UNIVERSITY OF THE VIRGIN ISLANDS

# COOPERATIVE LEARNING:
# THE VERBAL INTERACTION OF
# THIRD GRADE STUDENTS
# IN MATHEMATICS
# AT THE
# RICARDO RICHARDS ELEMENTARY SCHOOL



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# Abstract

This study examined the content and form of third grade students' verbal interactions while working in a naturalistic setting. Four students, two boys and two girls, attending the Ricardo Richards Elementary School participated in the study. Students' verbal interactions were tape recorded during mathematics group instruction for two weeks or a total of 400 minutes.

The content and form of students' verbal interactions were examined in terms of four general categories. These were Procedural, Academic, Individualistic and Social/Emotional. These general categories were further divided into a total of ten subcategories to provide a comprehensive description of the types of content discussed in small learning groups. The data were transcribed and categorized using the *Taxonomy of Verbal Interaction Content* (TVIC) designed by Web (1988).

Results showed that students' verbal interactions were primarily characterized as Procedural and Academic in focus with a substantial portion of discussions occurring both at a low and a high cognitive level of complexity. Students' group discussions evidence a minimal amount of Individualistic and Social/Emotional talk. Group discussions were on task and non negative in tone.

# CHAPTER I

## Introduction

Cooperative learning is a family of instructional approaches that have been widely used throughout the United States and other nations. A number of research studies have supported the use of cooperative learning indicating its positive outcomes. Studies have shown that cooperative learning increases academic achievement (Kambiss, 1990; Slavin, 1987), increases students' self-esteem (Sharan, Hertz-Lazarowitz & Ackerman, 1980) and facilitate student motivation by providing peer support (Lyman & Foyle, 1988).

Kalowski (1988) points out that cooperative learning is not one specific method but rather a variety of approaches. These approaches differ substantially in their structures, but they all depend on students helping each other to learn within their groups. Some of the approaches can be used across subject areas, while others are subject specific. The common elements of cooperative learning approaches, however, are that they all involve groups ranging from two to six students, who work together to learn academic content and skills with little or no direct teacher instruction during group work (Deering & Meloth, 1990).

Many cooperative learning methods are currently being used in classrooms. A brief discussion of the most common ones follow.

Student-Teams-Achievement Divisions (STAD) is one cooperative arrangement in which each group reviews material previously taught by the teacher. Students take individual tests; a group score is calculated by comparing each member's performance with that on the previous test. Two other approaches identified by Johnson & Johnson (1986) are Teams-Games-Tournaments (TGT) and Group Investigation. In the former approach each group reviews materials previously taught by the teacher. Each member then competes in a tournament against members of equal ability from other groups. Points are

awarded for tournament competition and these are added for each group. In the later, each group completes a project on a selected topic. The entire class may do the same topic or it can be subdivided. In addition, Johnson and Johnson (1986) identify the Jigsaw approach in which the material to be learned is broken into pieces. Each member learns one part and reviews this with those from other groups. They then return to the original group and teach other members.

Slavin (1987) described two different approaches to cooperative learning. These are Teams Assisted Instruction (TAI) and Cooperative Integrated Reading And Composition (CIRC). The first approach is a method designed to practice math computation in grades 3 thru 6. Once students are grouped, they enter an individualized sequence determined by a placement test, then proceed at their own pace. Students check one another's work against answer sheets, discuss reasonableness of answers and help with problems. The second approach uses basal readers with reading groups. Each student is paired to create four person teams. Each pair comes from the same reading group. Pairs read to one another, make predictions, summarize stories, and practice spelling. During language arts periods, students write drafts, edit one another's work, and publish team books.

With each of the aforementioned approaches, group interaction is a critical factor. According to Slavin (1987), the positive outcomes of cooperative learning are predicated upon eliciting cooperative behaviors from students through cooperative tasks and incentive structures. Cooperative behaviors include supporting and encouraging teammates, asking for and providing explanations, sharing materials and listening and taking turns. These behaviors are designed to provide more academic, affective, and social support than is typically available from a single teacher using a direct instructional approach. Cooperative task structures either permit or necessitate that students work together on their assignments.

