffolding refers to a process in which sensitive tutors simplify the task to match the developing capabilities of the tutee. As the tutee's ability to carry out the task increases, the support provided by the tutor is gradually removed until the tutee is able to carry out the task independently (Wood & Middleton, 1975; Wood, Bruner & Ross, 1976; Wood, Wood & Middleton, 1978). Although the concept of guided participation is very similar to that of scaffolding it goes further in that it takes into account the contribution made by the child who may *"seek, structure, and even demand"* (Rogoff, 1990, p.255) the assistance of those around. Guided participation also differs from scaffolding in that it is applicable to learning in everyday situations where the adult or more capable other may not intentionally be taking the tutoring role.

The thesis begins by examining what is meant by the term "collaboration". As the establishing of intersubjectivity and the use of dialogue are found to play an important role in the collaborative process, the current literature on the development of intersubjectivity and the development of interactive communication is also reviewed. The research questions are then outlined and the two main tasks used in the experiments that follow are introduced. The experimental method is used as it allows the researcher a greater control over a variety of variables that may, if using the more naturalistic method, influence the results that are obtained.

Six experiments are reported in Chapters Three to Eight. The first two look at age differences in the ability to co-construct and co-maintain collaboration; the next three examine the role of parents in the development of collaborative ability, and the sixth looks at the collaborative ability of children younger than those taking part in the previous experiments. The final chapter discusses the findings of these experiments in terms of the development of the ability to collaborate.

Throughout the thesis, the author refers to herself as either "the author" or "the experimenter" depending on which term is the most appropriate at the time.

2. CHAPTER TWO

Literature review

The following chapter is divided into three sections; the first examines the current literature on collaboration; the second, on intersubjectivity; and the third, on interactive communication. The attention of the reader is drawn to limitations within the existing knowledge, especially with regard to how the development of the ability to collaborate, to construct intersubjectivity, and to use interactive communication are interlinked and the role that interaction with others may take in the development of these abilities. The research questions that arise from this chapter are then outlined and the two main tasks used in the experiments that follow are introduced.

2.1. Section 1: Collaboration

Forman & Cazden (1985, p.329) proposed that collaboration *"requires a mutual task in which the partners work together to produce something that neither could have produced alone."* This definition suggests that collaboration involves a partnership in which the partners jointly construct something new between them, something that neither partner could have produced independently. John-Steiner (1985), however, offered a somewhat different view when she defined the collaborative process as one *" in which the successful intellectual achievements of one person arouse the intellectual passions and enthusiasms of others, and through the fact that what was at first expressed only by one individual becomes a common intellectual possession instead of fading away into isolation"* (p.187, cited in Azmitia, 1996, p.133). This definition suggests that an early part in the collaborative process involves the transference of ideas from one individual to another, a kind of meeting of mental minds.

2.1.1. Theory

Piaget (1926/59) and Vygotsky (1978) both agreed that the experience of collaborating with others was important for the child's social and cognitive development (Tudge & Winterhoff, 1993; Tudge & Rogoff, 1989). However, as shown below, there are a number of points on which the two theorists differed.

Piaget (1926/59) identified two forms of collaboration, "active" and "abstract". In active collaboration the remarks made by the partners concern a shared activity or common memories, for example, a television programme that both partners have watched. "Intelligible" talk (which is talk that can be understood by others) is not necessary as the partners can see the object they are discussing or know that they were both present at the time the event took place. In abstract collaboration, the partners discuss something that is not physically present, for example, a story that requires reconstructing, or a problem that has been set by the teacher. "Intelligible" talk is necessary, as the partners are required to express their thoughts and ideas in a manner that can be understood by others. According to Piaget, if collaboration is to result in learning, socio-cognitive conflict is necessary, as it is only when partners realise that there is a difference in their skills (Mugny & Doise, 1978) or viewpoints (Doise & Mugny, 1979) that cognitive disequilibrium can take place. It is through the process of struggling to resolve these differences and to re-establish cognitive equilibrium that individuals achieve new and higher modes of thinking. Piaget proposed that abstract collaboration is the most advanced form of collaboration as with this form the partners are required to adjust their individual thinking, whereas with the active form they are only required to imitate their partner's behaviour. Piaget proposed that children only participate in abstract collaboration after they have reached the age of seven years and have started to decentre (the process by which the child becomes less egocentric). Egocentrism refers to perceiving, understanding, and interpreting the world only in terms of the self coupled with the inability to differentiate between the self and other people. According to Piaget, until children have started to decentre they do not use argumentation, explanation and justification in their speech, as they do not realise that the viewpoints of others may differ from their own.

Piaget proposed that collaboration between peers is of greater benefit than working with an adult, as the unequal power base between the child and adult prevents argumentation. Hartup (1989) has described the relationship between adult and child as asymmetric in that the adult holds most of the power, knowledge, and expertise making it difficult for the child to question the adult's contribution. In peer interaction, a more symmetrical relationship exists making it easier for partners to challenge each other's contributions.

The age of six to seven years has been cited as a transitional point in cultural learning (Tomasello, Kruger & Ratner, 1993). Tomasello et al. identified collaborative learning as the

most advanced form of cultural learning which they proposed was not possible until the child had developed the ability to engage in reflective and recursive dialogue and to co-construct with another a new perspective or point of view. Their definition of collaborative learning is similar to Piaget's definition of abstract collaboration in that the child is required to consider the viewpoint of others and to change his/her own viewpoint when required. Tomasello et al. proposed that for children younger than six to seven years the purpose of peer collaboration was to enable knowledge to be acquired through a process of transmission and imitation. The idea that young children acquire their knowledge through imitating the behaviour of others is also shown in the work of Piaget (1945/62) who described children in the egocentric stage (two to seven years) as imitating the behaviour of others when playing the game of marbles. Although, according to Piaget, children younger than seven years are able to imitate marble playing behaviour, for example they roll the marbles, they fail to understand that the purpose of the game is to try and win. According to Piaget, it is only after the age of seven years that children play to win. Tomasello et al. proposed that the collaborative behaviour of older children differs from that of the younger children due to older children having developed other abilities making it possible for them to jointly co-construct new knowledge, which they then individually internalise, as opposed to imitating existing knowledge. In this way, the collaborative behaviour of younger and older children can be seen to differ. As for younger children it is their actions that are collaborative, whilst for older children it is their thinking.

Vygotsky (1978) differed from Piaget in that he was interested in explaining cognitive and social development from a socio-historical perspective. Vygotsky proposed that starting at birth children are required to interact with others as all higher mental functions originate first in the social interactions that take place between the child and more capable others before they are internalised by the child to become internal mental functions. How this internalisation process operates is not clear (Elbers, Maier, Hoekstra & Hoogsteder, 1992; Rogoff, 1990). Whilst theoretically Vygotsky proposed that it was not one of straightforward transmission but involved a combination of learning and developmental processes, there has been very little research carried out into establishing the exact mechanisms of the process (Rogoff, 1990; Wertsch & Stone, 1985).

Vygotsky (1978) differentiated between the interaction that takes place between children and adults and between child peers by proposing that adults provide guidance whilst peers provide

the opportunity for collaboration. The distinction between adult and child interaction and peer collaboration has been somewhat eroded of late, with followers of Vygotsky (for e.g., Gauvain & Rogoff, 1989; Rogoff 1990; Moss, Parent, Gosselin & Dumont, 1993) applying the term collaboration to the interaction that takes place between adults and children as well as between child peers. However, Rogoff (1990) proposes that interaction amongst peers, especially in play, provides children with the opportunity to learn different skills to those acquired when interacting with adults, as when child peers are engaged on a joint activity for the joint activity to continue the children are required to construct and maintain intersubjectivity (shared understanding) by explaining their own behaviour as well as making sense of the behaviour of others. According to Rogoff (1991), in adult and child interaction the adult is more likely to take sole responsibility for the structuring of the interaction and for constructing and maintaining intersubjectivity. However, this has been shown to vary depending upon the age and experience of the child and the mode of interaction that is used (Rogoff, 1991; Hoogsteder, Maier, & Elbers, 1996).

Due to Vygotsky (1978) providing very little detail regarding the nature of collaboration apart from the fact that one partner was required to be more capable than the other, followers of Vygotsky have focused on the idea that collaboration involves some form of tutoring with an older or more experienced peer teaching a younger or lesser-experienced one (see section 2.1.2). However, Vygotsky also proposed that children could learn by imitating the behaviour of the other children with whom they were carrying out a collective activity as long as the observed behaviour was in the child's zone of proximal development. The zone of proximal development refers to the ability of the child to carry out actions in collaboration with others that he/she is not yet able to carry out independently but will be capable of carrying out independently in the not too distant future. Followers of Vygotsky have proposed that collaboration involves cooperation between partners (e.g., Forman, 1989; Rogoff, 1990; Silverman & Geiringer, 1973). Cooperation has been characterised as requiring joint agreement plus clarification, extension and compromise (Damon & Killen, 1982).

A possible explanation for the differences between Piaget and Vygotsky regarding their approach to collaboration can be found by examining the theoretical viewpoints taken by the two theorists regarding the relation between learning and development. For Vygotsky (1978), *"learning and development are interrelated"* (p.84), with learning setting into notion *"a*

variety of development processes that would be impossible apart from learning" (p.90). Therefore, for Vygotksy learning precedes development, with learning taking place through the child's social interactions with more capable others. However, learning does not take place instantly, nor is it necessarily the same form in the initial stages as in the final stages. To illustrate how an interpersonal process is transformed into an intrapersonal process Vygotsky used the example of the development of finger pointing. In the initial stage, the child's hand movements are simply an attempt to grasp an object. It is only when the mother realising that the child's hand movements mean something comes to the child's aid, that the child's movements are given social meaning. However, a long period of development is required before the child understands this movement as pointing. This suggests that although the child may be collaborating by carrying out actions in the company of others, the learning that is takes place does not result in any immediate change in the child's behaviour.

For Piaget, *"learning trails behind development"* (Vygotsky, 1978, p.80), in other words, development occurs first and then learning take place. For Piaget, other functions such as the ability to decentre (the process whereby children become less egocentric) have to develop before children are able to learn (or make cognitive advances) by collaborating with others.

This difference in theoretical viewpoints means that whereas for Vygotsky social interaction is important from birth, in that this is the route through which children acquire their knowledge, for Piaget social interaction gains in importance with development, as related abilities have to develop first and these develop due to innate biological processes.

Recently, the distinction between the Piagetian and Vygotskian camps has been somewhat eroded with researchers attempting to find a compromise between the two (Kruger, 1992, 1993; Miell & MacDonald, 2000). Kruger coded for transactive reasoning (operationalised as the number of criticisms, explanations, justifications, clarifications and elaboration of ideas) the dialogues of 48 8-year-old girls who had collaborated with either their mothers or a best friend on a moral reasoning task. She reported that only rejected solutions that had been discussed and then discarded for a more suitable solution were indicative of cognitive change, as when an agreement was reached without discussion, for example, when the child without questioning followed the mother's instruction, cognitive change did not take place. Based on these findings, Kruger proposed a new conceptualization of collaboration *"that focused on the*

importance of dyadic consideration of multiple perspectives" (Kruger, 1993, p.165) rather than on simple measures of conflict or cooperation. For details of additional studies, see section 2.1.3.2.

2.1.2. Collaboration and peer learning

Stemming from the theoretical viewpoints of Piaget and Vygotsky there have been attempts both in the United Kingdom and abroad to introduce various methods of peer learning into schools and colleges (Damon & Phelps, 1989; Topping, 1992). This educational-based research provides a useful insight into the way in which scholars have differentiated between peer collaboration and other forms of joint learning.

In the *peer tutoring* approach, children work in dyads consisting of an expert and a novice with the expert taking the role of teacher (for reviews see Cohen, Kulik & Kulik, 1982; Sharpley & Sharpley, 1981; Topping, 1988). Although due to the knowledge difference, the relation between the partners is to some degree unequal, it is more equal than that which occurs between adult and child (see section 2.1.1.). The term *cooperative learning* has been applied to a diverse range of team-based learning methods (for reviews see Slavin, 1990; Topping, 1992), with the majority of these methods the teacher provides the team or group with a defined task that the group members divide into a number of sub-components. Each group member then takes responsibility for a single sub-component. After developing their individual knowledge regarding their specific sub-component, the group-members feed back their knowledge to the group. Depending on the method that is followed, differing degrees of emphasis are placed upon the amount of joint learning that takes place (Damon & Phelps, 1989). In the *peer collaboration* approach, children work together in pairs on a problem-solving task provided by their teacher. Unlike the peer tutoring approach both children are relative novices with neither partner having more knowledge than the other, and unlike the cooperative approach the partners are required to work together jointly on the problem rather than breaking it up into separate components. When comparing the above three approaches Damon & Phelps (1989) noted that peer collaboration differed from the other two approaches in that it *"forces children to communicate about task-solving strategies and solutions"*, [allowing learning to be discovered] *"in a context of peer assistance and support"* (p.142).

2.1.3. How collaboration has been examined by previous researchers

The aim of this subsection is to identify the key issues that have been examined by previous researchers interested in collaboration and the methods that they have used.

2.1.3.1. Collaboration as a means to aid learning

As noted in section 2.1.2, one of the key areas of interest has been into how peer collaboration can facilitate cognitive growth (or learning). Howe and Tolmie, plus a variety of colleagues, have carried out a number of studies in this area. In these studies (Tolmie, Howe, Mackenzie & Greer, 1993; Howe, Tolmie & Rodgers, 1992; Howe, Rodgers, & Tolmie, 1990) children, aged eight to twelve years, have worked in fours to create a joint understanding of a physical event, for example, floating and sinking. The children's discussions have been recorded and coded for references to concepts in the relevant formal physics. By testing the children's individual understanding of the relevant concepts both a few weeks before and again a few weeks after the group work, evidence has been obtained which shows that children learn from their collaborative experiences. However, this learning has been shown not to be related to the group discussion, as there has been very little relation between the concepts generated within the group and the pre-test and post-test changes. These findings have led Foot & Howe (1998) to conclude that group interaction regarding the understanding of physical events is a catalyst towards private reflection and subsequent consolidation.

The amount of learning that takes place when children are partnered by partners of either a similar or different status to themselves has also been investigated. For example, Radziszewska & Rogoff (1988) examined whether nine-year-olds gained greater skills in planning when they collaborated with an adult compared with a similar aged peer. The partners were given a map of a town centre and had to plan a route so that a driver could make a single journey to pick up five items, presented on a list, needed for a school play. The partners planned two trips together and then the children completed a post-test trial in which they planned a route independently. The same maps were used on each trial but the lists were different. The results of the post-test showed that children who worked with adults produced routes about 20% shorter than children who had worked with peers, and that they used strategies which they had previously used with the adults which were not used by the "with peer" dyads.

Other researchers, however, have found that adults do not facilitate learning. For example, Hughes & Greenhough (1995) compared improvements in the ability of six- and seven-year-olds to plan a route after working alone, with a peer, with their teacher, or with another peer as well as their teacher. The results showed that whilst the children working with an adult performed significantly better than those working without an adult, there was no significant effect for the status of the partner, either when carrying out the post-task or for the pre-task to post-task gain.

Rogoff (1990) has suggested various factors that might account for why some studies have found that adults facilitate learning whilst others have not. These include whether the situation involves the development of the child's understanding and/or skills, for example, learning to tie shoe laces or to associate things in order to be able to recall them, or involves a shift in perspective, for example, a child who makes the transformation from nonconservation (believing that the quantity of water changes when poured into different shaped glasses) to conservation (recognising that the water quantity does not change despite the change in the shape of the container). However, in regards to the two studies cited above, as both Radziszewska & Rogoff (1988) and Hughes & Greenhough (1995) measured planning ability in this instance it would seem that some other factor, for example, the age of the children or the status of the adult, either parent or teacher, could be more applicable.

The main drawback with comparing adult-child interaction with peer interaction is that even if adult-child interaction is found to facilitate learning over and above that of peer interaction, its usefulness in the classroom is limited as children rarely have the opportunity to work on a one-to-one base with an adult. A more realistic scenario would be to compare the amount of learning that takes place when children work in groups facilitated by a teacher, groups in which there is no adult present, compared to when they worked independently.

Within the cognitive change (or learning) approach a number of other variables have also been examined, for example, whether the partners were friends or non-friends (Azmitia & Montgomery, 1993), the age of the child who the target child is partnered by (Duran & Gauvain, 1993), and the competence level of the partner (Duran & Gauvain, 1993; Golbeck, 1998; Tudge, 1999). These studies have all used pre- and post-tests to measure the amount of cognitive change that has taken place following the collaborative experience. In addition, in

studies which have examined competence level, the pre-test has also been used to identify the child's competence level therefore enabling the target child to be paired with a peer who is either more competent, less competent, or of the same ability level. Using this method, Tudge (1999) showed that when children were partnered by a child who was less competent than they were, regression in thinking was just as likely as improvement.

The main limitation with the cognitive change (or learning) approach is that it is not suitable for use with very young children as it can only be used with children who are at an age where they can construct and maintain a discussion that may, or may not, result in a measurable change in their thinking.

2.1.3.2. The transactive reasoning approach to collaboration

Within the transactive reasoning approach (see section 2.1.1), there have been attempts to identify the type of partners most likely to benefit from collaboration (Azmitia & Montgomery, 1993; Miell & MacDonald, 2000).

For example, Miell & MacDonald examined whether existing friendship influenced the collaborative behaviour of eleven- and twelve-year-old peers when creating a musical composition. The children's talk was coded for transactive and nontransactive communication (Kruger, 1992). Transactive communications include utterances that extend, elaborate, or work on ideas that have already been proposed in the interaction, whilst non-transactive communications are utterances that do not extend or elaborate existing ideas. The former differ from the latter in that they involve the partners working together to explore ideas that have already been introduced. A similar classification scheme was created for the children's musical compositions in which transactive codes were applied when partners extended existing musical motifs and non-transactive codes when partners introduced new motifs not related to those which had previously been introduced. The results showed that children who had received musical instrument training used more transactive communication compared to children who had not had any musical training. However, overall, the most successful collaborators, as judged by the quality of the music produced, were those children who were friends before carrying out the task. These dyads engaged in more transactive communication in both the verbal and musical domains.

Whilst the transactive communication approach is useful, in that it provides a means for analysing collaboration which does not necessarily involve conflict, it is only applicable to children who are already at a stage of development were they understand the need to work together and have developed the skills needed to communicate their thoughts and ideas to one another.

2.1.3.3. Collaboration and preschoolers

With younger children, especially those under school age, the focus of the research has been upon how the children coordinate their joint actions rather than how they advance cognitively. However, as shown in the following two examples, even with pre-school children, the ability to communicate is seen as an important component of collaboration.

The first example is of a study by Brownell & Carriger (the same experiment was reported in 1990, 1993, & 1998) who examined the collaborative behaviour of children aged 12 to 30 months when required to collaborate to obtain toys from a clear plexiglass box. The task required one child to push a lever on the box whilst the other child retrieved the toy. Various behaviours which were taken as attempts to coordinate actions were coded including the child's movements around the apparatus, the number of times the child operated the handle with a pause for the partner to respond or no pause, the number of times the child anticipated the appearance of a toy as the partner operated the handle, commands, compliance versus resistance, displacement by one child of the partner, and simple exploration.

The second example is of a study by Cooper (1980) who examined the collaborative behaviour of three- and five-year-olds when engaged on a balanced scale task. Working in pairs, the children were required to find matching pairs of blocks from an array that varied in weight and surface design, but not size. To measure the amount of collaboration that took place Cooper coded thirteen variables related to the children's communication strategies: attention-focusing, question, directive, relevant comment, irrelevant comment, ignore, verbal response, nonverbal response, evaluative feedback, accurate labeling, accurate attribute, inaccurate attribute, and comparatives.

The above two examples show that the type of classification schemes that have been used for measuring collaboration have differed depending on the age of the participants and the types

of task that have been used which makes it difficult to use the existing literature to obtain a full understanding of how collaborative ability varies with age.

2.1.3.4. Collaborative styles

Rather than measuring a variety of variables that have taken to be representative of collaboration, some researchers (e.g., Forman, 1981; Verba, 1994; Mercer, 1996) have labeled the observed interaction as being typical of a particular collaborative mode or style. For example, Mercer (1996) reported on three styles of collaborative talk used by nine- and ten-year-olds when collaborating on a series of classroom based tasks (see Figure 2.1). Each talk style is very different, partly due to differences in the type of tasks that the children were required to carry out, but also, although not discussed by Mercer, probably due to differences in the type of relationships that the children had, with the boys in the first example having a more competitive-based friendship than the girls in the second example (Pellegrini & Blatchford, 2000).

On the other hand, when looking for the start of peer collaboration in the interactive behaviour of children aged eighteen months to four years, Verba (1994) combined both approaches by first coding a range of variables which she then condensed into three modes of collaborative behaviour (for details of modes see Figure 2.2). However, in her report Verba only discussed the modes and not the results for the individual codes.

The collaborative styles approach is useful when the researcher wishes to compare a number of dyads (Forman, 1981), or groups (Verba, 1994; Mercer, 1996). However, if the aim is to provide a highly detailed account of exactly what behaviour is taking place, the collaborative styles approach does not provide the same depth of detail as coding a range of variables.

Figure 2.1. Collaborative talk styles (Mercer, 1996)

Disputional talk - By keying in co-ordinates and reacting to the feedback received two boys were required to find an elephant that had been lost in New York. According to Mercer, although the boys appeared to be working collaboratively they were in actual fact working competitively as they took turns to key in the coordinates, with the child who keyed in the last pair before the elephant was found claiming it as a personal victory rather than being due to joint effort. Disputional talk was characterised by assertions, counter-assertions and individual decision-making.

Cumulative talk - Two girls worked together to produce a class newspaper. The girls were reported as working together cooperatively, in that they asked each other questions, made suggestions and provided justifications for their decisions. They also confirmed and validated each other statements creating an intersubjective understanding (shared understanding) of what their text should look like. The talk style was labeled as cumulative in that it positively built with each successive addition.

Exploratory talk - Three children took the role of Viking raiders and had to decide between them which of four possible sites they should raid when planning an invasion of the English coastline. Mercer reported that the children asked each other questions, commented and made suggestions, discussed and evaluated alternative proposals and reached a joint consensus. Exploratory talk is talk in which knowledge is shared and reasoning made visible with progress emerging from the eventual joint agreement reached.

Figure 2.2. Modes of interaction (Verba, 1994)

The observation-elaboration mode – One child observes the actions of another child and then carries out the same action. This results in the children carrying out the same actions virtually simultaneously.

The co-construction mode - The children form a social bond characterised by the use of communication (may be very limited) to share meanings, achieve joint management, and to make reciprocal contributions, all serving to achieve the same goal.

The guided activity mode - One child acts as a tutor to another child. This may be no more than providing a prompt or facilitating an action.

2.1.3.5. The lifespan approach

The idea of the ability to collaborate as a bank of skills that develop and change during the life-span has been proposed by a number of researchers (for e.g., Forman, 1992; Azmitia, 1996). Azmitia (1996) proposed that these skills included the ability to co-construct and co-maintain a shared dialogue, the ability to co-construct and co-maintain shared actions, and the ability to co-construct and co-negotiate shared goals.

Forman (1992) has also taken the approach that the ability to collaborate changes with age. She proposed that for children still at the play stage, there is no need to co-construct formal goals as the children can adopt very separate roles with very little shared dialogue or action and yet still be playing together, sharing a common theme. However, when older children are engaged on collaborative problem-solving tasks, the demands placed upon them are very different as these children are required to co-construct and co-maintain a shared dialogue through which they can communicate their thoughts and ideas regarding their shared goal. Forman proposed that for older children the increased demands for intersubjectivity (i.e. shared understanding) leads them into co-constructing new modes of discourse, deeper levels of intersubjective understanding and different types of intrapsychological regulation (example, voluntary memory, selective attention and logical reasoning).

The main limitation with the life-span approach is that so far there has been very little empirical work carried out to test the theory.

2.1.3.6. The multi-layered nature of collaboration

An alternative method for examining the various approaches that have been used when examining collaboration is to divide them into those that examine product and those that examine process.

Looking first at the product of collaboration, on the most basic level, the product of collaboration can be taken as the goal of the task in that the product is what the collaborators work together to produce. A popular method for examining this form of product has been to give pairs of children a problem-solving task and to instruct them to work together. The researcher arrives at a measure of the product by measuring how well the partners have succeeded at the task. For example, in Miell & MacDonald's (2000) study (see section

2.1.3.2) the product was the musical composition that each dyad constructed, with the amount of transactive communication that the dyad used being compared with the quality of their musical composition as rated by a teacher.

An alternative way of looking at product has been in terms of the amount of cognitive change or learning that takes place within the individual. The most popular method for examining this form of product has been to measure the amount of cognitive gain resulting from the collaboration (see section 2.1.3.1). For example, Golbeck (1998) tested whether the ability of ten- and twelve-year-olds to independently provide correct answers would change after they had carried out a Piagetian water task with either a peer who was of a similar ability to themselves, a peer who was of a different ability to themselves, or independently.

The main problems with studies that have focused solely on product are that some researchers have assumed that the presence of a partner is evidence that collaboration is taking place (Tudge & Winterhoff, 1993), whilst others have assumed that all collaboration is of an equal quality (Glachan & Light, 1982; Radziszewska & Rogoff, 1988). However, the results from a number of studies that have looked at the process of collaboration have shown that just because children are told to work together it does not necessarily follow that this will happen (Forman, 1981; Renshaw & Garton, 1986) or that all collaboration is the same (Forman, 1981; Mercer, 1996).

As with product, researchers who have examined the collaborative process have differed depending on whether they are interested in process in terms of working together to produce a task goal or in terms of cognitive gains. In both cases the method of study has been to examine the communication that takes place between partners when engaged on a joint task. For example, in Miell & MacDonald's (2000) study (see section 2.1.3.2) the researchers' interest was in the type of talk the children used to complete the task whereas in Golbeck's (1998) study the interest was in the type of talk used in relation to cognitive change.

Renshaw & Garton (1986) introduced a further tier in understanding the collaborative process by proposing a model (see Figure 2.3) of the pre-task collaborative stages that successful collaborators are required to go through if they are to achieve task success. The model shows that before dyad partners can collaborate to achieve the task goal they first have to collaborate

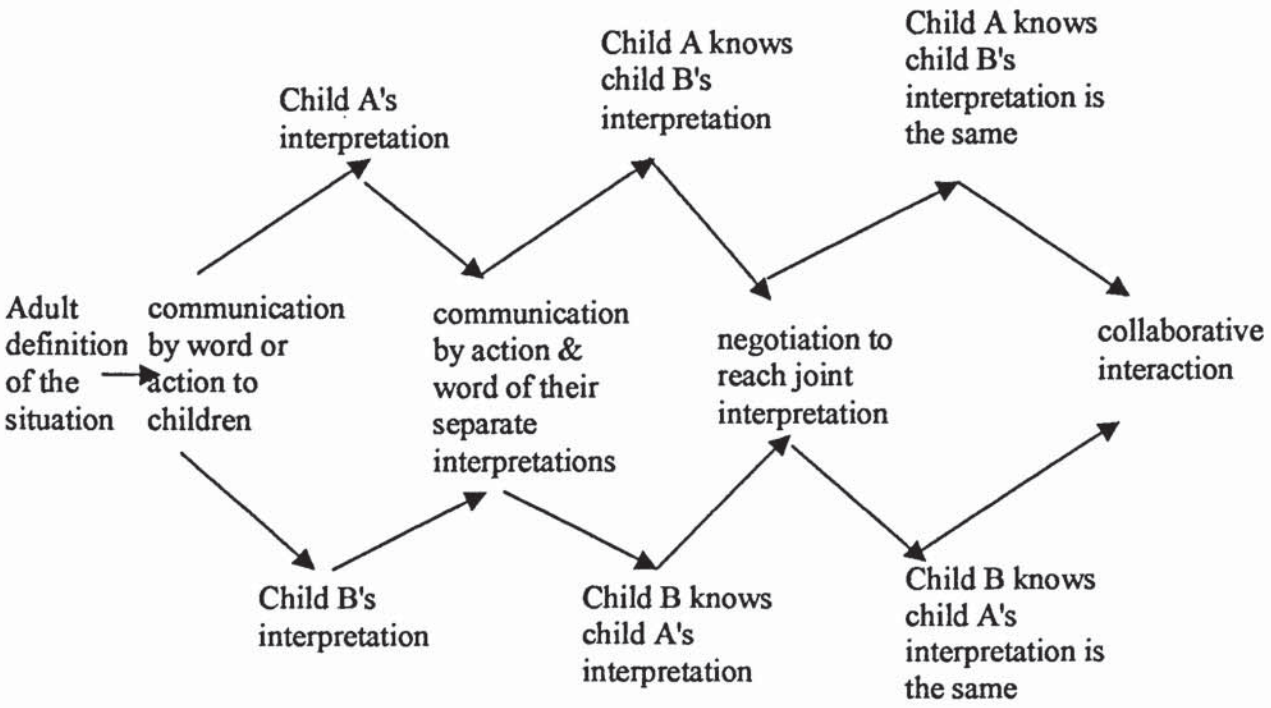
to co-construct a new joint interpretation (i.e. intersubjective understanding) of the experimenter's instructions. Renshaw & Garton proposed that this collaborative pre-task collaboration involved a number of stages. First, the dyad members are required to individually interpret the instructions given by the experimenter. Next, they have to communicate to each other their separate interpretations before negotiating to reach a joint interpretation of the experimenter's instructions. It is only when this stage has been reached that they can collaborate to achieve the task goal. According to Renshaw & Garton, the new joint understanding of the task requirements acts as a transcending rule to which the dyad members can refer whenever they encounter problems, thus allowing the task goal to be successfully achieved.

Renshaw & Garton reported the testing of their model with twelve pairs of children (six pairs of seven- and nine-year-olds). The children, working in pairs, were required to make a line of blocks according to a specific difference rule. For example, each block had to differ from the previous one on one dimension, for instance, shape, size or colour. The childrens' interaction was videoed and transcribed and the period in which they placed the first six blocks (no details were given regarding the total number of blocks used) examined for evidence of a joint rule being created. In addition, all instances of disagreement, wherever they occurred in the interaction, were identified. A disagreement was defined as *"any instance of conflict or dissent expressed by one of the children"* (Renshaw & Garton, 1986, p.52). Renshaw & Garton reported that only with two dyads (one of each age group) was there any evidence of an explicit attempt to establish a joint rule, although there was evidence with a further four dyads of a joint rule being followed. In addition, although no statistical evidence was reported, dyads following a joint rule compared to no joint-rule dyads were reported as making approximately half the number of disagreements and to resolve their disagreements quicker (measured by the number of utterances made when resolving the disagreement). However, in a later paper by Garton & Renshaw (1988), in which statistical evidence was provided, these latter claims were not upheld.

It is not clear from Renshaw & Garton's (1986) report whether all disagreements were successfully resolved or if the subject matter about which the dyads who constructed a joint-rule disagreed, was the same or different to the subject matter for which they had constructed a joint rule. As this is the only age group for which testing of the model has been reported it is

also not known whether the stages outlined in the model are applicable to the collaborative behaviour of older children and adults.

Figure 2.3: Model of the processes involved in establishing a collaborative problem-solving dyad (adapted from Renshaw & Garton, 1986)



Forman (1981) studied the collaborative process by examining how it changes over repeated interactions. She reported on the collaborative behaviour of three nine-year-old dyads when carrying out a selection of logical-reason tasks over eleven classroom-based science lessons. The tasks were seven chemical problems, graded in terms of logical complexity with the least complex being presented first. Each lesson followed the same sequence. First, the experimenter performed two demonstration experiments. The children were then asked a standard set of questions before setting up and carrying out their own experiments. The lesson finished with the experimenter repeating the same set of questions that had been asked previously. By analysing the behaviour of the dyads in the part of the sessions that were to do with planning and setting up the experiments, Forman identified three forms of procedural collaborative behaviour: parallel, associative and co-operative. In parallel interaction, the children shared the materials and exchanged comments about the task but made few if any attempts to monitor each other's work or to share with each other their own thoughts and ideas.

In associative interaction, the children tried to share information about each other's work but there was no attempt to co-ordinate their interaction. In co-operative interaction the children constantly monitored each other's work and performed coordinating roles. Over the three-month period in which the children carried out the task, Forman reported that the children in one of the dyads never reached the cooperative stage. Other researchers have also reported that some children have problems in constructing their joint interaction, (e.g., Garton & Renshaw, 1988).

The findings from Forman's (1981) study show that the collaborative experience is not the same for all children within the same age group. However, as no measures were taken of the children's pre- and post-task knowledge regarding the scientific problems it cannot be assumed that the greatest amount of learning took place when the children interacted cooperatively. Although Forman's study is informative, in that it demonstrates that not all collaboration is the same and that there are differences in the amount that dyads cooperate, the study is limited in that it only reports on the collaborative behaviour of three dyads, all belonging to the same age group. This makes it not possible to establish age-related norms or to establish if the reported behaviour is typical of children in this age group.

2.1.4. Summary for Section 1

The key issues that have arisen in this section are:

- A number of issues have been examined by researchers interested in the subject of collaboration, whilst each makes a valuable contribution to knowledge regarding collaboration, only the lifespan approach (see section 2.1.3.5) attempts to address the question of how the ability to collaborate develops, with so far, very little empirical work being carried out in this area.
- The behaviours that previous researchers have been taken as collaborative are to some degree dependent upon the age of the group being studied. For example, the classification scheme used by Miell & MacDonald (see section 2.1.3.2) would not be applicable to the collaborative behaviour of pre-schoolers whilst the codes used by Brownell & Carriger (see section 2.1.3.3) would provide very little information regarding the collaborative ability of adolescents. This fits in with the lifespan approach (see section 2.1.3.5) which proposes that there are different types of collaboration, with use being related to age.
- When carrying out research looking at collaborative ability some measure or

measurements needs to be made of the type and amount of collaboration that takes place as this has been shown to differ both between and within age groups and depending on the type of task that has been used. However, whether a variety of variables are coded, for example, the number of agreements, justifications, and disagreements, or the observed behaviour classified as being typical of a particular style or type, depends upon the research question that is being asked.

- Whilst the main research focus so far has been on collaboration as a tool for bringing about cognitive change or learning for the individual, the author proposes that there are other forms of collaboration which are also worthy of investigation. Evidence for this proposal comes from the work of Mercer (1996) who provided three examples of children collaborating when engaged on a joint task (see Figure 2.1). In the first two examples the partners collaborated to carry out the task. However, there was no evidence to suggest that there was any change in individual cognition. It is only the description of the children's talk in the third example, which suggests that the children may have challenged each other's thoughts or ideas leading to cognitive change. However, it could be that one child in the group got the other children to agree with him/her without there being any change in individual cognition. In addition, as evidence from the work of Howe & Tolmie and colleagues (see section 2.1.3.1) suggests that what is said during the group discussion is not a good indicator of cognitive change, to ensure that cognitive change had taken place the views of the individual children would need to be measured both a few weeks before and after the interaction.
- The term collaboration can be applied to the joint interaction that takes place between adults and children, children of unequal status, and same-aged peers. However, as there are differences in the power relationships that are formed depending upon the status of the partners, the type of collaboration that takes place is not necessarily the same. This is an area requiring further research.
- Renshaw and Garton (1986) have suggested that more successful collaborators, in terms of achieving the task goal, carry out pre-task collaboration in which they create an intersubjective understanding regarding the experimenter's instructions. However, more research is needed in this area as no support was found for this proposal when tested with seven- to nine-year-olds.
- The ability to collaborate is to some degree dependent upon communicative ability, as

characteristics of communicative ability, for example, attention focusing, questions, agreements, directives, relevant and irrelevant comments, are frequently used to measure collaboration. This issue is explored further in Section 3.

- The construction of intersubjectivity plays an important role in collaboration as it creates for the collaborators the belief that they are both sharing the same understanding. This issue is explored further in the following section.

2.2. Section 2: Intersubjectivity

Although the subject of intersubjectivity has been explored by philosophers, sociologists, psychologists and political thinkers (Crossley, 1996), as much of this work is not applicable to the present research the subject of intersubjectivity in this thesis is examined from a child developmental perspective.

It could be argued that humans as social beings live in a social world where their thoughts and actions are shaped through their interaction with others. Starting at conception, whether the result of medical intervention or sexual intercourse, the fetus cannot come into being without the actions of others. Even in the birth process the neonate is not alone but is part of a micro-social unit that includes the baby, mother, sometimes father, and any medical staff that may be present. This micro-social unit is enmeshed in other social units. For example, if the baby is born in Western society it may be born in a maternity ward in a local hospital with the other families and nursing staff on the ward composing a larger social unit. In the neonate's immediate family there may be other siblings, with a larger family unit consisting of grandmothers, grandfathers, aunts and uncles. Crossley (1996) summed up the importance of intersubjectivity for human life when he wrote:

> *"Intersubjectivity is the key to understanding human life in both its personal and societal forms. It is that in virtue of which our societies are possible and we are who we are. Moreover, it is irreducible and sui generis, a generative* principle *of our identities, our agencies and of the societies in which we live. And it is something which we cannot step out of. No amount of methodological procedure, either philosophical or social scientific, can negate this or even bracket it out. We are inter-subjects. Our actions and thoughts aren't reducible to us alone. They are moves in a game which has many players, responses to a call to action which is expressed in every gesture of the other. And their significance is precisely constituted through their place in that game."* (p.173)

2.2.1. The development of intersubjectivity

In this section a number of theories are examined which have been proposed to explain how various factors related to the ability to establish intersubjectivity develop.

Trevarthen proposed that humans are born with *"a readiness to know another human"* (Trevarthen, 1980, p.318), that they are preprogrammed with innate "motives" which enable them to engage with "motives" in other brains (Aitken & Trevarthen, 1997). Trevarthen defined motives as *"mental structures underlying perception and actions"*(Trevarthen, 1980, p.325). He proposed that newborns have two forms of motives, subjective ones that enable them to know the physical world, and intersubjective ones that enable them to communicate with others. Trevarthen proposed that as infants develop and their ability to engage in reciprocal, cooperative behaviour increases, there are corresponding changes in their motives in that they become increasing intersubjective. In his early work, Trevarthen (1979) identified the use of pre-speech in seven-week-old infants. He proposed that in order to communicate infants were required to adapt or fit this pre-speech to the speech rhythm of others, therefore creating intersubjectivity. In later work with Aitken (Trevarthen & Aitken, 1994, Aitken & Trevarthen, 1997), the concept of the innateness of intersubjectivity was further expanded by the introduction of the Intrinsic Motive Formation hypothesis (IMF). The IMF proposes that during fetal development certain parts of the brain that connect sensory input (perception) with motor output (actions) are adapted in order to regulate interpersonal attachments and communication of mental states. This adaptation process equips the neonate from birth with the necessary equipment to enable him/her to meet others as corresponding partners. Communication disorders are caused by either neurological dysfunctions related to the IMF, as in the case of autism and schizophrenia, or to a mismatching between the infant's and mother's motives, as in the case of mothers with postnatal depression who do not provide the *"sympathetic expressive and imitative reciprocity"* (Aitken & Trevarthen, 1997, p.666) that the infant requires for normal development.

Trevarthen (1980; Trevarthen and Hubley, 1978) labeled the first part in the development of the infant's communicative behaviour as primary intersubjectivity and the later part, starting about the age of nine months, as secondary intersubjectivity. Whereas primary intersubjectivity is characterised by two-way interaction, either between the infant and an object or the infant and another person, secondary intersubjectivity is characterised by

triangular interaction involving the infant, an object, and another person. The age of nine months is seen as a transformation point, as at this age infants are capable of constructing joint attention with others regarding an object in their visual field (Adamson & Bakeman, 1991).

