

Differences of children's verbal interaction in peer collaboration according to age, gender, and pairing conditions

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Abstract

The purpose of the study is to investigate young children's verbal interaction in joint problem solving according to their age, gender and pairing conditions. A total of 120 4- and 5-year-old children were assigned to the matched dyad (pairing children with same level) or the unmatched dyad (pairing children with differing level) condition. Each dyad's verbal interaction, while working with a block task collaboratively, were videotaped and then transcribed for analyses. As a result, the differences between the matched and the unmatched groups, boys and girls, and 4- and 5-year-old in total amount of verbal interaction are observed. Significant effect and interaction effect of gender for 'task-oriented interaction' and 'affective support interaction' were observed.

Keywords: peer collaboration, verbal interaction, pairing condition

Introduction

As collaborative work is perceived by educators as a valuable educational activity that enhances learning through active participation (De Lisi & Golbeck, 1999), teachers have been urged to create cooperative learning environment in which children work together to solve problems and to construct understanding. However there have been little research about peer collaboration because of the belief that childhood is period of egocentrism (Kim & Oh, 2001). So, teachers for young children are not

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familiar with peer collaboration as a learning strategy and as a manner of structuring the interactions within the classroom.

Peer collaboration involves children working together and an experienced peer assisting an inexperienced peer in completing a task. It is a ‘mutual engagement and coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem’ (Rochell & Teasley, 1995, p. 70). The substantial amounts of research on peer interaction during collaborative work demonstrate positive effects on children’s learning and achievement (e.g., Chambers, 1995; Fawcett & Garton, 2005; Forman, Minnick, & Stone, 1993; Kwon, 2005; Manion & Alexander, 1997; Teasley, 1995).

Two frameworks offer explanations about how children learn from each other within a collaborative setting. The sociocultural perspective of Vygotsky (1978) and the sociocognitive conflict perspective of Piaget (1926) constitute the basis for most studies of peer learning. From the developmental perspective of Piaget (1926), sociocognitive conflict provides an important impulse. Children can experience a conflict between their own ideas and the ideas of others and, in order to resolve this cognitive conflict, the children must explain their viewpoints to each other. That is, children can learn by not only hearing the explanations of others but also providing their own explanations (De Lisi & Golbeck, 1999).

In contrast, researchers in the Vygotskian tradition argue that cognitive development is most likely to occur when two participants, who differ in terms of their initial level of competence, work collaboratively on a task to arrive at a shared understanding (Garton, 1992; Johnson & Johnson, 1994). Within this perspective, there are two key concepts; zone of proximal development and intersubjectivity (Vygotsky, 1978). The zone of proximal development is conceptualized as the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable partner. Intersubjectivity is a process of shared understanding that results from individuals discussing a purpose and a focus their differing opinions. The more capable partner is viewed as having responsibility for adjusting the level of support or guidance required to fit the novice’s zone of

proximal development.

According to Vygotsky (1978), language is a powerful mediating mechanism in cognitive change, critical in the development from 'natural' to 'higher' mental processes. Language, through the course of interacting with others, provides the tools for reflection and reasoning. Effective verbal interactions support student's engagement in higher order cognitive processes (King, Staffieri, & Adelgais, 1998). Such interactions include providing elaborate explanations, asking appropriate questions, providing sufficient time for the partner to think, and using supportive communication skills such as listening, giving feedback and encouragement (Webb & Favier, 1999).

Many studies have documented the benefits of collaborative peer interaction (e.g., Ames & Murray, 1982; King, 1999; Light & Littleton, 1994; Rogoff, 1990; Samaha & De Lisi, 2000; Teasley, 1995; Webb & Favier, 1999). Studies by Teasley (1995) and Garton, Harvey, and Pratt (2003) found that the total number of utterances used in interaction between peer collaborators was significantly associated with improvement in reasoning strategies or problem-solving ability. And Samaha and De Lisi (2000) reported that students working with peer were outperformed those working alone on the block design task.