A review of literature conducted by Deering and Meloth (1990) revealed that two-thirds of the studies examined found positive achievement effects for cooperative learning. Similarly, Slavin (1987) found comparable results.

While empirical investigations and expert opinion indicate that cooperative learning leads to positive outcomes, a majority of research on cooperative learning has been in the form of interventions (methods used to prevent behaviors from occurring) by university researchers in school classrooms or laboratory studies. Neither of these provides a view of cooperative learning as it is enacted by groups of students and teachers under naturalistic conditions. Additionally, the majority of cooperative learning studies used traditional paper and pencil pre/post measures to assess student change but do not systematically examine what occurs in student groups during cooperative lessons (Slavin, 1987; Web, 1982). Investigations on cooperative learning therefore needs to move beyond traditional modes of assessment and focus on the actual verbal communication taking place within these learning groups in the content area. As a result, little is known about the content and form of students' interactions during cooperative learning sessions.

Since cooperative learning is highly dependent for its success on the quality of student discussions, it is important to examine those verbal interactions. This study will examine the verbal interactions among students in their small learning groups at the Ricardo Richards Elementary School.

## Statement of the Problem

Educators of the Virgin Islands have expressed concern and dissatisfaction with the mathematical abilities of students in the public schools. Students' scores, specifically on standardized achievement tests, such as the Metropolitan Achievement Tests, are below the level of national norms. Accordingly, the level of mathematical attainment is generally below expected levels. This has been widely acknowledged in the academic community

and business sector as well. Given the low achievement of mathematics learning and the strong research on academic learning, this research study examined the verbal interaction of third grade students during regular mathematics lessons. Research findings provide strong evidence that it is important for students to verbalize their knowledge in learning groups, for quality cooperative group interactions contain detail exchanges regarding academic content (Glassman, 1988). Given the low achievement of mathematics learning and the strong research evidence supporting the positive effects of academic achievement of students, this research study looked at cooperative learning in mathematics instruction and specifically, it will describe students verbal interactions focusing on the content and form of these verbal interactions. This research study investigated the verbal interaction of third graders in mathematics instruction. The focus was on the content and form of students' cooperative verbal interaction at the Ricardo Richards School.

## Purpose of the Study

The purpose of this study was to describe and interpret the content and form of third grade students' cooperative verbal interaction during their regular mathematics instruction at the Ricardo Richards Elementary School.

## Definition of Terms

*Communication:* the term "communication" refers to the act of transmitting, giving, or exchanging information, signals, or messages by talk, gestures, or writing.

*Cooperative Learning*: the term "cooperative learning" refers to a teaching strategy involving children's participation in small group learning activities.

*Form* : the term "form" refers to the length of utterances.

*Taxonomy of Verbal Interaction Content:* this refers to a categorical listing of student talk while interacting among themselves.

*Utterances* : the term "utterances" refers to the words or sounds in a verbal interaction.

## Theoretical Rationale

As the student population grows even more diverse today, educational researchers have started to become aware of the need to examine the verbal interaction among students to understand the impact of small cooperative learning groups in the classroom (Web, 1982).

It is realized that students differ in knowledge, skills, background, rate of learning, and development. When teachers present a lesson to a class, each student should benefit from the lesson. For the sake of instructional efficiency, students are grouped in a way that the potential of every student is maximized. While in these groups, students are actually having discussions about their instructional tasks placed before them. As they sit together, they are forced to interact and learn about themselves academically, affectively and socially. They are also forced to learn about their peers in the same manner.

The verbal interaction among students allows for a non threatening atmosphere where they can learn and work freely with their peers using mathematical manipulatives and other related resource materials. Kalowski's (1988) study verifies that most students learn faster and better when working with their peers because there is that constant giving and receiving of elaborate information. As students interact together, they develop a

relationship that was invisible prior to working in groups. They become appreciative to their classmates. Constructive verbal interaction within learning groups makes it possible for students to visualize one another in a positive light and form friendships based on human qualities (Mergendoller & Packer, 1989). Consequently, students develop more positive feelings about themselves and their work.