A view which opposes the view that intersubjectivity is innate was offered by Kaye (1979) who proposes that intersubjectivity is learned through the child's interaction with her/his mother. Kaye (1979) carried out a longitudinal study of the interaction of 50 mother and child dyads when carrying out a variety of functions including feeding, face-to-face play, and a maternal teaching task. Kaye concluded that in all of these functions the mother controlled the interaction. On the final part of the study, the experimenter took the part of the mother and the infant was required to imitate a series of five goldfish movements that the experimenter made with his/her mouth. As most of the six month olds imitated the goldfish mouthing behaviour on at least one trial, Kaye concluded that this showed that the infants had learnt to engage in reciprocal imitation behaviour through the experiences that they had shared with their parents.

The idea that the ability to imitate was a learned behaviour was a core concept of Piaget's (1945/62) work on play, dreams and imitation. Using evidence from the study of his own children, Piaget charted how the ability to imitate was gradually acquired. However, in more recent studies (e.g., Kugiumutzakis, 1985, 1998; Meltzoff & Moore, 1983, 1989) newborns of just a few hours have been shown to imitate tongue protrusion, mouth opening, lip protrusions, smiles, head movements, finger movements and vocal sounds. This suggests that the ability to imitate is innate rather than learned, providing support for Trevarthen's hypothesis that neonates are born equipped to construct intersubjectivity with others.

As the term "intersubjectivity" is not commonly found in dictionaries, Gómez (1998) attempted to define it by using the dictionary definitions of its components "subjective" and "inter". Two definitions were reported for "subjective". In the first, "subjective" was anything "*belonging to, proceeding from, or relating to the mind of the thinking subject and not the nature of the object being considered*". In the second, subjective was anything "*relating to or emanating from a person's emotions, prejudices, etc.* (p.245). Based on these definitions Gómez proposed that intersubjectivity takes place when the subjectivity of one individual takes the subjectivity of another as its object, or, in Gómez's words, *"when my mind thinks about the minds of other subjects, or when I think about the minds or the feelings*

of others" (Gómez, 1998, p.245). Gómez, however, identified a problem with this definition, as it does not take into account the need for both subjects to be reciprocally aware of each other's awareness. He labeled the type that only refers to the ability of a single person to take into account the subjectivity of another, one-way intersubjectivity, and the type in which both partners take into account each other's subjectivity, two-way intersubjectivity.

Gómez identified a further dualism in the child developmentalist account of intersubjectivity that also reflects the difference between the dictionary definitions (reported above). Starting with the work of Trevarthen (see above), the view that intersubjectivity was linked with perception and emotions was taken. The main question for proponents of this approach was whether the ability to construct some form of intersubjectivity was present from birth in the emotive responses of the caregiver and infant. However, from research into theory of mind (TOM) an alternative approach developed with proponents of this approach taking the view that any appraisal of the subjectivity of another had to be based on some sort of theoretical knowledge or abstract representation (metarepresentation) of the other's mind, with intersubjectivity only being possible after the child had acquired the ability to take into consideration the thoughts of the other. In both approaches, the ability to construct "joint attention" (Adamson & Bakeman, 1991), emerging around the age of nine months, is significant. However, whilst in the emotive approach the ability to construct joint attention is a more advanced form of intersubjectivity, in the TOM approach it signals the start of intersubjectivity and is one of the simplest forms. Research in the emotive paradigm has mainly concentrated on assessing two-way intersubjectivity, for example, as seen between mother and infant. However, research in the TOM paradigm has mainly concentrated on assessing one-way intersubjectivity, for example, the child participant's awareness of the mental state of a fictional child who is not present at the time of assessment. Bråten (1998) has offered an account of the development of intersubjectivity that attempts to unite these two separate approaches.

Bråten (1998) used the metaphor of a four level "staircase" to indicate that the abilities that develop at each step (or domain) endure and continue to evolve throughout the life course with the lower steps supporting those of the higher levels and the higher levels mediating those of the lower. The model has a very strong Piagetian feel with the ages for the emergence of each domain mirroring those of Piaget's sensorimotor and preoperational stages. The content of

each domain is also heavily Piagetian with the emphasis in the first two domains being on the child's growing ability to differentiate between self, other, and objects and to use this knowledge to control their physical environment, whilst the emphasis in the second two domains is on the child's growing ability to engage in mental representations of their own thinking and the thinking of others. The evidence for the domains follows a very similar pathway to that used by Piaget (1945/62) in his work on imitation, play and dreams with the first two domains being centered on the infant's growing ability to imitate, culminating in the ability to engage in deferred imitation, whilst the second two domains are centered on the child's growing ability to engage in symbolic communication, with the division between the two domains reflecting the distinction made by Piaget between solitary and collective symbolism. According to Piaget (1945/62), although children younger than four years are able to engage with others in play they are not able to co-ordinate their roles. This fits in with Bråten's model in which only in the final stage do children come to realise that the thoughts and emotions of others may differ from their own, and that these are required to be taken into consideration when constructing intersubjectivity.

2.2.2. Intersubjectivity and collaboration

Intersubjectivity is constructed when both partners believe that they both share the same knowledge. Intersubjectivity can be achieved by the listener asking the speaker for clarification, indicating by the use of acknowledgements that he/she is accepting the information that the speaker has given, or in some cases, by not challenging and therefore indicating acceptance of the information that the speaker has provided (discussed further in Section 2.3). Although in studies which have used classification schemes no direct reference has been made to measuring intersubjectivity, all codes which measure behaviours which enable the partners to reach a joint understanding, for example, asking for clarification, providing an explanation or justification, extending an existing idea, acknowledging acceptance or understanding of the speaker's previous utterance, are measures of intersubjectivity.

Although the need for constructing intersubjectivity when collaborating has been mentioned by a number of researchers, for example, Forman, 1992; Gauvain & Rogoff, 1989 (see section 2.1) there has not been any research which has directly compared changes in intersubjectivity (this could be type and/or amount) with changes in collaboration (this could be type and/or

amount). However, although Forman (1981) did not refer to the subject of intersubjectivity when examining how collaboration changes over time (see section 2.1.3.6), it is possible to relate different degrees of intersubjectivity to the different collaborative styles that she identified. For example, in parallel interaction, which is the least collaborative style, the children worked independently without influencing each other's thoughts and ideas, whilst in cooperative interaction, which is the most advanced collaborative style, the children shared the same thoughts and ideas, monitored each other's work and performed coordinating roles. In associative interaction, which is more collaborative than the parallel style and less collaborative than the cooperative style, there was some attempt to share ideas. However, whilst the degree of intersubjectivity which was constructed was greater than in the parallel style, it was less than that constructed in the cooperative style.

Gauvain & Rogoff (1989) presented yet another slant on the relationship between intersubjectivity and collaboration. After carrying out a study looking at whether the status of the partner, either peer, adult or no partner, had an effect on the child's later independent performance, Gauvain & Rogoff reported that children who shared responsibility with a partner were more likely to achieve task success at a later time when working alone, than those who either did not share responsibility with their partners, took turns, or worked independently. However, they also proposed that children who did not share responsibility but carefully observed their partners, were also likely to achieve task success. Gauvain & Rogoff proposed that the reason for the latter's success, was that children who observed their partners were responsible for constructing intersubjectivity. In this example the construction of intersubjectivity is not something that the partners are equally responsible for, as it is up to the observing child to make sense of their partner's actions by trying to understand their partner's actions from their partner's perspective.

2.2.3. The importance of intersubjectivity for scaffolding

Wood and colleagues (Wood & Middleton, 1975; Wood, Bruner & Ross, 1976; Wood, Wood & Middleton, 1978) showed that when teaching children new tasks more successful mothers, as measured by the child's subsequent success on the task, scaffold the interactive process in such a way that the child is able to carry out functions beyond his/her present unassisted capability level. The success of the scaffolding process is dependent upon the construction of intersubjectivity (Wood, 1980), as the mother's input is contingent upon her assessment of the

child's behaviour, with a greater amount of help being provided when the child shows signs of failing and control being relinquished when the child shows signs of success. According to Rogoff (1990), the scaffolding process can be likened to the construction of a bridge between existing and new knowledge. Mothers who provide the most effective forms of scaffolding are those who simplify their initial introductions to a level that the child can understand. Once a common ground (or intersubjectivity) has been established, the mother draws the child into a more mature understanding linked to the child's existing knowledge.

2.2.4. Summary of Section 2

The key issues to have arisen in this section are:

- There is evidence to suggest that neonates are born with some form of basic ability for establishing intersubjectivity. However, the experience of interacting with adults seems to play a contributory role in the development of more advanced forms.
- Gómez (1998) proposed that there are two forms of intersubjectivity, one-way which occurs when one individual takes into consideration the thoughts and feelings of another, and two-way which occurs when two (or more) people take into consideration the thoughts and feelings of each other. One-way intersubjectivity has been studied by the theory of mind paradigm, whilst two-way has been studied in the mother and child paradigm. The present thesis is mainly interested in two-way intersubjectivity.
- Bråten (1998) proposed a four-step metaphor to explain the development of intersubjectivity from 0 - 6 years, with the first two steps being centered on the infant's growing ability to imitate, culminating in the ability to engage in deferred imitation, whilst the second two steps are centered on the child's growing ability to engage in symbolic communication. The ability to construct joint attention, which emerges at around nine-months, is seen as a transformation point in the development of the ability to construct intersubjectivity.
- The construction of intersubjectivity is a key factor in the scaffolding process as it enables a link to be formed between new and existing knowledge.
- Intersubjectivity is usually established through communication. Whilst with older children and adults this usually involves the use of language, it can be established non-verbally, for example, through actions and the use of eye-gaze.
- There has been a lot of interest into how the ability to construct intersubjectivity develops

during infancy and the role that interaction with adults may take in this development. However, there has been very little research that has examined how the increased demands for intersubjectivity placed on older children are related to changes in collaborative ability (Forman, 1992).

2.3. Section 3: Interactional communication skills

In order to collaborate, partners need to be able to communicate, with communication usually involving the use of language. However, language, specifically discourse, also requires collaboration, both for its construction and maintenance as well as for establishing a shared understanding of the topic under discussion. The purpose of this section is to report on research that has examined the skills needed to collaborate over the construction and maintenance of a shared dialogue and how these skills develop. The section is divided into three main areas: the first reports on research carried out in the referential communication paradigm looking at the development of communicative ability; the second examines the use of a number of key features related to the construction and maintenance of a shared dialogue, and the third examines the role of adults in the development of interactive communication skills.

2.3.1. Referential communication

Referential communication is the type of communication involved when a speaker gives instructions to a listener regarding the construction of an object or the selection of a target object from an array of similar objects. The standard procedure that has been followed has required two communicators to sit at opposite ends of a table with a screen between them. The purpose of the screen is to limit the means of communication to the verbal channel. Depending on the interests of the researcher the participant either takes the role of speaker and provides the information (Maratsos, 1973; Whitehurst & Merkur, 1977), or the role of listener and uses the received information in some manner, for example, to select the target object from an array of similar objects (Cosgrove & Patterson, 1977; Ironsmith & Whitehurst, 1978, Patterson, Massad & Cosgrove, 1978).

A number of models have been produced to show the communication skills used in referential communication. Two of these models, the first by Bowman (1984), which identifies the processes that the speaker and listener must follow in order to obtain task success, and the

second by Whitehurst & Sonnensachein (1985), which provides a more in depth analysis of the skills needed if task success is to be achieved, are discussed below.

Bowman's (1984) model shows that the speaker, who is the person providing the instructions, is required to select the critical attributes of the referent whilst taking into consideration attributes specific to the listener, for example, their age, language ability and/or state of knowledge of the referent. Based on this information the speaker encodes an appropriate message. The listener attends to and decodes the speaker's message in relation to the available referential array, evaluates the adequacy of the message and provides feedback regarding any ambiguities. The speaker attends to the feedback and provides, where necessary, changes to the message that the listener must then re-evaluate. The latter part of the process is repeated until the listener believes that s/he has enough information to complete the task. According to Bowman, violations of this process by speaker or listener can only lead to task success by chance.

Whitehurst & Sonnensachein (1985) proposed that referential communication consisted of the three components of substantive knowledge, enabling skills and procedural rules. Substantive knowledge is domain specific knowledge, comprising of factual or conceptual knowledge about the subject matter. Enabling skills are domain general, they include skills relating to vocabulary, memory, perception, and information processing. Procedural rules include knowledge of how dialogue is constructed, for example, the cooperative principle (see section 2.3.2.2) and turn taking rules (see section 2.3.2.1), as well as knowledge more specific to referential communication tasks (see Figure 2.4).

Figure 2.4. Procedural rules specific to referential communication (Whitehurst & Sonnensachein, 1985)

- The listener rule (for speakers) - The speaker is required to attend to cues regarding the listener's status, knowledge and ability and to produce the type of message that will result in the relevant response from listeners with these characteristics.
- The feedback rule (for speakers) -The speaker is required to attend to cues from the listener regarding non-comprehension or noncompliance and to reformulate the message on the basis of these cues.

- The difference rule (for speakers) - The speaker is required to be able to discriminate between the target referent and other objects in the referential array, to have the necessary vocabulary to enable them to do this, and to know the importance of describing differences rather than similarities.
- The editing rule (for speakers) - The speaker is required to assess the risk of the listener's non-compliance or non-comprehension to the message and edit those assessed as carrying a high risk.
- The comprehension monitoring rule (for listeners) -The listener is required to assess the importance of the message and to determine whether those of importance have been understood.
- The feedback rule (for listeners) - The listener is required to respond to request for action made by the speaker and let the speaker know if the message has not been fully understood.

2.3.1.1. The development of referential communication skills

Developmental trends have been noted for the amount of information contained in the speaker's utterance with young child speakers omitting large amounts of crucial information from their messages (Piaget, 1926/59; Glucksberg, Krauss, & Higgins, 1976; Whitehurst, 1976; Lloyd, Camaioni, & Ercolani, 1995; Girbau, 2001). For example, Girbau (2001) compared the performance of eight- and ten-year-olds when producing messages for an imaginary listener. Her results showed that eight-year-olds produced twice as many ambiguous messages and that the mean length of their messages were half those of the older children. Data regarding the length of the message had been collected, as longer messages were taken as an indication that the speaker was taking into account the needs of the imaginary listener with whom no common ground could be established. However, there is some dispute as to whether message length can be taken as an indication of message quality. Whilst some researchers, for example, Lloyd & Beveridge (1981), have implied that the best type of messages are those that contain non-redundant or contrastive information (containing the minimal amount of information necessary to be informative), other researchers, for example, Sonnenschein (1982, 1984a, 1984b, 1985, 1988) have argued that in some circumstances messages that contain redundant information are of a higher quality as they reduce the information processing demands made upon the listener.

Age trends have also been noted in the manner in which speakers edit their messages after receiving feedback from the listener concerning message adequacy. In an early study (Gluckberg & Krauss, 1967), older child and adult speakers were shown to provide clearer and/or additional information after receiving feedback whilst under six-year-olds were shown to repeat word-by-word what they had just said, provide equally ambiguous messages and use pointing, even though the listener could not see the information that they were pointing to. Later studies (e.g., Peterson, Danner & Flavell, 1972; Karabenick & Miller, 1977; Cosgrove & Patterson, 1979) reported that the ability of young speakers to provide accurate information could be improved if the right type of feedback was provided. For example, Cosgrove & Patterson (1979) showed that when six-year-olds were provided with specific, general or no feedback, the most successful outcome, as measured by task success, was found when the listener provided specific queries that identified the precise information that they needed to know. Robinson & Robinson (1985) later showed that the optimal time for providing feedback regarding message ambiguity was immediately after the message had been provided. A related body of research has examined whether the provision of feedback can be used to teach children communicative skills. For example, Patterson & Massad (1980) showed that when seven-year-old speakers were exposed to systematic feedback from nine-year-old listeners their initial messages became less ambiguous. Overall, this body of research demonstrates that although young children in general as speakers are quite poor at providing accurate information, their ability can be improved if the right kind of feedback is given.

Developmental trends have been noted for skills related to the role of the listener (reviewed in Patterson & Kister, 1981) with a number of researchers (e.g., Bearison & Levey, 1977; Patterson, Cosgrove & O'Brien, 1980; Flavell, Speer, Green & August, 1981; Jackson & Jacobs, 1982) reporting that the non-verbal behaviour of children as young as four years differs depending on whether a message is ambiguous or unambiguous. For example, when the message is ambiguous the listener makes a greater amount of eye contact with the speaker, takes longer to react, and use more hand movement. However, other researchers (e.g., Pratt, 1984) have reported that it is not until the age of eight years that children start seeking clarification by requesting it verbally. Pratt (1984) proposed that this difference between younger and older children represents a difference in communication strategy, with younger children using a non-verbal strategy where they select what they assume is the suitable item, if this is incorrect they then make an alternative selection, whilst older children and adults have

developed the ability to use verbal strategies to check on the information that they are unsure about.

Age differences have also been found in the way in which children perceive the role of the message. Robinson & Robinson (1976) reported that when a speaker produced an ambiguous message causing the listener to identify the wrong referent, 100% of six-year-olds incorrectly blamed the listener for identifying the wrong referent, whilst 100% of ten/eleven year olds correctly blamed the speaker. In later studies, Robinson & Robinson (1978, 1982, 1983) compared the relationship between children's communicative performance as speakers and their understanding of message ambiguity. Their results showed that children who as speakers had a more accurate understanding about ambiguity provided less ambiguous information.

Most of the studies carried out in the referential communication paradigm have either examined skills related to the role of the speaker or the role of the listener. However, Lloyd, Mann & Peers (1998), examined age differences in the ability to be an effective speaker and listener and the relationship between the two. Their results show that in circumstances where the message is ambiguous and additional information is required, speaker and listener skills are closely related. Marked improvements with age in both speaker and listener skills were also reported, with average accuracy rising from 10% for five-year-olds, to 50% for nine-year-olds, to around 66% for eleven-year-olds.

A number of explanations have been put forward to account for age differences in performance in referential communication tasks. In relation to the role of the speaker, links have been found between performance on perspective taking tasks and referential communication tasks (Glucksberg et al., 1975), comparison tasks (which require the participant to select a target referent from a number of similar objects) and referential communication tasks (Whitehurst & Sonnenschein, 1981; Camaioni & Ercolani, 1988) and perspective taking tasks, comparison tasks and referential communication tasks (Roberts and Patterson, 1983), suggesting that the development of all three abilities are interrelated. With regard to the role of the listener, explanations that have been offered are that younger children confuse what the speaker actually means with what is actually said (Robinson, Goelman, Olson, 1983; Flavell et al., 1981; Beal & Flavell, 1984; Bonitatibus, 1988, Beal & Belgrad, 1990), and base their judgment of the communicative adequacy of the message on the age

and/or the status of the speaker (Sonnenschein & Whitehurst, 1980; Ackerman, 1983; Sonnenschein, 1984a, 1986). These findings suggest that the ability to carry out referential communication tasks may be dependent upon the development of other related abilities (see enabling skills, section 2.3.1).

2.3.1.2. Limitations of the referential communication method

There have been a number of criticisms of the referential communication method. Whilst the early research investigated the communication skills of pairs of same-aged children (e.g., Glucksberg & Krauss, 1967) a lot of the more recent research has required the child to interact with an adult experimenter. In everyday interaction adults usually provide support for children (see section 2.3.3). However, in referential communication tasks due to experimental constraints, no support is provided. Lloyd (1994) has reported that a far greater degree of communicative success has been recorded in studies where children interact with similar aged peers (Lloyd, 1991, 1992). However, in these studies no direct comparison was made between performance with an adult and performance with a similar aged peer.

The high information processing demands made by referential communication tasks may distort the findings. Although young children may have the information processing capacity to carry out everyday communication, referential communication tasks require additional capacity in that as well as constructing and maintaining a dialogue, the participants are required to discriminate between the different referents. Shatz (1978) has shown that by increasing the processing demands, for example, by increasing the number of referents in the array, the performance of adults is reduced to a similar level to that of children.

The question of the ecological validity of the standard referential communication method has also been raised (Lloyd, Boada & Forns, 1992). The majority of referential communication studies have focused on how speakers produce, and listeners interpret, a single utterance (Anderson, Clark, & Mullin, 1991, 1994). This is not typical of normal communication in which partners collaborate to try and ensure intersubjectivity (see section 2.2). Recently, a number of studies have been reported in which pairs of same-aged children and/or adults have collaborated over the giving and receiving of information relating to a route marked on a map. The aim of this research has been to examine the more interactional aspects of successful communication (Lloyd, 1991, 1992, 1993, 1994; Anderson, Clark & Mullin, 1991, 1994;

Anderson & Boyle, 1994).

2.3.2. Features of successful discourse

The following section introduces a number of features considered necessary for the construction and maintenance of interactive communication and reports on research that has examined the use by children of these features.

2.3.2.1. Turn taking

The turn taking nature of conversation is a widely accepted phenomenon and depends on the cooperation of the interlocutors who are taking part in the conversation (an interlocutor is a person who takes part in a conversation). Sacks, Schegloff & Jefferson (1974) proposed that in conversation participants speak in units known as turn-constructional units that range in size from a single word, for example, "Okay," to a number of sentences. The end of each turn-constructional unit is a transition-relevance place, at which point there may be a change in speaker. Sacks et al. identified 14 rules that govern basic turn taking (see example below). These rules are mainly concerned with the sequencing of the turn taking but also include rules for repair mechanisms for dealing with turn taking errors and violations.

An example of a turn-allocation rule taken from Sacks et al. (1974, p.704)

1) For any turn, at the initial transition-relevance place of an initial turn-construction unit:
    a) If the turn-so-far is so constructed as to involve the use of a "current speaker selects next" technique, then the party so selected has the right and is obliged to take the next turn to speak; no others have such rights or obligations and transfer occurs at that place.
    b) If the turn-so-far is so constructed as not to involve the use of a "current speaker selects next" technique, then self-selection for next speakership may, but need not, be instituted; first starter acquires rights to a turn, and transfer occurs at that place.
    c) If the turn-so-far is so constructed as not to involve the use of a "current speaker selects next" technique, the current speaker may, but need not continue, unless another self-selects.

In everyday conversation, interlocutors use a number of strategies that are not covered by the turn allocation rules identified by Sacks et al. For example, acknowledgements that overlap

with the end of the unit that they are acknowledging, and instances in which the listener finishes off the speaker's utterance (Clark, 1994).

A number of researchers (e.g., Schaffer, Collis & Parsons, 1977, Ervin-Tripp, 1979; Collis 1985; Pellegrini, Brody & Stoneman, 1987; Tomasello, 1988) have reported how children from the age of two years are able to respond to a partner's utterance and to maintain the same topic of conversation when replying. Both of these abilities are seen as requisites for successful turn taking. Other researchers, (e.g., Ervin-Tripp, 1979; Garvey & Berninger, 1981) have shown that whilst the gaps in the conversations of young children are longer than those in adult conversations, by the age of five years they are similar to those of adults. Taken together, this evidence suggests that the ability to use turn taking in conversation occurs quite early in development. However, whether young children are aware of the need for both (in a dyad), or all (in a group), partners to contribute to the conversation when carrying out a collaborative task has not been addressed, nor whether there are differences in the amount of interactive communication that takes place depending on whether the child is partnered by an adult or similar aged peer.

2.3.2.2. Conversation maxims

Grice (1975) proposed that interlocutors follow a basic cooperative principle that requires them to make their conversational contribution appropriate to the conversation that is taking place. To specify what would count as appropriate, Grice introduced the four maxims of quantity, quality, relevance and manner. For quantity, talk must only be as informative as required for the current purpose, for quality, talk must only include what the speakers knows, and has evidence is true, for relevance, relevance changes as talk progresses and the speaker must ensure that their talk remains relevant at all times, and for manner, talk must be expressed clearly, briefly and orderly. Grice proposed that these maxims could be flaunted by what he termed conversational implicatures. These nonconventional forms are used, for example, when the rules contradict each other (for example, when being relevant and informative violates the quantity rule of only providing enough information for the current purpose), when irony is intended, or when the speaker uses repeated questioning to ensure that the listener has understood what has been said (Siegal, 1991).

Dunham, Dunham and colleagues (Dunham & Dunham, 1996, Dunham, Dunham, Tran &

Akhtar 1991, Ferrier, Dunham & Dunham, 2000), have carried out a series of experiments to examine the use of the Gricean maxims by two-year-olds. In each experiment the children interacted with a robot that has been preprogrammed to reply to their utterances. When examining for manner (Dunham, Dunham, Tran & Akhtar 1991), the robot replied to the children's utterances either in a temporally contingent manner or at random intervals. The results showed that the children made significantly more replies when the robot replied in a timely contingent manner. When examining for relevance (Dunham & Dunham, 1996), the robot replied to the children's utterances either making an on- or off-topic comment. The results showed that the children were twice as likely to reply to on-topic comments. When examining for quantity (Ferrier, Dunham & Dunham, 2000), the robot replied to the children's utterances making either a general (e.g., What?) or specific (e.g., Piggy is in what?) clarification request. The results showed that the children were able to differentiate between the quantity requirement needed in their replies as they replied to the general queries with complete repetitions and to specific queries with only the amount of information required. Further details regarding use of clarification requests are reported in 2.3.2.4.

2.3.2.3. Question forms of introduction

Clark & Wilkes-Gibbs (1986) proposed the collaborative theory of reference to explain how speakers, when introducing a reference into the conversation, try to establish with their partner the mutual belief that the partner understands the reference to a criterion sufficient for current purpose. After examining the forms of introduction used by adult speakers when providing instructions regarding a route drawn on a map, Anderson & Boyle (1994) proposed that speakers who introduced new references using the question form of introduction (for example, Have you got baboons?) are more communicatively cautious speakers, in that they assume less shared knowledge with their partners, or assume less about their partner's abilities to interpret new information and instructions. Dyads in which the speaker used the question form were reported to be more successful at achieving the task aim of producing an identical route drawing compared to dyads in which the speaker used a non-question form (for example, Go to the right of the baboons).

When examining the forms of introduction used by children Anderson et al. (1991) reported that twelve- and thirteen-year-olds as speakers use the question form more frequently than younger children (seven years plus) and as listeners are much more likely to explicitly challenge statement forms of introduction. Anderson et al. claimed that there are two separate

developmental effects at work in the process of establishing mutual knowledge in dialogue. One relates to the form of introduction used by speakers, with older speakers preferring to use the question form, the other relates to the listener, who with age acquires the confidence to challenge their partner's statements when requiring additional information. However, Anderson et al. warned that their findings must be treated with caution as the high information processing demands made by the task may have inhibited the performance of the youngest children. Whilst Anderson et al.'s (1991) study identified age differences in the forms of introduction used by children over the age of seven years, there have not been any studies which have looked at age differences in the forms of introduction used by children younger than seven years, or at how the ability to use the question form develops.

2.3.2.4. Clarification requests

Listeners, when requiring additional information or not fully understanding what has been said, can use the question form to check on their knowledge (Holtzman, 1972; Garvey, 1977; Berninger & Garvey, 1981; McTear, 1985; Lloyd, 1992). The term 'contingent query' was used by Garvey (1977) to describe how the listener's requests for clarification are contingent upon the information contained in the speaker's previous utterance and how, by the listener using a contingent query, the speaker does not lose the floor as the turn is returned to them as soon as the query has been resolved. Garvey also showed that the way in which the contingent query is phrased affects the type of reply that is given. For example, when a speaker is providing information about a particular person, if the listener uses the general query "What?" the speaker repeats the whole sentence, whereas if the listener uses the specific query "Who?" the speaker only repeats the name.

A number of researchers (Gallagher, 1981; Anselmi, Tomasello & Acunzo, 1986; Ferrier, Dunham & Dunham, 2000) have shown that from the age of two years children are able to differentiate between general and more specific types of queries and provide appropriate answers (see Figure 2.5). In addition, by using a referential task in which dyads aged seven, ten and adult were required to collaborate regarding the giving and receiving of instructions Lloyd (1992) showed that older children like adults, used significantly more of the potential forms of requests compared to younger children. As shown in Figure 2.5, potential requests allow the listener to identify information that is potentially available but missing from the speaker's previous utterance. Lloyd proposed that the age differences were due to the

potential types making greater demands on the part of the listener, as before they can be used the listener has to carry out some form of evaluation of the received message. Whilst Lloyd's study identifies age differences in the use of clarification requests after the age of seven years, no studies have looked at age differences in clarification request use by children younger than seven years or at how the ability to use the more advanced styles develops.

Figure 2.5. Clarification request types used in Lloyd's (1992) route-finding task

(Lloyd 1992 p.p. 366 & 367). Key: S = Sender, R = Receiver

Nonspecific Requests for Repetition (NRR)

As shown in examples 1 and 2, the listener does not specify the part of the speaker's previous utterance that she/he wants the speaker to repeat.

1. S] I mean the fourth from the bottom

   R] What?

   S] On the fourth from the bottom

2. S] Right, then the one that's opposite from the other one

   R] Say that again

   S] The one that's opposite

Specification Requests for Repetition (SRR)

As shown in examples 3 and 4, the listener specifies the part of the speaker's previous utterance that she/he wants the speaker to repeat

3. S] To the house with two trees and a chimney and two windows and a door at the side

   R] With what at the side?

   S] The door

4. S] You know the one with the roof?

   R] The one with which?

   S] You know the one with the roof? There's a cross on top of there

Specific Request for Confirmation (SRC)

As shown in examples 5 and 6, the listener asks the speaker to confirm information contained in the speaker's previous utterance.

5. S] Go to the church with the point on it

   R] The point?

   S] Yeah. The point at the top

6. S] Go to the one with the tree at each side of it

R] Tree each side of it?

S] Yeah. Not the one with the door at the side

Specific Request for Specification (SRS)

As shown in examples 7 and 8, the listener specifies the part of the speaker's previous utterance for which she/he wants further information and the type of information that is required.

7. S] You go near the petrol station

R] Which one?

S] There's some swings with zigzags on

8. S] Count the, count the houses with the orange roofs

R] Count how many houses with orange roofs?

S] Right, hold on a minute (starts counting)

Potential Request for Confirmation (PRC)

As shown in examples 9 and 12, the listener asks the speaker to confirm information that is not present in the speaker's previous utterance but is potentially available.

9. S] Go straight up and turn a bit and then go to the house

R] What the one with two trees?

S] Yeah. Not the first one, the second one

10. S] Go to the church with the cross, the second one from the last one

R] The one with the spike, you know the one with the triangle thing at the top?

S] No, the one like...

Potential Request for Specification (PRS)

As shown in examples 11 and 12, the listener asks the speaker to choose between two alternative pieces of information, both of which are potentially available.

11. S] No go to the one with the line across

R] In the window or at the top

S] The one with the line across at the top, the second one

12. S] The church that is like a castle

R] The left or the right?

S] I don't know

Potential Request for Elaboration (PRE)

As shown in examples 13 and 14, the listener asks the speaker to provide further information. However, the listener does not specify the manner in which the information is to be provided.

13. S] Well go up go turn and then

R] Go up and turn where?

S] Left and then..

14. S] Go forward

R] Go forward yeah. Go to which petrol station?

S] The one with the um, lines

2.3.3. The role of adults in the development of children's communicative ability

A great deal of research has been carried out looking at the role of adult and child interaction in the development of language in young children (for examples see Nelson, 1973; Snow, Perlmann & Nathan, 1987; Shatz, 1982; Hoff-Ginsberg & Shatz, 1982, Akhtar, Dunham & Dunham, 1991). Although this research has shown that interaction with adults may be important for lexical acquisition it does not directly examine the role played by adults in the acquisition of the ability to construct and maintain shared dialogue. However, as shown below there is some evidence to suggest that the experience of interacting with adults may assist in the acquisition of these skills.

A number of researchers (e.g., Bruner, 1974/75; Trevarthen, 1974) have claimed a developmental continuity from the early proto-conversations that take place in the pre-linguistic period in which mother and child take turns to take the role of "speaker" and "listener", through to the single word stage, and onto later verbal exchanges that can be classified as full-blown conversations. However, Collis (1985) has argued that there is no evidence to suggest that children need to learn conversation skills before acquiring language.

As reported in Section 2.2, interaction with adults plays an important role in the development of the ability to construct intersubjectivity with the adult initially initiating and maintaining joint attention by either following into the child's already established attention focus (Collis & Shaffer, 1975) or by directing the child's attention so that both adult and child are focusing on the same concrete object (Murphy & Messer, 1977). Around the age of nine months, infants themselves start to initiate the construction of joint attention regarding objects in their visual

field (Trevarthen & Hubley, 1978; Bakeman & Adamson, 1984; Adamson & Bakeman, 1991) and by the age of two years, children are able to initiate the construction of joint attention in dialogue regarding topics that are not visibly present (Foster, 1986). Support for the importance of joint attentional processes in the development of conversational skills has been provided by Tomasello & Farrar (1986), who reported that when interacting with their mothers 15- to 21-month-olds averaged twice as many turns per conversation during periods of joint visual attention as opposed to periods of non-joint attention.

Use of maternal scaffolding has also been cited as an important factor in the development of communicative ability. The concept of scaffolding was first introduced by Wood et al. (1976) to describe how adults or more experienced others facilitate the process that enables a child or novice to solve a problem, carry out a task, or achieve a goal that is beyond their current unassisted capability level. Wood & Middleton (1975) found that mothers who scaffolded the most successfully (as measured by the child's success on the task), were those who were able to estimate the child's current ability level and provide instructions accordingly, and were able to change the level of their input depending on the feedback received from the child. Support for the role of maternal scaffolding in the acquisition of conversational skills can be found in a study by Foster (1986) which looked at how children up to thirty months learnt about topic management in discourse. Foster (1986) found that infants started by making only a minimal contribution to the interaction process with most of the weight being carried by the task structure of the routine of the task (Ninio & Bruner, 1978; Snow & Goldfield, 1983) and the scaffolding behaviour of the mother. As the infant's ability to construct joint attention increases, a corresponding decrease occurs in the amount of scaffolding provided by the mother until the child is able to plan his/her own contributions to the topic whilst making both relevant responses to the utterances of the mother as well as new contributions of his/her own. Adult-child interaction may also provide children with routines that they can use in other interactions. By filling in slots in social routines such as saying "Hello" or "Excuse me" and in social games such as Peekaboo, infants may learn chunks, defined by Rogoff (1990, p.95) as *"ready made pieces of meaningful actions"*, that they can use in later conversations (Ratner & Bruner, 1978; Nino & Bruner, 1978; Snow & Goldfield, 1983; Rogoff, 1990). Rogoff (1990) proposed that children understand the communicative functions of chunks before understanding them semantically. Participation in routine interaction also gives children the chance to practice their turn taking skills, as they become familiar with the routine and their

role within it (Foster, 1986; Tomasello, 1988).

There have been a number of studies that have looked at the effect of kinship on issues related to communicative ability, for example, Lloyd (1993) examined whether related pairs (mothers with eight-year-olds) would achieve greater task success, in terms of successfully communicating information regarding a route drawn on a map, compared with unrelated pairs (eight-year-olds with non-related adults). Lloyd had predicted that related pairs would achieve greater task success due to their previous history of shared experience. The results showed that whilst kinship was not related to task success, with related pairs not performing any more successful then non-related pairs, it did affect the type of strategies which were used (see Chapter 3 for description of Component, Numbering, Directional and Minimal strategies), with related pairs using similar strategies both when the child acted as route-giver and the parent acted as route-giver, whilst unrelated pairs used different strategies depending on the status of the route-giver, whether adult or child. The children in this study when interacting with adults were also reported to use more advanced strategies than children in an earlier study (Lloyd, 1991) who had interacted with their peers (see Chapter 3). This suggests that the status of the partner, whether peer or parent, has an effect on the type of strategies that children use. However, due to the data being from different subjects, and the children in the "with peer" study being a year younger than those in the "with parent" study, this finding must be treated with caution. Lloyd (1993) also drew attention to the way in which the interaction changed as it developed. Whilst initially the relationship between the adult and child was asymmetric, with the adult taking most of the control, by the end of the interaction the relationship was much more equal, with the child taking at least equal control. This suggests that through the process of interacting with adults, children learn both task-related and collaboration-related skills.

2.3.4. Summary for section 3

The main points to arise from this section are:

- A developmental trend has been noted in the ability of children to takes the roles of speaker and listener, with young children as speakers providing highly ambiguous messages and as listeners failing to recognise when a message contains ambiguities. However, much of this research has been criticised on the ground that it lacks ecological validity.

- Interactive communication relies on the use of turn taking, conversation maxims, questions and clarification requests. The use of turn taking ensures that both partners contribute to the dialogue. Conversation maxims ensure that both partners follow the same rules when constructing and maintaining their dialogue. The use of questions by the speaker and confirmations by the listener ensures that both speaker and listener attend to the same information. And finally, the use of clarification requests by the listener enables additional information missing from the speaker's original utterance to be obtained. Previous research has shown that compared to older children and adults young children (seven-year-olds) as speakers are less likely to use the question form and as listeners (seven-year-olds) are less likely to provide feedback including requests for clarification. However, in order to chart the development of these skills the ability of children younger than the age of seven years need to be compared with that of older children and adults.
- Adult and child interaction has been shown to play a key role in the development of communicative ability with "sensitive" adults providing scaffolding contingent on the child's performance. In addition, research by Lloyd (1991, 1993) suggests that interaction with adults, in particularly parents, provides children with the opportunity to develop their interactive communication skills.
- Adult and child interaction has been shown to provide children with the opportunity to learn routines that they can use in later interactions with others. However, there has not been any research into whether the ability of children to structure their joint interaction with their peers improves following collaboration with an adult.

2.4. The main research questions to be addressed

Five key questions arise from the sections above regarding the development of the ability to construct and maintain collaboration.

1. How does age affect the way in which collaborators construct their collaboration?
2. Do children and adults carry out pre-task collaborations as suggested by Renshaw & Garton's (1986) model?
3. When given a collaborative problem-solving task at what age do children, when taking the role of information giver, take the needs of their partner into consideration by using the question form thereby inviting a response from their listener, and as listener use clarification requests to check on ambiguities and omissions in the information provided

by the speaker?

4. When children collaborate with an adult does the adult scaffold the child to enable the child to participate in more advanced forms of collaboration than would be used if two same-aged peers collaborated?
5. Does the experience of collaborating with an adult assist in the development of collaboration skills?

In relation to the first question, the author recognises that there will be differences in ability level within the same age group. However, the purpose of the thesis is to identify the collaborative behaviours that occur the most frequently within a given age group and to establish how these differ with age.

To address the research questions outlined above, two experimental tasks were designed. The purpose of the first task was to examine differences according to age and status in the interaction styles used by dyads. The purpose of the second task was to examine differences according to age and status in the communicative strategies used. Further details of the tasks are given in the relevant chapters.

3. CHAPTER THREE

Experiment 1

Age differences in the construction of collaboration

3.1. Introduction

The first experiment had three aims. These were to examine age differences in the styles used by dyads to construct their collaboration; to examine age differences in the strategies used by dyads to establish intersubjectivity; and to investigate Renshaw & Garton's (1986) claim that collaborators carry out pre-task collaborations.

Looking at the first aim, as shown in Chapter 2 there is some evidence, for example, the increased complexity of the demands made by researchers on older compared to younger children, to support the view that age changes in the nature of collaboration are related to the increased demands for intersubjectivity placed upon older children (Forman, 1992). Forman (1992) proposed that these increased demands lead older children into co-constructing new modes of discourse, deeper levels of intersubjective understanding and different types of intrapsychological regulation (e.g., voluntary memory, selective attention and logical reasoning).

