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**COMPUTER-PAPER: GENDER DIFFERENCES IN CHILDREN'S
COLLABORATIVE CONVERSATIONS**

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INTRODUCTION

The opening chapter of this book begins by reporting an extract of talk taken from a discussion between two secondary school-aged pupils who are trying to solve a science problem together. The discussion ends in disagreement, with one child exclaiming 'I don't give a damn'. For us, an interesting feature to note about this extract is that one of the students is a boy and the other is a girl. Is it just a coincidence or is gender an important factor in explaining the conflictual nature of the discussion observed? For some time now theories of collaborative learning have neglected the social and affective dimensions of collaborative learning situations, such as gender. Yet we know that gender is an important part of a child's everyday life (Lloyd & Duveen, 1992). It impacts the name of the child, the way a child is talked to and played with, the clothes he or she wears and the toys they play with. At school, gender is implicated, in complex ways, with the subjects students choose to study and their performance at school. The aim of this chapter is to explore the significance of gender in respect of children's interactions and how this relates to processes of development and Learning. We will go on to examine possible theoretical explanations for gender differences in respect of patterns of interaction, before reporting a study which investigates the efficacy of these different explanatory accounts in the context of collaborative work on an English language problem solving task.

Gender differences in whole-class interaction

Research has indicated that gender impacts boys' and girls' interactions in whole class settings. Howe (2010) reviews the literature relating to this and draws three broad conclusions. The first is that boys typically contribute more than girls to classroom

dialogue. This conclusion is underscored by the findings emerging from three major British research studies (Boustead, 1989; French & French, 1984; Swann & Graddol, 1988), and one Australian investigation (Dart & Clark, 1984), which have indicated that boys' contributions dominate discussions in respect of curriculum content, classroom management and problem behaviour. A recent study by Hardman (2008) also indicates that this pattern can be observed in classrooms in Kenya and Nigeria.

Howe's second conclusion is that the predominance of boys' contributions was the result of both teacher selection and pupil-initiated interactions (Boustead, 1989; Swann & Graddol, 1988). Related work by Duffy, Warren & Walsh (2001), who undertook a large scale study of Canadian high school children, indicates that boys are more likely to initiate interactions than girls in class. Sadker & Sadker (1985) have also reported that boys were eight times as likely to initiate interactions than girls. In terms of teacher selection, Swann & Graddol (1988) found that teachers were more likely to select boys than girls to talk (a similar finding has been reported by Duff et al., (2001) and Altermatt, Jovanovic & Perry (1998)). It is also apparent that boys receive more attention than girls even before a question is asked. Swann & Graddol, (1988) found that teachers directed their gaze to boys twice as often as girls.

The third general conclusion Howe reached is that boys receive more feedback than girls. Whilst boys typically receive more negative feedback than girls (Good et al., 1973; Jones & Wheatley, 1989; Simpson & Ericson, 1988; Stake & Katz, 1984), it is also the case that they receive more positive feedback than girls (Good et al., 1973; Jones & Wheatley, 1989; Simpson & Ericson, 1988).

Gender differences in small group interaction

In addition to gender differences in patterns of whole class interaction, some research has indicated that gender can impact boys' and girls' conversations in small groups. For example, Leaper (1991) investigated the influence of the speaker's and partner's gender on conversation. He examined communication between pairs of children who were aged 5 and between pairs of children who were aged 7. He found that boys tended to use more assertive and controlling utterances than girls, but this was only true in all boy pairings. Girls used more affiliative utterances than boys. All children modified their communication style depending on the gender of their partner. For example, boys and girls used more informing acts and fewer controlling and domineering acts when with communicating with a girl. This pattern was subsequently replicated by Leaper et al., (1999). Leaper's research suggests that boys and girls use different communication styles and they adapt these styles depending on the gender of the listener.

Such differences in communication style are also reported by Leman et al. (2005) who undertook a study which investigated the relationship between gender and children's conversational styles in a problem solving task. In this task children were given different three different types of counters (triangles, squares and circles). Each type of counter had a different value. The children were asked in pairs to add the counters together to make 100. However, unbeknown to them they had been told the counters had different values, which led to conflicts between the children. Leman et al. (2005) found that the children used gendered styles of communication. Girls' conversation were characterised by more affiliative talk than boys' conversations. However, Lehman and his colleagues also found that boys and girls varied their conversational

style depending on their partner. For example, boys tended to interrupt their partner more if they were a girl than if they were a boy. More recent work by Leman & Bjonberg (2010), comparing differences in conversational style between girls and boys when they were discussing what constituted a fair punishment, has also reported similar findings.