Research shows that those teachers who use small cooperative groups in mathematics instruction look for primarily one of two results: an improvement in student academic achievement or an improvement in student moral and social development which basically comes about through the unrestricted verbal interaction that takes place among students during instruction (Slavin, 1987).

In considering ways to expand or strengthen existing practices, particular attention should be given to the use of small cooperative group in enhancing mathematics achievement. To date, there has been no research addressing the issue on the island of St. Croix.

## Significance of the Study

In the researcher's initial search for documented facts and findings on verbal interaction in students' learning groups, it was found that there was little research done in this area in the mainland United States. In the United States Virgin Islands, there were no known studies. Yet, administrators, teachers, and parents unanimously recognize that basic mathematics skills are an important basic element to function in society. Likewise, in today's workplace, cooperation is also an essential skill needed to succeed. It is also the conviction of the researcher that students, themselves, are one of the most influential and crucial elements today in the process of their peers' cognitive, affective and social development.

It is hoped that the outcome of this study will shed some insight and generate full involvement of everyone in order to increase students' mathematics achievement. With this study and other related studies, it is hoped that obtained skills will successfully alter pupil's results in this area and their attitude about cooperation.

# CHAPTER II

## Review of the Literature

Research in the area of cooperative learning is now beginning to unfold. Over the last five years, a substantial body of research conducted at various grade levels and in numerous content areas has documented the effectiveness of cooperative learning (Glassman, 1988; Hilke, 1990). A number of research studies have been shown to yield positive results such as increased achievement, enhanced self-esteem, and greater social adjustments among students. Watson and Rangel (1989), in examining children's behavior within cooperative groups, reported that students who gain most from these kinds of cooperative work are those who give and receive elaborated explanations. Similar findings were revealed by Deering and Meloth (1990).

Cooperative learning has been cited to have a positive impact on social relations. (Mergendoller & Packer, 1989). Students are able to view one another in a positive light and to form friendships on human qualities rather than skin colors or accents. Similarly, Sharan (1980), in her review of research on cooperative learning (conducted in a laboratory setting) revealed that people who work in cooperative group learn to like one another. Overall, the cooperative learning classroom studies found that students express greater liking for their classmates in general, as a result of participating in cooperative learning (Lyman & Foyle, 1988).

Slavin (1988), in his review of the literature, asserts that cooperative learning has positive effects on all cognitive levels in subject areas such as mathematics problem solving, reading comprehension, creative writing, social studies, science, as well as mathematics computation, spelling and language mechanics. A similar review was performed by Lyman and Foyle (1988).

One of the most important aspects of a child's personality is the child's self-esteem. Many individuals have assumed that self-esteem is a relatively stable personal attribute that schools have little ability to change (Glassman, 1988; Slavin, 1987). Sharan et al. (1980) examined studies on cooperative learning techniques and found that cooperative learning groups do increase students' self-esteem and that students in cooperative learning classes have more positive feelings about themselves than do those in traditional classes.

According to Lyman and Foyle (1988), students' motivation to work in school is dependent on the extent to which students' basic psychological needs are met. Cooperative learning increases student motivation by providing peer support for students. As part of a learning team, students can achieve success by working successfully with others. Students are also encouraged to learn material in greater depth than they might otherwise have done, and to think of creative ways to convince the teacher that they have mastered the required material.

While social psychological research on cooperation dates back to the 1920s, research on specific applications of cooperative learning to the classroom did not begin until the early 1970s (Slavin, 1980). Despite the research on cooperative learning, little is available on the verbal interaction of students. Furthermore, no research has been conducted on this topic in the United States Virgin Islands. Bossert (1988) suggests that research on cooperative learning needs to move beyond traditional modes of assessment and, " begin to peer into the black box of classroom interaction and study mediational processes directly ".

Web (1988) reviewed several studies which examined students' interactions in cooperative groups in mathematics classes in grades two thru eleven. She identified a number of types of giving and receiving interactions as predictors of achievement. Among her findings were that giving and receiving upper level elaborations is found to be moderately associated with achievement gains. Web's findings provide strong evidence

Kalowski's (1988) work lends further support for the value of students verbalizing cognitive explanations in their groups. The work of Web (1988) and Glassman (1988) indicate that quality cooperative group interactions contain detailed exchanges regarding academic content.