Turning to the second aim, Lloyd (1991) reported that the strategies used by dyads when collaborating on a map task became increasingly complex with age. In Lloyd's (1991) study, one partner (the information giver) was required to tell the other partner (the information follower) information regarding a route marked on a map so that the information follower (from now on referred to as IF) could produce the same route. The IF was told that she/he could ask the information giver (from now on referred to as IG) for additional information if required. The partners communicated with one another via a telephone, eliminating the need for a screen. Screens have traditionally been used in referential communication tasks to encourage the construction of dialogue. However, Lloyd considered that the screen method lacked ecological validity, as communication does not usually take place through a screen.

Lloyd (1991) found that the youngest dyads (seven-year-olds) were the only group to use a **minimal** strategy in which the description given by the IG included no critically determining features. For example, the IG said, "Go to the church" but failed to give any additional detail

which allowed the IF to identity the target church from the other churches on the map. The IFs in these dyads did not ask for any additional detail. The strategy most frequently used by the older child dyads (10-year-olds) was a **component** strategy in which the IG provided a description of the features of the target building. The IFs in these dyads showed an awareness of the inadequacy of the message by requesting further details. These children used significantly more turns than either the adult or the younger child group and were as successful as the adults at achieving the task goal. The adult IGs mainly used **dual strategies,** for example, directional and numbering. Directional included the use of standard route-giving terms such as "left" and "right" and "straight on" as well as other terms such as "Go to the one above". Numbering referred to a counting process, for example, "The third church". Even though the adult IGs provided highly detailed instructions, the adult dyads still used significantly more turns compared with the youngest children. The increased complexity of the information provided by the older IGs, suggests that with age, collaborators establish a greater amount of intersubjectivity.

Turning to the third aim, Renshaw & Garton proposed that before collaborating to achieve the task goal, more successful collaborators (in terms of achieving the task goal) collaborate to co-construct a new joint interpretation (i.e. intersubjective understanding) of the experimenter's instructions. Renshaw & Garton proposed that this pre-task-collaboration involved a number of stages (see Figure 2.3). First the dyad partners are required to individually interpret the experimenter's instructions. Then they have to communicate their separate interpretations to one another before negotiating to reach a joint interpretation. According to Renshaw & Garton, the joint understanding of the experimenter's instructions acts as a transcending rule to which the dyad members can refer whenever they encounter problems, thus allowing the task goal to be successfully achieved.

Renshaw & Garton (1986) reported testing their model on 24 children (six pairs of seven-year-olds and six pairs of nine-year-olds). Working in pairs, the children were required to make a line of blocks based on one or more dimensions, for example, shape, size or colour. The interaction was videotaped and the period in which the first six blocks were placed was transcribed. In addition, all instances of disagreements, wherever they occurred during the interaction, were identified. A disagreement was defined as any instance of conflict or dissent. Only two dyads, (one from each age group) were reported to make an explicit attempt to

establish a joint rule in the manner suggested by Renshaw & Garton's model. However, in half of the dyads there was evidence from the monitoring behaviour of the partners that a joint rule was being followed. Dyads following a joint rule were reported to achieve greater task success.

When designing a task that would measure all of the above three aims the following list was drawn-up of the criteria that the task was required to meet.
The task had to:

- be suitable for a wide range of age groups and abilities
- be unfamiliar enough to prevent the participants from simply replicating a familiar style of interaction but familiar enough so that the instructions did not need to be directive in regards to how the task was to be carried out
- hold the attention of the participants
- be suitable for carrying out without any specialised equipment or training
- encourage talk (Mercer, 1996)
- encourage co-operation rather than competition (Mercer, 1996).

The task was also required to meet a further two conditions, specified as important for ensuring that collaborative talk would take place (Mercer, 1996).

- The participants were required to have a good understanding of the point and purpose of the activity
- The researcher had to create a working environment that encouraged free exchange of relevant ideas and the active participation of all involved.

Many of the tasks previously used in collaboration studies were not considered suitable as they examined the product rather than the process of collaboration (see section 2.1.3.6.). Others, for example the music task used by Miell & MacDonald (2000, see section 2.1.3.2), were also not considered suitable due to their use being restricted to a narrow age range. The use of telephones rather than a screen as a means of ensuring that the partners verbally communicated with each other was also considered. However, as Lloyd had reported that due to the uniqueness of the situation, the telephone method was unsuitable for children younger than seven years, the decision was taken to use a screen.

A pattern-making task was finally developed and piloted (see Appendix 6). The main advantage of this task was that it met all of the above requirements and also allowed the dyad partners to believe that they had fulfilled the task requirements even when they failed to co-construct and/or co-maintain their collaboration.

3.2. Method

3.2.1. Design

A between group design was used with age as the independent variable. Age had four levels: four/five years, six/seven years, nine/ten years, and adult. The dependent variables were various characteristics of the dyad's verbal interaction.

3.2.2. Participants

The participants were 152 children from three first schools in an urban area in the North East of England. Sixty of the children were four/five-year-olds (mean age 59 months, S.D. 3.89, range 54 to 68 months), 58 were six/seven-year-olds (mean age 87 months, S.D. 3.5, range 82 to 93 months) and 34 were nine/ten-year-olds (mean age 119 months, S.D. 3.87, range 114 to 125 months). Forty-eight adults also participated (39 first-year psychology undergraduates and nine postgraduates, mean age 21.6 years, S.D. 7.29, range 18 to 45 years). Parental permission had been sought and granted for all the children taking part.

3.2.3. Materials

The task materials were three sets of 15 domino style picture cards with two packs of cards for each set. The cards featured either cartoon animals, for example, zebra/giraffe, monkey/hippo, or simple everyday objects, for example, boat/sun, tree/flower (see Appendix 2 for an example of the cards). A table-top screen was used to encourage the dyad partners to construct a dialogue with two audio-tape recorders and a microphone being used for recording purposes.

3.2.4. Procedure

The school-based procedure is reported in detail. A similar procedure was followed with the adult dyads although the instructions were modified to take into consideration the developmental level of the participant group (see Appendix 6 for an account of the pilot studies that were conducted and Appendix 3 for the instructions given to the dyads).

A few days before the data was due to be collected the author visited the school and was introduced to the children. The children were each given a letter to take home to their parents (see Appendix 1 for a copy of the letter). The letter gave brief details of the research and asked for the parents' consent and an indication of whether the parent would be willing to participate in a follow-on study. On data collection days a small table was set up in a small room in a quiet area of the school. Two small chairs were positioned, one at each end of the table. The children, in their friendship pairs, were collected from their classroom and taken to the study area. The children were seated and the screen with microphone attached was positioned across the centre of the table.

The cards were placed in two vertical lines at the left-hand side of each child. The author pointed to the various pictures on the cards and asked the child to name the pictures. The purpose of doing this was to ensure that the child knew the names of the pictures. In some cases the train was referred to as "a puff puff" and the cup as "a cup of tea". As both children understood this terminology, the child was allowed to continue. The children were told that they had both been given some cards but that not all of their cards were exactly the same. It was explained that they were to use their cards to make a pattern and that both their patterns were required to be the same. This meant that they both had to choose the same cards and put them in the same place in their patterns so that when they had finished and the screen was removed their patterns were exactly the same.

Piloting (see Appendix 6) had indicated that the use of the screen caused children to think that the task was about secrecy and seeing if the same patterns could be made without communicating. It was therefore explained to the children that because the screen was present they would need to talk to each other and tell each other which cards they were using and where they were putting them in their pattern. The children were then asked if they understood the instructions. Clarification was given when requested, and the children were told they could start. When the children indicated that they had finished, the screen was removed and the children were allowed to look at their patterns. A record was made on a separate sheet of whether each partner had carried out the instructions given by their partner, anything of interest that could be used as anecdotal evidence and whether the task aim of producing identical patterns had been achieved.

3.3. Results

The audio taped data was transcribed and four forms of analysis carried out. The first looked at age differences in interaction style, the second at age differences in strategy use, the third at age differences in the use of checking and the fourth at age differences in the use of pre-task collaboration. The rationale for the choice of classification schemes and analysis is given in Appendix 6.

Age differences in the need for the experimenter's assistance were also noted. Although a number of requests for assistance were made by the younger dyads (four/five-year-olds and six/seven-year-olds) only one request was made by the older dyads (nine/ten-year-olds). The data from dyads requiring adult assistance has been included in the analysis as the dyads were still responsible for the construction of their collaboration.

3.3.1. Interaction styles

The interaction style of each dyad was classified as being typical of one of the following: non-verbal, parallel, information giver/follower (IG/IF), turn taking, and negotiating. Details describing the main characteristics of each style are given below. The styles are to some degree hierarchical as a dyad could start their interaction by using one of the more basic styles, for example, the turn taking style, and then switch to a more advanced style, for example the negotiating style, once they became more involved in the task. Due to this the classification of the dyad's style reflects the most advanced style that was used. A second scorer also classified the dyad's interaction style. Inter-rater reliability was 92%, with the first and second scorer agreeing on the styles used by 92 out of the 100 dyads (see Appendix 5 for details relating to how inter-reliability was established). The classification of the remaining eight dyads was resolved through discussion.

3.3.1.1. Non-verbal

No form of verbal communication was used.

3.3.1.2. Parallel

There was some attempt to communicate verbally in that one or both of the partners spoke but they did not cooperate with one another over the choosing and/locating of the cards. The examples below show the total utterances made by a four/five-year-old (example 1) and a

six/seven-year-old (example 2) dyad. As shown in the second example, although one of the children tried to take the role of IG the fact that her partner did not take the corresponding role of IF meant that the dyad failed to construct their collaboration.

Example 1

C1] What are you doing Jake? I'm making a boat

C2] "I'm doing a stick with a ball on".

Example 2

C1] Tina, put the sun somewhere

C2] I've put it somewhere

C1] Put the boat onto the other side. Now get a flower; put it down facing bottom. Now get another sun and put it down facing bottom. Is it like a square one with a gap?

C2] Maybe

C1] Is it round Tina?

C2] I've done it (Tina has finished her pattern)

C1] Has it got a gap in it?

C2] Yes, No, Yes, No

C1] No?

C2] No

C1] Right, have you put the two flowers, have you put the two flowers on there?

C2] Yes

C1] Have you put the two flowers facing downwards on the other flower?

C1] I've got one facing right and two facing left

C2] Right

C1] Get one of your boats

C2] I've finished

C1] Have you finished with...Are all your cards all gone?

C2] No I've finished with 'em all

C1] Are all your cards all gone?

C2] No I've finished with 'em

C1] Right. Haven't you got any boats?

C2] Yes I've got boats. I've got fishes, boats, flowers, trees and suns. I've finished though. I've finished

3.3.1.3. Information giver/follower (IG/IF)

The partners assumed the complementary roles of IG and IF. The IG told the IF which of the cards to use, and in dyads in which intersubjectivity was established for the location of the cards, where to locate the cards. The IF selected the cards specified by the IG, and in dyads where location details were given, located the card as instructed. The example below shows the IG/IF style being used by a six/seven-year-old dyad (bold type is used to emphasise the utterances made by the IG).

C1] What you putting Jessica?

C2] What?

C1] What have you put? What have you put first?

C2] Tree, flower, flower, flower, then a cup. Then those cups

C1] Tree, flower, flower, flower

C2] Then those cups

C1] First thing you put is tree, flower, flower, flower?

C2] Yes

C1] And then what's after that?

C2] Cups

C1] And cups. Yes, then what?

C2] Fish and fish

C1] Two fish

C2] And then two

C1] I haven't got a two fish one though. And then what?

C2] Two suns

3.3.1.4. Turn taking

The partners took turns to act as IG and IF. Although a single card sequence was mainly adopted with the roles being alternated when intersubjectivity was reached regarding a single card, there were examples with the younger children of multi-card sequences being used. For example, a six/seven-year-old dyad worked on a four-card sequence with intersubjectivity being established for four cards before the roles were alternated. Intersubjectivity was then established for a further four cards before the roles were again reversed. In all cases the partner whose turn it was to act as IG specified the choice of card, and in dyads where location details were given, the card's location. The example below shows the turn taking style used

by a six/seven-year-old dyad.

C1] I'll go first. Come on Jenny

C2] Emm, Have you got two cups?

C1] Umm, Yes

C2] Well put them out

C1] I have

C2] Right it's your go

C1] Have you got two trees?

3.3.1.5. Negotiating

The negotiating style differed from the previously mentioned styles in that rather than rules being followed regarding which partner chose the cards and their locations, both partners made suggestions regarding possible card choices and/or possible locations. As shown in the example below this style was much more collaborative than the other styles as the partners worked together at constructing all aspects of their interaction. The example below shows the negotiating style being used by an adult dyad.

A1] Shall we have the double giraffe next to it on the far left?

A2] Hold on, I haven't got a double giraffe. I've got a double snake

A1] Umm I haven't got a double snake

A2] Okay, I have got other giraffes though

A1] Okay, I'll just take my double giraffe out

A2] Okay

A1] What else have you got with a.. ?

A2] I've got a giraffe and an elephant, a giraffe and a zebra

A1] Yes I've got a giraffe and a zebra

A2] Okay, which way do you want to put the giraffe and the zebra? Do you want it going down?

A1] It'll be alright going down

A2] Yes Okay

A1] Okay, shall we go for the zebra?

A2] Okay

A1] What have you got with a zebra?

A2] I've got a zebra and an elephant, one with a hippo, a parrot and a double zebra

A1] I've got a double zebra, shall we have the double zebra?

3.3.1.6. Distribution of interaction styles within and between age groups

As shown in Table 3.1, the non-interactive styles of non-verbal and parallel were mainly used by the younger dyads whilst the interactive styles of IG/IF, turn taking and negotiating were used by the older children and adults.

Table 3.1. The number and percentage of dyads using interaction styles by category and age

Age in years	N	Non-verbal	Parallel	IG/IF	Turn taking	Negotiating
4/5	30	6 (20%) *2.7*	17 (56.7%) *5.7*	3 (10 %) *5.1*	4 (13.3%) *11.1*	0 *5.4*
6/7	29	3 (10.35%) *2.6*	2 (6.9%) *5.5*	5 (17.2%) *4.9*	16 (55.2%) *10.7*	3 (10.35%) *5.2*
9/10	17	0 *1.5*	0 *3.2*	3 (17.5%) *2.9*	13 (76.5%) *6.3*	1 (6%) *3.1*
Adult	24	0 *2.2*	0 *4.6*	6 (25%) *4.1*	4 (16.7%) *8.9*	14 (58.3%) *4.3*

(Expected frequencies shown in italics)

A χ^2 test calculated on the observed frequencies shown in Table 3.1 reported expected frequencies below five for more than 50% of the cells. This violates the test requirements that recommend that no more than 20% of the cells should have expected frequencies of less than five (Cochran, 1954, cited in Siegal & Castellan, 1988). To increase the size of the expected frequencies, the styles were combined into the two categories of non-interactive and interactive (shown in Table 3.2). Non-interactive styles were those in which the partners did not interact, i.e. the non-verbal and parallel styles, whilst the interactive styles were those in which the partners interacted, i.e. the IG/IF, turn taking, and negotiating styles. When a χ^2 test was computed on the frequencies shown in Table 3.2, a highly significant difference was reported [χ^2 (3) = 52.854; $p<0.001$] with use of interactive styles increasing with age.

Table 3.2. The number and percentage of dyads using non-interactive and interactive styles by age

Age in years	N	Non-interactive	Interactive
4/5	30	23 (76.7%) *8.3*	7 (23.3%) *21.7*
6/7	29	5 (17.8%) *8.0*	23 (82.2%) *21.0*
9/10	17	0 *4.7*	17 (100%) *12.3*
Adult	24	0 *6.9*	23 (100%) *18.1*

(Expected frequencies shown in italics)

3.3.2. Strategy use

The transcripts were coded for use of the following three strategies:

a] No strategy

b] Agreed cards

c] Agreed cards and locations

Twenty five (25%) of the transcripts were also coded by a second scorer. Inter-rater reliability was 96% with the two scorers only disagreeing regarding the classification of a single male dyad in which one of the partner's provided card details but the other partner, although verbally agreeing, did not select and place the card in his own pattern. This was identifiable from the transcript as when the second child acted as IG, he specified cards that the first child had already specified. The first child then objected on the ground that he had already specified the cards. This led to the game being abandoned. As the second child had verbally indicated agreement this dyad were classified as agreed cards (see section 3.3.2.2.).

3.3.2.1. No strategy

Dyads who failed to construct a joint form of interaction were classified as using no strategy as they did not reach agreement regarding their choice of cards and/or the location of their cards.

3.3.2.2. Agreed cards

Intersubjectivity was established regarding the choice of cards. Agreement was not recorded in dyads where one partner provided card choice information but the corresponding partner did not verbally indicate that they had chosen the same card. This was because in these dyads intersubjectivity regarding card choice was not established. The following example from a six/seven-year-old dyad shows intersubjectivity being reached regarding card choice

C1] A sun with a cup

C2] A sun with a cup. Done it. My go. Two fish with bubbles. Go on

C1] Not got one

C2] Two ships

C1] Done it

3.3.2.3. Agreed cards and locations

To achieve the task goal the partners were required to construct intersubjectivity for both their choice of cards and the location of the cards in the pattern. In all dyads where location details were provided (apart from one adult dyad whose scores were not included in the analysis), the partners agreed both the choice of cards and locations. The example below is of an adult dyad establishing intersubjectivity for a card's location.

A2] Yes. Erm You could join, you know the top the very top sunflower

A1] Yes

A2] You could join, with it facing the right way. You could join it along side the sunflower so the kite is to the right of the sunflower.

A1] Okay

3.3.2.4. Distribution of strategy use within and between age groups

As shown in Table 3.3, very few of the four/five-year-old dyads used either of the strategies. However, in the nine/ten-year-old group all but one of the dyads constructed an intersubjective understanding for both the cards and their locations. When a χ^2 test was computed on the frequencies shown in Table 3.3, a highly significant difference was reported [χ^2 (6) = 81.15; $p<0.001$], which shows that strategy use increased with age.

Table 3.3. The number and percentage of dyads using none, one, or two strategies by age

Age in years	N	No strategy	Agreed cards	Agreed cards + locations
4/5	30	23 (76.7%)	4 (13.3%)	3 (10%)
		8.5	*5.5*	*16.1*
6/7	29	3 (17.25%)	13 (44.75%)	11 (38%)
		8.2	*5.3*	*15.5*
9/10	17	0	1 (6%)	16 (94%)
		4.8	*3.1*	*9.1*
Adult	23	0	0	23 (100%)
		6.5	*4.2*	*12.3*

(Expected frequencies shown in italics)

3.3.3. Checking

The transcripts were coded for the use of checking. Dyads checked on their progress in a variety of ways including part checks that were carried out during the construction of the pattern, final checks that were carried out after all the cards had been selected, and shape checks that checked on the shape of the pattern but not on the choice of cards, for example, "Does yours look like a cross?" Apart from two six/seven-year-old dyads, all of the dyads using checking, agreed both their choice of cards and the location of the cards in the pattern.

Table 3.4 shows that the use of checking increased with age. This was confirmed by the application of a χ^2 test to the frequencies shown in Table 3.4 (χ^2 (3) = 55.04; $p<0.001$).

Table 3.4. The number and percentage of dyads using checking by age

Age in years	N	No checking	Checking
4/5	30	30 (100%)	0
		19.8	*10.2*
6/7	29	24 (82.8%)	5 (17.2%)
		19.1	9.9
9/10	17	10 (58.8%)	7 (41.2%)
		11.2	*5.8*
Adult	24	2 (8.3%)	22 (91.7%)
		15.8	*8.2*

(Expected frequencies shown in italics)

3.3.4. Constructing a collaborative problem-solving dyad

The utterances from the first twelve turns, or all of the utterances in cases where dyads had used less than twelve turns, were examined for evidence of an intersubjective understanding being reached regarding some issue connected to the construction of the dyad's collaboration (examples provided in following section). As shown in Table 3.5, 53% of the dyads constructed an intersubjective understanding. This percentage included nearly all of the adults, over half of the six/seven-year-olds, just less than half of the nine/ten-year-olds, but very few of the four/five-year-olds. There was a significant difference between the groups [χ^2 (3) = 29.98, $p<0.001$] with use increasing with age.

Table 3.5. The number and percentage of dyads constructing an intersubjective understanding by age

Age in years	n	Intersubjective understanding	No intersubjective understanding
4/5	30	3 (10%) *14.1*	27 (90%) *15.9*
6/7	29	16 (55.2%) *13.6*	13 (45%) *15.4*
9/10	17	8 (47.1%) *8.0*	9 (52.9%) *9.0*
Adults	24	20 (83.3%) *11.3*	4 (16.7%) *12.7*
Total	100	47 (47%)	53 (53%)

(Expected frequencies shown in italics)

The identified utterances were categorised according to whether their subject matter referred to task structuring, pattern formation, role allocation, or experimenter's instructions. Only one dyad (adult) constructed an intersubjective understanding for more than one issue. Details and examples for each category type are provided below. Inter-rater reliability was 96% with the two scorers disagreeing regarding whether two of the adult utterances were interaction style or task structuring.

3.3.4.1. Task structuring

With task structuring, an intersubjective understanding was reached regarding some aspect related to the structuring of the task. An example from an adult dyad is given below.

A1] I reckon the best approach will be to go through the cards and pick out the ones that we have the same first of all

A2] Yes that's a good idea

3.3.4.2. Pattern formation

With pattern formation, an intersubjective understanding was reached regarding some aspect related to the form the pattern was to take. An example from an adult dyad is given below.

A1] You know how you used to play dominoes...

A2] Yes

A1]...when you were little, you used to join them all altogether?

A2] Like you had the two sixes and the two.. yes?

A1] Yes. We could do that with matching the pictures

3.3.4.3. Interaction style

Interaction style differed depending on whether the partners used the IG/IF or the turn taking style. As shown in Example 1, with the IG/IF style an intersubjective understanding could be reached regarding which partner was to take which role. As shown by Example 2, partners using the turn taking style did not start their interaction by explicitly agreeing that they were going to use the turn taking style but the subsequent references made to whose turn it was to choose the next card indicated that an intersubjective understanding had been reached regarding their interaction style.

Example 1 (from an adult dyad)

A1] Do you want to start B?

A2] Alright then. Do you want me to make the pattern?

A1] You might as well

Example 2 (from a six/seven-year-old dyad)

(Bold print used to identify the relevant text)

C1] I'll go first. Come on Jenny

C2] Emm, Have you got two cups?

C1] Umm, Yes

C2] Well put them out

C1] I have

C2] Right it's your go

C1] Have you got two trees?

C2] Er, no, ***It's your go again***

3.3.4.4. Experimenter's instructions

With experimenter's instructions, an intersubjective understanding was reached related to some aspect of the experimenter's instructions. As shown in Example 1, this could follow a request for clarification or, as shown in Example 2, it could follow the identification of a problem.

Example 1 (from a adult dyad)

A1] Have we got to use all the cards?

A2] I think so, yes

A1] Right

Example 2 (from a four/five-year-old dyad, bold print used to identify relevant text)

C1] I'm doing a 5

C2] a 5?

C1] Yes but its going to be a different 5

C2] I'm doing a tree and a cup

C1] Oh no, because we're not going to do the same are we? *Do a 5 because I'm going to do a different 5. Come on C do a 5, I've done a 5.*

C2] I dun't know what a 5 is

C1] You're not allowed to look

C2] What?

C1] You're not allowed to look

C2] (addresses experimenter) Is that right?

(Experimenter explains the rules again)

Also shown in the latter example is the fact that with the younger dyads, when one of the partners recognised they had a problem, they referred to the adult experimenter rather than attempting to find a solution by discussing the problem with their partner.

3.3.4.5. Age distribution of issues for which intersubjectivity was established

Table 3.6 shows that the dyad's interaction style was the main issue for which intersubjectivity was established, accounting for nearly 60% of the total issues discussed and 81% of the issues discussed by the children. The higher percentage of six/seven-year-old dyads compared to nine/ten year-old dyads to construct an intersubjective understanding (reported in section 3.3.4), can be explained by the fact that a greater number of the six/seven-year-olds constructed an intersubjective understanding regarding their interaction style. This was due to the six/seven-year-olds who used the turn taking style being very explicit in their monitoring of the turn taking sequence. This was in contrast to the four/five-year-olds, who mainly did not use the turn taking mode, and the nine/ten-year-olds, who made very little references to the turn taking sequencing. Joint understandings related to task structuring and pattern formation, with the exception of one six/seven-year-old dyad, were only established by adult dyads. One or two dyads in each age group established a joint understanding regarding an issue connected with the experimenter's instructions.

Table 3.6. Number and percentage of issues raised by type and age

Age in years	Experimenter's instructions	Interaction style	Task structuring	Pattern formation	Total
4/5 N=30	2 4.2%	1 2.1%	0	0	3 6.3%
6/7 N=29	1 2.1%	14 29.1%	0	1 2.1%	16 33.3%
9/10 N=17	1 2.1%	7 14.6%	0	0	8 16.7%
Adults N=24	4 8.3%	6 12.5%	7 14.6%	4 8.3%	21 43.7%
Total N=100	8 16.7%	28 58.3%	7 14.6%	5 10.4%	48 100%

3.4. Discussion

The first aim of Experiment 1 was to examine whether there were age differences in the styles used by dyads to construct their collaboration. This aim was achieved by classifying the dyad's interaction style as either non-verbal, parallel, turn taking, IG/IF, or negotiating. The results suggest that a developmental trend exists, as the non-verbal and parallel styles were mainly used by four/five-year-olds, the role-based styles of IG/IF and turn taking by six/seven-year-olds and nine/ten-year-olds, and the negotiating style by adults. These results provide support for the proposal that the ability to collaborate develops and changes during childhood and adolescence (Forman, 1992; Tomasello et al., 1993; Azmitia, 1996).

One of the main influencing factors in the ability to co-construct and co-maintain collaboration appears to be related to the ability to use role-based styles of interaction. Although the choice of task may have been a contributing factor, in that children use turn taking when playing the game of dominoes, the predominance of the turn taking style used by the older children is in keeping with previous studies. Azmitia (1996), for example, reported that most collaborators (aged between four and eleven years) on a range of tasks, for example, copying models, writing, and isolating causal variables, initially adopted a "let's-take-turns" strategy, and that the ability to maintain this strategy increased with age. In the present study, the high number of references to the turn taking sequence by the six/seven-year-olds suggests that considerable attention was devoted by this group to the monitoring of the turn taking sequence. Even the older dyads who used the turn taking style did not attempt to contravene the turn taking code by taking extra turns.

Compared to the negotiating style, in which both partners made suggestions, discussed alternatives and negotiated over the choice of card and the card's location, role-based styles of interaction can be seen to allow partners to work together cooperatively without requiring them to construct a deep intersubjective understanding regarding how they are going to carry out the task. Many of the IFs who used role-based styles simply followed their partner's instructions. On occasions when they tried to contribute their own thoughts and ideas, their partner could, and often did, choose to ignore them. Likewise, the IGs in these dyads often did not fully communicate their thoughts and ideas regarding the overall pattern construction. An example of this was found with a six/seven-year-old dyad in which the IG told his partner how to position his cards. However, the IG did not tell his partner that his intention was to

make a letter "J". This information was only disclosed after the IF had indicated that he might not have followed the instructions correctly.

The second aim was to examine whether there were age differences in the amount of intersubjectivity that was established. This aim was achieved by comparing the number of strategies used by the different groups. The results showed that with age children went from using no strategy, to agreeing cards, to agreeing both cards and locations. These results support those of Lloyd (1991) who also reported strategy use becoming increasingly complex with age. However, the present results go further than Lloyd's in that they show that the older dyads checked on information for which intersubjectivity had already been established. The use of checking appears to be a more advanced strategy as it was almost exclusively used by dyads in which there was agreement over both the cards and their locations. Checking also appeared to be related to the style of interaction that the dyads used. When following a strict turn taking procedure, referring back to previously placed cards violates the rules of the interaction as there is no rule that allows for checking of previously placed cards. Azmitia (1996, p.141) also reported that young children had great difficulty in establishing a style of interaction wherein *"strict accounting of turns are deemphasised in favor of a joint goal"*, and that this ability improved with age. The use of checking also appears to be related to task responsibility, as checking is only required when one or both partners take responsibility for ensuring that the task goal is achieved.

The idea that the younger children did not take full responsibility for the task is supported by their behaviour when they encountered problems. When one of the younger partners recognised that there was a problem, they referred the problem directly to the adult experimenter rather than attempting to find a solution by discussing the problem with their partner. The older dyads, on the other hand, could be seen to take full responsibility, in that when problems were encountered they worked together to find a joint solution without referring to the experimenter.

As noted above, when the younger children recognised that there was a problem they referred it to the adult experimenter rather than attempting to find a solution by discussing the problem with their partner. Schubauer-Leoni, Perret-Clermont and Grossen (1992) have discussed how if the researcher becomes an active participant in the interaction this changes the nature of the

interaction, as the dyad becomes a triad rather than a dyad with the adult becoming the dominant partner. The main problem for researchers who become part of an interactive triad is that they end up measuring what children are capable of carrying out with adult help (the child's zone of proximal development), rather than measuring what the children are capable of carrying out unaided. However, ignoring children's overtures creates an ethical issue, as young children, especially in a school environment, are used to having an adult present and are encouraged to interact with adults. By not responding to the child the researcher is sending out very confusing messages which may have a negative effect on the child's confidence and self-esteem. In the present study, if a child specifically requested assistance or did not seen to know how to proceed, low-level assistance was given. The experimenter, however, kept out of the interaction as much as possible.

The final aim was to examine whether there was any evidence to suggest that partners collaborated to construct a joint understanding of the experimenter's instructions in the manner suggested by Renshaw & Garton (1986). This aim was achieved by examining the utterances from the first 12 contributions, or all of the utterances in cases where dyads had used less than 12 contributions, for evidence of intersubjectivity being constructed regarding some issue connected to the construction of the dyad's collaboration. The results showed that nearly 50% of the dyads constructed an intersubjective understanding regarding some issue other than the choice and location of the cards. This percentage included nearly all of the adult dyads, approximately half of the older aged child dyads, but very few of the four/five-year-old dyads. Closer inspection of the issues for which intersubjectivity was established showed that very few dyads constructed a joint understanding regarding the experimenter's instructions as suggested by Renshaw & Garton's model. Instead, intersubjectivity was constructed regarding issues related to how the dyad were to carry out the task, for example, the style of interaction that they were to follow or the pattern that they were going to make. The results of the present study, therefore, do not support Renshaw & Garton's (1986) model of the processes involved in constructing a collaborative problem solving dyad but suggest instead that until problems are encountered, collaborators take it for granted that they share the same understanding of the experimenter's instructions. It is only when problems arise that partners check on each other's understanding. In these circumstances, adults have the necessary communication skills available to negotiate a new or revised joint understanding; children, however, look to the adult experimenter to clarify the instructions for them.

Whilst the processes outlined in Renshaw & Garton's (1986) model make intuitive sense, in reality collaboration is achieved through dialogue, and dialogue has its own norms, rules and expectations. Rules regarding the co-operative and economical nature of conversation (Grice, 1975) ensure that conversationalists do not waste effort on making unnecessary checks on each other's understanding, but allows shared understanding to be assumed, which if proved false, can soon be rectified by further dialogue. To quote McTear (1985, p.168) *"Social actors normally assume that they interpret the world in a similar fashion, [therefore] vagueness and ambiguity are allowed to pass on the assumption of this common understanding, and interpretation of utterances is often postponed in the expectation that meaning will become clear as talk proceeds".* The results of the present study suggest that Renshaw and Garton's (1986) model is an idealised version of the processes involved in the construction of a collaborative problem-solving dyad. As children develop the skills needed to co-construct and co-maintain their collaboration they also develop other complementary skills, such as the ability to check on previous actions, which makes the need to carry out initial checks for mutual understanding redundant. However, with age collaborators recognise the need to construct an intersubjective understanding regarding issues related to how they are going to carry out their collaboration. This is known as planning.

One of the limitations of the present study was that it was not clear whether it was age differences in the participant's ability to carry out tasks of this nature, or age differences in their experience of carrying out tasks of this nature, that was assessed. The aim of the study was to assess the former. However, the latter is a possible confounding variable. Young children compared to older children and adults have a lot less experience of carrying out tasks with externally set goals as they normally only interact with their peers in play situations where the goal of the task is developed through their play. When adults want young children to carry out novel or unusual tasks they usually make explicit the process by which the goal can be achieved and/or bring to the children's attention things that they might miss or be unsure about (for example see Cooper, 1980). For young children to be given an externally set goal and then left to develop their own method of achieving the goal is a very unusual occurrence but in this study, because the subject under inquiry was the style of interaction that dyads used to structure their interaction, the dyads had to be free to construct their own interaction style. The next experiment, reported in Chapter 4, examines age differences in the communication strategies used by same-aged peers when using the IG/IF style.

4. CHAPTER FOUR

Experiment 2

Age differences in interactive communication

4.1. Introduction

The second experiment had two aims, to examine age differences in the interactive communication strategies used by same-aged peers when using the IG/IF style and to overcome the problem with Experiment 1 that the younger children may have thought they had to work independently.

With the pattern construction task (Experiment 1) there were a number of cases where the interaction style of the younger dyads was classified as non-interactive. This failure to co-construct a joint style of interaction would suggest that children have to first realise that in order for the task goal to be achieved they need to co-construct a joint style of interaction. However, there is the possibility that with the previous experiment the younger dyads failed to interact because the design of the task led them to believe that they were required to work independently. The following experiment examines age differences in the interactive communication strategies used by same-aged dyads when presented with a task which requires one partner to take the role of IG and tell the other partner (the IF) where to draw a route on a map. According to Doherty-Sneddon, O'Malley, Garrod, Anderson, Langton & Bruce (1997, p.90) the use of map tasks *"elicits natural, spontaneous, and yet content-controlled dialogues."* The map task method was chosen as it dictates the interaction style that is to be used, as well as making it clear to the partners that the only way the task goal can be achieved is by constructing a dialogue. Unlike the pattern construction task used in Experiment 1, the map task could not be completed independently.

The author recognises that the map task approach differed from the more usual approaches that have been taken for examining collaboration, in that rather than the collaborators being required to construct "new" knowledge between them, one of the collaborators is provided with knowledge that they are required to share with their partner. The reason for adopting this approach was that it enabled the author to examine a different form of collaboration to the one that had previously been examined.

In order to elicit dialogue, the maps given to the partners contained a number of ambiguities for which the partners were required to establish intersubjectivity. In the past, ambiguities had been introduced in two ways. Anderson et al. (1991, 1994; Anderson & Boyle, 1994) used pairs of maps that contained non-identical landmarks in that some of the landmarks on one of the maps had been omitted or replaced. On the other hand, Lloyd (1991, 1992) duplicated the landmarks so that the partners had identical maps that showed a number of houses, churches, garages, etc. that were exactly the same. Due to Anderson et al. (1991) reporting that the high information processing demands made by the unmatched maps had probably inhibited the communicative ability of the seven-year-olds, in the present study ambiguities were introduced by duplicating the landmarks in the manner used by Lloyd (1991, 1992). However, rather than buildings, which four-to-five-year-olds may have found difficult to identify, schematic pictures of animals were used (see Appendix 10).

In the present study, the transcripts were coded for the number of contributions made per dyad, the number of clarification requests, checking requests and acknowledgements made by the IF, and the number of questions asked by the IG. This classification scheme was used because it enabled the author to first address the question of whether there were age differences in the overall amount of interactive dialogue that took place, in that the greater the number of contributions made per dyad, the greater the amount of interactive dialogue. By examining the type of contributions made by the IG and IF, a more detailed picture was then obtained regarding the development of the ability to participate in interactive communication. At this point it is necessary to emphasise that although the labels "IG" and "IF" are used, the author recognises that characteristics of each partner's style may influence the way in which the other partner behaves (explored in Experiments 3, 4, & 6), making these measures more a characteristic of the dyad than the individual. As variations on some of these measures had previously been used by other researchers, for example, Anderson et al., 1991; Anderson & Boyle, 1994; Lloyd 1992, a brief review of their findings are given next.

Lloyd (1992) used a map task (described above) to examine age differences in the use of requests for clarification. He reported that requests for repetition, which according to Lloyd make the least information processing demands upon the IF, were mainly made by seven-year-olds. Specific requests, in which the IF identifies the information that the IG is to repeat, confirm, or specify, were used in similar amounts by all age groups (seven-year-olds, ten-year-

olds and adults). The most frequently used requests by all age groups were the potential forms. These are claimed to make the greatest information processing demands upon the IF in that the IF introduces new information into the conversation which is missing from the IG's previous utterance but is potentially available. Seven-year-olds used significantly fewer of the potential types compared with ten-year-olds and adults, who did not significantly differ from each other.

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In the same study, Lloyd (1992) also examined age differences in the use of acknowledgements. He reported that seven-year-olds, compared with ten year-olds and adults, made fewer acknowledgements. Lloyd proposed that this was due to seven-year-old still developing the skills needed to play the role of *"supportive interlocutor"* (p.372).

Anderson & Boyle (1994) also used a map task (described above) to examine the forms of introduction used by adult IGs. They reported that some adults used the question form of introduction, for example, "Can you see the waterfall?" which ensures that feedback is received from the partner. Other adults, however, used the statement form, for example, "Go to the waterfall," which does not ensure that feedback is given. Anderson & Boyle proposed that IGs who introduced new references using the question form of introduction are more *"communicatively cautious speakers, assume less shared knowledge with their instruction followers, or assume less about their partner's abilities to interpret new information and instructions"* (p.118). Dyads in which the IG used the question form were reported to be more successful at achieving the task aim of producing an identical route drawing compared to dyads in which the IG used the statement form. Anderson et al. (1991) had earlier reported using the same task to examine the forms of introduction used by same-aged child IGs (seven-thirteen-year-olds). A developmental effect was reported, with older IGs being more likely to use the question form whilst younger IGs were more likely to use the statement form.

In the present study all of the questions asked by the IG rather than just those used to introduce new location markers (Anderson et al., 1991, 1994; Anderson & Boyle, 1994) were examined. This change was due to the fact that in the results reported by Anderson et al. (1991), seven/ eight-year-olds were reported as using very few question introductions and this was in circumstances where the partners had been given non-identical maps in order to encourage the use of the question format. In the following experiment, in an attempt to reduce information

processing demands, the partners were given identical maps meaning that they would be likely to have less reason to use the question form of introduction. In addition, by measuring the total number of questions asked by the IG, further analysis could be carried out looking at age differences in the use of the question form.

The results of Experiment 1 suggested that age differences exist in the use of checking, with checks on information for which agreement has already been reached, mainly made by older (ten years plus) dyads. Although it is recognised that in everyday conversation both the speaker and listener can initiate checks, the focus in this experiment is on checking requests made by the IF.

The complexity of the maps used by Anderson et al. (1994) and Lloyd (1991,1992, 1993), meant that data could not be collected on children younger than seven years of age. By using a simplified version of a map task, Experiment 2 examined the interactive communication of children from four years of age. Although a three-dimensional model, as used by Lloyd (1991, 1992), initially appeared suitable, piloting showed that the younger children wanted to play with the model rather than carry out the task. A simplified version of a pencil and paper map task previously used by Anderson et al. (1991, 1994, Anderson & Boyle, 1991) was piloted and found to be suitable. See Appendix 7 for details of pilot studies.

