DEVELOPING UNDERSTANDING AND SOCIAL SKILLS THROUGH COOPERATIVE LEARNING

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This study has two parallel research agenda: (1) the development of social skills and pedagogical content knowledge in teacher candidates as they work collaboratively in pairs, and (2) the development of conceptual understanding and social skills in elementary school students who are taught by teacher candidates with cooperative learning orientation. The extent of pedagogical content knowledge gained from the collaborative work by the teacher candidates was compared with those working individually. The social skills gained from collaboration were assessed through the use of observation rubrics and a checklist. The same checklist was used to rate the elementary students' participation as they carried out the science activities provided by the teacher candidates. Student understanding of the science concepts in the lessons taught was assessed by a test. Results show that success, in terms of enhanced understanding and social skills development, was associated with varying levels of cognitive complexity of the lessons and higher levels of accountability.

INTRODUCTION

Research has shown that cooperative learning has many positive effects on a range of student outcomes. Two of these outcomes are explored in this study – achievement and social skills development. According to the Education Research Consumer Guide, student

achievement in cooperative learning is best promoted when two necessary key elements, group goal and individual accountability, are used together. In order for members of a group to reach the common goal (the group goal), they must utilize adequate collaborative social skills to function successfully. Students working in cooperative groups are not only responsible for learning the material that is presented to them in class, but also for ensuring every one in the group knows the material as well (Henley, 2004). This responsibility carries both group and individual accountability.

THE RESEARCH PROBLEM

This study has two parallel agenda: (1) the development of social skills and pedagogical content knowledge in teacher candidates as they work collaboratively in pairs, and (2) the development of conceptual understanding and social skills in elementary school students who are taught by teacher candidates with cooperative learning orientation.

Three research questions emerged out of the above-mentioned research agenda:

1) How do the two types of teaching using different cooperative learning structures compare in terms of beneficial effects for both teachers and students?
2) What is the effect of cooperative learning on student achievement and social skills development?
3) What conditions are necessary for the successful implementation of cooperative learning in the science classrooms?

The first research question deals with the impact of teaching on student outcomes and the teachers' own learning. Two types of teaching that utilized cooperative learning are compared in terms of their effects not only on the teachers' own professional life but

also on two student variables. They are achievement and social skills development. These are the two dependent variables that will be investigated to answer the second research question.. The third research question explores the conditions that cooperative learning may be expected to be more productive. These conditions are more or less associated with the basic elements of cooperative learning cited by Johnson and Johnson (1999) that include: (1) face-to-face oral communication, (2) positive interdependence, (3) individual and group accountability, (4) interpersonal, collaborative social skills, and (5) group processing.

Research Methodology

Four schools were involved in this study with one of the schools initiating the partnership between University of Guam School of Education and the Department of Education. This partnership involved the major participation of the teacher candidates enrolled in methods and practicum courses in the Elementary Education Program. Four lessons in the area of *Matter and Energy* were agreed to be taught by them using cooperative learning strategies. All the teacher candidates who went out to schools for their practicum experience had a month orientation on cooperative learning in their science methods course. They were allowed to choose the cooperative learning strategies they deemed appropriate for developing conceptual understanding and social skills in students from K-5. (In Guam, elementary schooling ends in Grade 5. The subsequent grade levels fall within the jurisdiction of middle school and high school).

The study focused on the teacher candidates who taught the science classes in Grades 3 and 5. These are the only grade levels with teacher candidates who worked collaboratively in pairs and with matching teacher candidates who worked individually on the same topics under the umbrella of *Matter and Energy*. Table 1 shows

the distribution of their respective students by gender and grade level.

Table 1
Students' Distribution by Grade Level and Gender

Grade	Level	School Teaching Type	Gender		Total
			Male	Female	
3	A	Pair teaching	8	6	14
	B	Individual teaching	10	11	21
5	C	Pair teaching	7	5	12
	D	Individual teaching	11	11	22
Total			36	33	69

Schools A, and C had two teachers who worked in pairs. They designed the lessons collaboratively and taught them cooperatively. One took care of lesson presentation and the other, the lesson closure. At least two cooperative learning structures were used by them per lesson.