Parker (1985) observed and analyzed elementary school students' cooperative discussions over a two year period and found that academic content accounted for 28 percent of all verbal interactions; requests for information (not necessarily accessible to each member and usually academic in nature) accounted for 7 percent, and information-supply (supply of information not necessarily accessible to each member and usually academic in nature) accounted for 21 percent. Parker further noted that complexity and variety of input (provided by students to their teammates) lead to some upper level cognitive improvement. It appears from the work of Web (1988) and Parker (1985) that cooperative learning is especially effective when it involves group interaction and tasks focusing on cognitive level content.

Sharan (1980) examined the content and form of students' verbal interactions and academic achievement under instructional conditions of cooperative learning and direct instruction in an Israeli school. Sharan compared five classes using a cooperative learning method and four using traditional class instruction. She found that students from the cooperative learning groups spoke more in terms of total words. Students utilizing cooperative learning also verbalized significantly more cognitive strategies which offers significant cognitive benefits. Similar findings were found in Web's (1988) study.

Deering and Meloth (1990) have examined classroom interactions in teacher directed, large and small group discussions during instruction, and noted that in order for a student's verbal interaction to be successful (to be incorporated into the flow of the discussion) it has to be appropriate in both content and form. The researchers found that the manner in which classroom rules were mutually constructed and used by the teacher

and students in their study facilitated the exchange of certain types of information and inhibited others.

Students in cooperative groups may also establish rules or norms, which facilitate discussion of particular types of content and inhibit discussion of high cognitive level content.

It is important that research on cooperative learning advance beyond conventional means of evaluation, and focus on the actual discussion process of students' cooperative group interactions and their cognitive, affective and social components (Bossert, 1988).

From the review of literature, while much has been done on the positive effects of student learning in cooperative groups, the majority of research on cooperative learning has ignored the content and form of students' verbal interaction during their daily mathematics lessons. The findings of studies has been minimal in the United States mainland and none has been conducted on St. Croix, United States Virgin Islands. As a result, little is known about the content and form of student interactions during cooperative learning sessions. Therefore, this study focused on the content and form of third grade students' cooperative verbal interactions, specifically in the subject area of mathematics.

# CHAPTER III

## Research Design

### Subjects

This study investigated the content and form of third grade students' cooperative verbal interaction during mathematics lessons.

The subjects in this study were four third grade students attending the Ricardo Richards Elementary School on St. Croix, Virgin Islands during the 1991-92 school year. There were two boys and two girls. One student is Hispanic, one is Arabic, and two are native to the island. They ranged in ages from eight to nine years old. Students in this class were divided into six groups. Each group had four students, one above average, two average, and one below average. This group of students was randomly selected from six groups operating in this classroom. This group was representative of the general population in terms of age, background, and socioeconomic levels. All have been attending Ricardo Richards School since the kindergarten and have been working together as a learning group since January of 1992.

### Procedures for Data Collection

This study employed a descriptive research methodology. Students verbal interactions during mathematics class were tape recorded. Each session was forty minutes long. This lasted for two weeks (10 days, 400 minutes of taping) or six hours and forty minutes. At the end of each day, the recordings were transcribed and categorized using the *Taxonomy of Verbal Interaction Content* (TVIC) designed and developed by Web (1988). Each student's statement was placed in the appropriate category of the TVIC. Transcripts provided information about the verbal interaction among students as they were engaged in

mathematical tasks such as completing worksheets, textbook pages, problem solving situations, self created tests, critiquing student made tests and using manipulatives. The cooperative learning strategy used in the classroom was the Teams Assisted Instruction (TAI).

In order to acclimate students to the presence of a cassette recorder, the equipment was used in the classroom one week prior to data collection during mathematics lessons.

## Analysis of Data

Students' verbal interactions were transcribed and categorized using the Taxonomy of Verbal Interaction Content by Web (1988). It provided a framework for examining the content of students' cooperative discussions.