4.2. Method

4.2.1. Design

An independent measures design was used with age as the independent variable, with four levels (four/five years, six/seven years, nine/ten years, and adults).

4.2.2. Participants

The participants were the same peer dyads as used in Experiment 1 (see section 9.8 for rationale for using the same participants). Sixty of the children were four/five-year-olds (mean age 59 months, S.D. 3.89, range 54 to 68 months), 58 were six/seven-year-olds (mean age 87 months, S.D. 3.5, range 82 to 93 months) and 34 were nine/ten-year-olds (mean age 119 months, S.D. 3.87, range 114 to 125 months). Forty-eight adults also participated (39 first-year psychology undergraduates and nine postgraduates (mean age 21.6 years, S.D. 7.29, range 18 to 45 years). Parental permission had been obtained

4.2.3. Materials

Two sets of maps (A & B), as detailed in the Introduction section (see Appendix 10 for an example of a map). The verbal interaction of the dyads was recorded using two Sony audio tape recorders, one positioned next to the chair of each participant. In order to encourage the dyad partners to use verbal means of communication, an opaque screen was positioned across the centre of the table.

4.2.4. Procedure

The procedure and instructions for both the adult and child groups was the same. However, the adult participants often checked with the experimenter regarding their understanding of the instructions whereas the children did not. This meant that the some adults may have received additional information.

The partners were seated at opposite ends of a small rectangular table on which a screen had been placed. One partner (from now on referred to as the IG) was given the marked map and the other (from now on referred to as the IF) the unmarked map and a pencil. Standardised instructions were given verbally (see Appendix 4), informing the participants that they had been given the same pictures with the same animals drawn on them but that participant X's picture also had a line marked on it, which was a pathway that went around some of the animals. Participant X was to tell Participant Y where the path went so that Participant Y could draw it on his/her picture. When they had finished and the screen was removed both their pictures were to have identical pathways. The participant acting as the IF was also told that he/she was to ask the IG questions if he/she did not understand or needed more information. The reason for telling the IFs that they could ask the IGs for further information was that it was felt that unless this information was made explicit the experimenter would be in danger of measuring age differences in the IF's interpretation of the experimenter's instructions rather than age differences in the IF's use of clarification requests. The participants were then asked if they understood what they were to do. If no questions were forthcoming the tape recorder was switched on and the participants were told they could start. When the first maps had been completed and the screen was removed the participants were allowed to look at the completed maps. The roles were then reversed and they were given the second set of maps. Upon finishing, the participants were once again allowed to look at their maps, listen to their voices on the tape, and thanked.

Due to Anderson et al. (1994) noting that some participants changed their behaviour on the second trial, only maps from the first trial were coded. The reason for this was to eliminate possible age-differences in how quickly the participants learned from feedback (see Appendix 9 for rationale). Both partners, however, were allowed to take both roles to avoid anyone feeling left out.

4.3. Results

Details regarding each of the classification systems and the related results are given below (see Appendix 9 for rationale for choice of classification systems and analysis and Appendix 13 for additional information regarding the results of the statistical tests). A second scorer trained in the use of the classification system coded a random subset of six transcripts from each group. Details of the resulting inter-rater reliability scores are given in the relevant sections (see Appendix 5 for details of how inter-rater reliability was calculated). The data for one of the nine/ten-year-old dyads was omitted from the analysis as this dyad's scores were over twice those of any other dyad and had a distorting effect on the results.

4.3.1. Contributions

A single contribution, independent of length or nature, was recorded for everything spoken by one partner before the next partner spoke. The example below is from a four/five-year-old dyad.

IG] Go near the, go straight, go near the duck *(contribution 1)*

IF] Slow down I can't hear the instructions. Near the duck and then where the monkey is? *(contribution 2)*

IG] You got to start where the crocodile then go to the duck, then to the lion, then to the penguin, then to the elephant *(contribution 3)*

Table 4.1 shows that the mean number of contributions increasing throughout childhood with the means for the oldest children and the adults being very similar. The ranges show that although there was some overlap between age groups, there was a great deal of variability in the scores for each group. Due to a Levene's test reporting that homogeneity of variance could not be assumed [Levene's statistic $(3,95) = 11.362$; $p<0.001$], the data was transformed by carrying out a square root conversion. According to Howell (1992, p.311), square root transformations not only help to "*equate group variances*" but also "*have the effect of making*

positively skewed distributions more nearly normal in shape". The application of a Levene's test to the transformed scores reported that homogeneity of variance could be assumed [Levene's statistic (3,95) = 0.626; p=0.60]. The application of a one-way ANOVA to the transformed scores resulted in a significant effect being found for age [F (3,95) = 41.29, p<0.001]. Post hoc analysis using Tukey's test found significant differences between all of the groups apart from the nine/ten-year-olds and the adults. Statistical tables for this and all subsequent post hoc tests can be found in the Appendices. The results show that with age the children made a greater number of contributions until the age of nine/ten years when their performance did not significantly differ from that of adults.

Table 4.1. The means, standard deviations and range for the number of contributions made per dyad by age

Age in years	N	Mean	SD	Range
4/5	30	9.57	8.87	1-24
6/7	29	26.00	19.66	1-84
9/10	16	55.38	32.59	10-116
Adult	24	63.67	26.42	22-112

4.3.2. Clarification requests

All requests made by the IF, in which the IG was asked for clarification, were coded using a scheme previously used by Lloyd (1992). Details of the classification scheme are provided in Figure 4.1. The results are reported below.

Figure 4.1. Examples of clarification requests taken from present research

Non-specific requests for repetition (NRR)

As shown in examples 1 and 2, the listener does not specify the part of the speaker's previous utterance that s/he wants the speaker to repeat.

1. IG] Round the crocodile

   IF] What?

   IG] Round the crocodile

2. IG] Go up the side of the monkey

   IF] Say that again

IG] Go up the side of the monkey

Specific requests for confirmation (SRC)

As shown in examples 3 and 4, the listener asks the speaker to confirm information contained in the speaker's previous utterance.

3. IG] Go to the crocodile nearest the edge of the page

   IF] Nearest the edge of the page?

   IG] Yes.

4. IG] Go down in between the two elephants

   IF] Down?

   IG] Yes, in between the two elephants.

Specific requests for specification (SRS)

As shown in examples 5 and 6, the listener specifies the part of the speaker's previous utterance for which s/he wants further information and the type of information that is require.

5. G] Go up round the side of the duck

   IF] Which duck?

   IG] The one at the top nearest the fish

6. IG] And join your line to the crocodile's tail

   IF] Whereabouts at the crocodile's tail?

   IG] At the third little line from the tip

Potential request for confirmation (PRC)

As shown in examples 7 and 8, the listener asks the speaker to confirm information that is not present in the speaker's previous utterance but is potentially available.

7. IG] Go straight up and curve a bit and then go over the top of the elephant

   IF] What, the one nearest the edge of the paper?

   IG] Yes. The first one that you come to

8. IG] Go past the penguin and over the top of the elephant

   IF] What, do I go over the fish's head and in front of the penguin's body?

   IG] No, you go don't do that you go ...

Potential request for specification (PRS)

As shown in examples 9 and 10, the listener asks the speaker to choose between two alternative pieces of information, both of which are potentially available.

9. IG] Take your line around the back of the fish's tail

IF] Is it the fish nearest the top of the page or the one nearest the bottom?

IG] The one nearest the top

10] IG] And finish at the crocodile

IF] The one on the left or the one on the right?

IG] I don't know which is me left and which is me right

Potential request for elaboration (PRE)

As shown in examples 11 and 12, the listener asks the speaker to provide additional information that is potentially available. However, the listener does not specify the manner in which the information is to be provided.

11. IG] Well go up, do a curve and then

IF] Curve whereabouts?

IG] Do a curve above the top of the lion's tail.

12. IG] Go straight on

IF] Too where?

IG] The fish that's on top of the lion

4.3.2.1. Non-specific requests for repetition

Inter-rater reliability for the use of non-specific requests for repetition was 100%. Table 4.2 shows that very few non-specific requests for repetition were made by any of the age groups. As would be expected with such small means, the standard deviations are larger than the means. When tested using a one-way between groups ANOVA, no significant effect was found for age [$F(3,95) = 0.65$; $p=0.59$]. However, care must be taken when interpreting the results as the homogeneity of variance assumption had been violated [Levene's statistic $(3,95) = 2.80$; $p=0.044$].

Table 4.2. The means, standard deviations and range for the number of non-specific requests for repetition by age

Age in years	N	Mean	SD	Range
4/5	30	0.23	0.82	0-4
6/7	29	0.28	0.70	0-3
9/10	16	0.25	0.68	0-2
Adult	24	0.04	0.20	0-1

4.3.2.2. Specific requests for repetition

No specific requests for repetition were recorded. Inter-rater reliability was 100%.

4.3.2.3. Specific requests for confirmation

Inter-rater reliability for the use of specific request for confirmation was 100%. Table 4.3 shows that the number of specific requests for confirmation made per age group increased with age. The standard deviations and range show that there was a great deal of variability within each age group. Due to a Levene's test reporting that homogeneity of variance could not be assumed [Levene's statistic (3,95) = 4.664; p=0.004], the data was transformed by carrying out a square root conversion. The application of a Levene's test to the transformed scores reported that homogeneity of variance could now be assumed [Levene's statistic (3,95) = 2.16; p=0.098]. The application of a one-way ANOVA to the transformed scores resulted in a significant effect being found for age [F (3,95) = 10.10, p<0.001]. A Tukey's post-hoc test showed that whilst the three child groups did not significantly differ, the adults used significantly more specific requests for confirmation compared with each of the child groups.

Table 4.3. The means, standard deviations and range for the number of specific requests for confirmation by age

Age in years	N	Mean	SD	Range
4/5	30	0.40	0.86	0-3
6/7	29	0.93	1.79	0-9
9/10	16	0.56	1.03	0-4
Adult	24	2.38	1.97	0-7

4.3.2.4. Specific requests for specification

The first and second scorer disagreed over the scoring of one specific request for specification giving an inter-rater reliability score of 80%. Table 4.4 shows that the nine/ten-year-olds made more specific requests for specification compared with the other groups. When tested using a one-way between groups ANOVA a significant difference was found [$F(3,95) = 8.84$, $p<0.001$]. However, the homogeneity of variance assumption had been violated [Levene's statistic $(3,95) = 13.63$; $p<0.05$] and was not correctable through the use of a square root transformation [Levene's statistic $(3,95) = 17.74$; $p<0.05$], thus any interpretation of the main effect must be undertaken with caution. The application of a Games-Howell post hoc test for use with non-heterogeneous variances showed that the nine/ten-year-olds made significantly more specific requests for specification compared to the adults and the four/five-year-olds, but did not significantly differ from the six/seven-year-olds. The four/five-year-olds made significantly fewer compared with each of the other child groups but did not significantly differ from the adult group. The Games-Howell post hoc procedure is suitable for use when the variances are heterogeneous as it calculates the critical difference between each pair of means using the degrees of freedom (Howell, 1992).

Table 4.4. The means, standard deviations and range for the number of specific requests for specification by age

Age in years	N	Mean	SD	Range
4/5	30	0.07	0.25	0-1
6/7	29	0.86	1.51	0-5
9/10	16	1.50	1.21	0-4
Adult	24	0.29	0.46	0-1

4.3.2.5. Potential requests for confirmation

Inter-rater reliability for the use of potential requests for confirmation was 100%. Table 4.5 shows that use of potential requests for confirmation increased with age. The range shows that although there was a great deal of variability within age group, the nine/ten-year-olds and the adults used this request type the most. When tested using a one-way between groups ANOVA a significant effect was found for age [$F(3,95) = 25.09$, $p<0.001$]. However, the homogeneity of variance assumption had been violated [Levene's statistics $(3,95)$ 13.71; $p<0.05$], and was

not correctable through the use of a square root transformation [Levene's statistics (3,95) 3.23; p=0.026], thus any interpretation of the main effect must be undertaken with caution. The application of a Games-Howell post hoc test for use with non-heterogeneous variances showed that the four/five-year-olds used significantly fewer potential requests for confirmation compared with each of the other groups, the six/seven-year-olds made significantly more compared with the four/five-year-olds but significantly fewer compared with the other groups, and the oldest child group and the adult group did not significantly differ.

Table 4.5. The means, standard deviations and range for the number of potential requests for confirmation by age

Age in years	N	Mean	SD	Range
4/5	30	0.53	1.31	0-6
6/7	29	2.34	2.06	0-6
9/10	16	5.94	4.49	0-16
Adult	24	6.58	3.71	1-16

4.3.2.6. Potential requests for specification

Inter-rater reliability for the use of potential requests for specification was 100%. Table 4.6 shows that the nine/ten-year-olds made the greatest number of potential requests for specification. When tested using a one-way between groups ANOVA a significant effect was found for age [F (3,95) = 9.42, $p<0.001$]. However, the homogeneity of variance assumption had been violated [Levene's statistic (3,95) = 23.48; $p<0.05$], and was not correctable through the use of a square root transformation [Levene's statistic (3,95) = 19.44; $p<0.05$], thus any interpretation of the main effect must be undertaken with caution. When a Games-Howell post hoc test for use with non-heterogeneous variances was applied, the only difference to reach significance ($p<0.05$) was between the four/five-year-olds and the nine/ten-year-olds.

Table 4.6. The means, standard deviations and range for the number of potential requests for specification by age

Age in years	N	Mean	SD	Range
4/5	30	0.17	0.46	0-2
6/7	29	0.52	0.78	0-3
9/10	16	1.69	1.85	0-5
Adult	24	0.46	0.66	0-2

4.3.2.7. Potential requests for elaboration

Inter-rater reliability for the use of potential requests for elaboration was 100%. Table 4.7 shows that very few potential requests for elaboration were made by any of the age groups with the youngest group not making any. When tested using a one-way between groups ANOVA, age was found to have a significant effect [$F(3,95) = 4.07$, $p<0.005$]. However, the homogeneity of variance assumption had been violated [Levene's statistics, $(3,95) = 18.03$; $p<0.05$), and was not correctable through the use of a square root transformation [Levene's statistics, $(3,95) = 62.70$; $p<0.05$], thus any interpretation of the main effect must be undertaken with caution. When tested with a Games-Howell post hoc test for use with non-heterogeneous variances the only differences to reach significance ($p<0.05$) were between the four/five-year-olds, who did not use this request type, and the six/seven year-olds and adults.

Table 4.7. The means, standard deviations and range for the number of potential requests for elaboration by age

Age in years	N	Mean	SD	Range
4/5	30	.00	.00	0-0
6/7	29	0.69	1.14	0-5
9/10	16	0.88	1.26	0-4
Adult	24	0.79	1.10	0-3

4.3.2.8. Summary of age differences in clarification request type use

The results for the age difference in the use of the various request types are summarised in Table 4.8.

Table 4.8. Summary table for use of clarification request types by age

Request type	Summary of usage
Non specific requests for repetition	No significant age differences in usage.
Specific requests for repetition	Not used.
Specific requests for confirmation	The adult group used significantly more compared with each of the child groups. The child groups did not significantly differ.
Specific requests for specification	The nine/ten-year-olds used significantly more compared with the adults and the four/five-year-olds, but did not significantly differ from the six/seven-year-olds. The four/five-year-olds used significantly fewer than the other child groups but did not significantly differ from the adult group.
Potential requests for confirmation	Use increased with age with six/seven-year-olds, nine/ten-year-olds and adults using significantly more than four/five-year-olds, and adults using significantly more than six/seven-year-olds. The nine/ten-year-olds and the adults did not significantly differ.
Potential requests for specification	The only difference to reach significance level was between the nine/ten-year-olds, who used the most, and the four/five-year-olds, who used the least.
Potential requests for elaboration	The only differences to be significant were between the four/five-year-olds, who did not make any of this request type, and the six/seven-year-olds and adults.

4.3.2.9. Age differences in overall use of clarification requests

To examine for age differences in the overall use of clarification requests the scores for the various clarification request types were combined. Table 4.9 shows overall use of clarification requests increasing until nine/ten-years, with use by the oldest children and adults being very similar. The ranges for the three older groups are also very similar and are much larger than that of the youngest group. Due to a Levene's test reporting that homogeneity of variance could not be assumed [Levene's statistic (3,95) = 12.32; $p<0.05$], the data was transformed by carrying out a square root conversion. The application of a Levene's test to the transformed scores reported that homogeneity of variance could be assumed [Levene's statistic (3,95) = 1.97; $p=0.124$]. The application of a one-way ANOVA to the transformed scores reported a significant effect for age [$F(3,95) = 28.84$, $p<0.001$]. Post hoc analysis using Tukey's test showed that the four/five-year-olds made significantly fewer clarification requests compared with each of the other groups, the six/seven-year-olds made significantly more than the younger children but significantly fewer than the older children and the adults, and the nine/ten-year-olds and the adults made significantly more than the two younger groups but did not significantly differ from one another. These results show that with age children made a greater number of clarification requests until the age of nine/ten-years when their performance did not significantly differ from that of adults.

Table 4.9. The means, standard deviations and range for the overall use of clarification requests by age

Age in years	N	Mean	SD	Range
4/5	30	1.40	2.25	0-8
6/7	29	5.55	5.00	0-22
9/10	16	11.06	8.19	1-24
Adult	24	10.58	5.73	2-25

4.3.3. Checking requests

A score of one was recorded each time the IF checked on information for which intersubjectivity had already been agreed. Inter-rater reliability was 100%. Table 4.10 shows that checks were mainly carried out by adults with very few checks being made by children.

Table 4.10. The means, standard deviations and range for the number of checking requests by age

Age in years	N	Mean	SD	Range
4/5	30	0.00	0.00	0-0
6/7	29	0.03	0.19	0-1
9/10	16	0.13	0.50	0-2
Adult	24	4.08	5.44	0-17

4.3.4. Questions

To examine possible age differences in the IGs' use of questions, the questions asked by the IGs were coded as follows:

Knowledge - The IG used the question form to introduce new information into the dialogue (as used by Anderson et al., 1991, 1994). For example "You know where the two elephants are at the top?"

Actions - The IG questioned whether the IF had carried out the required actions. For example, "Have you done it yet?"

Both - This type usually took the form of a tag question at the end of an utterance. For example, (from an adult IG, bold type is used to emphasise the question) "So curve it round and slight diagonal make sure that your line hit the left-hand side of the bone, **Okay**?" It was unclear as to whether the IG was checking on the IF's understanding of the content of the utterance, checking that the required action had been carried out, or checking for both understanding and action.

Any questions that did not fit into one of the above categories, for example, "Have you got a pencil?" were not coded.

Due to the four/five-year-olds asking very few questions (mean number of questions overall = 0.17, standard deviation = 0.46) the data for this group was omitted from the following analysis.

The first and second scorer disagreed over the scoring of one "knowledge" and one "action" question, producing an inter-rater reliability score for each measure of 95%. Inter-rater reliability for the use of "both" questions was 100%. Table 4.11 shows that although the

oldest two groups asked a similar number of questions in total, the nine/ten-year-olds asked the most "knowledge" questions and the adults asked the most "action" and "both" questions. To test for differences between age groups three one-way ANOVAs were carried out (one for each question type).

Table 4.11. The means and standard deviations (given in brackets) for use of question types by age

Age in years	Knowledge	Actions	Both	Total
6/7	0.83	1.07	0.10	2.00
N=29	(1.89)	(2.39)	(0.41)	(3.92)
9/10	3.69	1.81	0.13	5.62
N=16	(4.38)	(2.56)	(0.34)	(6.06)
Adults	1.96	2.38	0.88	5.21
N=24	(2.03)	(2.90)	(1.15)	(4.93)

4.3.4.1. Knowledge

Due to a Levene's test reporting that homogeneity of variance could not be assumed [Levene's statistic (2,66) = 8.98; $p<0.05$], the data was transformed by carrying out a square root conversion. A further Levene's test reported that homogeneity of variance could now be assumed [Levene's statistic (2,66) = 0.70; $p=0.501$]. The application of a one-way ANOVA to the transformed scores reported a significant effect for age [F (2,66) = 9.037, $p<0.001$]. Post hoc analysis using Tukey's test showed that the six/seven-year-olds asked significantly fewer questions relating to knowledge compared with the two older groups, who did not significantly differ.

4.3.4.2. Action

The application of a Levene's test reported that homogeneity of variance could be assumed [Levene's statistic (2,66) = 3.02; $p=0.056$]. The application of a one-way ANOVA test showed that age did not significantly affect use of questions relating to actions [F (2,66) = 1.66; $p=0.20$].

4.3.4.3. Both

The application of a Levene's test reported that homogeneity of variance could not be assumed [Levene's statistic (2,66) = 9.42; $p<0.05$], and this was still the case following a square root conversion [Levene's statistic (2,66) = 20.47; $p<0.05$]. The application of a one-way ANOVA to the original scores reported a significant effect for age [F (2,66) = 8.14; $p=0.001$]. A Games Howell post hoc test for use with non-heterogeneous data showed that the adults compared with the children asked significantly more questions relating to both actions and knowledge. The child groups did not significantly differ.

4.3.5. Acknowledgements

A score of one was recorded for each acknowledgement made by the IF. Acknowledgements were confirmation statements such as "Yes", "Okay", and "Done it", repetitions of the IG's previous utterance carried out in a confirming manner and requests for the next section of information to be provided, for example, "And where do we go then?"

Inter-rater reliability for the use of acknowledgements was 100%. As shown in Table 4.12, the mean number of acknowledgements for the children increased with age. However, the means for the nine/ten-year-olds and the adults were very similar. The ranges show that although there was some overlap between the scores the maximum scores became greater with age. A Levene's test reported that homogeneity of variance could not be assumed [Levene statistic (3,95) = 6.268; $p<0.001$], so a square root conversion was carried out. A further Levene's test showed that homogeneity of variance could now be assumed [Levene statistic (3,95) = 1.011; $p=0.391$]. A one-way ANOVA on the transformed scores found a significant effect for age [F (3,95) = 33.74; $p<0.001$]. Post hoc analysis using Tukey's test found significant differences between all groups apart from the nine/ten-year-olds and the adults. These results show that with age children made a greater number of acknowledgements until the age of nine/ten-years when their performance does not significantly differ from that of adults.

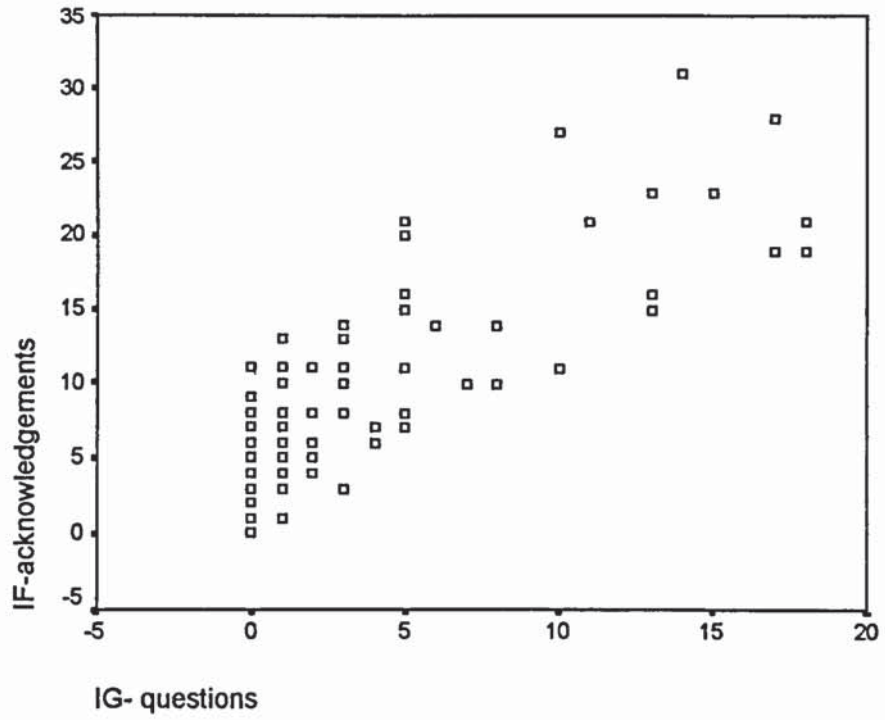
Table 4.12. The means, standard deviations and range for the number of acknowledgements by age

Age in years	N	Mean	SD	Range
4/5	30	2.60	2.85	0-9
6/7	29	5.38	4.02	0-19
9/10	16	12.75	6.03	3-23
Adult	24	14.08	7.48	3-31

4.3.6. The relationship between questions and acknowledgements

To test for a relationship between the use of the question form by the IG and the use of acknowledgements by the IF, the number of questions asked by the IG (regardless of type) and the number of acknowledgements made by the IF, were plotted in a scattergram. As shown in Figure 4.2 the scattergram suggested that there was a strong positive relationship. This was confirmed by a Pearson's correlation test [r (n=99) = 0.82, $p<0.01$, one-tailed].

Figure 4.2. Scattergram for the relationship between questions and acknowledgements



4.4. Discussion

Experiment 2 had two aims which are discussed in turn. First, age differences in the use of interactive communication by same-aged peers when using the IG/IF style were investigated by comparing the number of contributions made per dyad. A developmental effect was found with use increasing with age amongst the children. However, a significant difference was not found between the oldest children and the adults. When further analysis was carried out which looked at age differences in the use of clarification requests, checking requests, and acknowledgements by IFs, and the use of questions by IGs, a number of differences were revealed. The results are discussed in detail below.

The findings regarding the use of specific requests for confirmation and specific requests for specification differed from those reported by Lloyd (1992), who reported that age did not affect use of the specific request form. However, in the present experiment the two specific request types were examined separately. This differed from Lloyd, who treated them as a single type. Looking first at specific requests for confirmation, as the use of this request type does not introduce, or seek to have introduced, any new information into the dialogue, this request type can be seen to act as a form of check which ensures that the key elements of the IG's previous utterance have been correctly heard. The higher use by the adults would suggest that adults take a more cautious approach, in that before carrying out the required action they are more likely to check the information.

Looking next at specific requests for specification, by using this request form the IF is asking the IG to provide specific information missing from his/her earlier utterance. In the present study this form of request was mainly made when the IF wished to identify which of two identical landmarks the IG was referring to, or the direction that the route was to take. The nine/ten-year-olds were found to make significantly more of this request type compared with both the four/five-year-olds and the adults. Previous research has shown that the use of the left and right concept develops around six years (Waller, 1985, 1986a, 1986b), although many ten-year-olds still apply their own left-right orientation to other people (Rigal, 1996). The use and comprehension of location prepositions such as "in front", "behind," "between," "near to" and "next to" has also been shown to develop during the school years (Sowden & Blades, 1996; Durkin, 1981). Young children (under seven years) are not likely to use this type of request if they are not aware of the need for this type of information. Adult IFs are also less

likely to use this request type, as adult IGs are more likely to have already provided the information.

Lloyd (1992) proposed that the reason why younger children made fewer potential requests (potential requests for confirmation, specification and elaboration) was due to the higher information processing demands made by this form. According to Lloyd, with the potential form the IF is required to check the incoming information against the available information and identify any discrepancies before formulating a suitable reply. An alternative explanation offered by the present author is that younger children make fewer potential requests because they are acting on their own interpretation of the speaker's intention. Research (Robinson, Goelman & Olson, 1983; Beal & Flavell, 1984; Beal & Belgrad, 1990) has shown that young (5-6 years) children do not differentiate between what is said and what is meant as they are so preoccupied with uncovering the speaker's meaning that they fail to pay attention to the actual words. It is only as children learn to read and write that they realise the importance of words (reviewed in Bonitatibus, 1988). Thus young children have less need to use the potential form, as they fail to realise that important information has been omitted.

Lloyd (1992) reported that the least demanding of the request types, nonspecific requests for repetition and specific requests for repetition, were mainly made by the youngest children (7-year-olds). However, in the present study no age differences were found for use of these two types. The fact that the children in Lloyd's study communicated via telephone, could account for the higher use by the younger children as they may not have been familiar with using telephones and therefore needed the information repeating.

The findings regarding the age differences in the number of acknowledgements are comparable to those of Lloyd (1992) but extend to a younger age group. Lloyd (1992) proposed that younger children make fewer acknowledgements because they are still developing the skills needed to play the role of *"supportive interlocutor"* (p.372). However, in the present study a positive correlation was found between the number of questions asked by IGs and the number of acknowledgements made by IFs suggesting that the IG's behaviour may influence the IF's use of acknowledgements. This relationship, however, is not based on one acknowledgement for one question, as the mean for the number of acknowledgements was twice that for questions. One possible explanation is that IFs, regardless of age, are more

likely to provide voluntary feedback in the form of acknowledgements to IGs who have indicated that feedback is welcomed. Therefore the increase in acknowledgements with age is due both to the increased awareness of the IG for the need to establish intersubjectivity with the IF as well as the development of the IF's skill of supportive interlocutor. Further research is required which examines whether IFs are more likely to provide voluntary feedback to IGs who use the question form.

Whilst the results regarding the use of the question types, "knowledge" and "action", suggest that the nine/ten-year-old IGs were performing at a similar level to the adult IGs, the adults were also found to use significantly more of the question type "both". This finding obscures the findings for the previous two question types as it shows that adults make use of a more "sophisticated" question form that checks on knowledge and actions at the same time.

The present findings regarding age differences in the use of knowledge questions are in keeping with those reported by Anderson et al. (1991) who also reported a developmental effect in the use of the question form when introducing new referents into the dialogue. However, the present results extend those reported by Anderson et al. (1991, 1994), in that they show that the question form, was used both to construct intersubjectivity regarding joint activity, as well as to construct intersubjectivity regarding the introduction of new knowledge. The results from the two studies, however, are not directly comparable, as although the maps in both studies had been purposely manipulated to encourage the use of the question form, the manipulation had been done in different ways. In Anderson et al.'s study, the participants were explicitly told there were discrepancies in the features, and this may have cued the IGs to ask questions regarding the absence or presence of features. In the present study no features differences were included but the landmarks were duplicated as a means of encouraging the IF to ask questions if the relevant differentiating information was not provided by the IG. These differences would suggest that the IGs in the present study, compared to those in Anderson et al.'s study, would ask fewer questions or would have different reasons for asking questions. To address the question of whether IGs use the question form to aid the construction of intersubjectivity with the IF or as a means of obtaining information to enable them to obtain task success, further research is required which examines differences in the use of the question form in situations where collaborators have been primed, or not primed, of the presence of discrepancies in the information they have been given.

To understand further the differences between the younger and older dyads, it was necessary to look at the kind of information for which intersubjectivity was established. With many of the younger dyads, the IGs only provided the names of the location markers and in some cases this was only the marker at the start and/or finish. With the older dyads, much more specific information was provided which allowed the IF to differentiate between the duplicated location markers as well as to locate the line in relation to the location marker (for examples, see Figure 4.3). These differences are in keeping with the findings from Experiment 1 that showed age differences in the number of strategies for which intersubjectivity was established.

Figure 4.3. Examples of the information provided by a four/five-year-old and a nine/ten-year-old dyad when drawing the same part of the route.

(The first example is from a four/five-year-old dyad. Note that only the name of the location marker is given)

IG] Penguin

IF] It's already done. Done it H

IG] Crocodile

IF] Okay. Done it.

IG] Monkey

IF] Done it

IG] Lion

IF] Done it

(The second example is from a nine/ten-year-old dyad. Note that where location markers have been duplicated the IG and IF reach agreement regarding the identity of location marker as well as the spatial location of the line in relation to the location marker.)

IG] Right Lucy

IF] Yes

IG] Make a cross from the penguin's feet

IF] Yes, there's a cross next to the penguin's feet

IG] Right, make it go up so it looks like a round, it looks like a round

IF] So where does it go?

IG] It goes on top of the crocodile

IF] To the tail or at the top of its head?

IG] On top

IF] Top of its tail?

IG] Yes

IF] Okay. Done

IG] And then you should make it go just down

IF] Down where to?

IG] Down to the monkey

IF] Okay. Which crocodile did you mean?

IG] The first one, not the one next to the elephant

IF] The one next to the elephant?

IG] No

IF] Well I've done it to the one next to the penguin

IG] That's good, you've got it right

IF] So it's the one that's just above the monkey?

IG] Yes

IF] So..

IG] So you go next to the monkey

IF] So you've got the penguin and you go left to the crocodile's tail?

IG] Yes

IF] Okay and then where do you go?

IG] You go down

IF] Which to?

IG] To the part where the monkey's tail is, there's only one tail and there's only one monkey

IF] Right down to the tail. Done

IG] And you go down, snake it round underneath the lions feet

IF] Okay. Which way, do you go around the lion's head or around the lion's tail?

IG] Draw underneath the lion's feet

IF] Yes but do you go around the lion's head to get to the front feet or the back feet. Do you go to the front feet or the back feet?

IG] Back feet

IF] Oh so you go around the lion's head to get to the back feet?

IG] Well you don't go around the lion's head

IF] You go around the lion's tail?

IG] No, you know I said go down make this part round

IF] So you go round the lion's tail?

IG] No, you don't go round the lion's tail

IF] So I mean do you go around to the back, so then you're going round in the middle and back so that you get to lion's back feet?

IG] Yes I think so

IF] Okay

IG] Done it?

IF] Yes

A further issue that may explain some of the differences between the child groups is related to the children's interpretation of what constitutes "sameness". When the screen was removed many of the younger children instantly claimed that their maps were the same although to an adult eye they were very different. In contrast, the older children and adults were much more critical, with many of them acknowledging that although the lines that they had drawn were similar, the two maps were not identical. If understanding of "sameness" is a developing concept, children are only going to construct intersubjectivity at the level required for their present developmental level. If, at their present developmental level, for the maps to be the same the pathway must simply go round some of the animals, children are not going to establish intersubjectivity regarding the distance of the line from the animals, as this has no importance for them.

With the six/seven-year-old dyads in particular, the IGs often started by describing the overall route without making any pauses or checks. They then switched to a more interactive style when their partner either asked them to slow down or made a request for some form of clarification. The way in which the response of the listener can affect the manner in which the speaker delivers information has been examined by a number of researchers (e.g., Krauss, Garlock, Bricker & McMahon, 1977; Kent, Davis & Shapiro, 1978; Kraut, Lewis & Swezey, 1982; Kraut and Lewis, 1984). For example, Kraut and Lewis (1984) showed that when feedback is not provided adult speakers assume that the information is mutually known and so present their narrative in a linear fashion without the use of backtracking to paraphrase what they have said or to provide clarification. When feedback is provided, speakers only wrap up a topic after they have received a feedback signal from the listener which they interpret as

meaning that the listener has understood the point that they are making. In relation to the present study, Kraut and Lewis's (1984) findings suggest that the speakers in the dyads who made the smallest number of contributions may have been capable of a greater amount of interaction or better at establishing mutual understanding if they had been partnered with a more experienced partner who had provided some form of feedback. This subject is explored further in Experiment 4.

The main conclusions regarding the first aim are that the ability to co-construct and co-maintain a shared dialogue develops during childhood. However, not all the skills which are needed develop together, as some skills rely on the acquisition of other knowledge such as the need to consider directional information such as left and right and above and below, and the need to differentiate between what the speaker intends and what the speaker actually says. Adults were shown to differ from children in that as IFs they checked on information for which intersubjectivity had already been agreed and as IGs they used the question type "both" which checks on both knowledge and actions at the same time.

The second aim was to overcome the problem in Experiment 1 that the younger children may have thought they had to work independently. With the map task used in this study the need to work together was made very explicit. However, not all of the younger dyads constructed a joint dialogue, (shown by range in Table 4.1). These findings support those of the previous experiment suggesting that the ability to co-construct and co-maintain a role-based style of interaction (such as the IG/IF style) develops during the early school years. This subject is explored further in experiments 3-5.

5. CHAPTER FIVE

Experiment 3

Interaction styles used by parent and child dyads and the use of scaffolding by parents

The first part of this chapter (sections 5.1-5.4) reports on Experiment 3 which examines age differences in the interaction styles used by adult and child dyads. The second part (section 5.5) examines how the interaction styles used by adult and child dyads differ from those used by same-aged peer dyads

5.1. Introduction

Experiment 3 had two aims, which were to investigate age differences in the styles used by adult and child dyads to construct their collaboration and to examine if adults provide scaffolding.

Scaffolding refers to a process in which sensitive tutors (adults or more capable peers) simplify the task to match the capabilities of the tutee. As the tutee's ability to carry out the task increases, the support provided by the tutor is gradually removed until the tutee is able to carry out the task independently (Wood & Middleton, 1975; Wood, Bruner & Ross, 1976; Wood, Wood & Middleton, 1978). The input of the tutor is contingent upon her/his assessment of the tutee's ability with a greater amount of help being provided when the tutee shows signs of failing and control being relinquished when the tutee shows signs of success (Wood, 1980). Tutors who provide the most effective forms of scaffolding are those who simplify their initial introductions to a level that the child can understand (for examples of studies see Rogoff, 1990). Once a common ground (or intersubjectivity) has been established the tutor then draws the child into a more mature understanding linked to the child's existing knowledge.

No previous research was found which directly examines how adults scaffold children in the acquisition of collaboration skills. However, support for the role of maternal scaffolding in the acquisition of conversational skills can be found in a study by Foster (1986) which looked at how children aged between birth and 30 months learn about topic management in discourse. Foster (1986) found that infants start by making only a minimal contribution to the interaction process with most of the weight being carried by the task structure of the routine of the task

(Ninio & Bruner, 1978; Snow & Goldfield, 1983) and the scaffolding behaviour of the mother (see above). As the infant's ability to construct joint attention increases, a corresponding decrease occurs in the amount of scaffolding provided by the mother, until by the age of 30 months children are able to plan their contributions to the topic whilst making both relevant responses to the utterances of their mothers as well as new contributions of their own, even in circumstances where no useful feedback is provided by the mother.

Evidence of maternal scaffolding in the acquisition of communicative skills with older children is reported in a study by Lloyd (1993) which examined whether related pairs (mothers with eight-year-olds) compared to unrelated pairs (eight-year-olds with non-related adults) would achieve greater task success, in terms of successfully communicating information regarding a route drawn on a map. Lloyd had predicted that related pairs would achieve greater task success due to their previous history of shared experience. The results showed that whilst kinship was not related to task success, it did affect the type of strategies which were used (see Chapter 3 for description of Component, Numbering, Directional and Minimal strategies), with related pairs using similar strategies both when the child acted as route-giver and the parent acted as route-giver, whilst unrelated pairs used different strategies depending on the status of the route-giver, whether adult or child. In addition, Lloyd (1993) drew attention to the way in which the interaction changed as it developed. Whilst initially the relationship between the adult and child was asymmetric, with the adult taking most of the control, by the end of the interaction the relationship was much more equal, with the child taking at least equal control. This suggests that through the process of interacting with adults, children develop the ability to become equal contributors to the interaction.

Adult-child interaction may also provide children with routines that they can use in other interactions. By filling in slots in social routines such as saying "Hello" or "Excuse me" and in social games such as Peekaboo, All Gone and Where Is It?, infants may learn chunks that they can use in later conversations (Rogoff, 1990; Ratner & Bruner, 1978; Nino & Bruner, 1978; Snow & Goldfield, 1983). Participation in routine interaction also gives children the chance to practise their turntaking skills, as they become familiar with the routine and their role within it (Tomasello, 1988; Foster, 1986).