Also research has found that children who work collaboratively with peers attain a combined higher achievements than children working individually (Moshman & Geil, 1998; Samaha & De Lisi, 2000; Underwood, Underwood, & Wood, 2000). However, the cognitive benefits of peer collaboration may depend on a complex set of factors such as age (Hogan & Tudge, 1999; Johnson-Pynn & Nisbet, 2002), comparative ability level of partners (Garton & Pratt, 2001; Lee & Lee, 2007), confidence (Tudge, Winterhoff, & Hogan, 1996), and gender (Strough, Berg, & Meegan, 2001). These studies imply that children's verbal interaction in peer collaboration can be differed by various factors for example, children's age, gender, and grouping conditions. Although peer collaborative interaction is not always associated with individual cognitive change (Doise & Mugny, 1984; Levin & Druyan, 1993; Tudge & Winterhoff, 1993), the researchers suggest that our knowledge of factors that provoke active participation in interaction and verbal communication with a partner can help teachers know how to implement collaborative learning in the classroom effectively.

However, there are few researches examine factors (for example, age and gender) influencing very young children's verbal interaction in collaborative situations and there exist inconsistent findings about the effects of grouping conditions. Therefore, this study aimed to examine young children's verbal interaction in joint problem solving situations that differed according to children's age (i.e., 4 and 5 years), gender (i.e., boy and girl), and pairing conditions (i.e., dyad matched for same cognitive level and unmatched dyad --different level).

Method

Participants

The participants of the study were 120 four year olds (29 boys and 31 girls) and five year olds (25 boys and 35 girls) recruited from a preschool in Busan, South Korea. They were assigned to one of two groups: 1) Matched Dyads (i.e., pairs of children with the same level of task completion) and 2) Unmatched Dyads (i.e., pairs of children at differing levels) based on a pretest to determine children's cognitive level. (Refer to table 1)

Table 1. *Participants*

Age	Gender	Matched Dyads	Unmatched Dyads	Total
4	Boy	14	15	29
	Girl	16	15	31
	Subtotal	30	30	60
5	Boy	13	12	25
	Girl	17	18	35
	Subtotal	30	30	60
Total		60	60	120

Procedure

Pretest for pairing. A pretest was used to determine assignments for pairing conditions. Subjects were tested individually by a female graduate student using a 4 cube block puzzle with an animal picture for 4 year olds and a puzzle with 12 cubes

with a Korean traditional play picture for 5 year olds. Each child was invited to a separate room at the preschool and asked to complete the picture correctly in 20 minutes. Children's task completions times were recorded and scored as falling within one of three levels (high, middle, and low). Based on the scores, the top 25% of the children were classified as high level group, 50% of the children as middle level, and the bottom 25% of the children as low level. The unmatched pair was composed of high level and low level subjects paired together randomly and the matched pair was composed of middle level and middle level subjects paired together, with each dyad composed randomly. For pairing, according to Golbeck(1998)'s study, which shows pairing same with same sex will produce positive interaction. We tried to make this condition but we failed. So there exist both same gender pairs and mixed gender pairs in this study.

Joint problem solving. After pairing each dyad took part in joint problem solving task. The children worked together on another block task composed of 4 sticks and 12 cubes. Each stick has space for 3 cubes to be placed in order on the stick to make a completed picture. When each dyad was invited to a separated room in the preschool, the children had 5 minutes to put together a flat puzzle while viewing a picture of the completed puzzle. This task provided an opportunity for the pair of children to get to know each other and to get familiar with collaborative work (i.e., a process for establishing rapport). After 5 minutes, the dyad was asked to work together to complete the season block as quickly as possible. Each dyad had 15 minutes of limited time for solving the task. Their performance and verbal interactions during joint problem solving were recorded by a video camera.

Data analysis

To analyze the children's verbal interaction, utterances used in interaction between the peer collaborators were transcribed from the videotapes and coded into one of eight categories that the researchers generated based on work by Hogan and Pressley (1997) and Kermani and Brenner (1996) (Refer to table 2). Inter-coder agreements for each category are also shown in table 2. After finishing the coding, the frequency of utterances in each category was counted. To test the hypotheses, we

analyze one-way ANOVA using with SPSS Win 12.0 program.