The *Procedural* content category of verbal interaction refers to issues such as the proper format for completing a task or the division of labor within the group. The Procedural category was further divided into the subcategories of *Non-directive* and *Directive* to differentiate between questions or suggestions versus imperatives. The final Procedural subcategory, *Attempts at Closure*, refers to suggestions or imperatives by students designed to bring discussion of a particular topic to an end.

The *Academic Content-Related* category includes any verbal interaction that involves cognitive operations. The subcategories of *Low-level* content and *High-level* content, along with *Requests for Academic Content* are included within the Academic Content Related category. Low-level content refers to students' statements which include only information without an explanation, while High-level content refers to both information and an explanation or reasoning. Requests for Academic Content refers to questions or statements soliciting either Low-level or High-level academic content.

*Individualistic* category refers to any verbal interaction which indicate that the speaker is diverting from the academic task as it is being engaged by the group at the time.

This category is further divided into two subcategories, *Individualistic On-task* and *Individualistic Off-task*. Individualistic On-task discussion content refers to statements by students indicating that they are going to pursue some facet of the group's task on their own. Individualistic Off-task discussion content refers to any talk that is unrelated to the group's task.

The *Social/Emotional* content category refers to any talk that is primarily affective in nature. This category is further divided into both *Positive* and *Negative* subcategories to differentiate between supportive versus personally critical statements. (See Appendix A.).

## Limitations

1. This study was limited to one group of four third grade students in one classroom at Ricardo Richards Elementary School in St. Croix.

2. This study was limited to data collected during a two week period (four hundred minutes per mathematics lesson).

# CHAPTER IV

## Results

The data collected from the tape recordings were transcribed and categorized according to the *Taxonomy of Verbal Interaction Content* (TVIC) (Web, 1988). (Appendix A.).

Student's verbal interactions in this study were primarily Procedural (PRO) and Academic Content-Related (ACR) with trace amounts of Individualistic (IND) and Social/Emotional (SOC) talk. The subcategory data indicate that the students' Procedural (PRO) content of verbal interaction was comprised of both Procedural Non-directive (PND) and Procedural Directive (PD) talk. Attempts at Closure (PCL) talk was far behind the Procedural Non-directive (PND) and Procedural Directive (PD) verbal discussions.

Examples of students' dialogue in the Procedural (PRO) category are as follows

Student B: "When were finished with our problem, do we do the rest?"

Student C: "No, we check our work over and share answers. Circle the number you did."

(after four minutes of quietness)

Student C: "Ok, this is how we're going to do it. I'm going to ask whoever did what number (#). 1, 2, 3. # 1 and 2. I am. The answer is 16. One six. Who did # 4 and 5?"

Student D: " Number 4 is 48 and # 5 is 4.6."

Student C: "Who did # 6 and 7?"

Student A: "Skip. Skip."

Student C: "No one is responsible for those, so let's move on".

These types of statements were representative of the verbal interaction used by the students throughout the study. Verbal interactions of these students were mainly Procedural (PRO) eventhough the group contained bilingual students. There was frequent dialogue in terms of questions and clarifications about the student's tasks and how to go about them. The enormous amount of Procedural Non-directive (PND) interaction suggests that this type of discussion occupied a substantially greater proportion of students' group learning time. Students' Procedural Directive (PD) verbal interactions could be characterized as polite or considerate, yet in some instances somewhat authoritative. Procedural Attempts at Closure (PCL) statements were infrequently used by students during the study. Students readily voted on matters of concern thereby eliminating the need for continuous requests to bring the discussion to closure.

Academic Content-Related talk was also used in this study. Students' verbal interaction, while in their learning groups, consisted of both Low-level (ACL) and High-level (ACH) interaction. There was an equal amount of both forms of Academic Content-Related (ACR) discussions. Requests for Academic Content (AC?) however, was minimally used.

Examples of students' dialogue in the Academic Content-Related (ACR) category are as follows

Student C: "What do you mean by *width* ?"

Student D: "Isn't the *width* across?"

Student A: "Yes, measure it ."

Student C: "The measurement is 58 cm, not 60 cm. Student 4, Student 4, it suppose to be 58, 30 + 28 = 58. 30 + 28 1/2 cm. You can put 30 here and 28. Right the answer could be 30 + 28?"