For example, Pair A, from School A used *Roundrobin/Roundtable* (for lesson closure) and *Cooperative Group Investigation* (for lesson presentation) in teaching the four lessons of *Matter and Energy.* Lesson presentation involved the utilization of guided discovery learning through the use of an activity sheet and a set of materials for the experiment performed by the group. *Roundrobin/Roundtable* was used to summarize what the members of the group learned from the activity they have carried out through the use of *Cooperative Group Investigation* where each member of the group was given a role to play (e.g. leader, recorder, materials officer, clean-up monitor). Assignment of roles was done on a rotation basis.

Pair C, from School C used three cooperative learning structures. Each lesson taught always started with a situation followed by a problem to solve. *Think-Pair-Share* was used for this part of the

lesson. After thinking of a possible solution or an idea to help solve the problem, each member of the group took a partner and both shared their ideas to one another. Each pair discussed with another pair their ideas. Both pairs had to agree on the most workable solution to be shared to the whole class. Activities related to the proposed solutions were tried out in different corners of the room. In *Corners*, each group chose a particular place in the room that had the procedure and materials to use to carry out the activity intended to provide the solution to the problem stated at the beginning of the lesson. After whole class discussion of findings, the groups were engaged in another cooperative learning structure, *Graffiti*, to summarize what they have learned.

Schools B and D had only one teacher candidate each to teach the class. Only one cooperative learning structure was used in teaching the same lessons taught by the teacher candidates in schools A and C. The teacher candidates in schools B and D chose *STAD (Student Teams Achievement Division).* Four groups were created in each of the two classes with 21 and 22 students from School B and School D respectively. Most of the groups had five members and some one or two groups had six. Without the support of a working partner each teacher candidate wrote lessons plans following the four-step cycle of *STAD* – teach, team study, test and recognition. The teaching phase began with the presentation of the material usually in a lecture-discussion format. During team study the members of the group worked cooperatively with teacher provided activity sheets. Then they discussed the results of the activity/ experiment and prepared for a test. Next, each member took the test and the scores of the members of the group were summated to determine the group grade for recognition purposes.

The extent of pedagogical content knowledge gained from the collaborative work by the teacher candidates in Schools A and C was compared with those working individually in Schools B and D. The social skills gained from collaboration were assessed through

the use of an observation rubric and a checklist. The same checklist was used to rate the elementary students' participation as they carried out the science activities provided by the teacher candidates. Student understanding of the science concepts in the lessons taught was assessed by a test.

The quasi experimental posttest only nonequivalent control group design was employed for this study (Wiersma, 2000). The independent variables operate at two levels:

1) Type of teaching – Pair teaching where the two teachers worked collaboratively in designing lesson activities that utilized cooperative learning and carrying them out cooperatively versus individual teaching involving only one teacher carrying out cooperative learning in his/her teaching. The former represents the experimental set-up while the latter represents the control set-up.

2) Gender – Performance of male students versus performance of female students in both set-ups.

The dependent variables are achievement and social skills development in terms of student outcomes. The teachers' pedagogical content knowledge and social skills development also form part of the dependent variables.

RESULTS AND DISCUSSION

Cooperative Learning and Student Achievement

The following table shows the means obtained by the four classes who were taught using different cooperative learning structures.

Table 2
Means of the Different Cooperative Groups by Gender

Grade	Sch	Type of Teaching	M	F	Grp
3	A	Pair teaching (Used *Roundrobin/Roundtable* and *Cooperative Group Investigation)*	86.25	83.33	84.79
	B	Individual teaching (Used *STAD*)	80.40	80.18	80.29
5	C	Pair teaching (Used *Think-Pair-Share, Corners, Graffiti)*	82.86	74.60	78.73
	D	Individual teaching (Used *STAD*)	75.73	76.27	76.00
		Gender Group	81.31	78.60	

The summary of means shown in Table 2 indicates that those who used at least two cooperative learning structures in teaching had higher student achievement outcomes than those who used only one cooperative learning structure.