A further important consideration is the context of the conversation. Leaper & Smith (2004), in a meta-analysis, found that activity context moderates gender differences in language use. For example, in 'feminine' games girls (e.g. playing 'mummy and daddy') would often take the lead, whereas in more 'masculine' games (e.g. superheroes) boys would assume the lead role. Leman (2010) argues that variations in the effects of gender in different contexts have important educational implications. For instance, in a classroom task where boys are perceived as more expert they may dominate the interaction in mixed gender group interaction, conversely girls may dominate the interaction in tasks where they are perceived to be the expert.

It is evident that the relationship between gender and aspects of language use is, however, far from clear-cut. Three meta-analyses undertaken to examine the effect of gender in respect of talkativeness, affiliative speech and assertive speech have indicated that whilst girls were slightly more talkative and used more affiliative speech than boys, and whilst boys used more assertive speech, the effect size for these differences was either small or negligible (Leaper & Smith (2004).

Gender differences in collaborative learning

Psaltis (2011) noted that gender emerged as an important issue early in research on collaborative learning, and having an important influence on boys' and girls' learning in collaborative interactions. There is, however, no simple relationship between gender, collaboration and learning and development. In a now 'classic' study on peer interaction and children's spatial reasoning, Bearison, Magzamen & Filardo (1986) found that there was a curvilinear relationship between sociocognitive conflict and development, but that this relationship was only prevalent for boys and not girls. Furthermore, Cannella (1992), in a study concerning the gender composition of pairs undertaking a spatial perspective-taking task reported that female same-gender pairs disagreed more often and made fewer justifications than male same-gender pairs and mixed-gender pairs. Male same-gender pairs progressed more than either female same-gender pairs or mixed gender-pairs. However, Barbieri & Light (1982) conducted a study investigating the effect of gender composition on children's computer based problem solving and found that the gender composition of the pair did not have an impact on children's learning outcomes.

Subsequent research has investigated the impact of gender and knowledge asymmetry. Leman & Duveen (1999, 2003) have, for instance, investigated the impact of gender and knowledge asymmetry in the context of a moral reasoning task. Their research is based on Piaget's (1932) distinction between asymmetric and symmetric relations. Asymmetric relations are characteristic of the relationships between adults and children and are based on an asymmetry of power, whereas the relations of symmetry are found between children or peers and are based on an equality of power. Piaget argued that developmental progress is only possible

through the resolution of inter-individual conflicts that occur in symmetric social relations (i.e. the relationships found between peers). In contrast, asymmetric relations inhibit the expression and/or the resolution of conflicts - thus limiting their potential for developmental progress. Leman & Duveen (1999, 2003) looked at two different sources of differential status, gender and knowledge and compared four different types of pairs: (i) a more expert male paired with a less expert male; (ii) a more expert male paired with a less expert female; (iii) a more expert female paired with a less expert female and (iv) a more expert female paired with a less expert male. They found that there were differences between these four different pair types in terms of the conversations observed. The biggest differences were between pairs comprising a more expert male and a less expert female and the pairs with a more expert female and a less expert male. The discussions observed with the more expert male and less expert female pairs were often very short with very little discussion. The male member would suggest an answer and their female partner would accept it. In contrast, the discussions observed in the female more expert and male less expert pairs were much more extended, with the female members having to work to persuade their male partner of the validity of their answer. Unfortunately, Leman & Duveen's (1999, 2003) studies did not include a post-test as part of the design and so it was not possible to determine whether these differences in conversation had a subsequent impact on children's learning and developmental outcomes.

Fortunately more recent research employing the same experimental paradigm has included a post-test in the design Psaltis and his colleagues, for example, investigated the impact of gender and knowledge asymmetry in the context of a conservation task. The design incorporated both a post-test and a control group who worked individually

throughout (Psaltis & Duveen, 2006, 2007; Psaltis et al., 2009). These researchers replicated the research findings reported above and found that pair type influenced the conversations and that these differences had an impact on later post-test performance. Male non-conservers who were paired with female conservers performed significantly better than males who were paired with other males and males who had only worked individually. These findings have also been replicated in a study of investigating the effect of gender and knowledge asymmetry using a spatial transformation task (Psaltis, 2011).