The proposal of the present study is that children learn to use role-based styles of interaction through their experiences of interacting with adults. This is not meant to imply that children cannot learn to use role-based styles through their interactions with other children. Examples of role-based styles are the turntaking and IG/IF styles (see Chapter 3 for details). These styles differ from non-role-based styles such as negotiating and parallel (see Chapter 3 for details) in that they have their own rules and norms relating to the role that each partner takes.

As the results of Experiments 1 and 2 suggested that by the age of nine/ten years the majority of children were able to co-construct and co-maintain joint styles of interaction, the study focuses on younger children. Age (four/five-years versus six/seven-years) is used as an independent variable, due to Experiment 1 reporting differences in the collaboration styles used by these two groups.

5.2. Method

5.2.1. Design

An independent design was used with the child's age being the independent variable. Age had two levels, four/five years and six/seven years. The dependent variable was the dyad's interaction style.

5.2.2. Participants

The participants were 18 parents with a son or daughter aged four/five years (referred to as younger dyads) and 15 parents with a son or daughter aged six/seven year olds (referred to as older dyads). The sample had been arrived at by asking the parents of all of the four/five-year-olds and the six/seven-year-olds who had participated in Experiment 1 and 2 if they would be willing to participate in a further study looking at communication between parents and children. All but two of the parents were mothers. Both of the fathers who took part were the main caregiver in the family.

5.2.3. Materials

The task materials were identical to those used for the pattern construction task in Experiment 1 except two adjustable screens with side wings replaced the single screen which had been used previously. The screens were constructed from cardboard to prevent any scratching to the family table. The screens were also adjustable in that they could be made narrower or

wider depending on the width of the family table. Two screens were used rather than one, as on the pilot study (see Appendix 7) when the family table was large, the screen appeared as if it belonged to the participant who was sat behind it. Two of the child participants had interpreted this to mean that the person who was sat behind the screen was the person in charge. The use of two screens, one in front of each participant, removed this inequality.

5.2.4. Procedure

The procedure was the same as the school-based study reported in Chapter 3 although it was carried out in the family home rather than the school. The family home was chosen as it was felt that the mother's behaviour would be more natural in the home environment. Due to the fact that the children had already participated in Experiment 1 and were therefore familiar with the task, the instructions that had been given to the adult dyads in Experiment 1 (see Appendix 3) were used.

5.3. Results

5.3.1. Use of interaction styles

The tapes were transcribed and the dyad's interaction categorised as being typical of one of the following styles: non-verbal, parallel, IG/IF, turn taking, or negotiating (see Appendix 8 for rationale for choice of classification system and analysis). A second scorer also classified the dyad's interaction style. Inter-rater reliability was 94% with the first and second scorer agreeing on the styles used by 31 out of the 33 dyads (see Appendix 5 for details of how inter-rater reliability was established). All disagreements were resolved through discussion.

The main characteristics of each style are given below (additional details are given in section 3.3.1. and rationale for classification system in Appendix 8):

Non-verbal - No verbal interaction takes place.

Parallel - The partners exchange information but construct their patterns independently.

IG/IF - One partner adopts the role of IG and is responsible for the choosing of the cards and the location of the cards in the pattern. The other partner takes the role of IF and carries out IG's instructions. The same roles are taken for the duration of the interaction or until the roles are exchanged.

Turn taking - The partners take turns to take the role of IG and IF (see above) with a strict role-alternation procedure being followed

Negotiating - Card choices and locations are arrived at by a process of negotiation with both partners making suggestions regarding possible card choices and/or locations.

Table 5.1 shows that all the older dyads and 78% of the younger dyads used the role-based styles of IG/IF and turn taking. A χ^2 test for differences between the two age groups, computed on the frequencies for non-role based and role-based styles, reported expected frequencies below five for the two non-role based cells (shown in Table 5.1.1). As this violates the requirements for the χ^2 test an amended version which produces a reduced value for χ^2, recommended by Clark-Carter (1997) for use when expected frequencies are less than five, was used instead. The age of the child was found not to make a significant difference [χ^2 (1) = 2.16; p>0.05], with role-based styles being used by the majority of the dyads.

Table 5.1. The number and percentage of dyads using each interaction style by age

	Non-role-based				Role-based	
Dyad	Not-classified	Non-verbal	Parallel	Negotiating	IG/IF	Turn taking
Younger n=18	1 (5.5%)	0	1 (5.5%)	2 (11%)	7 (39%)	7 (39%)
Older n=15	0	0	0	0	8 (53.3%)	7 (46.7%)
Total N=33	1 (3%)	0	1 (3%)	2 (6%)	15 (45.5%)	14 (42.5%)

Table 5.1.1. The number and percentage of dyads using non-role-based and role-based styles by age

Dyad	Non-role-based	Role-based
Younger N=18	4 (22%) *2.2*	14 (78%) *15.8*
Older N=15	0 *1.8*	15 (100%) *13.2*

(Expected frequencies shown in italics)

Partners who used the turn taking style took turns to take the role of IG and IF, which allowed both partners to experience both roles. However, with the IG/IF style the same partner could retain the same role for the duration of the interaction allowing each partner to experience only one role. The transcripts for the dyads using the IG/IF style were coded for whether the adult, the child, or the adult and child combined took the IG's role. As shown in Table 5.2, the child's age did not appear to be the determining factor in which partner took the role of IG as within both ages all three approaches were used (due to the small sample size, no statistical tests are reported).

Table 5.2. The number and percentage of participants taking the role of information giver, by status and age

Dyad	Adult IG	Child IG	Combined
Younger	2 (28.5%)	4 (57%)	1 (14.5%)
Older	2 (25%)	3 (37.5%)	3 (37.5%)
Total	4 (26.5%)	7 (47%)	4 (26.5%)

5.3.2. Evidence of parental scaffolding

The transcripts were examined for instances where the parent provided scaffolding. A number of examples are given below. The utterances have been numbered to enable the reader's attention to be drawn to the relevant section.

Use of the combined IG/IF style is in itself a form of scaffolding in that the parent models the role of IG until such a time as they believe the child is capable of performing the role. With the dyad in the example below, the transfer took place on the 112th utterance (not shown) with the child taking the role of IG for the remainder of the interaction. As shown in the example (utterances 161-176), when a problem was encountered the parent supported the child enabling the child as IG to provide the solution.

156] C] Well put that, put that where the six balloons is. But you have to put it downwards

157] D] Down, from the six balloons?

158] C] Yes. And put it the normal way

159] D] Put it the normal way?

160] C] Yes

161] D] I can't. I can't no because you told me to put the six balloons underneath the two flowers

162] C] Move the six balloons on in between the two flowers

163] D] Oh in between the two flowers, right. Now you want me to put this the right way next to it, do you?

164] C] No below it.

165] D] Below it, I can't because now I've got two flowers below it. So what do you want me to do with these two balloons that you told me?

166] C] These six balloons?

167] D] Yes the six balloons

168] C] I've an idea

169] D] Go on then

170] C] We'll just swop the teddy and the kite

171] D] The teddy and the kite

172] C] Put everything in right order

173] D] Right. The teddy and the kite swop it

174] C] Put everything up top

175] D] You mean swop it for the balloons. Is that what you are saying, swop it for the balloons?

176] C] Yes

Some parents provided scaffolding by giving very explicit instructions (shown in examples 1 and 2 below). However, as shown by example 3, other parents did not give any instructions. With the dyad in example 3, this led to the use of the parallel style as neither the mother or child selected the cards specified by their partner.

Example 1

3] M] Right Listen, Which one shall we start with first?

4] C] Err

5] M] You choose which one we start with first and then move it over to the other side and then we can start our pattern then. Okay?

6] C] The football ones

7] M] Alright then. How many footballs has it got on there?

8] C] One, two, three

9] M] No, on the card that you've just moved across, how many footballs is on that card?

10] C] The card that I've just moved across?

11] M] You have to move it across so?

12] C] Derda

13] M] You have to move the card across into the space, the same one as me, and you said that we'll start with the football one. Now has it got anything else on the card as well as a football?

14] C] A flower

Example 2

3] M] [..] so I'll go first and tell you which card I'm going to use and you tell me if you've got the same one.

4] C] Yes

5] M] So the first card that I have is one with two balls on it. Yes?

6] C] I haven't got that

7] M] Right okay so we'll leave that one. Do you have one with two teddy bears on?

8] C] Yes

9] M] Right. Pick that one up

10] C] Yes

11] M] And place that in the middle of your blank area with the teddy bears facing you. Side to side. Can you see? Okay?

Example 3

1] C] Mum

2] M] What?

3] C] What you doing?

4] M] What am I doing, I'm looking first. Right I'm going to start with...

5] C] I've got a sun and a flower

6] M] You've got a sun and a flower, I've got two sunshines

7] C] I've got a tree and a fish

8] M] I'm going to do the sun shining first. All the sun shining

9] C] I've got a boat and a tree now

When the child acted as IG some parents provided scaffolding by asking the child questions (shown in the examples below). By answering the questions the child provided the information that the parent as IF required. Whilst in some dyads (see example 1) this mode of

scaffolding drew the child's attention to the need to structure the information so that intersubjectivity was created for the choice of card (utterances 1-7) before details were given for the card's location in the pattern (utterance 8), in other dyads (shown by example 2) intersubjectivity was only agreed for the choice of cards but not locations.

Example 1

1] M] What picture do you want to use first?

2] C] Flower, flower

3] M] Flower?

4] C] Yes

5] M] With what?

6] C] With another flower on it

7] M] I haven't got one, oh yes I have. And where you putting it?

8] C] At top because I'm making a house

Example 2

2] M] Tell me which one you're picking up and putting onto the next

3] C] I've got two balloons, two and a teddy

4] M] Right

5] C] I've got two teddies the same

6] M] So your first card has got what on it David?

7] C] Um two balloons

8] M] A card with two lots of pictures of balloons on?

9] C] Yes

10] M] Right

11] C] And next it's got a balloon and a teddy and then after that it's got two teddies

12] M] Right. Oh you're going quickly then

13] C] I am

14] M] Lovely. What's your next one you're picking up?

15] C] I've got a balloon and a football, a balloon and a football

16] M] A balloon and a football

17] C] (mutters to himself)

18] M] I've got three cards now how many have you got on your?

19] C] I've got one, two, three, four, five. You need to get five

With dyads who used the turn taking style by verbally drawing the child's attention to the turn taking sequence (shown in the example below) the mother could ensure that the child followed the turn taking routine (utterances 1, 5, 9 and 15). In addition, in the example shown below, the mother also drew the child's attention to the fact that as IG he was required to provide information regarding the card's location (utterances 3, 11 and 21) and as IF he was required to provide feedback (utterances 5, 7 and 17).

1] M] Are you going to start or shall I put one down?

2] C] The elephant and the giraffe

3] M] The elephant and the giraffe, and where are we going to put them?

4] C] At the top

5] M] At the top, mmm Right, well I'll go next then. And there's one with two elephants. Have you got that one?

6] C] Yes

7] M] Okay. Well put one of the elephants underneath the elephant with the giraffe and the other one sticking out the other side. Not the side of the giraffe but on the other side, so that it makes like a step. Do you know what I mean?

8] C] Yes

9] M] Okay. Do you want to go next?

10] C] The two parrots

11] M] Where are they going then?

12] C] Underneath the elephants

13] M] What, straight underneath them so that the white lines are lined up?

14] C] Yes

15] M] Yes. Right, so is it my turn now then?

16] C] Yes

17] M] Okay. There's a parrot and a zebra. Got it? Have you got it?

18] C] Yes

19] M] Okay. Put the zebra underneath the giraffe, so the parrots sticking out at the side.

20] C] The parrot and the snake.

21] M] Yes. Where's that going?

The mother in the dyad whose interaction style did not fit any of the existing categories also

scaffolded the child so that she was included in the interaction. As shown in the example below, the mother asked the child to choose the cards. However, she did not leave the child free to choose just any card but guided her choice so that the new card had the same picture as the preceding card (utterance 5, 7 & 9). In this way the mother not only drew the child's attention to the fact that both partners were required to select the same cards but also drew attention to the particular manner in which the pattern was to be constructed.

1] M] Annie, You know the pictures Annie, the ones that have got the same picture on either side? Yes? There's the teddy, there's the kite, the sunflower, and the train and the balloon. We'll start with those first. Which one shall we start with?

2] C] Teddy

3] M] The teddy. Right, start with the teddy, with two teddies on both side. Yes?

4] C] Yes

5] M] Then we'll do, we want a teddy one at the side of it, so which one? The teddy and ? Which one shall we put at the side? The teddy and ? The teddy and the train?

6] C] Yes

7] M] Right, so I'll put teddy and the train. We'll put that at the left-hand side, left-hand side, Yes? So we've got teddy and the train next to the two teddies. And then we need another teddy one. Which other teddy? Teddy and ?

8] C] Train

9] M] No we've already done train we need another one. With the other pictures. Teddy and ? Balloon?

10] C] Yes

5.4. Discussion for Experiment 3

The results of this third experiment showed that when required to collaborate on a task such as the card task, the majority (88%) of adult and child dyads (four- to eight-year-olds) used role-based styles of interaction, with the age of the child having little affect on their choice of interaction style.

The use of the combined approach, in which the adult takes the role of IG for a number of turns before relinquishing it to the child who either retains it for the remainder of the interaction or until encountering problems when the role is returned to the adult, complies with the procedure for "good" scaffolding outlined by Wood et al. (1975, 1976, 1978), in that the

parent's response is contingent upon the feedback received from the child with the child being given more responsibility as his/her competence level is shown to increase. In addition, parents also supported their children by explained the rules so that the child understood what he/she was required to do, and/or by providing verbal guidance, for example, "Where are you going to put that one?" This latter form of support fits the criteria for guided participation (Rogoff, 1990), as the intention of the parent is not to teach the child how to carry out the task, but to cooperate with the child to achieve the task goal.

Whitehurst & Sonnenschein (1985) proposed that referential communication involves three generic components: substantive knowledge, enabling skills, and procedural rules. Substantive knowledge is domain specific knowledge, comprising of factual or conceptual knowledge about the subject matter. Enabling skills are domain general, they include skills relating to vocabulary, memory, perception, and information processing. Procedural rules include knowledge of how dialogue is constructed, for example, the cooperative principle (see section 2.3.2.2.) and turn taking rules (see section 2.3.2.1), as well as knowledge more specific to referential communication tasks (see Figure 2.4). The type of support provided by the parents in the present experiment enabled the children to develop their knowledge of procedural rules, in that parents drew attention to the need to create intersubjectivity regarding the card choice before providing card location details. An alternative way of interpreting the latter is that the child learned the "routines" used in role-based styles of interaction (Tomasello, 1988; Foster, 1986).

The findings of this third study, suggest that children can learn the routines used in role-based styles of interaction through interacting with their parents. However, before any conclusions can be drawn, comparisons are required between the styles of interaction used by adult and child dyads (Experiment 3) and those used by same-aged peers (Experiment 1). These results are reported in the next section.

5.5. Comparison between interaction styles used by parent and child dyads and same-aged peer dyads

5.5.1. Introduction

The aim of section 5.5 was to investigate if four/five-year-olds when interacting with an adult compared to a same-aged peer were more likely to share in role-based styles of interaction. The rationale for this further investigation was that if young children used non-interactive styles with peers and role-based styles with adults, this would provide evidence to suggest that children learn to use role-based styles of interaction through interacting with adults. This is not meant to imply that children cannot learn to use role-based styles through their interaction with peers. However, unless one of the partners has already learnt to use a role-based style, children are unlikely to structure their interaction in this manner.

The data for this study were obtained from Experiment 1 (interaction with a same-aged peer) and Experiment 3 (interaction with a parent). Only the data for the youngest children (four/five-year-olds) was used, as all but one of the six/seven-year-olds used a role-based style when interacting with a peer (Experiment 1) and all but two when interacting with a parent (Experiment 3). For the purpose of carrying out the analysis, the negotiating style used by two of the parent and child dyads (Experiment 3) was classified as a non-role-based style.

5.5.2. Method

5.5.2.1. Design

A repeated measures design was used with one independent variable. The independent variable was the status of the child's partner, with two levels, same-aged peer or adult. The dependent variable was the style of interaction that was used.

5.5.2.2. Participants

The participants were the same 18 four/five-year-olds and their parents who had acted as participants in Experiments 3.

5.5.2.3. Procedure

Details of the procedures used for collecting the data are given in sections 3.2.4 and 5.2.4.

5.5.3. Results

To test whether the partner's status, either adult or peer, made a difference to the interaction style that was used, a McNemar's test of change was carried out. The results are shown in Table 5.3. Whilst children who already used role-based styles in the with-peer condition continued to do so in the with-parent condition, a number of the children who used non-role based styles in the with-peer condition changed to a role-based style in the with-adult condition.

Table 5.3. The number of children in each condition using role-based and non-role-based styles

Partner's status	Role-based	With adult: no	With adult: yes
With peer	no	3	9
	yes	1	5
McNemar's test of change		p<0 05	

5.5.4. Discussion

The style of interaction used by the same child (aged four/five years) was found to differ depending on the status of the child's partner. When partnered by an adult the majority (78%) of the children used role-based styles, and when partnered by a same-aged peer the majority (66.7%) used non-role-based styles. These results support the proposal that children learn how to use role-based styles of interaction through interacting with more experienced others. However, this does not imply that children cannot develop their ability to use role-based styles by interacting with a same-aged peer but suggests that until children are familiar with the routines used in role-based styles they do not use these styles in their interactions with same-aged peers.

Within the same age group children vary in their ability to co-construct and co-maintain joint interaction (Experiments 1-3 this thesis, Forman, 1981; Renshaw & Garton, 1986, Mercer, 1996). Whilst the experience of interacting with a peer who is more capable at the task may

enable less capable children to become more competent, this does not always happen as the more capable peer may not supply the level of support that will enable the less experienced partner to obtain success (see results section of Experiment 1). Adults, however, who are more skilled at interacting with less experienced partners, scaffold the child by assessing their ability and providing the required level of assistance. This means that children are more likely to develop their interaction skills when interacting with an adult compared to a same-aged peer. This subject is explored further in Experiments 4, and 5.

5.6. Chapter summary

This chapter has shown that when given a collaborative task the majority of adult and child (aged between four and eight years) dyads construct their interaction using a role-based style. Whilst the status of the partner, either adult or same-aged peer, has very little effect on the style of interaction used by six/seven-year-olds, as they use role-based styles in both conditions, the majority of four/five-year-olds use role-based styles when partnered by an adult and non-role-based styles when partnered by a same-aged peer. This finding supports the Vygotskian view that children develop new and/or existing skills through interacting with more capable others, especially parents.

6. CHAPTER SIX

Experiment 4

Differences in the interactional communication strategies used by parent and child dyads depending on the status of the information giver and the age of the child

6.1. Introduction

The rationale for conducting Experiment 4 was as follows. Experiment 2 showed that adult dyads compared with younger child dyads (four/five-year-olds and six/seven-year-olds) used a greater amount of interactive dialogue (adult IFs compared with child IFs made significantly more specific requests for confirmation, potential requests for confirmation, potential requests for elaboration, checking requests and acknowledgements and adult IGs asked significantly more questions). To some degree, this finding was surprising considering that adult IGs have more experience of providing information/instructions therefore reducing the need for the IF to ask for clarification. However, the findings also showed that adults are more aware of the need to provide feedback, in that as IGs they were more likely to use the question form which invites, or in some circumstances, demands feedback and as IFs were more likely to provide acknowledgements and check on information for which agreement has already been reached. These findings suggest that adult collaborators take joint responsibility for the successful achievement of the task goal. The same experiment also showed that there were differences in the amount of interactive dialogue used by four/five-year-olds and six/seven-year-olds, with the older children as IFs making a significantly more specific requests for specification, potential requests for confirmation, potential requests for elaboration, and acknowledgements. As adults are known to provide scaffolding in order that children can achieve task goals that are beyond their present unaided capability level (see Experiment 3), the next experiment (Experiment 4) examines if there are differences in the communication strategies used by adult and child dyads related to the status of the partner taking the role of IG and IF and/or the age of the child.

Due to the nine/ten-year-olds in Experiment 2 being shown to construct their dialogues in a manner similar to that of adults, (see Chapter 4 for exceptions, i.e., specific requests for specification, checking requests, and the use of the question form "both"), this age group were omitted from the experiment which follows.

enable less capable children to become more competent, this does not always happen as the more capable peer may not supply the level of support that will enable the less experienced partner to obtain success (see results section of Experiment 1). Adults, however, who are more skilled at interacting with less experienced partners, scaffold the child by assessing their ability and providing the required level of assistance. This means that children are more likely to develop their interaction skills when interacting with an adult compared to a same-aged peer. This subject is explored further in Experiments 4, and 5.

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6.2. Method

6.2.1. Design

An independent design was used with two independent variables, age and status. Both independent variables had two levels, four/five years and six/seven years for age, and adult and child for status. The dependent variables were the number of contributions made per dyad, the number of acknowledgements, clarification requests, and checking requests made by the IF and the number of questions asked by the IG.

6.2.2. Participants

The participants were the same 18 adult and younger-child dyads (four/five-year-olds) and fifteen adult and older-child dyads (six/seven-year-olds) who had previously carried out the card task in Experiment 3. The data for one of the older child dyads was omitted due to the exercise being abandoned part way through.

6.2.3. Materials

The materials were the same as those used in Experiment 2 except that the single screen was replaced by double screens (see Experiment 3).

6.2.4. Procedure

The procedure was the same as the school-based study reported in Chapter 4 although it was carried out in the family home rather than the school. The family home was chosen as it was felt that the mother's behaviour would be more natural in the home environment. The instructions were the same as those used in Experiment 2 (see Appendix 4). In all cases the child took the role of IG on the first map. This was due to the fact that on the pilot study (see Appendix 6) when the mother took the role of IG on the first trial the children could be seen to imitate her behaviour when taking the role of IG on the second trial.

6.3. Results

The tapes were transcribed and the transcripts coded for the number of contributions made per dyad, the number of clarification requests, checking requests and acknowledgments made by the IF and the number of questions asked by the IG. Brief details of each of the coding categories are given at the start of the relevant sections. Full details, including examples, can be found in Chapter 4. A second scorer trained in the use of the classification system coded a

random subset of six transcripts from each group. Details of the resulting inter-rater reliability scores are given in the relevant sections (see Appendix 5 for details of how inter-rater reliability was calculated). The data for two dyads (one per age group) was omitted due to their scores being abnormally high (50% more than any other dyad in the same condition) which had a distorting effect on the results.

6.3.1. Contributions

A single contribution, independent of length or nature, was recorded for everything spoken by one partner before the next partner spoke.

Table 6.1 shows that a greater number of contributions were made when the child acted as IG, with the greatest number of contributions being made in dyads with older children. The application of a two factor mixed ANOVA, with age (two levels) as the between factor and the status of the IG (two levels) as the within factor, reported a highly significant effect for status [$F(1,28) = 14.14$; $p=0.001$]. The effect for age [$F(1,28) = 0.55$, $p=0.466$] and the interaction between status and age [$F(1,28) = 0.53$; $p=0.472$] were not significant. These results show that a greater number of contributions were made when the child acted as IG.

Table 6.1. The means and standard deviations (given in brackets) for the number of contributions made per dyad by status and age

Dyad	Child IG	Adult IG	Total
Younger	61.94 (37.96)	35.18 (20.83)	48.56 (24.50)
Older	63.31 (15.73)	45.23 (22.98)	54.27 (15.04)
Total	62.53 (29.96)	39.53 (21.99)	51.03 (20.81)

6.3.2. Clarification requests

All requests made by the IF, in which the IG was asked for clarification, were coded using a classification system previously used by Lloyd (1992). Details of the coding categories are provided in Figure 4.1. The results are reported below.

6.3.2.1. Non-specific requests for repetition

Inter-rater reliability for the use of non-specific requests for repetition was 100%. Table 6.2 shows that very few non-specific requests for repetition were made by each age group. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of non-specific requests for repetition as the dependent variable, neither the age of the child [F (1,56) = 2.00; p=0.163], the status of the IF [F (1,56) = 0.006; p=0.938] nor the interaction between age and status [F (1,56) = 0.347; p=0.558] were significant. These results show that the status of the IF, and/or the age of the child, did not affect the use of non-specific requests for repetition.

Table 6.2. The means and standard deviations (given in brackets) for the number of non-specific requests for repetition by status and age

Dyad	Child IF	Adult IF	Total
Younger	0.60	0.00	0.30
	(0.24)	(0.00)	(0.17)
Older	0.15	0.23	0.19
	(0.38)	(0.83)	(0.63)
Total	0.10	0.10	0.10
	(0.31)	(0.55)	(0.44)

6.3.2.2. Specific requests for repetition

Due to the very small number of specific requests for repetition that were made (see Appendix 14), and these were only by adult IFs, no further analysis was carried out.

6.3.2.3. Specific requests for confirmation

Inter-rater reliability for the use of specific requests for confirmation was 100%. Table 6.3 shows that the adult IFs, regardless of the child's age, made more specific requests for confirmation compared to the child IFs. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of specific requests for confirmation as the dependent variable, neither the age of the child [F (1,56) = 0.009; p=0.924], the status of the IF [F (1,56) = 3.634; p=0.062] nor the interaction between age and status [F (1,56) = 0.288; p=0.594] were significant. These results show that the status of the IF, and/or the age of the

child, did not affect the use of specific requests for confirmation.

Table 6.3. The means and standard deviations (given in brackets) for the number of specific requests for confirmation by status and age

Dyad	Child IF	Adult IF	Total
Younger	1.53	2.18	1.85
	(1.91)	(1.85)	(1.88)
Older	1.23	2.38	1.81
	(1.36)	(2.02)	(1.79)
Total	1.40	2.27	1.83
	(1.67)	(1.89)	(1.82)

6.3.2.4. Specific requests for specification

The first and second scorer disagreed over the scoring of one specific request for specification giving an inter-rater reliability score of 84%. Table 6.4 shows that the adult IFs partnered by younger child IGs made the greatest number of specific requests for specification. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of specific requests for specification as the dependent variable, neither the age of the child [$F(1,56) = 3.62$; $p=0.062$], the status of the IF [$F(1,56) = 1.69$; $p=0.199$] nor the interaction between age and status [$F(1,56) = 1.05$; $P=0.310$] were significant. These results show that the status of the IF, and/or the age of the child, did not affect the use of specific requests for specification.

Table 6.4. The means and standard deviations (given in brackets) for the number of specific requests for specification by status and age

Dyad	Child IF	Adult IF	Total
Younger	0.71	1.35	1.03
	(0.99)	(1.54)	(1.31)
Older	0.46	0.54	0.50
	(0.78)	(0.52)	(0.65)
Total	0.60	1.00	0.80
	(0.89)	(1.26)	(1.10)

6.3.2.5. Potential requests for confirmation

Inter-rater reliability for the use of potential requests for confirmation was 100%. Table 6.5 shows that the adult IFs, regardless of the child's age, made a much greater number of potential requests for confirmation compared to the child IFs. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of potential requests for confirmation as the dependent variable, status was found to have a significant effect [$F(1,56) = 28.63$; $p<0.001$]. The effect for age [$F(1,56) = 1.41$; $p=239$] and the interaction between age and status [$F(1,56) = 0.005$; $p=0.944$] were not significant. These results show that adult IFs compared with child IFs, regardless of the age of the child, made significantly more potential requests for confirmation.

Table 6.5. The means and standard deviations (given in brackets) for the number of potential requests for confirmation by status and age

Dyad	Child IF	Adult IF	Total
Younger	1.35 (1.22)	7.12 (5.10)	4.24 (4.68)
Older	2.69 (2.36)	8.31 (5.96)	5.50 (5.29)
Total	1.93 (1.89)	7.63 (5.42)	4.78 (4.95)

6.3.2.6. Potential requests for specification

The first and second scorer disagreed over the scoring of one potential request for specification giving an inter-rater reliability score of 80%. Table 6.6 shows that the adult IFs, regardless of the child's age, made a much greater number of potential requests for specification compared to the child IFs. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of potential requests for specification as the dependent variable, status was found to have a significant effect [$F(1,56 = 23.27$; $p<0.001$]. The effect for age [$F(1,56) = 0.37$; $p=546$] and the interaction between age and status [$F(1,56) = 1.17$; $p=0.284$] were not significant. These results show that adult IFs compared with child IFs, regardless of the age of the child, made significantly more potential requests for specification.

Table 6.6. The means and standard deviations (given in brackets) for the number of potential requests for specification by status and age

Dyad	Child IF	Adult IF	Total
Younger	0.24	4.00	2.12
	(0.56)	(4.11)	(3.46)
Older	0.54	2.92	1.73
	(0.78)	(2.10)	(1.97)
Total	0.37	3.53	1.95
	(0.67)	(3.38)	(2.90)

6.3.2.7. Potential requests for elaboration

The first and second scorer disagreed over the scoring of one potential request for elaboration giving an inter-rater reliability score of 84%. Table 6.7 shows that the adult IFs, regardless of the child's age, made a greater number of potential requests for elaboration compared to the child IFs. When tested using a Univariate ANOVA, with age and status as the fixed factors and the number of potential requests for elaboration as the dependent variable, status was reported to have a significant effect [$F(1,56) = 14.02$; $p<0.001$]. The effect for age [$F(1,56) = 0.34$; $p=0.56$] and the interaction between age and status [$F(1,56) = 0.02$; $p=0.883$] were not significant. These results show that adult IFs compared with child IFs, regardless of the age of the child, made significantly more potential requests for confirmation.

Table 6.7. The means and standard deviations (given in brackets) for the number of potential requests for elaboration by status and age

Dyad	Child IF	Adult IF	Total
Younger	0.18	1.88	1.03
	(0.39)	(2.62)	(2.04)
Older	0.38	2.23	1.31
	(0.77)	(2.35)	(1.95)
Total	0.27	2.03	1.15
	(0.58)	(2.47)	(1.99)

6.3.2.8. Summary of age differences in clarification request type use

The results reported above show that adult IFs make on average three times as many clarification requests as children and use significantly more of the request types: potential requests for confirmation, potential requests for specification and potential requests for elaboration. The age of the child did not significantly affect the number of clarification requests that were made or the type that were used.

6.3.2.9. Age and status differences in the overall use of clarification requests

To test whether the age of the child and/or the status of the IF had an effect on the overall use of clarification requests the scores for the individual types were combined. Table 6.9 shows that the adults, regardless of the age of the child, made approximately three times as many clarification requests compared with the children. A Univariate two factor (age and status) ANOVA reported a highly significant effect for status [$F(1,56) = 34.18$; $p<0.001$], but not for age [$F(1,56) = 0.10$; $p=0.748$] or the interaction between status and age [$F(1,56) = 0.14$; $p=0.715$].

Table 6.8. The means and standard deviations (given in brackets) for the overall use of clarification requests by status and age

Dyad	Child IF	Adult IF	Total
Younger	4.06 (2.90)	16.71 (11.84)	10.38 (10.64)
Older	5.46 (4.65)	16.62 (8.06)	11.04 (8.60)
Total	4.66 (3.75)	16.67 (10.21)	10.67 (9.73)

6.3.3. Checking requests

A score of one was recorded each time the IF checked on information for which agreement had already been agreed.

Inter-rater reliability for the use of checking was 100%. Table 6.9 shows that checking was mainly carried out by adults with very few checks being made by children. A Univariate two

factor (age and status) ANOVA reported a highly significant effect for status [F (1,56 = 8.39; $p<0.005$], but not for age or the interaction between age and status

Table 6.9. The means and standard deviations (given in brackets) for the number of checking requests by status and age

Dyad	Child IF	Adult IF	Total
Younger	0.00	2.59	1.29
		(4.05)	(3.11)
Older	0.38	1.46	0.92
	(1.12)	(2.10)	(1.74)
Total	0.17	2.10	1.13
	(0.75)	(3.35)	(2.59)

6.3.4. Questions

The questions asked by the IGs were coded as being typical of one of the following:

Knowledge - The IG used the question form to introduce new information into the dialogue (as used by Anderson et al. 1991, 1994). For example "You know where the two elephants are at the top?"

Actions - The IG questioned whether the IF had carried out the required actions. For example, "Have you done it yet?"

Both - This type usually took the form of a tag question at the end of an utterance. For example, (from an adult IG, bold type is used to emphasise the question) "So curve it round and slight diagonal make sure that your line hit the left-hand side of the bone, **Okay**?" It was unclear as to whether the IG was checking on the IF's understanding of the content of the utterance, checking that the required action had been carried out, or checking for both understanding and action.

Any question not falling into one of the above categories, for example, "Have you got a pencil?" was not coded

Inter-rater reliability for the use of each of the question types was 100%. As shown in Table 6.10, for each question type the adult IGs, regardless of the child's age, asked the most. Each

group, regardless of age or status, asked a greater number of knowledge and action questions compared to "both" questions.

Table 6.10. The means and standard deviations (given in brackets) for use of question types by status and age

Dyad	Knowledge	Action	Both	Dyad	Knowledge	Action	Both
Child Younger	0.18 (0.39)	0.35 (1.06)	0	Adult Younger	1.88 (2.11)	1.94 (2.14)	1.65 (1.90)
Child Older	0.62 (0.96)	1.00 (1.29)	0.14 (0.28)	Adult Older	1.62 (2.10)	2.31 (3.73)	0.77 (1.09)
Child Totals	0.37 (0.72)	0.63 (1.19)	0.06 (0.18)	Adult Totals	1.77 (2.08)	2.10 (2.88)	1.27 (1.64)
Younger Totals	1.03 (1.73)	1.15 (1.84)	0.82 (1.57)	Older Totals	1.12 (1.68)	1.65 (2.81)	0.42 (0.86)

To test for differences due to the age of the child and/or the status of the IG, three Univariate ANOVAs (one for each question type) were carried out with age and status as the fixed factors and the question type as the dependent variable. For each of the question types, status was found to have a significant effect [Knowledge, $F(1,56) = 10.91$, $p=0.002$, Action, $F(1,56) = 6.23$, $p=0.016$, Both, $F(1,56) = 15.44$, $p<0.001$], with the adults asking significantly more of each of the question types compared with the children. The effect for age and the interaction between status and age did not reach significance level (see Appendix 14).

6.3.5. Acknowledgements

A score of one was recorded for each acknowledgment made by the IF. Acknowledgments included confirmation statements such as "yes", "okay", and "done it", repetitions of the giver's previous utterance carried out in a confirming manner, as well as requests for the next section of information to be provided.

Inter-rater reliability for the use of acknowledgements was 100%. Table 6.11 shows that a greater number of acknowledgements were made by the IFs in the older groups, with status appearing to make very little difference. The application of a Univariate two factor (age and

status) ANOVA test reported a significant effect for age [F (1,56) = 5.26, $p<0.05$], but not for status or the interaction between status and age.

Table 6.11. The means and standard deviations (given in brackets) for the number of acknowledgements by status and age

Dyad	Child IF	Adult IF	Total
Younger	9.59 (7.06)	6.47 (2.92)	8.03 (5.55)
Older	11.69 (6.16)	10.69 (3.86)	11.19 (5.06)
Total	10.50 (6.66)	8.30 (3.92)	9.40 (5.53)

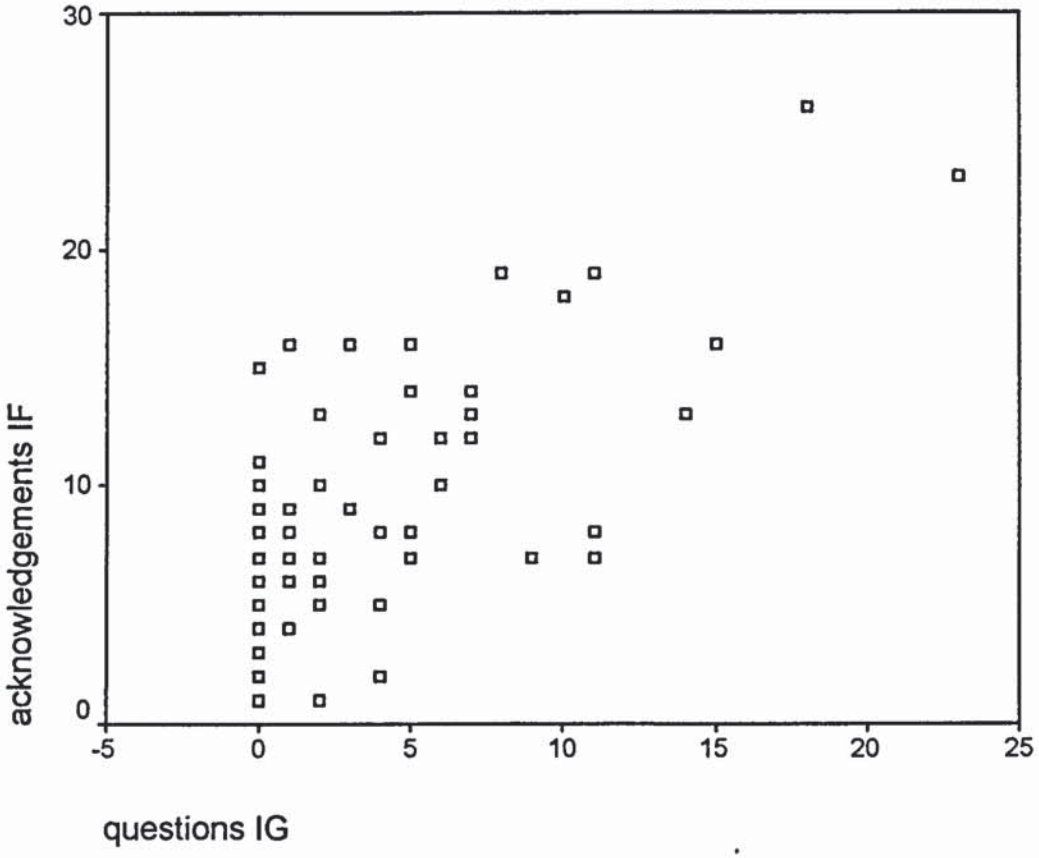
6.3.6. The relationship between questions and acknowledgements

To examine whether a relationship existed between the number of questions asked by the IGs and the number of acknowledgements made by the IFs a correlation was carried out using the two sets of scores. Table 6.12 shows that over twice as many acknowledgements compared to questions were made. The scattergram in Figure 6.1 suggests a positive relationship. This finding was confirmed by a Pearson's correlation test [r (n=60) = 0.71, $p<0.001$, one-tailed].