The use of more cooperative learning structures per lesson provided the students more opportunities to interact with one another. Current research on student/student interaction shows that students who 'talk through material with peers' learn it more effectively than students who just read or listen to the material (Johnson & Johnson, 2004).

The utilization of varied interactive opportunities enhanced student thinking and communication skills. In Grade 3 (School A), for example, the use of *Cooperative Group Investigation* helped students go through the process of inquiry as they carried out various roles. This cooperative learning structure puts heavy premium on both oral and written communication. In *Roundrobin/ Roundtable* that was used for lesson closure, the students were encouraged to recall what they have learned, apply them to practical situations, and share them to the whole class. The use of *Think-Pair-Share, Corners* and *Graffiti* in Grade 5 by School C for difficult lessons involving higher thinking skills proved successful. In *Think-Pair-Share*, the students were encouraged to think of solutions to problem situations, formulate hypothesis, and share their ideas to a larger group. *Corners* allowed them to test their ideas through cooperative group experiments and process cooperatively information obtained from testing their ideas. For lesson closure, *Graffiti* was used to summarize what they have learned and order the information they have provided in a logical sequence. The 2.73 lead of the combined use of *Think-Pair-Share, Corners* and *Graffiti* over *STAD* shows that these cooperative learning structures favor students' performance at higher learning levels (those that required the use of integrated science processes and problem-solving skills). This finding supports an earlier one in the study conducted by Chang and Mao (1999).

Moreover, retention of information is enhanced because when students are given more opportunities to work in various cooperative relationships, they develop a conscious strategy on how to study and search for answers to questions. Informal interviews by teacher candidates of their students revealed the students' strong preferences for 'making things happen together' and group processing of the material because from it they ' come to know how to do things right.' It appears that the more interaction the group is

provided, the more likely the group will be successful and that all members will master the material.

It is interesting to note that those who used at least two cooperative learning structures have smaller classes. Thus, membership per group was also small. Schools A and C had mostly three members in a group. The group was small enough to facilitate useful interaction in contrast with those in Schools B and D where interaction was limited by time and number of participants. There was not much time for all the members to participate actively, talk things through and negotiate meanings for what they were learning. It appears that group size can have a significant effect on student performance. According to Holt (2004), the highest levels of success occur when groups are kept small. Additionally, the smaller the size of the group, the greater the individual accountability. Individual accountability is one of the two key elements needed to promote student achievement.

COOPERATIVE LEARNING AND SOCIAL SKILLS DEVELOPMENT

The social skills checklist developed at Lester University and used by National Institute of Education Singapore was utilized in this study to determine the social skills development in students as they used cooperative learning. Refer to Table 3 below for the results.

The social skills that were *always* manifested in cooperative learning activities are skills 1, 5 and 10. Those that were exhibited by the students *most of the time* are skills 3, 4 and 7. Skills 2, 6 and 8 were *sometimes* demonstrated by the students. Skill 9 – *resolving conflict* was *seldom* manifested in student interactions. When conflicts emerged out of group discussions, the students simply sought the assistance of the teacher. Very little attempt was done (usually by a few assertive male students) to resolve the conflict.

Generally, the social skills development in Schools A and C is much better than in Schools B and D. This may be due to the fact that the groups in these schools are smaller than those in Schools B and D. The use of cooperative learning in small groups allows students to interact more freely; thus, greater social skills are demonstrated.

Table 3
Social Skills Percentage Scores by Schools

	Social Skills	A	B	C	D	Overall
1.	Staying on task with the group	83	83	84	82	83
2.	Speaking in quiet voices	82	78	70	64	74
3.	Taking turns	87	74	77	65	76
4.	Listening attentively	82	63	84	78	77
5.	Contributing ideas	100	82	100	82	91
6.	Asking questions	80	78	70	67	74
7.	Interrupting appropriately	89	74	78	73	79
8.	Encouraging one another	70	78	70	62	70
9.	Resolving conflict	43	42	43	40	42
10.	Speaking politely	100	100	100	80	95

As a whole, this study has shown the development of social skills in various cooperative learning structures used by Schools A, B. C and D. With the exception of one skill (resolving conflict), cooperative learning has demonstrated its positive effect on social development. Cooperative learning encourages social and interpersonal development as students learn how to work together and to appreciate diversity. Many studies credit the approach with improved cooperative attitudes (Walters, 2004).