Explanations for these gender differences in communication

The research outlined in the previous section confirms that there are differences in communication between mixed-gender and same-gender pairs and these differences in communication can be of significance and consequence for children's learning and development. There are two possible explanations for the observed gender differences in communication. The first explanation is often referred to as the 'two cultures' approach. Maltz and Borker (1982) explain gender differences by arguing that boys and girls grow up in different subcultures and develop different conversational styles with males being more assertive and controlling and females being more affiliative and supportive.

A second explanation is termed the 'status characteristic' theory (Berger, Hamit, Norman & Zelditch 1977; Berger, Rosenholtz and Zelditch, 1980), which proposes that in social interaction individuals evaluate themselves relative to the other participants (Cohen, 1994; Cohen, Lotan, & Catanzarite, 1990; James & Drakich, 1992, Lotan, 2006). If a group expects one of its members to be more competent or more expert then the group will allow that individual to participate more and afford

that member greater influence than others. Leman (2010) argues that the gender differences in conversation could be the result of gender differences in perceived expertise. If one gender is typically perceived as more expert in one domain than the other gender then the gender perceived in the wider culture as more expert will take the lead role and the gender perceived as less expert will take the more supportive role. He also argues that these gender differences in conversation will only be apparent in mixed gender interactions if gender is a relevant consideration in terms of expertise. If it is not a relevant consideration then there should be no gender differences in conversation. The status characteristic theory characterisation of expert-novices interaction is similar to Piaget's (1932) characterisation of asymmetrical social relations, with potentially the same negative consequences in respect of learning and development.

These explanations are not necessarily mutually exclusive and they may both explain some or all of the differences observed. However interestingly they do give rise to differing predictions if we were to compare girls' and boys' conversations in a collaborative activity where males are perceived more expert than girls, as compared with a collaborative activity where there are no perceived gender differences in expertise. The 'two cultures' explanation would predict first that there would be differences in language between all boy pairs and all girl pairs in same gender interactions because the different communication styles between girls and boys would lead girls to use more affiliative speech and boys to use more assertive or controlling speech. On the other hand, the 'status characteristic' theory would predict first no difference in language between all girl and all boy pairs in same gender interactions because in expertise terms children in a pair are comparatively equal. Second, there

would be no predicted differences in language between girls and boys in a collaborative activity where girls and boys are perceived to be equally expert. Third, there would be predicted differences in language between girls and boys in the mixed gender interactions in a collaborative activity where boys are perceived to be expert because these gender differences in perceived expertise would lead boys to use more assertive and controlling language and girls to use more affiliative language.

The aim of this chapter is to report a study which compared boys' and girls' conversations in the context of a collaborative activity where boys are culturally perceived as being more expert, with a collaborative activity where there is no gender difference in perceived expertise. The task was an English language task and was the same for both activities. The difference was the mode of presentation. In one collaborative activity the task was presented on a computer. Boys are generally perceived as being more expert in respect of computer activities than girls (Joiner et al., 1998; Robinson-Stavely & Cooper, 1990) and thus this computer presentation of the task was the collaborative activity where boys were perceived as the expert. In the other collaborative activity, the task was presented on paper and thus there were no expected gender differences in perceived expertise.

METHOD

We employed a three factor mixed design with gender (boy and girl) and type of pair (same and mixed) as the between participants factors and the mode of presentation (computer and paper) as the within participants factor. There were forty eight children (24 boys and 24 girls), aged between 13 and 14 years, who participated in the study. They were placed, with the teachers' consultation, into either boy-boy pairs, girl-girl pairs or boy-girl pairs. They were from a large state school in west London, which

served a socially mixed catchment area. The children already had considerable experience of using computers and, working in pairs and groups, including mixed gender groups.

Two poems were used in this study. The first was the 'The Wife's Lament' written by Nikolay Nekrasov and translated by Juliet M. Soskice.

My life is like daytime
With no sun to warm it!
My life is like night
With no glimmer of moon!
And I - the young woman -
Am like the swift steed
On the curb, the young swallow
With wings crushed and broken;
My jealous husband,
Is drunken and snoring,
But even while snoring,
He keeps one eye open,
And watches me always,
Me, poor little wife!

The second poem was 'On a Cat, Ageing' written by Alexander Gray.

He blinks upon the hearth rug,
And yawns in deep content,
Accepting all the comforts

That Providence has sent.
Louder he purrs, and louder,
In one glad hymn of praise
For all the night's adventures
For quiet restful days.
Life will go on for ever,
With all that cat can wish:
Warmth and the glad procession
Of fish and milk and fish.
Only - the thought disturbs him -
he's noticed once or twice,
The times are somehow breeding
A nimbler race of mice.