Student D: "Ah huh."

Student C: "See, it's 58."

The preponderance of data on Academic Content-Related (ACR) talk was comprised of Academic Content-Related Low-level (ACL) and High-level (ACH) talk. This was quite encouraging. This suggests that students had the opportunity or were likely to express complex concepts to group members, especially when they are in disagreement about their group process and final work. The amount of Academic Content-Related High-level (AHL) talk was also encouraging, especially for mathematics group instruction which espouses strategic thinking as a major goal. The researcher observed that much of the Academic Content-Related Low-level (ACL) talk. Most of the time, these were followed by simple student analysis or critiques, as evidenced by the equal amounts of Academic Content-Related High-level (AHL) talk. The modest amount of Requests for Academic Content (AC?) suggest that students relied much on their peers to provide explanations of academic content. Strategic questions regarding problem-solving processes were frequently observed. The majority of Procedural (PRO) and Academic Content-Related (ACR) verbal interactions in these observations indicate that for the most part students were engaged in their learning tasks a great deal of the time. The majority of the verbal interaction statements were comprised of academic content and the general type of interaction was closely associated with higher achievement. This observation was quite encouraging.

Analysis of the data showed minimal Individualistic (IND) verbal interaction content. When used, these statements can be categorized as Individualistic Off-task (I-Off).

Examples of students' dialogue in the Individualistic (IND) category are as follows

Student D: "This is CNN Headlines News. (laughter) One time right, Shaney expelled gas and she said, This is CNN Headlines News. I am only playing a trick, man."

Student B: "I don't think that's funny."

It was recognized that even though most of the group's learning time was comprised of Academic Content-Related (ACR) discussions, the general amount of Individualistic (IND) talk was quite low, therefore indicating that the students were generally task-oriented and concentrated on working with their groups. The very low amounts of Individualistic Off-task (I-Off) discussion indicate that elementary students can and will stay on-task in cooperative mathematics learning groups. This is a positive finding as it relates to cooperative learning as an instructional approach.

The Social/Emotional (SOC) content was minimally reflected in students' verbal interaction statements.

Examples of students' dialogue in the Social/Emotional (SOC) category are as follows

Student D: "I did it like Student A because it's good. Beautiful, do you want me to check the one with blue?"

Student B: "All of us have it ok."

The low amounts of both positive and negative talk of the Social/Emotional (SOC) verbal interaction content indicates that the students did very little praising and insulting. The general distribution of the discussions indicates that students were engaged in at least minimally acceptable types of discussion most of the time. Clearly, students were functioning quite well in terms of monitoring their social relations and their attention to their tasks.

# CHAPTER V

## Conclusion and Recommendations

The purpose of this study was to investigate the verbal interaction of third grade students at the Ricardo Richards Elementary School on St. Croix, United States Virgin Islands. The third grade students in this study focused on their groups' mathematical tasks. This is reflected in the high amounts of Procedural (PRO) and Academic Content-Related (ACR) verbal interaction and the lesser amount of Individualistic Off-task (I-Off) verbal interaction observed. These students worked with their groups most of the time as evidenced by the moderately low amount of Individualistic (IND) talk. In addition, they engaged in minimal antagonistic interaction as indicated by the extremely low amount of Social/Emotional (SOC) negative talk. Students were engaged in behaviors that is well within the standards of acceptability for most classrooms. The on-task and positive nature of these students' cooperative group interactions at Ricardo Richards School are quite positive findings. So too, is the moderately high amount of academic interaction as portrayed in this study.

The patterns of group content and verbal interaction observed appeared to be more closely associated with learning tasks than with the age, developmental level or language of the students. A potentially fruitful line of inquiry then would be to examine how carefully structured instructional tasks could be used to increase the strategic content in mathematics groups.

While the sample size and short duration of this study limit the generalizability of findings, the naturalistic setting enhances its validity. Further, naturalistic studies in the Virgin Islands and nationwide are needed in this area to describe and interpret cooperative learning discussion as they are conducted by students in a wide variety of classrooms in order to build an understanding of cooperative learning in practice.