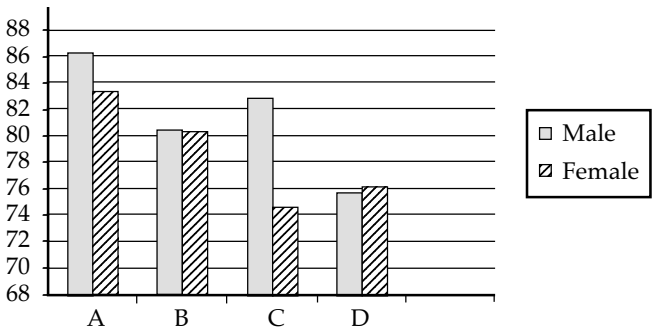

Figure 1: Difference in Achievement Between Males and Females Across Schools

GENDER DIFFERENCES

The graph below shows how male and female students differed in their science achievement after going through cooperative learning in studying the four lessons on *Matter and Energy.*

Generally, the male students who obtained a mean score of 81.31 performed better in cooperative learning than the female students whose mean score was only 78.60. This finding concurs with that of Chen (1999) in his study of cooperative learning in elementary science. His study showed a significant difference in gender in favor of the male students in a test that measured student achievement in terms of science concepts, nature of science and processes of science.

The result of the current study may be attributed to the kind of interactions that favored the male students in Schools A and C. Observation results show the dominance of male participation in group discussion, presentation of ideas to a larger audience, asking questions, and an increased persistence in task completion.

In terms of social skills development, there is not much difference between the genders. The female students had an overall score of 76.4% while the males scored only 75.4%. The lead of the females

over the males is shown in their performance in four skills: skill 2 – *speaking in quiet voices*, skill 3 – *taking turns*, skill 4 – *listening attentively*, and skill 7 – *interrupting appropriately*. Refer to Table 4 below.

Table 4
Gender Difference in Social Skills Development Across Schools

Skills	Gender	A	B	C	D
1	M	83	84	83	82
	F	83	82	84	82
2	M	80	76	71	64
	F	83	80	68	64
3	M	80	72	74	65
	F	93	75	80	65
4	M	80	64	83	78
	F	83	62	84	78
5	M	100	82	100	82
	F	100	82	100	82
6	M	83	78	71	67
	F	77	78	68	67
7	M	78	70	80	73
	F	100	78	76	73
8	M	70	76	71	62
	F	70	80	68	62
9	M	43	42	46	40
	F	40	42	40	40
10	M	100	100	100	80
	F	100	100	100	80

The males scored better than the females in just two skills: skill 6 – *asking questions*, and skill 9 – *resolving conflict*. The lead of the males in these two skills was contributed by the male students from Schools A and C. The groups in these classes are smaller than those in Schools B and D. This finding supports the statement of Schmidt (2000) that the use of cooperative learning in small groups allows for more student participation while developing greater social skills. Her statement also holds true with the performance of the female students between schools within the same grade levels (A vs B and C vs D) for skills 1, 2, 3, 4, 5 and 7. The females in School C did better than their counterpart in School D for skills 6, 8 and 10.

COLLABORATIVE LEARNING IN PROFESSIONAL DEVELOPMENT

The teacher candidates working in pairs developed their plans of action collaboratively. They underwent much discussions on what cooperative learning structures to use until an agreement was reached. The underlying premise of collaborative learning is based upon consensus (Panitz, 1996).

Initial reflections of the teacher candidates' teaching revealed certain realizations about how students learn. Their observations and discussions with their learning partners enabled them to plan appropriate learning experiences for students within various cooperative learning contexts. One teacher candidate stated, "It was a bonus to have a partner during each lesson because he was able to give me immediate feedback on what went well or needed improvement in my teaching." Another one revealed, " Teamwork is a great opportunity to enhance my strength and face the challenges of teaching that lie ahead." The other partners commented on the value of dialogue as an avenue for 'learning more.' "I learned a lot from observing my students work but I learned much more from dialoguing with my partner." It is primarily through dialogue and

examining different perspectives that one can become knowledgeable, strategic, self-determined, and empathetic.