The lines in the poems had been placed in a standard random order. The pupils' task was to discuss the order in which the lines should appear and move them into what they considered to be the correct order. There were two versions of the task: (i) a paper version of the task, where the students used a pair of scissors to cut the lines into individual strips and move them until they were satisfied that they were in the correct order and (ii) a computer version of the task where all the lines were visible on the computer screen and the students used the mouse to select lines and move them into what they thought was the correct order for the poem.

The study consisted of two sessions for each of which the children were taken in pairs to a quiet area of the school. The sessions lasted 20 minutes and they were recorded

on audio tape. For the paper presentation of the task the children worked in pairs, seated at a table. In the centre of the table was a sheet of A3 paper, a copy of the poem, a pair of scissors and some glue. For the computer presentation the children worked in pairs and were seated at a computer placed on top of a trolley. The children were shown how to move the lines of the poem. On the top of the computer were instructions in case the children forgot how to move the lines. Before the students started the first session, they were given the following instruction.

‘We’ve talked a lot about spoken English and how your teacher has to assess this for the National Curriculum. Today I’m going to look at your discussion work when you’re working with a partner. The paper/screen you see in front of you has a poem on it, but the lines are in the wrong order. What I’d like you to do, between you, is cut up/move the lines until you think the poem makes sense. Remember that we’re not looking at who gets it right, but at how well you discuss things with your partner. I’m just going to watch and take a few notes, so I can’t answer any questions once you start. Okay’.

All students attempted both the computer and paper presentation of the task. In the first session they attempted one presentation of the task and in the second session they attempted the other. The second session was approximately two weeks after the first session. The order of presentation for both versions of the task (computer versus paper) and for each poem were counterbalanced (see Table 1).

Table 1. Order of presentation

<i>Session</i>	<i>Order 1</i>	<i>Order 2</i>	<i>Order 3</i>	<i>Order 4</i>
1	Computer The wife's lament	Paper On a Cat ageing	Computer The wife's lament	Paper On a Cat ageing
2	Paper On a Cat ageing	Computer The wife's lament	Paper On a Cat ageing	Computer The wife's lament

In the second session, the students were given the following instructions.

'If you remember, a couple of weeks ago you looked at a poem that was mixed up and tried to put it in the right order. We'll today, you are going to do a similar exercise, with a different poem only this time it's on paper/ the computer'.

During the sessions, the experimenter recorded the number of times the lines of poetry were moved by each student and the time each student had control of the mouse. The audio tape recordings of the interactions were transcribed.

To investigate whether boys and girls differed in their use of affiliative and assertive utterances and whether that differed according to the version of the task, the transcripts were analysed for number of utterances and the type of utterance. Four types of assertive utterances were identified, which were based on the categories uses

by Leaper & Smith (2004) for describing assertive utterances and they were as follows:

(i) Proposing: an utterance was classified as proposing when one of the pair suggested something they might do (e.g. cutting the paper). For example

A I'll cut and you sort.

An utterance was also classified as proposing if it concerned a decision about where a line might go. For example.

A Oh. This is definitely the start. 'My life is like daytime. Where my life is like night'.

(ii) Disagreeing: an utterance was classified as Disagreeing when one member of the pair disagreed with or discouraged their partner's proposal. For example.

A That comes last.

B No, its got a comma.

(iii) Seeking Information: an utterance was classified as seeking information when one or both members were trying to seek information from the other.

A Where do you think that goes, before or after?

(iv) Repetition: an utterance was classified as repetition when one pair merely repeated the lines of the poetry. An example is shown below. The lines are repeated from 'On a cat ageing'.

- A And watches me always.
B But even while snoring.

The final category was classified as an affiliative utterance and was based on the categories identified by Leaper & Smith (2004).

(v) Supporting: an utterance was classified as supporting when one pair agreed or encouraged the other's proposal. For example

- A Oh that's definitely first.
B Oh yeah.

An independent coder performed a reliability check. The coder analysed 25 percent of the transcripts (i.e. 820 utterances) and agreed with all but three of the utterances.

RESULTS

We first compared the number and type of utterances observed in the all boy pairs and the all girl pairs, regardless of whether the task was the computer version or the paper version. Tables 2 and 3 present the findings and shows that there were a number of significant differences. Contrary to predictions we found that girls in the all girl pairs were more likely to disagree compared to boys in all boy pairs both in the paper version and the computer version. Moreover, the boys were more likely to be

supportive both in the paper version and the computer version than girls in all girl pairs. Finally the boys made more utterances asked for more information than girls in the computer version. All other differences were non significant.