Table 6.12. The means and standard deviations for the use of questions and acknowledgements

	Mean	Standard deviations
Questions	3.78	5.01
Acknowledgements	9.42	5.53

Figure 6.1. Scattergram for the relation between questions and acknowledgements

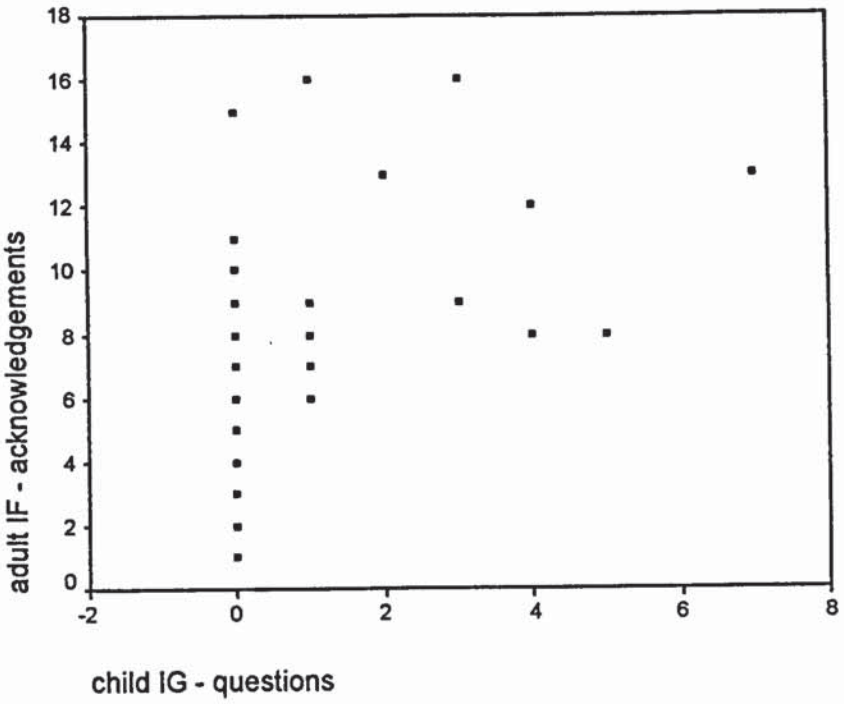


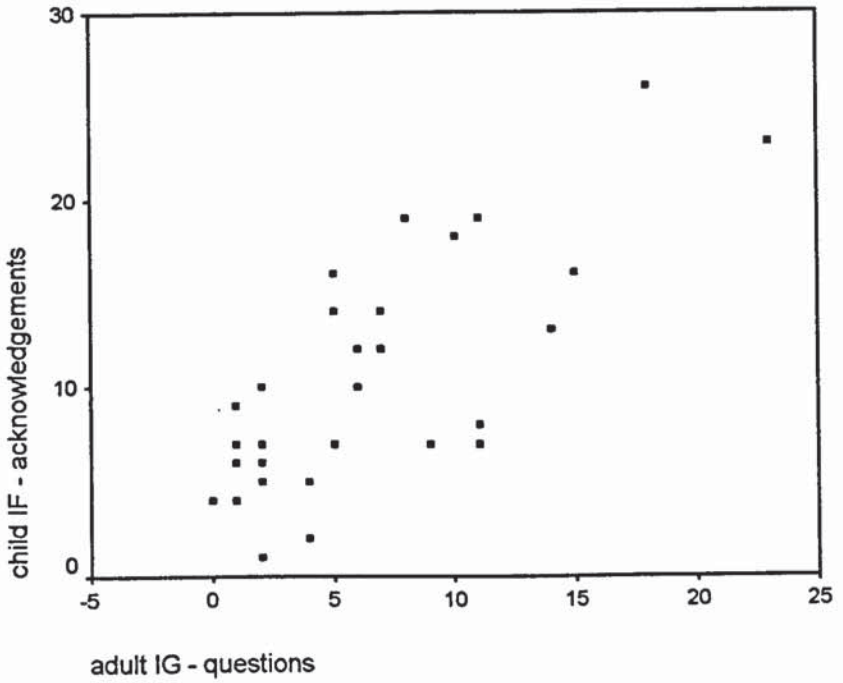
The data was further split by the status of the IG (either adult or child). Table 6.13 shows that whilst the child IGs asked very few questions the adult IFs made a greater number of acknowledgements. The scattergrams in Figure 6.2 suggest a strong relationship for adult IGs with child IFs, and a lesser relationship for child IGs with adult IFs. These findings were confirmed by Pearson's correlation tests [adult IGs = r (n=30) = 0.79; $p<0.001$, one-tailed; child IGs = r (n=30) = 0.47; $p<0.01$, one-tailed].

Table 6.13. The means and standard deviations (given in brackets) for the use of questions and acknowledgements by status

Dyad	Questions	Acknowledgements
Child IG/adult IF	1.23 (1.89)	10.50 (6.66)
Adult IG/child IF	6.33 (5.83)	8.33 (3.92)

Figure 6.2. Scattergrams for the relation between questions and acknowledgements by status





6.4. Discussion

The aim of Experiment 4 was to investigate if there were differences in the communication strategies used by adult and child dyads related to the status of the partner taking the role of IG and IF, and/or the age of the child. Looking first at the results regarding differences due to status, the status of the IG was shown to have a significant effect on the number of contributions that were made, with significantly more contributions being made when the child took the role of IG and the adult the role of IF, compared to when the roles were reversed. This result can be partly explained by the fact that when the child was IG, the adult as IF made a greater number of requests for clarification. The higher use of clarification requests by the adults suggests that the child IGs were either omitting a great deal of important detail or the adult IFs required more precise instructions before executing their drawings. The differences in the type of clarification requests that were used are explored in detail below.

Significant differences according to the status of the IF were found for the three potential forms (potential requests for confirmation, specification and elaboration), with the adult IFs compared to the child IFs using significantly more of each type. The lower use of the potential forms by the child IFs suggests that adult IGs either provide less ambiguous information or that child IFs draw their routes based on less accurate information. The higher use by adults, supports Bowman's (1984) model of the referential communication process in which the IF attends to and decodes the IG's message in relation to the available referential array, evaluates the adequacy of the message, and provides feedback regarding any ambiguities by asking the IG for either confirmation, to choose from a number of alternatives or to provide additional details. However, the fact that with the present study both the IG and IF were given identical maps, meant that the IF was to some degree primed regarding the possible route as both parties already shared knowledge of the location markers shown on the maps. An alternative proposal is that adult IFs accommodate the inexperience of child IGs by using the potential form to obtain the information they believed necessary to complete the task. In other words, adult IFs scaffold child IGs by using the potential form to obtain the information they believe is necessary to ensure that the task goal is successfully achieved. This explanation differs from Bowman's model (cited above) in that rather than adult IFs processing the information provided by the child IG and identifying the ambiguities within it, adults use the potential form to obtain the information they believe necessary for the successful achievement of the task goal.

The low use of checking requests by the child groups is in keeping with the results of Experiments 1 and 2, which also showed adults to be the main group to make checking requests. The low use of checking requests by the children can be explained by the fact that if children have not developed an awareness that a message can be inadequate (Robinson, 1981), they will not need to carry out checking requests as they will not realise that they and their partner may not share the same understanding. A related issue is that the use of checking requests violates the Gricean maxims of quality and quantity. Children have to develop the ability to recognise that in certain contexts standard conversational principles such as the Gricean maxims do not apply (Lloyd, 1994), and until children develop this ability they will not use checking requests.

The adults as IGs asked significantly more questions than the child IGs. This also applied for each of the question types when separated into the three categories of "knowledge", "actions" and "both". However, the higher usage of the question form by the adults did not affect the number of acknowledgments that were made, as both child and adult IFs made a similar number. The fact that adult IGs asked more questions is in keeping with previous reports regarding the high use of the question form by adults when talking to children (MacLure & French, 1981; McTear, 1985; Wood, 1998). It also suggests that adult IGs adopt a more cautious approach (Anderson & Boyle, 1994), as the use of the question form ensures that feedback is received. The similar number of acknowledgements made by both the adult and children suggests that adults provide feedback in the form of acknowledgments, even when feedback has not been sought.

"Acknowledgements" was the only category for which the age of the child was shown to have an effect, with significantly more acknowledgements being made in the older child dyads. The lower use by the younger dyads can be explained by the lower mean for the number of acknowledgements made by the adult IFs (see Table 6.11). This lower mean suggests that the younger child IGs were providing less information for which acknowledgements could be made or were providing information which led to the adult IFs making requests for clarification rather than acknowledgement.

The fact that the age of the child did not significantly affect use of any of the communication strategies apart from acknowledgements was somewhat surprising considering that when the

children were paired with similar aged peers (Experiment 2) the six/seven-year-old IFs compared with the four/five-year-old IFs made significantly more specific requests for specification, potential requests for confirmation, potential requests for elaboration, as well as acknowledgements. However, the fact that in the present experiment, use by children of these request types was in general much lower than that of adults, may have obscured any differences between the child groups. Further research is recommended that compares children of different ages when partnered by adults, without examining status differences.

To summarise, adult IGs compared to child IGs are more likely to use the question form thus ensuring that feedback is given by the child IF. Adult IFs compared to child IFs make more requests for clarification using the potential form, thus providing information that is either missing or ambiguous in the child's previous utterance, or draws the child's attention to the information that is required. Adults as IFs also make a greater number of checks on information for which agreement has already been reached, thus indicating that they have a more cautious approach or take more responsibility regarding the successful achievement of the task goal. The above results support a model of interactive communication in which adults, both as IGs and IFs, support their child partners. Comparisons between the results of Experiments 2 & 4 are reported in Appendix 12.

7. CHAPTER SEVEN

Experiment 5

Do children become more aware of the need for accuracy after collaborating with a parent?

7.1. Introduction

The aim of Experiment 5 was to examine whether children give and/or seek more accurate information following the experience of having collaborated with a parent.

A possible reason for the younger children's poorer performance on the map task (Experiment 2) is that they were less aware of the need for accurate information and therefore, in comparison to the older children and adults, were willing to make their drawings based on inaccurate information. However, Day & Bissell (1978) have shown that when children (4 years plus) are asked to justify their choice of "same" or "different" their accuracy rate increases as they carry out a more in-depth search. This led Day & Bissell to conclude that young children are capable of making more accurate (adult-like) judgments but for some reason choose not to unless specifically asked to justify their decision.

There is some evidence to suggest that children may be aware of the need to give/or seek more accurate information after having interacted with a parent. For example, Lloyd (1993) compared the results of two studies, the first of which (Lloyd, 1991) looked at the collaborative ability of seven-year-old peers when carrying out a map task and the second (Lloyd, 1993), at the collaborative ability of eight-year-olds with parents when carrying out the same map task. Lloyd (1993) reported that when partnered by a parent, children used more advanced strategies (in the earlier study Lloyd had shown how the strategies that were used became more advanced with age) than when they were partnered by peers. However, due to the data being from different studies, and the children in the "with peer" study being a year younger than those in the "with parent" study, this finding must be treated with caution. Lloyd (1993) also drew attention to the way in which when interacting with a parent, the parent initially took most of the control for the interaction. However, by the end of the interaction the relationship was much more equal, with the child taking at least equal control. These findings suggest that in Lloyd's (1993) study the parents were scaffolding the emerging skills of their children (see Experiments 3 and 4 in this thesis). However, Lloyd (1993) did

not examine whether use of these more advanced skills was temporary and/or transferable to situations in which the child collaborated with a same-aged peer.

There is also evidence from the referential communication paradigm (section 2.3.1.) to show that the performance of young children at referential communication tasks improves when training is provided. For example, Cosgrove & Patterson (1979) reported that when six-year-old speakers were provided with specific, general, or no feedback the most successful outcome (as measured by task success) was obtained when the listener provided specific queries that identified the precise information that he/she needed to know. In addition, Patterson & Massad (1980) showed that when seven-year-old speakers were exposed to systematic feedback from nine-year-old listeners the subsequent messages which the speakers provided became less ambiguous. Other studies have examined whether the skills of the young listeners to detect message ambiguity and/or to ask for clarification can be improved. For example, Patterson and colleagues (reviewed in Patterson & Kister, 1981) reported that when child listeners were told to ask for clarification if they were unsure of which object the message was referring to, the number of questions which were asked was greater compared to a control group who were not instructed to ask questions, with significantly more of the correct referents being chosen. Taken together these findings suggest that if young children are exposed to partners who are more experienced at giving and receiving information, their own performance at giving and receiving information is likely to improve.

The rationale underpinning the following experiment was that parents will be more experienced compared with five-year-old peers at giving and seeking information. Therefore, following the experience of having interacted with a parent compared to a same-aged peer, the ability of children to give and seek information should be enhanced.

The map task was used in the following experiment as it had already been shown to be a suitable instrument for collecting data on the collaborative behaviour of young children. However, the following amendments were carried out.

- Each participant was required to complete three sets of maps over a four-week period. The first set was completed at school with a same-aged peer. The second set, which formed the intervention part of the study, was completed approximately one week later in the child's home with the child partnered by his/her mother. The third set was completed at school

with the same partner as for the first set. The intervention trial was carried out in the child's home, as the home is a familiar setting for mother and child interaction. To control for the fact that the experience of carrying out the task may have resulted in a certain amount of learning taking place a control group carried out the task the same number of times as the experimental group but on each trial the children were partnered by a peer.

- At the start of each trial the participants were required to make a copy of a route shown on a marked map. This additional task was added due to the fact that when the completed maps from Experiments 2 and 4 had been examined it was noted that in some cases the IFs, adults as well as children, had simply drawn a line linking the location markers together. This suggested that a possible reason for why some of the IFs did not ask for additional information was due to them not realising the need for accuracy. By drawing attention to the route, both verbally and by having the participants draw it, if spatial location details were not given or sought, it would be possible to record this as a failure by the dyad to recognise the need for this type of information rather than as a failure by the IF to recognise the need for accuracy.

7.2. Method

7.2.1. Design

An independent design was used with one independent variable, which was the mapping between trial one and trail three. The dependent variables were the amount of change (between trials one and three) in the number of location markers, differentiators, and spatial location detail that the dyad referred to.

7.2.2. Participants

The participants were 40 children with a mean age of 60 months (S.D. 3.93, range 54 to 66 months) and 20 of their mothers. Those children whose mothers participated formed the experimental group and the other children made up the control group, resulting in 10 pairs of children in each group. The children attended two schools which had been matched demographically.

7.2.3. Materials

Overall eight map sets were used. Two sets were used on the copying task (the same maps were used on trial one and two but a different one was used on trial three) and a further six (two for each trial) for the interaction task. To ensure that the children did not improve on subsequent trials simply because they had become familiar with the layout of the route, great care was taken to ensure that the routes started and finished in different positions and that the location markers and their locations were not the same. Each map included a number of duplicated location markers (example of map given in Appendix 11). The duplicated location markers were included to provide an additional measure of the children's ability to construct intersubjectivity as when information is duplicated it is necessary for both the speaker and listener to ensure that the correct choice is made. Two audio tape recorders and the screens used in Experiment 4 were also used.

7.2.4. Procedure

Each dyad completed three trials. In the control condition all three trials were carried out with the same peer. In the experimental condition the second trial was carried out with mother and the first and last trial with the same peer. The children were paired into dyads by their class teacher. The procedure (described below) was the same for all three trials apart from the fact that the instructions given on the final trial were in an abbreviated form. Trial two for the experimental group (the intervention trial) was carried out at the child's home. For both groups, all other trials were carried out at the child's school.

The partners were seated at either end of a rectangular table. Each partner was asked to complete a simple copying task which required them to draw a route on an unmarked map identical to one on a marked map that they had in front of them (details given in the Introduction section). To ensure that each participant was aware of the complexity of the information that was required, the experimenter described the route verbally whilst tracing it with her finger. Upon completion the copying task was removed and the screens positioned on the table. The participants were told that they were going to be given similar maps to the ones they had just completed but this time instead of copying the route one of them was going to tell the other one where to draw it. In the peer condition, the child to the experimenter's left was given the marked map and the child on the experimenter's right the unmarked map. In the mother and child condition, the child was given the marked map and the mother the unmarked

map. The standardised instructions used in Experiments 2 and 4 were then given verbally (see Appendix 4). When the first set of maps had been completed the screen was removed and the participants were allowed to look at the completed maps before being given the second set for which their roles were reversed. Upon finishing the second set, the participants were once again allowed to look at their maps, listen to their voices on the tape, and thanked.

7.3. Results

The data for four of the intervention dyads and four of the experimental dyads were excluded from the analysis leaving six dyads in each condition. The reasons for the exclusions were technical problems with the tape recorders meaning that the children carried out the task but were not recorded, one child did not speak loud enough to be heard on the tape, a further two children went into hospital, and one child was not able to carry out the task. The measures were made per dyad across both map sets within the trial.

7.3.1. Constructing the scoring sheets

The present author created a series of scoring sheets by going through each map and writing down the information considered necessary to enable the route to be accurately reproduced. A number of trials were then carried out using adult participants. The adults were told that they could not ask for any further information but were to write down any uncertainties that they experienced. Amendments were then carried out until adults who were new to the maps could reproduce the route without experiencing any uncertainties. The information was then divided into the three categories of location marker, differentiators and spatial location. Location marker refers to the animals shown on the route. Differentiators refers to the need to differentiate between two identical location markers. Spatial location refers to the need to locate the line in relation to the location marker (for example, "above the dog's head"). An example of a scoring sheet is shown in Appendix 11.

7.3.2. Scoring the transcripts

The transcripts from the experimental and control groups in the pre- and post-conditions (trials one and three) were scored. Marks were not given for information that did not appear on the scoring sheets. A second scorer used the scoring sheets to second score the transcripts. Inter-rater reliability was 94% for location markers, 85% for differentiators, and 92% for spatial locations (see Appendix 5). All disagreements were resolved through discussion. Due to the

fact that differences existed between the map sets for the number of possible location markers, differentiators, and spatial locations, the scores for each category were expressed as a percentage of the total.

7.3.3. The actual results

As shown in Appendix 15, for each measure the standard deviations for the experimental group were much larger than those for the control group, suggesting that there was a great deal more variance in the scores for the experimental group. As this meant that the data failed to meet parametric test requirements non-parametric tests were applied. The results are described below.

7.3.3.1. Location markers

As shown in Table 7.1, both groups referred to a greater number of location markers in the post- compared to the pre-condition. A Wilcoxon test was carried out to test whether the overall improvement in the use of location markers was significant. The results reported a significant difference between the pre- and post-condition scores ($w\ (n=12) = 2.20$; $p<0.05$), showing that overall there was a significant improvement in the use of location markers. To test whether one group improved more than the other the differences between the scores for the pre- and post-conditions were calculated (presented in column three of Table 7.1) and a Mann Whitney U test carried out. The results [$U\ (n=12) = 9$, $p>0.05$] showed that there was no significant difference between the two groups for the amount of improvement in the use of location markers.

Table 7.1. The median percentage scores and interquartile ranges (shown in brackets) for the number of location markers by group and condition

Group	Pre-	Post-	Differences
Experimental	71.74 (41.30)	91.18 (29.60)	+19.44
Control	80.44 (18.48)	88.24 (5.89)	+7.80
Total	76.09 (23.92)	88.24 (10.30)	+12.15

7.3.3.2. Differentiators

As shown in Table 7.2, both groups referred to a larger number of differentiators in the post- compared to the pre-condition. A Wilcoxon test was carried out to test whether the overall improvement in the use of differentiators was significant. The results showed a significant difference between the pre- and post-condition scores [w (n=12) = 2.31; $p<0.05$] showing that overall there was an improvement in the use of differentiating material. To test whether one group improved more than the other the differences between the scores for the pre- and post-conditions were calculated (presented in column three of Table 7.2) and a Mann Whitney U test carried out. The results [U (n=12) = 13, $p>0.05$] showed no significant difference between the two groups for the amount of improvement in the use of differentiating material.

Table 7.2. The median percentage scores and interquartile ranges (given in brackets) for the number of differentiators by group and condition

Group	Pre-	Post-	Differences
Experimental	5.56 (11.11)	27.04 (38.46)	+21.48
Control	5.56 (5.56)	7.70 (25.00)	+2.14
Total	5.56 (9.72)	15.39 (29.02)	+ 9.83

7.3.3.3. Spatial locations

As shown in Table 7.3, both groups referred to a larger number of spatial locations in the post- compared to the pre-condition. A Wilcoxon test was carried out to test whether the overall improvement in the use of spatial locations was significant. The results showed a significant difference between the pre- and post-condition scores [w (n=12) = 2.98; $p<0.005$], showing that overall there was an improvement in the use spatial locations. To test whether one group improved more than the other the differences between the scores for the pre- and post-conditions were calculated (presented in column three of Table 7.3) and a Mann Whitney U test carried out. The results [U (n=12) = 12, $p>0.05$] showed a non-significant difference between the two groups for the amount of improvement in the use of spatial locations.

Table 7.3. The median percentage scores and interquartile ranges (given in brackets) for the number of spatial locations by group and condition

Group	Pre-	Post-	Differences
Experimental	22.72 (29.58)	47.73 (27.57)	+25.01
Control	4.55 (14.78)	47.73 (20.46)	+43.18
Total	9.10 (21.46)	47.73 (17.05)	+38.63

7.4. Discussion

The aim of Experiment 5 was to examine whether child dyads give and/or seek more accurate information following collaboration with a parent. To realise this aim the differences in the number of location markers, differentiators and spatial locations that child dyads referred to after having collaborated with either a mother or peer were compared. No significant differences were found between the two groups, which suggests that the experience of having carried out the task with a parent did not afford the children any greater benefit. However, when the scores from the pre- and post-condition were compared a significant improvement was found for each measure. This suggests that following the experience of having carried out the task the ability of children to give and/or seek accurate information was improved. However, whether this was due to the fact that the experience caused the children to have a heightened awareness of the need for accuracy (Day & Bissell, 1978), or whether they had developed other abilities such as the ability to make clarification requests was not clear. The results for each measure are explored in detail below.

Most dyads in both the pre- and post-condition referred to a number of the location markers with two dyads in the experimental group scoring 100% on the post condition. The reason for the children's higher use of location markers compared to the other measures can be accounted for by the fact that once the children realised the significance of the location markers all they were required to do was follow the line and name the next location marker that they came to. Compared to the other two measures naming the location markers requires very little information processing.

The low use of differentiating material is in keeping with research which has reported links between comparison tasks and referential communication tasks (Whitehurst & Sonnenschein, 1981; Camaioni & Ercolani, 1988) and perspective taking tasks, comparison tasks and referential communication tasks (Roberts and Patterson, 1983). In each instance, improvement on one was related to improvement on the other/s. However, with the maps used in the present study the children had to supply differentiation material for identical targets, for example, three identical fish were shown (see map in Appendix 2) with the children being required to differentiate between the target and non-target fish. For example, "The two fishes together". This meant that as well as contrasting the location markers and recognising the need to provide differentiating material, the children were also required to know what type of additional information was required. Whitehurst and Sonnenschein (1985) refer to the ability to provide differentiating material as an enabling skill. Enabling skills are defined as *"domain general abilities that are prerequisites to communicating referentially but are not communicative per se"* (Whitehurst and Sonnenschein, 1985, p.7). The present findings suggest that there is a limit to which the ability of young children to provide differentiating material can be improved, as related skills, such as the ability to provide additional information, are also required.

The ability to provide spatial location details is also an enabling skill. The reason for the children's higher use of spatial location details in the post condition was probably due to the fact that once they were aware of the need to provide this kind of information they were able to do so as due to their developmental age they were becoming aware of the left and right concept (Waller, 1985, 1986a, 1986b) and beginning to use and understand location prepositions such as "in front", "behind," "between," "near to" and "next to" (Sowden & Blades, 1996; Durkin, 1981). However, as shown by their low scores in the post-condition (median of less than 50%), they were not fully competent in their use.

The rationale underpinning the present experiment was that mothers compared with same-aged peers would be more experienced at giving and receiving information, and therefore the children who worked with their mothers on trial two would show a greater amount of improvement between trials one and three compared to children who had only worked with a same-aged peer. However, as no measures were taken on trial two, it could be that the non-significant differences that were found between the two groups, was due to both groups

performing at a similar level on this trial. Before any conclusions can be drawn from this study further research is required which compares the performance of mother and child dyads and same-aged peer dyads, to establish if one is superior to the other.

Another factor that may have influenced the findings was that at the start of each trial the participants were required to carry out a drawing task in which they copied the route shown on a marked map. Whilst the purpose of this task was to draw the attention of the participants to what a completed map should look like, it may also have heightened the children's awareness of the need for accuracy (Day & Bissell, 1978). This means that the drawing task may have encouraged the children to give and/or seek more accurate information than they would have done if the task had not been included.

There were two main limitations with the present study. First, there were large differences between the experimental group and the control group in their pre-task ability, which meant that the scores were not suitable for parametric testing. Second, due to the high number of dyads for whom completed data sets were not acquired, either because of technical problems or because they failed to complete all three trials, the sample size was very small. Further research is needed which uses a larger sample size and matches the children in the groups by assessing their ability before carrying out the experiment.

8. CHAPTER EIGHT

Experiment 6

The collaborative behaviour of nursery children

8.1. Introduction

A number of researchers have described the behaviour of pre-school children as collaborative (e.g., Brownell & Carriger, 1990, 1993, 1998; Cooper, 1980) suggesting that children younger than four/five years (the youngest children to participate in Experiments 1-5) are capable of co-constructing and co-maintaining some form of joint collaboration. The aim of this final study was to examine the collaborative behaviour of preschool children when given a task that was based on the same principles as the pattern construction task used in Experiments 1 and 3 but was more suited to the children's developmental level.

Brownell & Carriger (1990, 1993) originally reported their study as a study into changes in cooperation and self-other differentiation during the second year. However, in 1998, it was reported as a study into collaboration amongst toddler peers. The behaviour of children aged 12, 18, 24 and 30 months was compared when they were required to collaborate to obtain toys from a clear plexiglass box. The task required one child to push a lever on the box whilst the other child retrieved the toy. Various behaviours which were taken as attempts to coordinate actions were coded including the child's movements around the apparatus, the number of times the child operated the handle with a pause for the partner to respond or no pause, the number of times the child anticipated the appearance of a toy as the partner operated the handle, commands, compliance versus resistance, displacement by one child of the partner, and simple exploration. Brownell and Carriger reported that although some of the 24-month-olds were as successful as the 30-month-olds at solving the problem cooperatively, the interaction of the older children was more collaborative as they were able to establish joint goals and adjust their behaviour in the service of these goals.

The task used in the following experiment was based on the same principles as the pattern construction task used in Experiments 1 and 3, in that children working in dyads were required to select identical objects and place them in the same locations. However, the opaque screen was not used, allowing the partners to use the action rather than the abstract form of collaboration (Piaget 1926/59). The action form differs from the abstract form in that

"intelligible" talk is not necessary as the partners can see each other's actions and therefore are not required to provide this information verbally. In addition, a training condition was included with the aim of heightening the children's awareness of the need to work together to choose the same objects.

The reason for including the training condition was that with Experiments 1-4 the author had noted that when the screen was removed the younger children often claimed that their patterns and maps drawings were the same, when in fact they were very different, whilst the older children and adults studied their patterns and drawings carefully before reaching a decision. This observation fitted in with the findings of research carried out by Vurpillot, (1976). Vurpillot (1976) showed children, aged between three and nine years, two similar drawings of houses drawn so that the outline of the houses were identical but the objects shown in the windows had been moved around so that the windows in the two houses did not correspond with each other. By tracking the children's eye movements Vurpillot showed that younger children (three to six year olds) compared only one or two features before reaching a decision whilst older children were much more cautious, systematic and exhaustive in that they made many more comparisons before reaching their decision. However, Day and Bissell (1978) extended Vurpillot's research by showing that when young children (four years plus) were specifically asked to justify their decision they acted in a similar way to the older children. In the following experiment, by drawing the children's attention to the need to use identical objects, it was hoped that the children's awareness of the need for accuracy would be increased.

The participant observation method was used as the author wanted to make the situation as near as possible to an everyday school activity, and when young children are given new and/or novel tasks in the school situation they usually have an adult present (discussed in Chapter 3). The author was aware that the presence of an adult may have changed the children's behaviour. However, she reasoned, that not having an adult present would have also affected their behaviour. Great care was taken by the adult to ensure that in the actual testing situation she only spoke to the children if they spoke to her first (see examples of children's dialogue below).

8.2 Method

8.2.1. Design

The design of the study was participant observation.

8.2.2. Participants

The participants were 22 children, twelve of each sex, with a mean age of 48 months, (S.D. 3.43, range, 42 months to 53 months). All of the children attended the same state-school nursery so were already in daily contact with one another. The children were paired, based on their general classroom ability, by their nursery teacher.

8.2.3. Materials

The materials were eleven small felt animals (two elephants, panda bears, frogs, pigs, and bears, and a single lion), six small plastic dressed dolls (two identical pairs and two non-identical dolls), two small wooden toy beds big enough for one animal/doll to lie on, and two wooden cars with removable roofs and seating for four dolls/animals. The children's attention was drawn to the fact that both children could not have a lion or the same non-identical dolls. A tape recorder was used to tape the children's dialogue and a pencil and notebook for making notes of the observed interaction.

8.2.4. Procedure

The observations took place in a small room in the corner of the nursery, which was a familiar play area for the children. One child was seated at each end of a small table with the felt animals and dolls in the centre of the table. The experimenter sat at the side of the table and gave the instructions verbally.

The training condition

The experimenter asked the children to each pick up one of a certain toy pair. For example, "I want you both to pick up a frog that's the same". After two of the animal pairs had been selected the children were told, "I want you both to pick up a doll that's the same". After two more animal pairs had been picked up the children were told, "I want you both to pick up a lion that's the same". After the remaining animal pair has been picked up the children were again told, "I want you both to pick up a doll that's the same". The children were then asked, "Will you have the same if you pick up any of the remaining toys?" The children were then

told to count their toys and asked, "Do you both have the same?" The toys were then put back in the centre of the table and a toy bed was placed in front of each child. The children were told "I want you both to pick up an animal that's the same and put it in your beds, so that you both have the same animal in your beds." This was repeated three times with the word animal being replaced with doll on the third trial.

The experimental condition

The beds were removed and the cars were placed on the table in front of the children. The cars differed to the beds in that the children had to agree not only on their choice of passengers but also on the passengers' location. The children were told, "I want you both to put the same toys in the same places in your cars, so that when you have finished and I put the two cars side by side you both have the same toys in the same places in your cars". The children's dialogues were taped on an audio-tape. At the end of the experimental condition the experimenter recorded the amount and type of interaction that had took place and whether the children had succeeded at the task.

8.3. Results

The style of interaction used by the dyad was categorised as either, non-interactive, parallel, or collaborative. The dyad rather than the individual child was used as a unit of analysis as the task goal could not be realised without the partners cooperating.

Non-interactive

The children seemed unaware of the joint nature of the task and made up their own games. The following example is from two boys (E = experimenter).

C1] I'm having a lion

C2] And I'm having girls. I'm having all girls (addresses experimenter) I've got all girls in my car.

C1] I'm having all animals

E] Are your cars going to be the same?

(C1 has put four dolls in his car and C2 seven animals. When asked, they recognise that the cars are not the same but are not willing to change them.)

Intermediate

The children were aware of the task goal but did not attempt to cooperate with one another. The following example is from two girls (E = experimenter).

C1] (addresses experimenter) She's got pig

E] Yes so what do you need?

C1] She hasn't got the same (C1 has put a doll in her car)

E] You've both got to do the same.

(C1 removes the doll and copies C2 for two toys and then she rushes and puts in two toys of her own choice)

C1] I've done mine

(The two cars are not the same)

Collaborative

The children were aware of the joint nature of the task. They monitored each other's actions and helped each other to choose the identical toys and place them in the same location. The following example is from two girls.

(E = experimenter)

C1] I'm going to use the dog. You use the dog too. I'm going to put it in back. Will you?

C2] Yes

C1] Alright. I'm going to put it in the middle.

C2] I'm going to put it at the side

C1] Alright, I'll do. There. A piggy

C2] Alright then. A piggy. I'm going to put it there, next to the doggy

C1] (addresses experimenter) I've put my piggy next to the doggy

C2] I'm going to put mine in the front

C1] I am too. I've put it in the middle, I've put it in the middle

C2] (singing) I've put it at the side, I've put it at the side. (talking). I can't reach it. Yes. Oh thank you

C1] I'm going to put it next to the girl

C2] There. (addresses experimenter) We've done it

E] You've done it, right, that's very good

C2] Two there and two there

E] Right and if I put them side by side, like that, are they the same?

C1] I think (child's name) has put the pig there and I've put the pig there
E] That's right so what will you need to do to make them both the same?
C1] I know. (moves her partner's pig).

As shown in Table 8.1, three dyads were classified as using the non-interactive style. These children did not try to interact to achieve the task goal but played independently constructing their own game. For example, one boy announced that he needed both the frogs because they were the "mummy" and the "daddy" and the two "girls" were their children. The daddy frog had to drive the car with the "girls" in the back and go and collect the mummy frog from work. His partner made up a similar story where he and his partner were the two dogs in the back of the car who were being taken to school by the two elephants in the front who were the adults. Three dyads were classified as using the intermediate style, these partners used very different toys and although they recognised this fact, for example, they complained to the experimenter that the other child was not picking up the same toys as they were, neither partner was willing to submerge their own wishes and select the same toys as their partner.

Five dyads were classified as using the collaborative style, with four of these dyads the children chose the same toys but put them in different places in their cars. The main problem appeared to be related to mirror image in that the children failed to take into account the fact that they were seated opposite each other. In another dyad one of the children put two dogs and two dolls in her car and the other child put two pandas and two dolls in hers. When asked, both children claimed sameness as they were comparing the toys in their individual cars for sameness rather than comparing the two cars against each other. The children in these dyads worked cooperatively as they passed toys to one another, monitored each other's actions, and commented on each other's choices.

Due to the exploratory nature of this chapter and the small sample size no statistical analysis was carried out.

Table 8.1. The number and percentage of dyads classified as non-interactive, intermediate and collaborative

	Non-interactive	Intermediate	Collaborative
Dyads	3 (27.25%)	3 (27.25%)	5 (45.5%)

8.4. Discussion

The results from this study support those reported for Experiments 1 and 2 (Chapter 3 & 4) in that the ability of young children to work with a partner to achieve a shared goal was shown to be poor, even when the task was more suited to the developmental level of the children, the children could see each other, and had received training. These results suggest that before children can begin to construct their collaboration they have to realise that they are required to work with a partner. Even then, collaboration is not easy, as children have to learn to submerge their own desires in preference of those of the partnership. It is only at this point that children can begin to work together to achieve a joint goal.

Two explanations for the difference in findings between the present study and those which have reported collaborative behaviour in younger children are offered. The first explanation is in terms of the motivation provided by the task goal. For example, in Brownell & Carriger's (1990, 1993, 1998) study, children, aged between 12 and 30 months, were required to cooperate to obtain toys from a plexiglass box. In the present studies the toys (and cards) were given to the three/four-year-olds and they were required to collaborate to achieve a goal that had been set by the experimenter. This means that Brownell & Carriger's study the children would have had a greater reason to cooperate, as they would want to obtain the toys so that they could play with them. However, in the present study the desire to play with the toys was probably greater than the desire to achieve the task goal, which may have held little or no interest for the children.

The second explanation is in terms of the measures used for measuring collaboration. In Experiment 6 the children were seated opposite each other and collaboration was recorded if the children selected the same toys by either watching each other's action or by verbally directing each other, for example, "I'm choosing a frog, so you've got to choose a frog". In Brownell & Carringer's study the children were free to move around the apparatus with a whole range of behaviours being taken as attempts to coordinate actions. This means that in

Brownell and Carringer's study the children could cooperate for only a small amount of time and still be classified as collaborative, whereas in the present study to be classified as collaborative the children had to co-construct and co-maintain their cooperation over time.

The author's intention, when comparing and contrasting Experiment 6 with studies such as Brownell & Carringer's, was not to imply that one researcher was right and the other not in their use of the term "collaborative" but to illustrate how different conclusions can be reached depending on the type of task and the sensitivity of the measures that are used.

To summarise, the results from this final study suggest that before children can work collaboratively they have to realise that they are required to work with a partner. They then have to learn to submerge their own desires in preference of those of the partnership. It is only at this point that they can begin to work together to achieve a joint goal. For young children the task goal needs to be of value to them, otherwise they will have less reason for submerging their own individual desires.

9. CHAPTER NINE

General Discussion

A review of the literature showed that the most popular reason for examining collaboration has been in terms of the cognitive changes that may take place when two or more children are required to collaborate to produce a solution for a problem-solving task. Whilst research in this paradigm has shown the value of peer collaboration as an aid to learning, very little attention has been paid to the fact that the ability to collaborate depends upon the development of other abilities, such as the ability to construct intersubjectivity, especially in dialogue. The focus of this thesis, therefore, has been on the ability to collaborate in terms of the ability to construct intersubjectivity through talk when working with another person to achieve a joint goal.

9.1. How the ability to collaborate changes with age

In Experiment 6 preschoolers were found to have great difficulty when required to co-construct and co-maintain a joint style of interaction. However, Experiment 1 showed that the majority of seven-year-olds were able to co-construct and co-maintain a joint interaction style in which the partners took separate roles but coordinated their roles so that the shared goal was achieved. Seven-year-olds, therefore, differ from preschoolers in that they have learned how to co-construct and co-maintain a joint style of interaction, which allows them to cooperate with one another. However, Experiment 1 also showed that the majority of adults used a more advanced form of collaboration, which involves the use of negotiating. The negotiating style differs from the role-based styles in that strict rules are not followed regarding which partner acts as IG and/or IF, with both partners offering suggestions and providing alternatives. Partners who used the negotiating style were also shown as being more likely to start their interaction by reaching a joint understanding regarding some aspect related to the task. Experiments 1 and 2 showed that adults, compared to children, were more likely to carry out retrospective checking. Taken together, these findings suggest that children have to first learn that in order to achieve a shared goal they have to cooperate with one another. In order to cooperate they first learn to construct their interaction using role-based styles, which are governed by rules. Adults, however, are not restricted to using role-based styles as they have developed more advanced communication strategies. For example, they interrupt each other to ask for clarification, recheck on information for which intersubjectivity has already been

established (Experiment 2) and agree factors related to how they are going to carry out the task (Experiment 1). These findings support a model of collaboration in which the ability to collaborate continues to develop and change during adolescence and early adulthood, if not beyond (Azmitia, 1996), with adults negotiating to reach a shared consensus, whilst children cooperate by either taking turns or by one partner been given, or taking, sole responsibility for the task.

9.2. Age differences in the construction of intersubjectivity

Experiments 1 and 2 showed that younger children only constructed intersubjectivity for the most salient features, i.e. the choice of cards (Experiment 1) and the location markers (Experiment 2), whilst older children and adults also establish it for more complex matters such as issues related to how the task is to be carried out (Experiment 1), the location of the cards in the pattern (Experiment 1) and the spatial location of the line (Experiment 2). Experiment 4 showed that when parents partnered children the parent drew the child's attention to the need to construct intersubjectivity by either asking questions in the form of potential requests for clarification when taking the role of IF, or in the form of "knowledge" questions when taking the role of IG. In addition, parents as IGs, also used the "action" and "both" form of questioning, which draws the IF's attention to the need to provide feedback so that intersubjectivity can be established regarding their joint actions. However, Experiment 5 showed that although there were improvements in the ability of children (four/five-year-olds) to establish intersubjectivity following collaboration with an adult, these improvements were no greater than those following collaboration with a same-aged peer. The results of Experiments 2 and 5 also suggest that until related abilities develop, for example, the ability to provide differential and directional information, there are limits to how much improvement can be made, as the ability to construct intersubjectivity is to some degree constrained by other developmental factors.

9.3. Age differences in the use of interactive communication strategies

In Experiment 2, four/five-year-olds were shown to perform very poorly on each of the interactive communication measures. These findings are in keeping with previous research which has found young children to experience problems with interactional communication (e.g., Lloyd, 1991, 1992; Anderson et al., 1991, 1994; Anderson & Boyle, 1994). However, the results of Experiment 4 suggest that when four/five-year-olds are partnered by a parent a

much greater amount of interaction takes place, as parents as IFs introduce information into the conversation which is missing from the child's previous utterance, and as IGs use the question form which ensures that feedback is obtained from the child. These findings suggest that interaction with parents, provides children, both as IGs and IFs, with the opportunity to participate in more advanced forms of interactive communication than they would do if they were partnered by a same-aged peer.