Table 2. *Categories of Eight Verbal Interaction Types*

Interaction Types		Categories	Inter-coder agreement
A. Task Oriented	1) Question	• An inquiry by a subject regarding task strategy or their partner's opinion. (e.g., OK. Hows that?)	.94
	2) Hint	• Give a new idea or cues indirectly to solve the problem. (e.g., How about finding trees or green color?)	.87
	3) Demonstration	• Demonstrates for the partner how to perform the task (e.g., To make a frame, you turn the piece like this)	.81
	4) Explanation	• Include an expression of a subject's reasoning or justification of a task strategy, statements about how to solve the puzzle or telling a partner what to do. (e.g., This piece should be the bottom part.)	.93
	5) Correction	• Correct the partner's error (e.g., Thats not right, try another piece)	.91
B. Affective Support	6) Prompt	• Bring focus back to the task and request clarification. (e.g., Let's come back to the puzzle.)	.88
	7) Encouragement	• Promote each other to encourage or motivate including emotional support (e.g., Good job, Cheer up)	.83
C.	8) Task Irrelevant	• Task unrelated interaction (e.g., This foot stinks.)	.92

Results

Descriptive statistics of children's verbal utterances are presented in Tables 3, 4, and 5. Tables 3, 4, and 5 present the means, standard deviations, and percentages for each of the eight categories of verbal interaction by groups, age, and gender, respectively. Several findings are apparent in these statistics.

First, children in both groups were engaged mainly in ‘demonstration’ and ‘explanation’ while working on problem solving. As seen in Tables 3, 4, and 5, these two categories both occupied the top two percentages of the eight categories in both groups.

Second, a larger number of total verbal interaction was observed in the unmatched condition than in the matched condition ($M=7.78$ vs. $M=7.28$) although in three of the eight subcategories (e.g., ‘question’, ‘encouragement’, and ‘task-irrelevant interaction’), children in the matched condition produced more utterances than those in the unmatched condition.

Table 3. Means, Standard Deviations, and Percentages of Eight Verbal Interaction Categories by Pairing Condition

	Matched			Unmatched		
	M	SD	%	M	SD	%
Q	1.05	1.50	14	.82	1.26	11
H	.33	.68	5	.45	.79	6
D	1.60	2.12	22	2.13	2.71	28
Ex	1.78	2.43	24	1.85	2.23	24
C	1.22	1.40	17	1.28	1.62	16
P	.15	.44	2	.33	.75	4
En	.78	1.33	11	.72	1.32	9
TI	.37	1.01	5	.20	.63	2
Total	7.28	8.08	100	7.78	7.67	100

Q : Question, H : Hint, D : Demonstration,
Ex : Explanation, C : Correction, P : Prompt
En : Encouragement, TI : Task Irrelevant

Third, four-year-olds showed more interaction in total frequency of verbal utterances than did five-year-olds ($M=7.87$ vs. $M=7.21$). However, this tendency is consistent in only three subcategories -- ‘demonstration’, ‘explanation’, and ‘correction’. Four-year-old children also had higher frequencies in these three subcategories than did five-year-olds. In the other categories of ‘question’, ‘hint’, ‘prompt’, ‘encouragement’, and ‘task-irrelevant’, five-year-olds emitted more utterances than four-

year-olds.

Table 4. Means, Standard Deviations, and Percentages of Eight Verbal Interaction Categories by Age

	4			5		
	M	SD	%	M	SD	%
Q	.83	1.26	11	1.03	1.50	14
H	.33	.68	4	.45	.79	6
D	2.17	2.93	28	1.57	1.79	22
Ex	2.17	2.73	28	1.47	1.79	21
C	1.33	1.64	17	1.17	1.37	16
P	.12	.37	1	.37	.78	5
En	.72	1.30	9	.78	1.34	11
TI	.20	.84	2	.37	.90	5
Total	7.87	8.68	100	7.21	6.99	100

Fourth, boys showed more verbal interaction than girls. Both the total and all sub frequencies of verbal interaction in boys were twice as frequent, or more than the frequency for girls.

Table 5. Means, Standard Deviations, and Percentages of Eight Verbal Interaction Categories by Gender

	Boys			Girls		
	M	SD	%	M	SD	%
Q	1.19	1.53	12	.71	1.22	13
H	.56	.79	6	.26	.67	5
D	2.61	2.72	26	1.25	2.01	23
E	2.41	2.48	24	1.34	2.10	25
C	1.56	1.78	15	.98	1.21	18
P	.33	.75	3	.17	.49	3
E	1.02	1.41	10	.51	1.20	10
TI	.44	1.09	4	.15	.62	3
Total	10.02	8.51	100	5.37	6.68	100

In order to determine whether there were differences in the frequency of children's verbal interaction in collaborative work based upon pairing conditions, age, and gender, several one way ANOVA were computed for the three categories of interaction (e.g., "task-oriented interaction", "affective support interaction", and "task-irrelevant interaction"). The results from the ANOVAs for each of the three categories of utterances were as follows:

Table 6. *Means and Standard Deviations of Three Categories by Pairing Condition, Age and Gender*

		Matched Dyads				Unmatched Dyads			
		4 (n=30)		5 (n=30)		4 (n=30)		5 (n=30)	
		Boys (n=14)	Girls (n=16)	Boys (n=13)	Girls (n=17)	Boys (n=15)	Girls (n=15)	Boys (n=12)	Girls (n=18)
Task Oriented	M	7.64	5.19	5.67	5.53	11.00	3.14	8.17	4.11
	SD	7.56	6.77	6.31	5.98	7.98	4.67	4.00	3.79
Affective Support	M	.93	.56	1.00	1.18	1.63	.14	1.83	.72
	SD	1.14	1.26	1.60	1.91	2.06	.53	2.29	1.23
Task Irrelevant	M	.57	.00	.42	.53	.19	.07	.67	.00
	SD	1.60	.00	.90	1.13	.54	.27	1.16	.00

For 'task-oriented interaction', a significant effect of gender ($F = 10.373, p < .01$) and an interaction effect of condition by gender ($F = 4.283, p < .05$) were observed. Boys produced more task-oriented interaction than girls in both matched and unmatched conditions. However, as seen in Figure 1, the difference in the amount of verbal interaction between boys and girls in the unmatched condition was larger than in the matched condition.

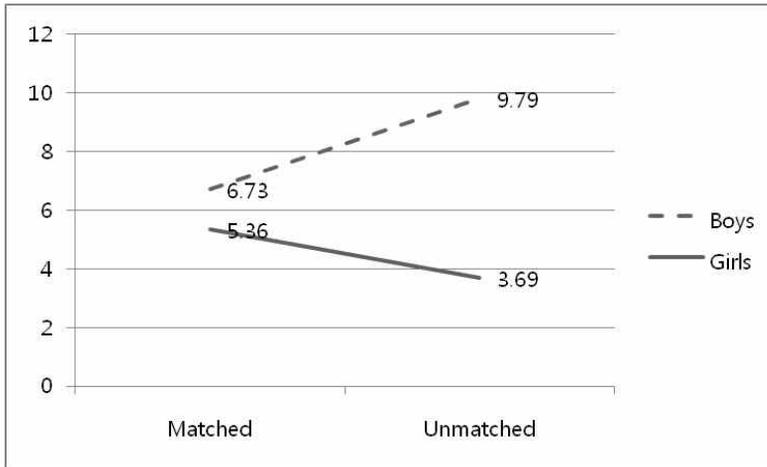


Figure 1. Interaction Effect of Pairing Condition by Gender on Task Oriented

A similar pattern of findings was observed for ‘affective support interaction’. A significant effect of gender ($F = 5.632, p < .05$) and an interaction effect of condition by gender ($F = 4.201, p < .05$) were found. In both pairing conditions, boys showed more affective support interaction than girls. The interaction shown on Figure 2 indicates that boys emitted many more utterances than girls especially in the unmatched condition.

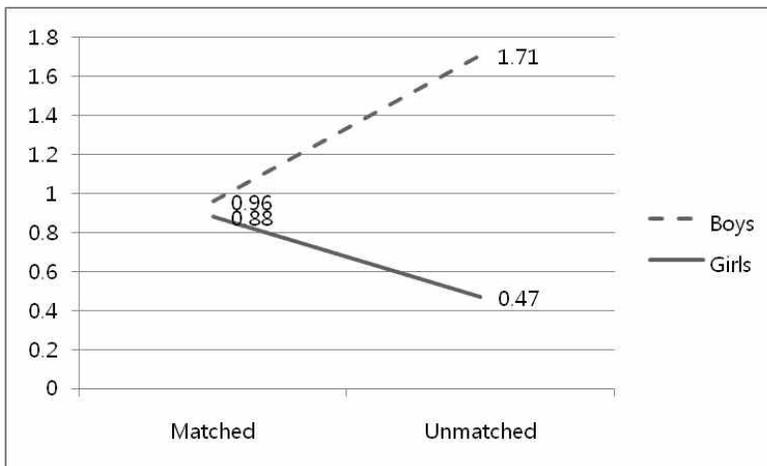


Figure 2. Interaction Effect of Pairing Condition by Gender on Affective Support

No significant effect was found for 'task-irrelevant interaction' in terms of pairing conditions, age, and gender.