Table 2. Differences between all boy pairs and all girl pairs in computer interactions

	<i>Boy</i>		<i>Girl</i>		<i>F</i>	<i>partial</i> η^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Total Number of Utterances	39.6	6.9	35.5	4.3	4.1	0.12*
Assertive						
Proposing	18.1	3.1	17.3	2.9	0.5	0.02
Disagree	4.1	1.4	6.7	1.7	21.5	0.42*
Seeking Information	5.8	1.4	3.5	1.3	22.9	0.43*
Repetition	9.5	2.2	8.6	1.8	1.5	0.05
Affiliative						
Supporting	6.6	2.0	4.6	1.4	10.5	0.26*
Action						
Move	544.1	208.8	495.6	203.1	0.5	0.02

* $p < 0.05$

Table 3. Differences between all boy pairs and all girl pairs in paper interactions

	<i>Boy</i>		<i>Girl</i>		<i>F</i>	<i>partial</i> η^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		

Total Number of Utterances	29.4	5.5	27.5	5.2	1.0	0.03
Assertive						
Proposing	13.8	3.5	13.0	13.8	0.4	0.01
Disagree	3.3	1.5	4.5	3.3	6.6	0.18*
Seeking Information	4.4	1.7	4.6	1.6	0.0	0.00
Repetition	8.1	1.9	7.6	1.4	0.7	0.02
Affiliative						
Supporting	5.7	1.4	4.6	5.7	4.6	0.13*
Action						
Move	11.6	3.0	11.8	11.6	0.0	0.00

* $p < 0.05$

The differences between boys and girls in mixed gender interactions were analysed regardless of whether they using the paper or computer version of the task. We found that there were no significant differences in terms of either affiliative utterances or assertive utterances.

Next, we compared boys and girls interactions in the computer version of the task in mixed gender pairs. Table 4 shows that there were a number of significant differences. Boys overall made more utterances, they made more proposals, more disagreements and repeated more utterances than girls. They also controlled the mouse more than girls. Girls made more supportive utterances.

Table 4: Differences between girls and boys in the mixed gender computer –mediated interactions

	<i>Boys</i>		<i>Girls</i>		<i>F</i>	<i>partial</i> η^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Total Number of Utterances	51.5	7.0	31.0	6.8	35.2	0.71*
<i>Assertive</i>						
Proposing	26.3	4.7	12.1	3.9	42.6	0.75*
Disagree	9.1	2.7	4.5	2.4	12.6	0.47*
Seeking Information	4.0	1.8	4.4	1.7	<1	0.01
Repetition	12.8	2.7	9.3	2.4	7.5	0.35*
<i>Affiliative</i>						
Supporting	4.8	1.2	6.4	1.2	6.1	0.30*
<i>Action</i>						
Move	751.8	318.9	287.1	276.5	9.7	0.41*

* $p < 0.05$

There were no significant differences between girls and boys in the mixed gender interactions when they were using the paper version of the task on either the affiliative or the assertive utterances (see table 5).

Table 5: Differences between girls and boys in the mixed-gender paper mediated interactions

	<i>Boys</i>	<i>Girls</i>
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	M	SD	M	SD	F	partial η^2
Total Number of Utterances	30.4	5.4	29.9	4.5	0.0	0.00
Assertive						
Proposing	12.0	2.5	12.6	2.8	0.2	0.02
Disagree	4.8	1.6	5.6	1.9	1.0	0.07
Seeking Information	5.1	1.1	4.5	1.9	0.7	0.05
Repetition	8.0	2.0	8.3	1.5	0.1	0.01
Affiliative						
Supporting	5.0	1.3	4.6	1.4	0.3	0.02
Action						
Move	11.9	4.1	11.9	2.5	0.0	0.00

* $p < 0.05$

DISCUSSION

The aim of the study reported in this chapter was to compare differences between the conversational dynamics of girls and boys in a collaborative activity where boys are culturally perceived as more expert than girls, with a collaborative activity where there was no gender difference in perceived expertise. Consistent with our expectations, boys in all boy pairs in the computer version of the task made more information seeking utterances than girls in all girl pairs. However, contrary to our expectations girls in all girl pairs in both the paper version of the task and the computer version of the task made more disagreeing utterances than boys in all boy pairs. Furthermore, boys made more supportive utterances than girls in same gender pairs in both the computer and paper version of the task. There was no difference in

the language used by girls and boys when they worked in mixed gender pairs on the paper version of the task, however, as expected, there were considerable differences in the language used by girls and boys when they worked in mixed gender pairs on the computer based version of the task. Boys made more assertive and controlling utterances (i.e. proposals, disagreements and repeated utterances) than girls and girls made more supportive utterances than boys. The boys also dominated control of the mouse in the computer base collaborative activity.