Collaborative learning has taught the teacher candidates in this study a myriad of techniques that create interactive environments. When asked about which one they preferred most, one replied, " I like *Think-Pair-Share* because there is a lot of negotiation of meaning here. The process of negotiation makes me learn to examine my own thoughts and accept their shortcomings. I think this is a powerful way of learning and I want my students to experience it." Another one mentioned the beneficial effects of *Roundrobin/ Roundtable.* "These cooperative learning structures helped my students develop listening skills, waiting for one's turn, contributing sensible ideas, and encouraging one another to talk (particularly the less active, less conversant ones)."

"Cooperative learning has developed in my students a sense of 'family' in the school. I think students who develop this kind of relationship with the teacher and group mates will achieve better results and tend to love school. I have a boy in class who was a truant prior to the introduction of cooperative learning. When cooperative learning was used regularly in his class he began reporting to class regularly, too. Cooperative learning, indeed, has a positive effect on this boy's motivation to learn. Of all the students in his class, he was the only one who got the highest gain score."

The journal writing entries of the teacher candidates in Schools B and D also showed favorable response towards cooperative learning. Although they find the managing component of cooperative learning easy they acknowledged 'certain difficulties in designing and carrying out some group tasks, especially those that require higher order thinking that need to be done in the team study phase of STAD.' Such a problem could be addressed by collaboration with peers. Boo, Ng, Chew, Lee, Yeo and D'Rozario (2001) hold the same view. They advocate that as part of teacher

training, pre-service teachers should work together in cooperative groups within schools. This was the case with the teacher candidates who worked in pairs as they carried out cooperative learning in schools A and C. Schools that connect teacher learning to student learning often have a better chance of making a positive impact on student outcomes. Collaborative work provides opportunities for teachers to work together to make those connections through examining their practice, consulting with colleagues, and developing their skills.

CONCLUDING STATEMENTS

Cooperative learning is very dependent upon interactions. There are cooperative learning structures that encourage promotive and useful interactions. The use of a combination of them in a single lesson can produce desired results in achievement.

Interactions are well promoted in small group learning activities. The size of the group has a strong influence on the quality of interactions taking place. The smaller the group, the better is the interaction because everyone gets a chance to participate. The use of cooperative learning in small groups allows students to interact more freely, develop greater social skills and participate more actively in the learning process.

Interactions among group members are helpful in focusing the group on their goals. Promotive and useful interactions can only be achieved when the social skills of students are well developed. Positive peer relationships formed during cooperative learning can help develop the social skills needed to bring about positive effects on student achievement.

Interactions among students around appropriate tasks increase their mastery of critical concepts. The appropriateness of tasks is determined better by not just one teacher. The saying that *two heads are better than one* holds true in this situation. When at least two

teachers get together to plan the learning tasks for children and the cooperative learning structures that are intended to carry out these tasks, their decisions are validated by discussions, arguments and even negotiations. When cognitive conflicts arise, inadequate reasoning will be exposed, disequilibrium will occur, and negotiated meanings will emerge. The interactions among teachers who operate in one another's zone of proximal development are very helpful in promoting the pedagogical content knowledge of teachers.

The benefits of collaborative work among teachers cannot be denied. Teachers who discuss their ideas with colleagues, work out a plan of action with them and seek their feedback of their own teaching learn more than those who just read about or listen to lectures on pedagogical knowledge development. Creating a community of professional learners is easily accomplished using collaborative and cooperative learning structures in the professional development of teachers.

The use of cooperative learning by teachers in the classroom offers numerous advantages. The following have been observed in this study:

1) Sense of responsibility is developed in students.
2) Interaction is promoted and the higher the level of interaction, the deeper the learning becomes.
3) A feeling of connection between teachers and students is achieved.

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