Discussions and Conclusions

The purpose of the study was to investigate whether young children's verbal interaction in joint problem solving would differ according to their age (i.e., 4 and 5 years), gender (i.e., boy and girl), and pairing conditions (i.e., matched dyad which is composed of same cognitive level and unmatched dyad composed of different level). First of all, although the unmatched condition elicited more utterances in many categories of task-oriented and affective support interaction than the matched condition, the difference between the matched and unmatched dyads was not significant. This finding contradicts Golbeck (1998). From an observation of children in middle childhood working on the Piagetian water-level task, Golbeck found that matched dyads talked more than the unmatched dyads in each type of interaction including 'disagreements', 'explanations', 'questions', 'agreements', 'organizational comments', and 'extraneous comments' as well as in total speech acts. The difference between the matched and the unmatched groups in total amount of talk approached, but did not reach significance with the matched group talking more. However, another study (Seo & Ohm, 2006) reported no differences in young children's social interaction between the matched and the unmatched groups.

The finding supports some previous studies, for example, Kim & Kim (2006), Lee & Lee, 2007, Webb, 1982). They showed that there are not many differences between the matched and unmatched group and suggest that the grouping condition may not be an important factor influencing children's interaction in collaborative work. However, as seen in the above, researchers reported different predictions and outcomes about effects of collaboration under differing peer collaboration situations on young children's collaborative strategies and little data are available at present, further studies are needed.

Secondly, boys showed significantly higher frequencies in task-oriented and affective support interaction than girls. This finding is consistent with Chung's (2003)

finding. She observed that boys produced more scaffolding than girls in peer interaction. An interesting finding in this study, however, was that the gap of interaction frequency between boys and girls was different, depending on the collaboration condition. The gap in the unmatched condition was larger than that in the matched condition, which means that the unmatched condition elicited an increase of both task-oriented and affective support interaction for boys while decreasing these interactions for girls.

To understand the gender difference, the researchers examined previous studies concerned on play qualities of girls' and boys' play. According to Smith and Inder (1993), boys tend to play in more public places with less proximity to and less supervision from adults than did girls. Boys also tend to be rougher than that of girls and more often involved physical contact, fighting, and taunting. In contrast, girls emphasize cooperation among play partners and promote group harmony (Maccoby, 1990). An example of the differing trajectories of development that are proposed for boy and girls on the basis of their peer experiences involves opportunities for structured and unstructured play (Carpenter, Huston, & Holt, 1986). Based on these reasoning, the researchers consider that the unstructured activities and less supervised interaction are likely to be associated with boy's more active interaction in this study.

In addition, boys prefer to guide peer in their task rather than adult. In contrast, girls expect to intervene from adult and prefer interacting with adult to peer (Ha, 2005; Fabes, Eisenberg, Jones, Smith, Guthrie, and Poulin et al., 1999). From these findings, it may possible to infer that preferring peer interaction and lacking adult's help and guidance made boys involve in peer interaction more actively than girls. And according to Maccoby & Jacklin (1987), boys quickly establish a hierarchical pecking order, and this order tends to remain stable over time. This may result in the higher level boy giving information and directions to the lower level boy partner. That is, while the boys tended to give as many as explanations, directions, and hints etc., to take the initiatives in their work, the girls might not tend to offer as many directions or information to each other due to their desire to maintain harmony in this study.

It was not easy to interpret the findings found in this study because there are little

researches on young children's dyad-collaborative work and on gender differences in children's verbal interaction in peer collaboration. The researchers consider that many other variables such as children's personality, interest, and sociality etc., might influence to the children's verbal interaction. Therefore, the researchers present two suggestions. First, further practical evidences are needed concerned on young children's verbal interaction in collaborative work especially in dyad learning. Second, it is necessary to examine possible factors besides age, gender, and grouping conditions to influence young children's verbal interaction during joint problem solving. From our previous study (i.e., Lee & Park, 2009), the researchers suggest to consider task type for collaborative work and individual characteristics such as individual interests and level of sociality besides individual cognitive level for grouping or pairing condition. Qualitative studies to look at characteristics of young children's peer interaction in depth will be also helpful to have better understanding of gender differences in collaborative work.

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