These findings are in accordance with earlier research which has shown that social categories such as gender have an impact on the conversational dynamics of collaborative activity and that the impact of gender is moderated by the context of the activity in a similar way to that reported by Leaper & Smith (2004) who found that the conversational dynamics changes depending on the gender-marking of the activity. Although for conversations in same gender collaborative activity our findings were not as predicted and counter to those reported in the literature and to the two cultures explanation (e.g. Leaper & Smith 2004). We had expected that girls would make more affiliative and less assertive and controlling utterances, whereas we found that girls made more assertive and controlling utterances and boys made more affiliative utterances. However, the gender differences observed in mixed gender interaction were consistent with the status characteristic theory and consistent with the literature on gender differences in collaborative computer based activities (Howe, 1997). Boys in the computer-based version of the task, where boys are thought to be more expert, were expected to use more assertive and controlling utterances and girls more affiliative utterances and this is exactly what we found. In the paper based

version of the task, where there were no gender differences in expertise, no gender differences in conversation were expected or found.

The interesting question is whether these gender differences in conversation have any impact on children's learning. Contemporary research would suggest that they do. For example, Leman & Duveen (1999, 2003) in their studies on the impact of gender and knowledge asymmetry on conversation involving an expert child with a non-expert child. They found that the pairs where the female child was expert and male child was less expert the discussion were extended and the female partners had to use a wide variety of arguments to convince their male partners of the validity of their answer. In contrast, the discussion of the pairs where the male was expert and the female was less expert were very brief and consisted of the male partner proposing an answer and the female partner agreeing to it. Psaltis (Psaltis & Duveen, 2006, 2007; Psaltis et al., 2009; Psaltis, 2011) found similar differences in conversation as a function of gender and knowledge asymmetry. Furthermore, they found this had an impact on later learning and development. The females who were less expert and paired with an expert male made the least progress, whereas the males who were less expert and paired with an expert female progressed the most. These findings suggest that the extended arguments, found in pairs with a female expert and a male who was less expert, may well be very beneficial for learning and development.

In the current study, we found that the female same gender pairs disagreed more than male same gender pairs in both the computer and paper version of the task, but the males in the mixed gender pairs in the computer version of the task disagreed the most. Unfortunately we do not know whether the disagreement in either the same

gender pairs or the mixed gender pairs were similar to the extended arguments observed by Leman & Duveen (1999, 2003) and Psaltis (Psaltis & Duveen, 2006, 2007; Psaltis et al., 2009; Psaltis, 2011) in pairs with the more expert female and the less expert male or the brief disagreements observed in the pairs with a more expert male and a less expert female. Plus the study did not have a measure of learning outcome and thus it was not possible to examine whether these differences significantly impacted learning. Further work is necessary to examine gender differences in the nature of the disagreements and to analyse whether they were extended arguments or brief disagreements and whether the differences in conversation observed in this study would have an impact on learning.

Another area of future research is to investigate the emotional tenor of the discussions and whether that is influenced by the gender composition of the pairs. Very little research has investigated whether the emotional tone of the pairs is influenced by the gender composition of groups. Children at the age of the participants in this study tend to have friends of the same gender, therefore in mixed-gender pairs they are unlikely to be working with people who are their best friends. Therefore, the emotional tone is unlikely to be positive. Research has reported that negative socio-emotional processes can have a negative impact on productive group work. Chiu & Khoo (2003) found that rudeness and especially rude criticisms undermine effective group work. Similarly, Webb, Nemer & Zuniga (2002) found that negative socio-emotional behaviour had a negative impact on productive group work. Further, research is required to investigate whether gender composition impacts the emotional tone of collaboration and if so, the significance and consequence of this.

In conclusion, this study showed that the gender and the gender marking of an activity had an impact on the conversations of the children. More specifically, it had an impact on the disagreements observed in the collaboration, which are known to be important in learning and development. More research is needed to further investigate the impacts of gender and gender marking on collaboration and how that in turns impacts on their learning development.

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