9.4. The role of parent and child interaction in learning to use role-based styles

Experiment 3 showed that when children (four to seven year olds) carried out the pattern construction task with a parent the majority of dyads used role-based styles with the parent scaffolding (Wood, Bruner & Ross, 1976; Wood, Wood & Middleton, 1978), or guiding (Rogoff, 1990) the child's participation in the task by using role modelling and verbal structuring. These result support the Vygotskian view that children develop higher functions through their interactions with more capable others. However, the results of Experiment 5 showed that although four/five-year-olds were more aware of the need for accuracy after collaborating with a parent, this experience afforded the child no greater benefit than the experience of collaborating with a same-aged peer. However, the results of Experiment 5 are very tentative, as the sample size was very small and the experimenter provided feedback between trials which may have influenced the ability of the control group.

9.5. The problem with using age as an independent variable

The author is aware that by using age as an independent variable, there is a tendency to interpret the results in terms of stages, with the interpretation being that all children must pass through the same stage at the same age, with the stages following a linear progression. However, as well as showing differences in collaborative ability relating to age, the results of Experiments 1 and 2 also showed differences within age groups, demonstrating that not all children develop at the same rate. In addition, the results of Experiments 3 and 4 showed that when similar aged children collaborated with a parent, there were differences in the way in which the dyads constructed and maintained their collaboration. These findings suggest, that other factors, such as personal preference, personality, and previous experience, may influence the way in which collaborative ability develops

9.6. How differences in the degree of friendship that existed between partners may have influenced the findings

A factor that has not been considered so far in this thesis, but is known to have a direct effect on interactive behaviour, is the degree of friendship that exists between partners (see below).

A large number of studies have been conducted examining the behaviours that differentiate friends from non-friends (for summaries see Azmitia, 1989; Hartup, 1996). The following summary is taken from Azmitia (1989).

- The conversations of friends contain a greater mutuality and involvement (Berndt, 1987; Gottman & Parkhurst, 1980).
- Friends are more likely to share resources and comply with each other's requests (La Freniere & Charlesworth, 1987; Newcomb & Brady, 1982).
- Friends are more likely to resolve conflicts equitably (Hartup & Laursen, 1987; Krappman & Oswald, 1987).
- Friends are more likely to give explanations for their actions (Nelson & Aboud, 1985).
- Friends are more likely to try to change each other's opinions by challenging their partner's position whilst upholding their own (Nelson & Aboud, 1985).

Other studies have shown how interactive behaviour changes over the course of interaction. The summary that follows is taken from Azmitia (1989).

- Children who work together on a series of problem-solving tasks develop more flexible cooperative skills compared with children who work with a different partner each time (Goldberg & Maccoby, 1965),
- Over the course of a session, partners become better at anticipating their partner's needs and resolving conflicts (Damon, 1983),
- Some partners need a number of sessions before they develop a stable working style (Forman & Cazden, 1985),
- Reciprocity is more common between familiar compared to unfamiliar peers, with familiar peers using more complex play strategies compared to unfamiliar peers (Doyle, Connolly & Rivers, 1980).

Differences in the amount of familiarity that exists between partners can be used to explain the findings cited above. With regard to the first set of findings, as friends have already established their friendship and know the way they like to work together they are able to give a greater part of their attention to the task, whilst nonfriends have to share their attention between the task requirements and the need to develop a working relationship, which may in time lead to a friendship. With regard to the second set of findings, the familiarity which comes from having interacted with someone over a period of time, whether this is a short or long period, changes the nature of the interaction so that it becomes more "shared" than it was in the beginning.

Hartup (1996) provided the following four reasons to account for the differences between the behaviour of friends and nonfriends.

- Friends are able to communicate more efficiently and effectively due to knowing each other better than nonfriends (Ladd & Emmerson, 1984).
- Friends expect more assistance and support from each other compared with nonfriends (Bigelow, 1977).
- A "climate of agreement" which is more favourable to exploration and problem solving exists between friends compared to nonfriends (Gottman, 1983).
- Friends want their interaction to continue so are therefore more willing to find ways to resolve their disagreements (Hartup & Laursen, 1992).

Both the degree of friendship between the partners, and the amount of time they worked together, or had previously worked together, may have influenced the findings. For example, although at the start of Experiments 1, 2, 5, and 6, the classroom teachers were asked to pair the children in friendship pairs, the experimenter did not control the pairing method, which means that in some dyads the partners might have been "best friends" with a lot of previous experience of interacting, whilst other partners may have been paired together because they were seated next to each other in the classroom, or appeared "to get along together" and yet had very little previous experience of carrying out a shared activity. This may have influenced the choice of interaction styles that were reported in Experiment 1 and the amount of interactive communication reported in Experiments 2 and 5.

9.7. The findings in relation to the theory

In the early stages of the PhD process, of which the present thesis forms a part, the author made the conscious decision that she wanted to focus on how the ability to take part in collaboration develops, in terms of how children develop a shared means of interacting and communicating (Forman & McPhail, 1993), without getting involved in the existing arguments surrounding the cognitive gains perspective (see section 2.1). Therefore, in the experiments reported in Chapters 3-8 no attempt was made to formally measure the amount of cognitive change that may have taken place due to having carried out the task. However, the fact that in Experiment 5 the collaborative skills of the children were shown to improve after having carried out the task, suggests that by the time of the post-test trial there had been a change in the children's cognition, as they were more aware of the need to mention location markers, to differentiate between similar location markers, and to provide spatial location details. Piaget (1926/59) proposed that collaboration could only result in cognitive change after children became able to use argumentation and justification in their speech. He proposed that these abilities developed around the age of seven years and were due to biological processes. On the other hand, Vygotsky (1978) proposed that all cognitive change was due to social interaction, and, therefore, placed no age threshold for when collaborating was the most beneficial. The findings of the present thesis show that the experience of interacting with others can lead to changes in thinking for children younger than seven years. However, any improvement is limited, as other abilities related to the specific task, for example, the ability to use left and right when giving directions, may not be fully developed. The question of whether the development of these more specific task skills is due to biological or environmental factors requires further investigation.

The most popular interpretation of Vygotsky's view of collaboration involves two partners, one with more advanced task specific skills than the other. The more capable partner, by demonstrating, modelling, offering encouragement, and/or explicit explanation, "tutors" the less capable partner, thus enabling the skills and/or knowledge of the less capable partner to be developed (Forman & McPhain, 1993). However, Experiments 1 and 2 showed that when children were not made aware of the differences between their own ability and that of their partners, the interaction could break down due to the more capable partner not recognising the deficits in their partner's skills and/or knowledge. For example, when one partner took the role of IG but the other partner made their own independent pattern. This finding fits in with a

model of young children as egocentric beings (see section 2.1.1) who have to come to recognise that other people may not have the same skills or knowledge as they have.

Still in terms of Vygotskian theory, whilst evidence was found in Experiments 3 & 4 of parents teaching and/or scaffolding their children so that they performed at a more advanced level than when previously partnered by a peer, there were also examples of parents failing to provide the necessary support. Rogoff (1990) proposed that parents who do not provide a high level of support are not necessarily harming their child's development, as the child may be stimulated to take greater control for his/her own communication. However, whether young children are capable of recognising for themselves that there are deficiencies in the way in which they are doing something, and to work out for themselves what these deficiencies are and what they must do in order to improve, has not been established.

Piaget (1926/59) proposed that there were two types of collaboration, action and abstract. The action type is less demanding in that it involves the use of physical objects or shared memories, which makes the use of speech less important. However, speech is important with the abstract type, as the subject matter of the collaboration is of an abstract rather than physical nature. In the tasks used in the Experiments 1-5 the partners were given physical objects, i.e. cards and maps. However, because their view of their partner was restricted, they were required to use speech to explain their actions. The findings suggest that young children's difficulties with the abstract form are not only due to their limited use of communication strategies, but also because they fail to realise that they are required to co-construct and co-maintain a joint form of interaction.

The form of collaboration that the partners needed to use in Experiment 6 differed from that needed in the other experiments, in that in Experiment 6 the children could see their partner's actions as there was no screen obstructing their view. This meant that the partners could use the less demanding "action" form of collaboration as they were able to copy each other's actions making the need for "intelligible" talk less important (Piaget, 1926/59). However, the results showed that although the children could see each other's actions, and therefore, were free to imitate each other, many of them were not willing to submerge their own individual desires in order to comply with their partner. The children most successful at collaborating were the ones who constructed a dialogue. This finding suggests that a relationship exists

between communicative ability and collaborative ability, even when language is not essential for collaboration to take place.

9.8. Limitations with the present thesis and suggestions for further research

As discussed below, there were a number of limitations due to the design of the studies, which must be taken into consideration when considering the findings.

The peer dyads carried out the pattern-construction task (Experiment 1) followed by the map task (Experiment 2) in the same visit. A few weeks later a selection of the children carried out the two tasks with their parents (Experiments 3 & 4). The rationale for using the same children for all four experiments was that originally the author intended to investigate if there was a relationship between performances on all four experiments. However, due to problems with the analysis of the data this part of the investigation was dropped. The reason for using the same dyads for both tasks was to control for the fact that if the children were paired with different partners, other variables, for example, the competence level of each partner and their friendship status, may have affected the results. To eliminate the possibility of carry over effects from the map to the pattern-construction task the latter was always completed first. In general, the two tasks seemed different enough for there to be no carry over effects from the pattern-construction task to the map task. However, Experiment 5 showed that performance did improve following repeated trials. Therefore, the fact that the children may have improved by the time they carried out Experiments 3 and 4 must be taken into consideration when considering the findings.

Before carrying out Experiments 1-5, the participants were told that the purpose of the research was to investigate communicative ability. This most likely caused some of the participants to change aspects of their communicative behaviour to fit in with the type of behaviour that they thought the experimenter wanted. It is therefore not possible to conclude from these experiments that the observed behaviours were typical of those that occur in everyday interaction. However, what the experiments do show are age related differences in the types of behaviour that dyads use when carrying out collaborative tasks. In addition, whilst care was taken to ensure that the experimental tasks had a degree of ecological validity, it is recognised that people (both children and adults) differ in the amount they interact and their motivation for interacting (Forman & McPhail, 1993). This means that whilst some

participants (both children and adults) would be used to playing games, for others it would be a very unusual occurrence, which again would have affected the type of behaviour that was displayed.

In the present thesis, the fact that the tasks given to the dyads were suitable for a wide range of age groups meant that they probably restricted the type of collaboration that took place. Further research is required using tasks that are more suited to the developmental level of the individual participant groups. For example, under seven-year-olds could be given a construction task that does not involve the use of directional information and spatial locations, whilst older children and adults could be given a problem-solving task that requires abstract thinking for the solution.

The classification systems used in the experiments were very simple. For example, in Experiment 1 the classification system measured the number of strategies for which the partners constructed an intersubjective understanding. Although age differences in strategy use were established, the classification system did not measure differences in the way in which the partners constructed their understanding, or checked on whether the corresponding actions were carried out (see Appendix 8). This same criticism can also be leveled at the classification system used by Lloyd (1992, 1993). In other instances the dyads interaction was categorised as being typical of a particular style (Experiments 1, 3 & 6). Whilst this method allowed the author to compare the particular styles that the dyads used, it ignored more subtle differences between dyads as well as between dyad partners. Further research is required which uses a more refined classification system and examines the actions as well as the speech of collaborators to see if the two are related.

With Experiments 3 & 4 parents were found to provide scaffolding and/or guidance which enabled children to participate in more advanced forms of collaboration, However, Experiment 5 showed that although the experience of collaborating led to an improvement in the ability to give and/or seek accurate information, the benefits due to being partnered by a parent were no greater than those obtained with a same-aged peer. The findings of Experiment 5, however, are very tentative, as due to various problems, such as illness and technical issues, the number of participants who provided completed data sets was very small. The children in the "with peer" group also received feedback from the experimenter that may

have contributed to their improved performance. Further research is required using a larger participant group with no feedback being provided.

Whilst in the present thesis age was treated as an indication of developmental level, the results showed that as well as differences between age groups there were also differences within age groups (Experiments 1-6). Further research is needed which uses a longitudinal design to examine how the ability to collaborate develops and changes over time. By using a longitudinal design and taking frequent measures of collaborative ability it should be possible to identify whether all children go through the same stages, although some may progress quicker than others; whether there are different routes, the nature of these routes and the factors which may influence them; and/or whether some children never manage to collaborate and the factors which may influence this.

9.9. Conclusions

Whilst there has been a great deal of research interest into the cognitive gains that may result from collaboration there has been very little research into how the ability to collaborate develops. Forman (1992) proposed that the increased demands for intersubjectivity (i.e. shared understanding) that are made upon children with age, leads them into co-constructing new modes of discourse, deeper levels of intersubjective understanding and different types of intrapsychological regulation (e.g., voluntary memory, selective attention and logical reasoning). The present thesis shows that the ability to collaborate is dependent upon the development of a range of functions, including the ability to construct intersubjectivity, especially in regard to the giving and/or seeking of accurate information; the ability to use role-based leading to a negotiating style of interaction and the ability to use interactional communication. Whilst the experience of collaborating with parents may assist young children to develop their knowledge of role-based styles and interactional communication, in regards to constructing intersubjectivity through the giving and/or seeking of accurate information, the experience of interacting with a parent was shown to be of no greater benefit than the experience of collaborating with a same-aged peer.

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Appendix 1: Example of letter sent to parents

The school has agreed to take part in a research programme looking at how children communicate. From Monday, 10th January 2000, Mrs Ann Walker from Aston University, Birmingham, will be attending the school in order to audiotape children from Reception class, Year 1, Year 2, and Year 5 whilst they are playing two games. If you would not like your child to take part in this research would you please sign part A of the form and return it to school.

If you would be willing to take part in a further study looking at how parents and children communicate, would you please enter your contact address on part B of the form and return it to school by Monday 10th January 2000.

If you would like to know anything else about the research please contact Mrs Ann Walker on 01405 814809.

.....

Part A

I would not like my child ..... to take part in the research into how children communicate.

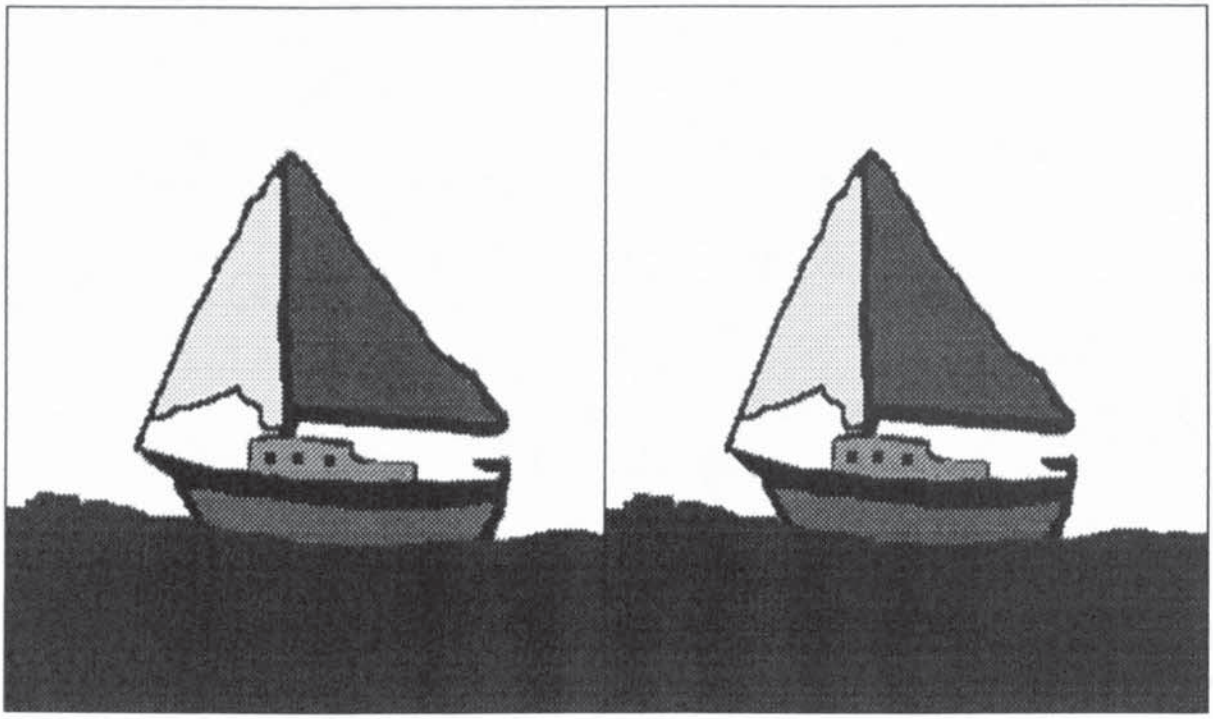
Signed .....

Part B

I would like to take part in the research into parent and child communication.

My telephone number is: .....

Appendix 2: Example of cards used in pattern-construction task



Appendix 3: Instructions for pattern construction task

A] Verbal instructions given to child dyads

"I want you to play a game for me. I want to see if you can both make the same pattern with some cards that I'm going to give to you. Here are your cards." [The experimenter uses Child A's name and spreads the cards out at the side of the child.] "And here are your cards." [The experimenter uses Child B's name and spreads the cards out at the side of Child B.] "I've spread the cards out so that you can see all the pictures. Can you tell me what this picture is?" [The experimenter points to each of the picture until Child A has named each picture type. The procedure is repeated for Child B.] "Some of your cards are the same as each others and some of your cards are different, although most of them are the same. I've put this screen on the table so that you can't see what each other are doing. So how do you think that you're going to make the same patterns?" [The experimenter pauses for the children to say that they're going to talk to each other.] "When I say start, I want you to talk to each other and see if you can both make the same pattern. That means that you've got to use the same cards with the same pictures on and put them in the same place on your table. Do you think you can do that?" [The experimenter pauses and waits for a reply.] "When you tell me that you've finished and I take these screens away, both your patterns should look the same. Okay? Do you understand what I want you to do?" [The experimenter pauses and waits for a reply]. "The rule is that you can talk to each other. I want you to talk to each other. But you mustn't look at what each other are doing. Okay?"

B] Verbal instructions given to adult dyads

"I want to see if you can both make the same pattern with some cards that I'm going to give to you." [The experimenter spreads the cards out at the side of each player.] "Some of your cards are the same as each others and some of your cards are different, although most of them are the same. I've put this screen on the table so that you can't see what each other are doing. When I say start, I want you to talk to each other and see if you can both make the same pattern. That means that you've got to use the same cards with the same pictures on and put them in the same place on your table. When you tell me that you've finished and I take these screens away, both your patterns should look the same. Okay? Are there any questions?" [The experimenter pauses and waits for a reply.] "The rule is that you can talk to each other. I want you to talk to each other. But you mustn't look at what each other are doing. Okay?"

Appendix 4: Instructions for map task (Experiments 2 & 4)

"You have both been given the same pictures with the same animals on them in the same places, but participant A's (name) picture also has a line marked on it which is a pathway that goes around some of the animals. Participant A (name), has to tell you, participant B (name), where the line goes so that you can draw it in exactly the same place as it is on participant A's (name) picture. You, participant B (name), are to ask participant A (name) questions, if you don't understand or you want any more information. When you have finished and the screen is removed I want both of your pictures to have the path marked on them in exactly the same place."

Appendix 5: Inter-rater reliability

Throughout the thesis whenever inter-rater reliability measures have been given the measure has been calculated using an index of concordance (Martin & Bateson, 1986) as described below.

For each coding category a table (example shown below) was constructed showing the number of agreements (A) and disagreements (D) between the first and second scorer. If a dyad did not use a particular category a score of zero was given for both agreement and disagreement. The number of agreements was then calculated as a percentage of the total agreements and disagreements A/(A+D). For establishing the inter-rater reliability measure for interaction styles (Experiments 1 & 3) the table was slightly amended so that a single mark was given for either agreed or disagreed. As before, the number of agreements was then calculated as a percentage of the total agreements and disagreements.

Example of a table used for calculating the inter-rater reliability measure for the use of Specific Requests for Confirmation in Experiment 2

Participant	Agreed	Disagreed
1	2	0
2	3	1
3	2	0
4	0	0
5	0	0
6	0	0
7	1	1
8	2	0
9	1	0
Total	11	2

Appendix 6: Pilot studies for pattern-construction task

Pilot 1

Introduction

The focus of the study when carrying out Pilot 1 was to identify characteristics of the mother and child's joint interaction style and to see if the child used these same characteristics in their interaction with a peer. The pilot resulted in major changes being made to the overall study (see conclusions below). However, as one of the aims was to test the design of the map task the pilot is still relevant to the present study and has therefore been included.

Method

Participants

The participants were twelve mother and child (aged between 4 and 7 years) dyads. In eight instances two of the children had the same mother, meaning that four of the mothers did the task twice, first with one child and then the other. The remaining four mothers were two pairs of close friends whose children frequently played together.

Materials

The materials were two identical sets of 28 children's picture dominoes (Safari animal dominoes as featured in the Early Learning Catalogue, Winter 1998). From each set ten dominoes were removed at random. A screen was positioned on the table in such a way that the mother and child could not see each other's cards but could make eye contact. A video camera and tripod plus a Sony tape recorder were used to record the interaction.

Procedure

The experimenter visited the family home, or in cases where the child was partnered by a peer, the home of one of the families with both families being present.

Part 1 – Mother and child interaction

The mother and one of her children sat at opposite ends of the table with the screen in front of the mother. The experimenter placed a pile of eighteen dominoes at the left-hand side of both the mother and child. The Experimenter gave the following instructions. "You have both been given some dominoes. Some of them are the same and some are different. What I would like you to do is to make a pattern on the table in front of you with the dominoes. I want both yours (to the child) and your Mummy's pattern to be the same, so you've got to talk to each other, but I don't want you to look at each others dominoes, so that's why you've got the screen between you. Don't worry if you don't make the same pattern but I'd like you to have a really good try. Please start when you're ready." The experimenter then left the room. When the

mother and child indicated that they had finished the screen was removed and the patterns were compared. The procedure was then repeated with the second child being partnered by their mother.

Part 2 – Peer interaction

The procedure was the same as part 1 apart from the fact that it was carried out with a peer dyad rather than a mother and child dyad.

Results

The following concerns were identified:

- Some of the children had difficulty naming some of the animals shown on the cards.
- It was noticeable by the conversations that took place between some of the mothers and their children that some of the children thought the task was about secrecy and seeing if the same patterns could be made without communicating.
- The use of the single screen presented a power division with some children thinking that it was the person who sat behind the screen who had to give the instructions.
- Two of the children kept all the cards in a pile in their hand and only referred to the top card. This was especially problematic if the mother asked the child if he/she had a particular card, for example, the hippo and elephant, as the child only considered the card that they had at the top of their pile.
- The video camera had to be abandoned part way through due to it being knocked over and broken. In addition, there were problems with it's use, for example, it was not possible to position the camera in such a way that both participants could be videoed together, and some children refused to carry out the task with the camera present.
- Some mothers appeared to change their behaviour depending on the age of the child, thus suggesting that the age of the child was an important variable.
- When interacting with a sibling or peer many of the children failed to provide information regarding where to locate the cards and then were amazed when the screen was removed to find that their patterns differed. From the childrens' conversations it appeared that a carry over effect was taking place, with the children assuming that there was only one pattern that could be made, and that was the pattern they had previously made with their mothers.

Changes following pilot 1

- Due to the naming difficulties experienced by some of the children the experimenter

made two new sets of cards which depicted everyday objects such as a sun, a boat, a flower, a tree, a mug, and a goldfish (see Appendix 2 for an example of a card).

- A second screen was introduced to remove any power bias created by the single screen.
- In subsequent tests the cards were spread out on the table to the left of each participant.
- The instructions were amended so that there was more emphasis on the need to talk to one another (see Appendix 3).
- The age of the child was to be treated as an independent variable (see Experiments 1-4).
- To eliminate possible carry over effects from parent and child dyads to child and peer dyads it was decided that the interaction style of the child with child should be assessed first, with the interaction style of the mother and child being assessed later (see Experiment 1-4).
- The use of the video camera was abandoned

Pilot 2

Introduction

The aim when carrying out the second pilot was to assess the youngest age for which the pattern construction task was suitable. Unlike Pilot 1, the table-top screen was not used as it was felt that this may have added unnecessary complications.

Method

Participants

The participants were twenty children aged 3 years 6 months to 4 years 7 months.

Materials

The materials were two sets of picture domino cards as described above. The dialogue was recorded on two Sony tape recorders, one positioned under each of the children's chairs. The experimenter also made notes using a notepad and pencil.

Procedure

The pilot took place in a small room attached to the nursery classroom. One child was seated at each end of the table and the experimenter sat at one side in the centre. The cards were spread in two rows at the left of each child. The children were asked to name the pictures on the cards in order to ensure that they shared the same language for each picture. The children

were told that they were both required to make a pattern with their cards, that their patterns were to be the same as each others meaning that they had to use the same cards which had the same pictures on them and put them on the same place on their table. The instructions were repeated a number of times to ensure that the children were paying attention.

Results

Only two pairs of children attempted to construct the same patterns. In both cases it was only one of the children in the dyad who appeared to realize that they were required to construct the same pattern. This child asked the observer for help and told her when their partner was not doing what they wanted them to do. In a further two dyads one of the children initially watched their partner and attempted to choose the same cards. However, these children did not ask for adult help and because their partner kept moving the cards around they ended up making their own individual patterns. With the remaining dyads the children did not look at their partners but took great pleasure in playing with the cards and making their own patterns.

Conclusion

Although there was some recognition by some of the children that they were required to work together to make the same patterns, they were unable to realize this aim without adult help. As the aim of Experiment 1 is to examine age differences in the way in which collaborators construct their collaboration the results of Pilot 2 suggest that nursery-aged children should not be included in this study. However, due to Pilot 1 showing that children as young as 4-years are able to carryout the pattern-construction task (although this was after they had carried it out with a parent), the decision was taken to use four/five-year-olds as the youngest children in Experiments 1-4.

Appendix 7: Pilot studies for map task

A variety of maps were constructed and piloted with mother and child dyads. The main findings are discussed below.

Pilot 1 – Farm model

Introduction

The first task was based on Lloyd (1991, 1992, 1993) and used two identical three-dimensional models. The models were constructed by using two flat pieces of plywood with plastic models of hedgerows and walls being used to mark the roadways and plastic models of animals and people to provide the landmarks. One of the models was marked with a route whilst the other model was left unmarked. The idea was that the IG would explain the route to the IF who would mark it on their unmarked model. This design was abandoned due to the children not been interested in carrying out the task as they wanted to play with the model.

Pilot 2 - Pirate treasure map

The maps were based on a pirate treasure map scenario used by Anderson et al. (1991, 1994) and Anderson & Boyle (1994). The main aim when designing the treasure map was to design a task which had, from the viewpoint of the participants, a very explicit goal. The mother was given typed instructions explaining that a pirate had drawn a route on a map showing where he had buried some treasure. The instructions explained to the mother that her child had been given a copy of the marked map and was required to tell her where to draw the route on her unmarked map so that she could find the treasure. It was left to the mother to tell the child about the task.

Problems identified by pilot 2

- There was a great deal of variability in the amount of information which the mothers gave to their children. For example, some mother provided very detailed instructions in that they either read the typed instructions to the child and/or explained to the child the purpose of the task and how they were to go about it. Other mothers gave the child no explanation or instructions but simply questioned the child about the map in order that they could obtain the information needed to achieve the task goal.
- Some dyads were so busy focusing on finding out where the treasure was buried that they ignored the need to provide information regarding the route. With these dyads once the child knew where the treasure was buried interest was lost in the task.

- Some children communicated with their mothers non-verbally, for example, by using hand signals. As it had been decided that the mother was the only person who could give information/instructions to the child the experimenter could not intervene and instruct the child herself or ask the mother to tell the child not to use hand signals.
- Having a finishing point in the form of a treasure chest marked on the map encouraged some dyads to construct, what they thought, were more "interesting" routes. For example, one mother thought that the route should go by "the lion's den" as this was more "exciting" than the route shown on the marked map.
- Some of the children had difficulty identify some of the landmarks, for example, the big river and the waterfall. This problem was to some degree related to the storyline, in that the storyline dictated the type of location markers that were used.

Conclusions from Pilot 2

- A strong storyline such as the pirate treasure map scenario is not needed as it only causes confusion.
- Standardised instructions need to be given verbally by the experimenter to both the mother and child, thus removing any variability between dyads due to differences in the instructions given to the child by the mother.
- It needs to be made clear in the instructions that the partners are not to rely on, or use, non-verbal means of communication.

Pilot 3 – Farm animal map

Introduction

The maps used in pilot 3 displayed a variety of farm animals. The experimenter told the dyad that the line marked on the IG's map was the route taken by the farmer when feeding the animals.

Problems with Pilot 3 and their solutions

- The children found the naming of farm animals easier than they had found the naming of landmarks. However, the first maps to be designed had to be changed, as they required very precise instructions to be given as to where on the animal's body the line had to be drawn. The problem was that the mothers did not realize that this amount of precision was required. With later versions the line went around and between animals rather than touching them.

- The storyline still presented a problem (see point 1 in conclusion to pilot 1) in that the children got very excited about feeding the animals and instead of following the route made up their own routes. With later versions the use of a story line was omitted altogether (see Appendix 4 for instructions given to dyads).

Pilot 4 – Animal maps

A variety of maps were constructed which used pictures of animals as location markers. The maps were piloted with six mother and child dyads with the order for which partner took the role of IG and IF on the first trial being counterbalanced. The only change to be made following this final pilot was that it was decided that in all instances the children should act as IG on the first trial to prevent them from mimicking their mother's style.

Appendix 8: Rationale for coding scheme and method of analysis used in Experiment 1

The classification system for the interaction styles was arrived at by examining the transcripts to see if there were particular styles that the dyads used. In the majority of cases the same style was used throughout the interaction making the style easy to categorise. However, in a few cases, the style changed over the interaction. For example, the partners started by using one of the role-based styles which changed to the negotiating style as they became more involved in task. The decision was taken to code the interaction as the most advanced style that the dyad used as this reflected the dyad's ability to use a particular style. In addition, inter-rater reliability was calculated to establish the reliability of the classification scheme (Breakwell, Hammond & Fife-Schaw, 1995).

It was not possible to use the classification system for strategy use (components, numbering, directional, minimal) used by Lloyd (1991, 1993) as this was specific to the particular task that was used. The first analysis to be carried out included details of the number of agreements that were reached for each strategy. However, as the adults tended to make their patterns using all of the identical cards whilst the children often said that they had finished before they had identified all of the identical cards (usually because they made a particular shape that only needed a certain number of cards), the results were not representative of the observed behaviour. It was also not possible to record the number of times agreement was reached as a percentage of the number of cards that were placed, as this information had not been collected. Therefore, use of a particular strategy was recorded if one of the partners provided the information and the other partner acknowledged that they had received it as this showed that the partners were aware that because they could not see what each other were doing they needed to verbally provide the information and acknowledge that it had been received. The experimenter, however, is aware that this does not necessarily mean that the partner who received the information carried out the required action (also see comments in section 9.8).

The use of checking was another strategy investigated for age differences. This was due to when carrying out Pilot Study 1(see Appendix 5) the experimenter had noticed that adults differed from children in that the adults tended to check on information for which intersubjectivity had already been established whilst the children did not. No previous research was found on this topic.

The final classification system to be used in Experiment 1 tested Renshaw & Garton's (1986) model of pre-task collaboration. The utterances for the first twelve turns were checked for evidence of the partners constructing an intersubjective understanding of the experimenter's instructions due to Renshaw & Garton's proposing that collaborators did this **before** carrying out the task. The first twelve turns were arrived at by examining all of the transcripts to find the latest point (turn) at which a dyad started to carry out the task rather than discuss issues relating to how the task was to be carried out. The classification system for the issues for which an intersubjective understanding was reached was arrived at by examining the identified utterances for common themes.

Appendix 9: Rationale for coding scheme and method of analysis used in Experiment 2

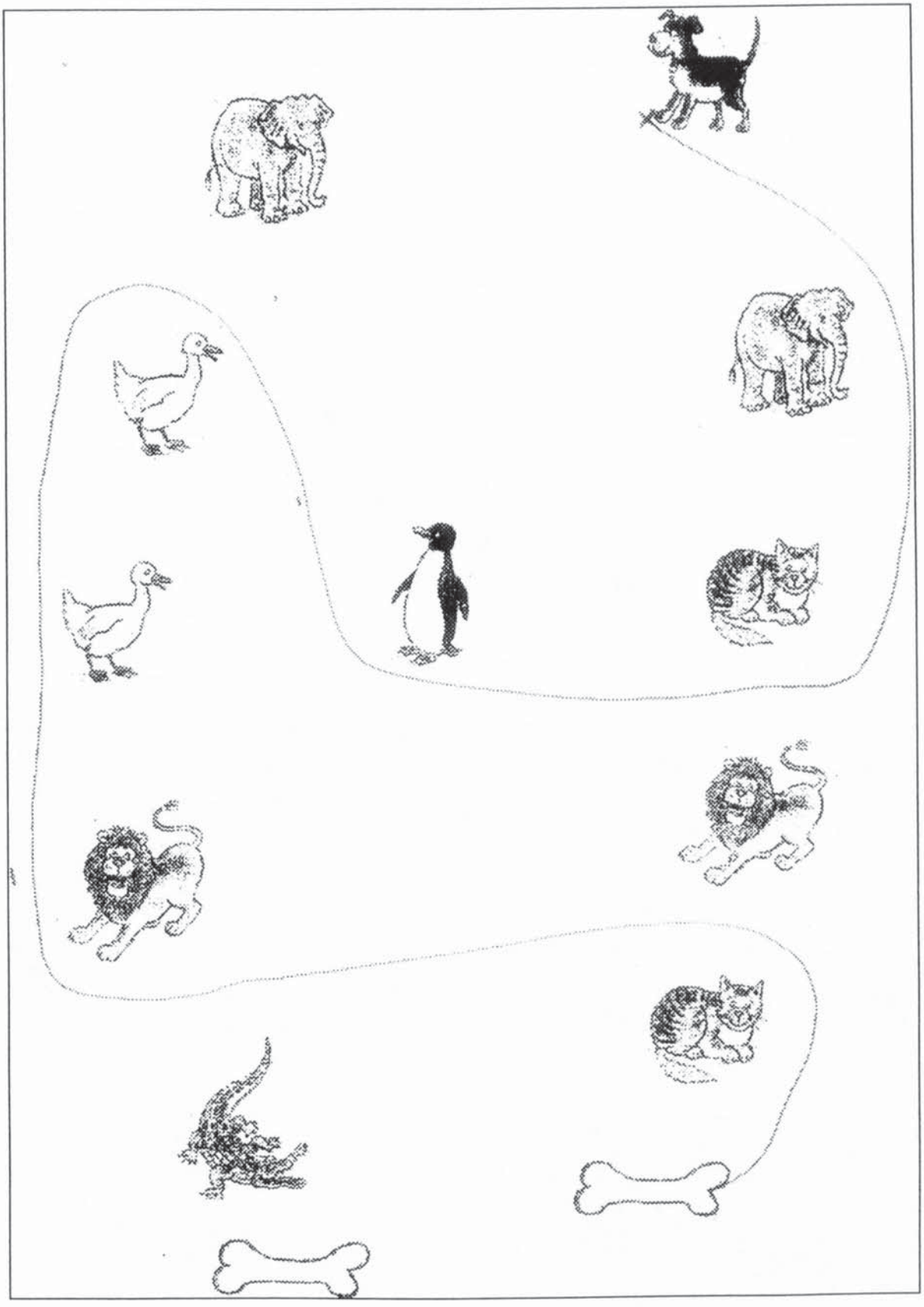
The majority of the codes forming the classification system for the map task had already been used by other researchers who had used map tasks to examine interactional communicative behaviour (e.g., Anderson et al., 1991, 1994; Anderson & Boyle, 1994; Lloyd 1991, 1992, 1993). The codes were, therefore, considered to have both reliability and validity. In addition, by using a similar task as well as the same coding categories it was possible to compare the results from the present study with those of the previous studies, therefore, helping to further establish the reliability of the findings. Also, by measuring:

- The number of contributions made per dyad – An overall measure could be obtained of the amount of collaboration that took place making it possible to examine whether and how this changed with age.
- The number of clarification requests made by the IFs – First, in terms of the different request types identified by Garvey (1977), it would be possible to extend knowledge regarding the age effects reported by Lloyd (1991, 1992), and then, in terms of overall clarification request use, to examine if age had an effect on overall use.
- The number of checking requests made by the IF - It would be possible to provide new knowledge regarding age related changes in the use of checking.
- The number of acknowledgements made by the IF - It would be possible to extend knowledge regarding the age effects reported by Lloyd (1992) and to provide new knowledge regarding the relationship between the use of questions by IGs and the use of acknowledgements by IFs.
- The number of questions asked by the IG – It would be possible to extend knowledge regarding the age effects reported by Anderson et al. (1991, 1994) and Anderson & Boyle (1994).

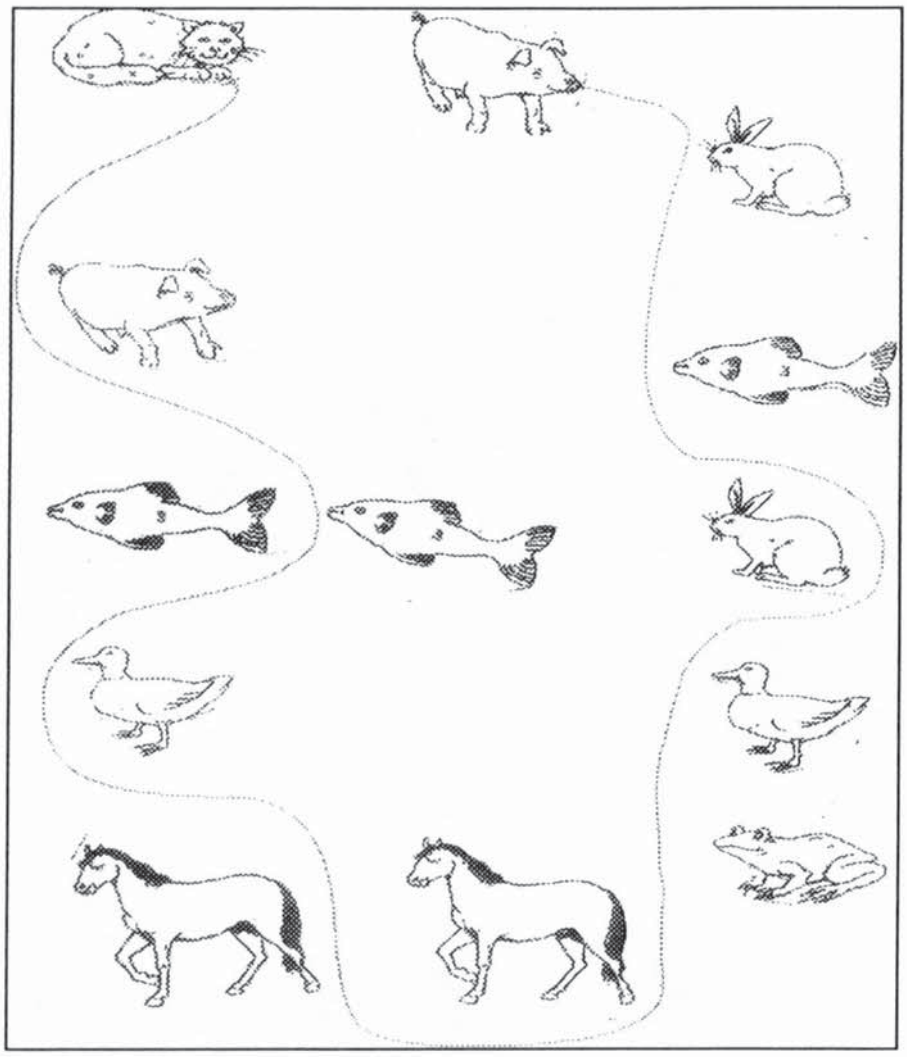
Due to the scores for the youngest dyads containing a high number of zeros it was suggested that that the scores from trials 1 and 2 should be combined. However, as it was the older age groups who benefited the most from repeated trials, with younger dyads who performed the poorest on the first trial continuing to do so on the second trial, adopting this method would not have resulted in decreasing the number of zero scores but would have introduced age-differences due to learning effects as a compounding variable. The issue of learning effects is explored in Experiment 5.

In terms of carrying out the analysis three possible methods were considered. The first, to identify if one measure, for example, acknowledgements, was used more by one age group than another each measure could be examined separately with the frequencies for the number of times the measure was used being compared. Second, to examine if differences existed between the individuals/dyads who took part in the study, the proportion of scores for each individual/dyad for each measure could be examined. Third, the number of clarification requests, checking requests and acknowledgements made by the IF, and the number of questions asked by the IG could be expressed as a percentage of the number of contributions made per dyad. As the second two methods obscure age differences in the use of the separate measures, which was one of the purposes for carrying out the experiment, the decision was taken to use the first method.

Appendix 10: An example of a map used by the information givers in Experiments 2 and 4



Appendix 11: An example of a map used by the information givers in Experiment 5 and a copy of the related scoring sheet



Location markers	Differentiators	Spatial locations
1] X/ cat		
2] Pig	2a] Underneath cat	2b] Behind/round pig's bottom
3] Fish/es	3a] Two fish together	3b] In between fishes/back of tail/front of face
4] Duck	4a] Left-hand side/below fishes	4b] In front of duck's face
5] 2 horses/horse	5a] left-hand/below duck	5b] In between horses/back of tail/in front of face
6] Horse	6a] 2nd horse	6b] Underneath feet/back of tail
7] Frog		7b] Past frog's face
8] Duck	8a] Other/2nd/right-hand side	8b] Past duck's face
9] Rabbit	9a] 1st/above duck/below fish	9b] Round back of rabbit
10] Fish	10a] Other/single fish	10b] In front fish's face
11] Rabbit	11a] Other rabbit/near top of page	11b] In front rabbit's face
12] Pig	12a] Other/2nd pig	12b] Finish at nose/mouth
12	10	11

Appendix 12: Comparison of results from Experiments 2 and 4

One of the original aims when starting the thesis had been to compare the performance of children and adults when collaborating with a peer of a similar status (Experiment 2) and a partner of a more/or less advanced status (Experiment 4). However, for the following two reasons this was not considered advisable. First, the children who participated in Experiment 4 had already participated in Experiment 2 and were therefore doing the task for the third and fourth time, whilst the adults had not previously participated and were therefore doing the task for the first and second time. Second, the two groups of adults who participated in Experiments 2 and 4 were not comparable, in that in Experiment 4, the adults were parents of young children, who had not received a university education, whilst in Experiment 2, they were young university students and graduates, who, on the whole, were not parents. This meant that any differences in interaction skills found between Experiments 2 and 4, could be due to factors other than the partner's status.

Keeping the above shortcomings in mind, when the results of Experiments 2 and 4 are compared a number of differences are revealed.

When an adult took the role of IG and a child the role of IF, far more contributions were made per dyad (six times as many for the younger and two and a half times as many for the older) compared to when two child peers collaborated. However, when an adult IG was partnered by an adult IF, 50% more contributions were made compared to when an adult IG was partnered by a child IF.

The main communication strategy to differ when the child was the IF was the number of acknowledgements that were made, with four/five-year-olds making three and a half times as many when partnered by an adult compared to a child IG, whilst six/seven-year-olds made twice as many*.

With the adult IFs there were a number of differences. When partnered by a child compared to an adult, adult IFs made 50% more clarification requests, with increases in the use of specific requests for specification and potential requests for specification and elaboration. However, they also made fewer checking requests and acknowledgements. These findings suggest that child IGs compared to adult IGs omit important information. Adults as IFs, scaffold the child,

by using clarification requests to draw the child's attention to the information which is missing. The child is then required to provide the missing detail.

The above findings support a model of interactive communication in which the behaviour of one partner is to some degree dependant on the behaviour of the other partner. The fact that children are more interactive with adults compared to child peers fits in with a model of the development of collaborative ability in which the adult's role, when interacting with a child who skills are still developing, is to provide scaffolding or guided participation which enables the child to further develop their interactive skills.

As has been already stated, these findings are only tentative, with more rigorous research being required.

*The much higher use of acknowledgements by the children in Experiment 4 compared to Experiment 2 suggests a] that adult IGs, compared to child IGs, provide a much greater amount of information for which acknowledgements can be given, b] that adult IGs compared to child IGs request or expect a greater amount of feedback, c] that child IFs are more willing to provide feedback in the form of acknowledgements to adult IGs compared to child IGs. .

Appendix 13: SPSS results for Experiment 2

Number of contributions made per dyad

Descriptive stats

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
Age in years					Lower Bound	Upper Bound		
4/5	30	9.57	8.87	1.62	6.25	12.88	1.00	24.00
6/7	29	26.00	19.66	3.65	18.52	33.48	1.00	84.00
9/10	16	55.38	32.59	8.15	38.01	72.74	10.00	116.00
Adult	24	63.67	26.42	5.39	52.51	74.82	22.00	112.00
Total	99	34.90	30.84	3.10	28.75	41.05	1.00	116.00

Test of Homogeneity of Variances

Levene's statistic	df1	df2	Sig.
11.362	3	95	.000

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	48118.54	3	16039.51	33.792	.000
Within Groups	45092.45	95	474.67		
Total	93210.99	98			

Descriptive stats (following square root transformation)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
Age					Lower Bound	Upper Bound		
4/5	30	2.68	1.57	.29	2.09	3.27	1.00	4.90
6/7	29	4.71	1.98	.37	3.96	5.47	1.00	9.17
9/10	16	7.13	2.21	.55	5.95	8.31	3.16	10.77
Adult	24	7.80	1.70	.35	7.08	8.52	4.69	10.58
Total	99	5.24	2.75	.28	4.69	5.78	1.00	10.77

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
.626	3	95	.60

ANOVA (following square root transformation)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	419.507	3	139.836	41.288	.000
Within Groups	321.750	95	3.387		
Total	741.256	98			

Post hoc tests for number of contributions (following square root transformation)
Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-2.0342	.47925	.000	-3.2875	-.7810
	9/10	-4.4477	.56971	.000	-5.9375	-2.9578
	Adult	-5.1247	.50400	.000	-6.4427	-3.8067
6/7	4/5	2.0342	.47925	.000	.7810	3.2875
	9/10	-2.4134	.57312	.000	-3.9122	-.9147
	Adult	-3.0905	.50784	.000	-4.4186	-1.7624
9/10	4/5	4.4477	.56971	.000	2.9578	5.9375
	6/7	2.4134	.57312	.000	.9147	3.9122
	Adult	-.6771	.59397	.666	-2.2303	.8762
Adult	4/5	5.1247	.50400	.000	3.8067	6.4427
	6/7	3.0905	.50784	.000	1.7624	4.4186
	9/10	.6771	.59397	.666	-.8762	2.2303

* The mean difference is significant at the .05 level.

Tukey HSD

	N	Subset for alpha = .05		
GROUP		1	2	3
4/5	30	2.6785		
6/7	29		4.7128	
9/10	16			7.1262
Adult	24			7.8033
Sig.		1.000	1.000	0.594

Means for groups in homogeneous subsets are displayed.

Nonspecific request for repetition

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.23	.82	.14920	-.0718	.5385	.00	4.00
6/7	29	.28	.70	.13033	.0089	.5428	.00	3.00
9/10	16	.25	.68	.17078	-.1140	.6140	.00	2.00
Adult	24	.04	.20	.04167	-.0445	.1279	.00	1.00
Total	99	.20	.65	.06576	.0715	.3325	.00	4.00

Test of Homogeneity of Variances

Levene's statistic	df1	df2	Sig.
2.802	3	95	.044

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.841	3	.280	.648	.586
Within Groups	41.118	95	.433		
Total	41.960	98			

Specific request for repetition

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.00	.00	.00000	.0000	.0000	.00	.00
6/7	29	.00	.00	.00000	.0000	.0000	.00	.00
9/10	16	.00	.00	.00000	.0000	.0000	.00	.00
Adult	24	.00	.00	.00000	.0000	.0000	.00	.00
Total	99	.00	.00	.00000	.0000	.0000	.00	.00

Specific request for confirmation

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.40	.86	.15610	.0807	.7193	.00	3.00
6/7	29	.93	1.79	.33267	.2496	1.6125	.00	9.00
9/10	16	.56	1.03	.25769	.0132	1.1118	.00	4.00
Adult	24	2.38	1.97	.40294	1.5414	3.2086	.00	7.00
Total	99	1.06	1.68	.16855	.7261	1.3951	.00	9.00

Test of Homogeneity of Variances

Levene's statistic	df1	df2	Sig.
4.664	3	95	.004

ANOVA (before square root transformation)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	59.012	3	19.671	8.626	.000
Within Groups	216.625	95	2.280		
Total	275.636	98			

Descriptive stats (after square root transformation)

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.30	.57	.10379	.0837	.5082	.00	1.73
5/6	29	.58	.79	.14581	.2807	.8781	.00	3.00
9/10	16	.44	.63	.15729	.1022	.7728	.00	2.00
Adult	24	1.32	.82	.16701	.9711	1.6621	.00	2.65

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
2.163	3	95	.098

Specific request for confirmation continued

ANOVA (following square root transformation)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	15.292	3	5.097	10.095	.000
Within Groups	47.971	95	.505		
Total	63.263	98			

Post hoc test Tukey's HSD (following square root transformation)

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-.2835	.18505	.423	-.7674	.2005
	9/10	-.1416	.21998	.918	-.7168	.4337
	Adult	-1.0207	.19461	.000	-1.5296	-.5117
6/7	4/5	.2835	.18505	.423	-.2005	.7674
	6/7	.1419	.22130	.918	-.4368	.7206
	Adult	-.7372	.19609	.002	-1.2500	-.2244
9/10	4/5	.1416	.21998	.918	-.4337	.7168
	6/7	-.1419	.22130	.918	-.7206	.4368
	Adult	-.8791	.22935	.001	-1.4789	-.2793
adult	4/5	1.0207	.19461	.000	.5117	1.5296
	6/7	.7372	.19609	.002	.2244	1.2500
	9/10	.8791	.22935	.001	.2793	1.4789

* The mean difference is significant at the .05 level.

		N	Subset for alpha = .05	
	GROUP		1	2
Tukey HSD	4/5	30	.2959	
	9/10	16	.4375	
	6/7	29	.5794	
	Adult	24		1.3166
	Sig.		.527	1.000

Means for groups in homogeneous subsets are displayed.

Specific request for specification

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.07	.25	.04632	-.0281	.1614	.00	1.00
6/7	29	.86	1.51	.27953	.2895	1.4347	.00	5.00
9/10	16	1.50	1.21	.30277	.8547	2.1453	.00	4.00
Adult	24	.29	.46	.09478	.0956	.4877	.00	1.00
Total	99	.59	1.10	.11029	.3670	.8047	.00	5.00

Test of Homogeneity of Variances (before square root transformation)

Levene's Statistic	df1	df2	Sig.
13.634	3	95	.000

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	25.747	3	8.582	8.836	.000
Within Groups	92.273	95	.971		
Total	118.020	98			

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
17.736	3	95	.000

Specific request for specification continued

Multiple Comparisons
Post hoc test (Games-Howell)

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-.4719	.15025	.017	-.8778	-.0660
	9/10	-.9668	.17591	.000	-1.4660	-.4675
	adult	-.2250	.10549	.163	-.5100	.0600
6/7	4/5	.4719	.15025	.017	.0660	.8778
	9/10	-.4949	.22187	.135	-1.0937	.1039
	Adult	.2469	.17150	.482	-.2099	.7037
9/10	4/5	.9668	.17591	.000	.4675	1.4660
	6/7	.4949	.22187	.135	-.1039	1.0937
	Adult	.7418	.19437	.004	.2060	1.2775
Adult	4/5	.2250	.10549	.163	-.0600	.5100
	6/7	-.2469	.17150	.482	-.7037	.2099
	9/10	-.7418	.19437	.004	-1.2775	-.2060

* The mean difference is significant at the .05 level.

Potential request for confirmation
Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.53	1.31	.23845	.0456	1.0210	.00	6.00
6/7	29	2.34	2.06	.38210	1.5621	3.1275	.00	6.00
9/10	16	5.94	4.49	1.12349	3.5428	8.3322	.00	16.00
Adult	24	6.58	3.71	.75880	5.0136	8.1530	1.00	16.00
Total	99	3.40	3.80	.38174	2.6465	4.1616	.00	16.00

Test of Homogeneity of Variances (before square root transformation)

Levene's statistic	df1	df2	Sig.
13.714	3	95	.000

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	625.049	3	208.350	25.093	.000
Within Groups	788.789	95	8.303		
Total	1413.838	98			

Potential request for confirmation continued

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
3.227	3	95	.026

Multiple Comparisons
Post hoc test (Games-Howell)

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-1.8115	.45040	.001	-3.0109	-.6120
	9/10	-5.4042	1.14852	.001	-8.6821	-2.1263
	adult	-6.0500	.79539	.000	-8.2238	-3.8762
6/7	4/5	1.8115	.45040	.001	.6120	3.0109
	9/10	-3.5927	1.18669	.033	-6.9371	-.2482
	adult	-4.2385	.84958	.000	-6.5319	-1.9451
9/10	4/5	5.4042	1.14852	.001	2.1263	8.6821
	6/7	3.5927	1.18669	.033	.2482	6.9371
	adult	-.6458	1.35574	.964	-4.3474	3.0557
adult	4/5	6.0500	.79539	.000	3.8762	8.2238
	6/7	4.2385	.84958	.000	1.9451	6.5319
	9/10	.6458	1.35574	.964	-3.0557	4.3474

* The mean difference is significant at the .05 level.

Potential request for specification

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.17	.46	.08419	-.0055	.3389	.00	2.00
6/7	29	.52	.78	.14572	.2188	.8157	.00	3.00
9/10	16	1.69	1.85	.46295	.7007	2.6743	.00	5.00
Adult	24	.46	.66	.13431	.1805	.7362	.00	2.00
Total	99	.59	1.06	.10649	.3745	.7972	.00	5.00

Test of Homogeneity of Variances (before square root transformation)

Levene's statistic	df1	df2	Sig.
23.476	3	95	.000

Potential request for specification continued

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	25.216	3	8.405	9.416	.000
Within Groups	84.804	95	.893		
Total	110.020	98			

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
19.441	3	95	.000

Multiple Comparisons

Post hoc test (Games-Howell)

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-.2860	.12951	.135	-.6306	.0586
	9/10	-.8015	.23979	.017	-1.4796	-.1235
	adult	-.2624	.13280	.214	-.6184	.0936
6/7	4/5	.2860	.12951	.135	-.0586	.6306
	9/10	-.5156	.25352	.207	-1.2198	.1887
	adult	.0236	.15623	.999	-.3916	.4388
9/10	4/5	.8015	.23979	.017	.1235	1.4796
	6/7	.5156	.25352	.207	-.1887	1.2198
	adult	.5392	.25522	.180	-.1689	1.2472
adult	4/5	.2624	.13280	.214	-.0936	.6184
	6/7	-.0236	.15623	.999	-.4388	.3916
	9/10	-.5392	.25522	.180	-1.2472	.1689

* The mean difference is significant at the .05 level.

Potential request for elaboration

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.00	.00	.00000	.0000	.0000	.00	.00
6/7	29	.69	1.14	.21116	.2571	1.1222	.00	5.00
9/10	16	.88	1.26	.31458	.2045	1.5455	.00	4.00
Adult	24	.79	1.10	.22505	.3261	1.2572	.00	3.00
Total	99	.54	1.01	.10184	.3333	.7375	.00	5.00

Potential request for elaboration continued

Test of Homogeneity of Variances (before square root transformation)

Levene's statistic	df1	df2	Sig.
18.027	3	95	.000

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.711	3	4.237	4.578	.005
Within Groups	87.915	95	.925		
Total	100.626	98			

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
62.696	3	95	.000

Multiple Comparisons

Post hoc test (Games-Howell)

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-.6897	.21116	.014	-1.2662	-.1131
	9/10	-.8750	.31458	.060	-1.7817	.0317
	adult	-.7917	.22505	.009	-1.4145	-.1689
6/7	4/5	.6897	.21116	.014	.1131	1.2662
	9/10	-.1853	.37888	.961	-1.2188	.8481
	adult	-.1020	.30861	.987	-.9223	.7183
9/10	4/5	.8750	.31458	.060	-.0317	1.7817
	6/7	.1853	.37888	.961	-.8481	1.2188
	adult	.0833	.38679	.996	-.9699	1.1365
Adult	4/5	.7917	.22505	.009	.1689	1.4145
	6/7	.1020	.30861	.987	-.7183	.9223
	9/10	-.0833	.38679	.996	-1.1365	.9699

* The mean difference is significant at the .05 level.

Total number of clarification requests
Within group differences

4/5 year-olds

Mauchly's Test of Sphericity

	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon
Within Subjects Effect					Greenhouse-Geisser
TYPE	.023	102.180	14	.000	.499

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TYPE	Sphericity Assumed	6.133	5	1.227	2.408	.039
	Greenhouse-Geisser	6.133	2.493	2.460	2.408	.085
Error (TYPE)	Sphericity Assumed	73.867	145	.509		
	Greenhouse-Geisser	73.867	72.291	1.022		

6/7 year-olds

Mauchly's Test of Sphericity

	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon
Within Subjects Effect					Greenhouse-Geisser
TYPE	.262	34.943	14	.002	.702

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TYPE	Sphericity Assumed	77.201	5	15.440	10.546	.000
	Greenhouse-Geisser	77.201	3.508	22.008	10.546	.000
Error (TYPE)	Sphericity Assumed	204.966	140	1.464		
	Greenhouse-Geisser	204.966	98.219	2.087		

Total number of clarification requests continued
9/10 year-olds
Mauchly's Test of Sphericity

	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon
Within Subjects Effect					Greenhouse-Geisser
TYPE	.008	62.542	14	.000	.325

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TYPE	Sphericity Assumed	352.177	5	70.435	20.529	.000
	Greenhouse-Geisser	352.177	1.627	216.441	20.529	.000
Error (TYPE)	Sphericity Assumed	257.323	75	3.431		
	Greenhouse-Geisser	257.323	24.407	10.543		

Adult
Mauchly's Test of Sphericity

	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon
Within Subjects Effect					Greenhouse-Geisser
TYPE	.002	129.356	14	.000	.341

Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TYPE	Sphericity Assumed	753.201	5	150.640	52.768	.000
	Greenhouse-Geisser	753.201	1.705	441.660	52.768	.000
Error (TYPE)	Sphericity Assumed	328.299	115	2.855		
	Greenhouse-Geisser	328.299	39.224	8.370		

Total number of clarification requests continued

Between groups

Descriptive stats

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	1.40	2.25	.41	.56	2.24	.00	8.00
6/7	29	5.55	5.00	.93	3.65	7.46	.00	22.00
9/10	16	11.06	8.19	2.05	6.70	15.43	1.00	24.00
Adult	24	10.58	5.73	1.17	8.16	13.00	2.00	25.00
Total	99	6.40	6.51	.65	5.11	7.70	.00	25.00

Test of Homogeneity of Variances (before square root transformation)

Levene's statistic	df1	df2	Sig.
12.321	3	95	.000

Descriptive stats (following square root transformation)

Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.73	.95	.17	.37	1.08	.00	2.83
6/7	29	2.07	1.15	.21	1.63	2.50	.00	4.69
9/10	16	3.07	1.32	.33	2.37	3.77	1.00	4.90
Adult	24	3.14	.88	.18	2.77	3.51	1.41	5.00
Total	99	2.08	1.44	.15	1.80	2.37	.00	5.00

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
1.971	3	95	0.124

ANOVA (after square root transformation)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.425	3	32.475	28.835	.000
Within Groups	106.993	95	1.126		
Total	204.419	98			

Total number of clarification requests continued

Post hoc test (following square root transformation)
Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-1.3385	.2764	.000	-2.0612	-.6158
	9/10	-2.3429	.3285	.000	-3.2020	-1.4837
	adult	-2.4102	.2906	.000	-3.1702	-1.6502
6/7	4/5	1.3385	.2764	.000	.6158	2.0612
	9/10	-1.0044	.3305	.016	-1.8687	-.1401
	adult	-1.0717	.2929	.002	-1.8376	-.3059
9/10	4/5	2.3429	.3285	.000	1.4837	3.2020
	6/7	1.0044	.3305	.016	.1401	1.8687
	adult	-6.7322E-02	.3425	.997	-.9630	.8284
Adult	4/5	2.4102	.2906	.000	1.6502	3.1702
	6/7	1.0717	.2929	.002	.3059	1.8376
	9/10	6.732E-02	.3425	.997	-.8284	.9630

* The mean difference is significant at the .05 level.

Homogeneous subsets
Tukey HSD

	N	Subset for alpha = .05		
GROUP		1	2	3
4/5	30	.7281		
6/7	29		2.0665	
9/10	16			3.0709
Adult	24			3.1383
Sig.		1.000	1.000	.996

Means for groups in homogeneous subsets are displayed.

Checking requests

Descriptive stats

Age in years	N	Mean	Standard deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
4/5	30	.00	.00	.00000	.0000	.0000	.00	.00
6/7	29	.03	.19	.03448	-.0362	.1051	.00	1.00
9/10	16	.13	.50	.12500	-.1414	.3914	.00	2.00
Adult	24	4.08	5.44	1.10977	1.7876	6.3791	.00	17.00
Total	99	1.02	3.17	.31814	.3889	1.6515	.00	17.00

Questions asked by the IG

Descriptive stat

	Age in years	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min - Max
						Lower Bound	Upper Bound	
Knowledge	6/7	29	.83	1.89	.35117	.1082	1.5469	0 –9.
	9/10	16	3.69	4.38	1.09437	1.3549	6.0201	0-13
	adult	24	1.96	2.03	.41476	1.1003	2.8163	0-7
	Total	69	1.89	2.89	.34765	1.1903	2.5778	0-13
Actions	6/7	29	1.07	2.39	.44371	.1601	1.9779	0-12
	9/10	16	1.81	2.56	.64043	.4474	3.1776	0-10
	adult	24	2.38	2.90	.59226	1.1498	3.6002	0-9
	Total	69	1.70	2.64	.31805	1.0610	2.3303	0-12
Both	6/7	29	.10	.41	.07600	-.0522	.2591	0-2
	9/10	16	.13	.34	.08539	-.0570	.3070	0-1
	adult	24	.88	1.15	.23554	.3877	1.3623	0-5
	Total	69	.38	.82	.09923	.1788	.5748	0-5

Test of Homogeneity of Variances

	Levene's statistic	df1	df2	Sig.
Knowledge	8.984	2	66	.000
Actions	3.016	2	66	.056
Both	9.416	2	66	.000

Questions asked by the IG continued

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Knowledge	Between Groups	84.539	2	42.269	5.782	.005
	Within Groups	482.534	66	7.311		
	Total	567.072	68			
Actions	Between Groups	22.684	2	11.342	1.656	.199
	Within Groups	451.925	66	6.847		
	Total	474.609	68			
Both	Between Groups	9.138	2	4.569	8.136	.001
	Within Groups	37.065	66	.562		
	Total	46.203	68			

Descriptives following square root conversions

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min – Max
						Lower Bound	Upper Bound	
Knowledge	6/7	29	0.45	.81	.14969	.1408	.7540	0-3
	9/10	16	1.60	1.10	.27556	1.0091	2.1837	0-3.61
	adult	24	1.12	.86	.17621	.7509	1.4799	0-2.65
	Total	69	0.95	1.00	.12059	.7056	1.1868	0-3.61
Both	6/7	29	0.08	.32	.05871	-.0370	.2035	0-1.41
	9/10	16	0.13	.34	.08539	-.0570	.3070	0-1
	adult	24	0.66	.67	.13776	.3772	.9472	0-2.24
	Total	69	0.29	.54	.06533	.1639	.4247	0-2.24

Test of Homogeneity of Variances for the number of "knowledge" and "both" questions (following square root transformation)

	Levene Statistic	df1	df2	Sig.
Knowledge	.698	2	66	.501
Both	20.471	2	66	.000

Questions asked by the IG continued

ANOVA for "knowledge" question (following square root conversion)

		Sum of Squares	Df	Mean Square	F	Sig.
Knowledge	Between Groups	14.667	2	7.333	9.037	.000
	Within Groups	53.559	66	.811		
	Total	68.226	68			

Multiple Comparisons for "knowledge" questions - Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
6/7	9/10	-1.1490	.28054	.000	-1.8216	-.4764
	Adult	-.6680	.24859	.024	-1.2641	-.0720
9/10	6/7	1.1490	.28054	.000	.4764	1.8216
	Adult	.4810	.29074	.231	-.2161	1.1781
adult	6/7	.6680	.24859	.024	.0720	1.2641
	9/10	-.4810	.29074	.231	-1.1781	.2161

* The mean difference is significant at the .05 level.

Tukey HSD

	N	Subset for alpha = .05	
GROUP		1	2
6/7	29	.4474	
Adult	24		1.1154
9/10	16		1.5964
Sig.		1.000	.192

Means for groups in homogeneous subsets are displayed.

Multiple Comparisons for "both" questions

Games-Howell

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
6/7	9/10	-.0216	.11431	.981	-.3009	.2578
	Adult	-.7716	.24750	.011	-1.3842	-.1589
9/10	6/7	.0216	.11431	.981	-.2578	.3009
	Adult	-.7500	.25054	.015	-1.3691	-.1309
adult	6/7	.7716	.24750	.011	.1589	1.3842
	9/10	.7500	.25054	.015	.1309	1.3691

* The mean difference is significant at the .05 level.

Number of acknowledgements

Descriptive stats

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min-Max
Age in years					Lower Bound	Upper Bound	
4/5	30	2.60	2.85	.52	1.54	3.66	0-9
6/7	29	5.38	4.02	.75	3.85	6.91	0-19
9/10	16	12.75	6.03	1.51	9.54	15.96	3-23
Adults	24	14.08	7.48	1.53	10.92	17.24	3-31
Total	99	7.84	7.03	.71	6.44	9.24	0-31

Test of Homogeneity of Variances

Levene's statistic	df1	df2	Sig.
6.268	3	95	.001

Descriptive stats following square root transformation

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
4/5	30	1.23	1.06	.1934	.8354	1.6265	.00	3.00
6/7	29	2.13	0.94	.1753	1.7668	2.4849	.00	4.36
9/10	16	3.47	0.86	.2144	3.0158	3.9298	1.73	4.80
Adult	24	3.62	1.00	.2037	3.2021	4.0447	1.73	5.57
Total	99	2.44	1.39	.1395	2.1586	2.7122	.00	5.57

Test of Homogeneity of Variances (after square root transformation)

Levene's statistic	df1	df2	Sig.
1.011	3	95	.391

ANOVA (following square root transformation)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.396	3	32.465	33.738	.000
Within Groups	91.416	95	.962		
Total	188.813	98			

Number of acknowledgements continued

Multiple Comparisons (following square root transformation)- Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GROUP	(J) GROUP				Lower Bound	Upper Bound
4/5	6/7	-.8949	.25546	.004	-1.5629	-.2269
	9/10	-2.2419	.30367	.000	-3.0360	-1.4478
	Adult	-2.3925	.26865	.000	-3.0951	-1.6900
6/7	4/5	.8949	.25546	.004	.2269	1.5629
	9/10	-1.3470	.30549	.000	-2.1459	-.5481
	Adult	-1.4976	.27070	.000	-2.2055	-.7897
9/10	4/5	2.2419	.30367	.000	1.4478	3.0360
	6/7	1.3470	.30549	.000	.5481	2.1459
	Adult	-.1506	.31660	.964	-.9786	.6773
Adult	4/5	2.3925	.26865	.000	1.6900	3.0951
	6/7	1.4976	.27070	.000	.7897	2.2055
	9/10	.1506	.31660	.964	-.6773	.9786

* The mean difference is significant at the .05 level.

Tukey HSD

	N	Subset for alpha = .05		
GROUP		1	2	3
4/5	30	1.2309		
6/7	29		2.1258	
9/10	16			3.4728
Adult	24			3.6234
Sig.		1.000	1.000	.953

Means for groups in homogeneous subsets are displayed.

Appendix 14: SPSS results for Experiment 4

Number of contributions per dyad

Descriptive Statistics

Status	Age	Mean	Std. Deviation	N
Child IG	Younger	61.94	37.96	17
	Older	63.31	15.73	13
	Total	62.53	29.96	30
Adult IG	Younger	35.18	20.83	17
	Older	45.23	22.98	13
	Total	39.53	21.99	30

Tests of Within-Subjects Contrasts

Source	Status	Type III Sum of Squares	df	Mean Square	F	Sig.
Status	Linear	7406.342	1	7406.342	14.14	.001
Status * Age	Linear	278.009	1	278.009	.53	.472
Error (Status)	Linear	14663.99	28	523.714		

Tests of Between-Subjects Effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	155784.50	1	155784.5	177.082	.000
Age	480.436	1	480.436	.546	.466
Error	24632.498	28	879.732		

Non-specific requests for repetition

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	.06	.24	17
	adult IF	.00	.00	17
	Total	.03	.17	34
Older	child IF	.15	.38	13
	adult IF	.23	.83	13
	Total	.19	.63	26
Total	child IF	.10	.31	30
	adult IF	.10	.55	30
	Total	.10	.44	60

Non-specific requests for repetition continued

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.459	3	.153	.783	.509
Intercept	.724	1	.724	3.707	.059
Age	.391	1	.391	2.001	.163
Status	1.207E-03	1	1.207E-03	.006	.938
Age * Status	6.787E-02	1	6.787E-02	.347	.558
Error	10.941	56	.195		
Total	12.000	60			
Corrected Total	11.400	59			

a R Squared = .040 (Adjusted R Squared = -.011)

Specific requests for repetition

Descriptive Statistics

Age	Condition	Mean	Std. Deviation	N
Younger	child IF	.00	.00	17
	adult IF	.18	.39	17
	Total	.09	.29	34
Older	child IF	.00	.00	13
	adult IF	.00	.00	13
	Total	.00	.00	26
Total	child IF	.00	.00	30
	adult IF	.10	.31	30
	Total	.05	.22	60

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.379	3	.126	2.867	.045
Intercept	.115	1	.115	2.600	.112
Age	.115	1	.115	2.600	.112
Status	.115	1	.115	2.600	.112
Age * Status	.115	1	.115	2.600	.112
Error	2.471	56	4.412E-02		
Total	3.000	60			
Corrected Total	2.850	59			

a R Squared = .133 (Adjusted R Squared = .087)

Specific requests for confirmation

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	1.53	1.91	17
	adult IF	2.18	1.85	17
	Total	1.85	1.88	34
Older	child IF	1.23	1.36	13
	adult IF	2.38	2.02	13
	Total	1.81	1.79	26
Total	child IF	1.40	1.67	30
	adult IF	2.27	1.89	30
	Total	1.83	1.82	60

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	12.243	3	4.081	1.241	.303
Intercept	197.430	1	197.430	60.058	.000
Age	3.017E-02	1	3.017E-02	.009	.924
Status	11.946	1	11.946	3.634	.062
Age * status	.946	1	.946	.288	.594
Error	184.090	56	3.287		
Total	398.000	60			
Corrected Total	196.333	59			

a R Squared = .062 (Adjusted R Squared = .012)

Specific requests for specification

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	.71	.99	17
	adult IF	1.35	1.54	17
	Total	1.03	1.31	34
Older	child IF	.46	.78	13
	adult IF	.54	.52	13
	Total	.50	.65	26
Total	child IF	.60	.89	30
	adult IF	1.00	1.26	30
	Total	.80	1.10	60

Specific requests for specification continued

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.727	3	2.576	2.258	.092
Intercept	34.463	1	34.463	30.215	.000
Age	4.129	1	4.129	3.620	.062
status	1.931	1	1.931	1.693	.199
Age * status	1.197	1	1.197	1.050	.310
Error	63.873	56	1.141		
Total	110.000	60			
Corrected Total	71.600	59			

a R Squared = .108 (Adjusted R Squared = .060)

Potential requests for confirmation

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	1.35	1.22	17
	adult IF	7.12	5.10	17
	Total	4.24	4.68	34
Older	child IF	2.69	2.36	13
	adult IF	8.31	5.96	13
	Total	5.50	5.29	26
Total	child IF	1.93	1.89	30
	adult IF	7.63	5.42	30
	Total	4.78	4.95	60

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	510.998	3	170.333	10.222	.000
Intercept	1396.366	1	1396.366	83.795	.000
Age	23.566	1	23.566	1.414	.239
Status	477.015	1	477.015	28.625	.000
Age * status	8.213E-02	1	8.213E-02	.005	.944
Error	933.186	56	16.664		
Total	2817.000	60			
Corrected Total	1444.183	59			

a R Squared = .354 (Adjusted R Squared = .319)

Potential requests for specification

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	.24	.56	17
	adult IF	4.00	4.11	17
	Total	2.12	3.46	34
Older	child IF	.54	.78	13
	adult IF	2.92	2.10	13
	Total	1.73	1.97	26
Total	child IF	.37	.67	30
	adult IF	3.53	3.38	30
	Total	1.95	2.90	60

Tests of Between-Subjects Effects

Dependent Variable: PRSMIF

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	159.637	3	53.212	8.890	0.000
Intercept	218.205	1	218.205	36.453	0.000
Age	2.205	1	2.205	0.368	0.546
Status	139.282	1	139.282	23.268	0.000
Age * Status	7.015	1	7.015	1.172	0.284
Error	335.213	56	5.986		
Total	723.000	60			
Corrected Total	494.850	59			

a R Squared = .323 (Adjusted R Squared = .286)

Potential requests for elaboration

Descriptive Statistics

Age	Status	Mean	Std. Deviation	N
Younger	child IF	.18	.39	17
	adult IF	1.88	2.62	17
	Total	1.03	2.04	34
Older	child IF	.38	.77	13
	adult IF	2.23	2.35	13
	Total	1.31	1.95	26
Total	child IF	.27	.58	30
	adult IF	2.03	2.47	30
	Total	1.15	1.99	60

Potential requests for elaboration continued

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	48.030	3	16.010	4.830	.005
Intercept	80.474	1	80.474	24.278	.000
Age	1.141	1	1.141	.344	.560
Status	46.472	1	46.472	14.020	.000
Age * Status	7.247E-02	1	7.247E-02	.022	.883
Error	185.620	56	3.315		
Total	313.000	60			
Corrected Total	233.650	59			

a R Squared = .206 (Adjusted R Squared = .163)

Overall use of clarification requests

Descriptive statistics

Age	Status of IF	Mean	Std. Deviation	N
Younger	Child	4.06	2.90	17
	Adult	16.71	11.84	17
	Total	10.38	10.64	34
Older	Child	5.46	4.65	13
	Adult	16.62	8.06	13
	Total	11.04	8.60	26
Total	Child	4.66	3.75	30
	Adult	16.67	10.21	30
	Total	10.67	9.73	60

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2174.555	3	724.852	11.873	0.000
Intercept	6760.409	1	6760.409	110.736	0.000
Age	6.342	1	6.342	0.104	0.748
Status	2086.546	1	2086.546	34.178	0.000
Age * Status	8.213	1	8.213	0.135	0.715
Error	3418.778	56	61.050		
Total	12420.00	60			
Corrected Total	5593.333	59			

a R Squared = .389 (Adjusted R Squared = .356)

Checking requests

Descriptive Statistics

Age	Status of IF	Mean	Std. Deviation	N
Younger	Child	.00	.00	17
	Adult	2.59	4.05	17
	Total	1.29	3.11	34
Older	Child	.38	1.12	13
	Adult	1.46	2.10	13
	Total	.92	1.74	26
Total	Child	.17	.75	30
	Adult	2.10	3.35	30
	Total	1.13	2.59	60

Test of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	66.508	3	22.169	3.757	0.016
Intercept	72.428	1	72.428	12.275	0.001
Age	2.028	1	2.028	0.344	0.560
Status	49.480	1	49.480	8.386	0.005
Age * Status	8.413	1	8.413	1.426	0.237
Error	330.425	56	5.900		
Total	474.000	60			
Corrected Total	396.933	59			

a R Squared = .168 (Adjusted R Squared = .123)

Number of questions asked by the IG

Descriptive Statistics

Age	Status of IG	Mean	Std. Deviation	N
Younger	Child	.71	1.49	17
	Adult	6.35	5.45	17
	Total	3.53	4.87	34
Older	Child	1.92	2.18	13
	Adult	6.31	6.52	13
	Total	4.12	5.26	26
Total	Child	1.23	1.89	30
	Adult	6.33	5.83	30
	Total	3.78	5.01	60

Number of questions asked by the IG continued

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	401.079	3	133.693	6.938	0.000
Intercept	861.059	1	861.059	44.685	0.000
Age	5.059	1	5.059	0.263	0.610
Status	370.670	1	370.670	19.236	0.000
Age * Status	5.870	1	5.870	0.305	0.583
Error	1079.104	56	19.270		
Total	2339.000	60			
Corrected Total	1480.183	59			

a R Squared = .271 (Adjusted R Squared = .232)

Acknowledgements

Descriptive Statistics

Age	Status of IF	Mean	Std. Deviation	N
Younger	Child	9.59	7.06	17
	Adult	6.47	2.92	17
	Total	8.03	5.55	34
Older	Child	11.69	6.16	13
	Adult	10.69	3.86	13
	Total	11.19	5.06	26
Total	Child	10.50	6.66	30
	Adult	8.30	3.92	30
	Total	9.40	5.53	60

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	236.509	3	78.836	2.816	.047
Intercept	5443.591	1	5443.591	194.427	.000
Age	147.391	1	147.391	5.264	.026
Status	62.451	1	62.451	2.231	.141
Age * Status	16.518	1	16.518	.590	.446
Error	1567.891	56	27.998		
Total	7106.000	60			
Corrected Total	1804.400	59			

a R Squared = .131 (Adjusted R Squared = .085)

Appendix 15: SPSS results for Experiment 5

Descriptives

		Pre-location markers	Post-location markers	Pre-differentiators	Post-differentiators	Pre-spatial locations	Post-spatial locations
N	Valid	12	12	12	12	12	12
	Missing	12	12	12	12	12	12
Median		76.09	88.24	5.56	15.39	9.10	47.73
percentiles	25	66.30	82.35	.00	1.92	1.13	37.50
	50	76.09	88.24	5.56	15.39	9.10	47.73
	75	90.22	92.65	9.72	30.94	22.72	54.55

Test Statistics for Wilcoxon test

	Post location markers – pre location markers	post differentiators – pre differentiators	post spatial locations – pre spatial locations
Z	-2.197	-2.312	-2.983
Asymp.sig. (2-tailed)	.028	.021	.003

Test Statistics for Mann Whitney U test

	Location markers	Differentiators	Spatial locations
Mann-Whitney U	9.000	13.000	12.000
Z	-1.444	-.808	-.964
Asymp. sig. (2-tailed)	.149	.419	.335
Exact Sig. [2*(1-tailed Sig.)]	.180	.485	.394