## Recommendations

It was found that third grade students are actually verbalizing among themselves about their academic tasks rather than merely socializing. It is recognized that grouping students allow for comfortable verbal interaction to improve mathematics skills, as well as their personal growth. Most importantly, the concept of cooperation was well achieved.

Ways in which future studies on cooperative learning could be conducted:

1. Compare the verbal interaction of boys and girls.
2. Compare the verbal interaction of other grade levels.
3. Compare the verbal interaction of students in learning groups at public, private or parochial schools.
4. Examine teachers' impact on cooperative learning group discussion.
5. Examine the relationship between students' verbal interaction and academic achievement.
6. Use a larger sample size.

Recommendations for teachers and other educators who deal with pupils on a regular basis:

1. Take into account that not all students learn best in a quiet, isolated environment.
2. Rearrange classroom environment so that students are free to collaborate.
3. Assist students to be involved in each others' learning.
4. Structure instructional tasks to increase the strategic content of students' group discussions.

## References

Bossert, S. T. (1988). Cooperative activities in the classroom. Review of Educational Research, 15, 225-250.

Deering, P. D. & Meloth, M. S. (1990). An analysis of the content and form of students' verbal interactions in cooperative groups. Paper presented at the Annual Meeting of the American Educational Research Association, Boston, MA.

Glassman, P. (1988). A study of cooperative learning in math, writing, and reading as self-esteem for males, females, Blacks, Hispanics and Anglos. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Goldberg, L. F. (1990). Implementing cooperative learning within six elementary school learning disability classrooms to improve math achievement and social skills. Inkster, MI: Nova University. (ERIC Document Reproduction Service No. ED 312 839)

Hilke, E. V. (1990). Cooperative Learning. Indiana: Phi Delta Kappan Educational Foundation.

Johnson, D. W., & Johnson, R. T. (1986). Circles of learning: Cooperation in the classroom. (rev. ed. ). New Jersey: Prentice-Hall.

Kalowski, P. (1988). Communication in cooperative learning groups. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Kambiss, P. A. (1990). The effects of cooperative learning in students' achievement in a fourth grade classroom. Atlanta, GA: Mercer University, Educational Specialist Field Program. (ERIC Document Reproduction Service No. 318 563).

Lyman, L. & Foyle, H. C. (1988). Cooperative learning: Does it work for teachers of young children? Paper presented at the Annual Conference of the Kansas Association or the Education of Young Children, Manhattan, KS.

Lyman, L. & Foyle, H. C. (1988). Cooperative strategies and children. (Contract No. OERI 88-062012). Washington, DC: Office of Educational Research and Improvement.

Mergendoller, J. & Packer, M. J. (1989). Cooperative learning in the classroom: A knowledge brief on effective teaching. Washington, DC (ERIC Document Reproduction Service No. 322 146).

Mevarech, Z. R. (1991). Learning mathematics in a different mastery environments. Journal of Educational Research. 84, 225-231.

Mevarech, Z. R. (1985). The effects of cooperative mastery learning strategies of mathematics achievement. Journal of Educational Research. 78 (6), 372-377.

Parker, R. E. (1985). Small group cooperative learning- improving academic, social gains in the classroom. NASSP Bulletin. 69, 48-57.

Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes and ethnic relations. Review of Educational Research. 50 (2), 241-267.

Sharan, S., Ackerman, Z., & Hertz-Lazarowitz, R. (1980). Academic achievement of elementary school children in small group versus whole-class instruction. Journal of Experimental Education. 48 (2), 125-129.

Slavin, R. E. (1987). Cooperative learning: Student teams. (2nd ed.). Washington, DC: National Education Association.

Slavin, R. E. (1987). Cooperative learning: Can students help students learn? Instructor. 77-78.

Slavin, R. E. (1988). The cooperative revolution in education. The Education Digest. 54, 22-24.

Watson, D., & R. L. (1989). Classroom evaluation of cooperative learning. The Education Digest. 55, 35-37.

Web, N. M. (1982). Peer interaction and learning in cooperative small groups. Journal of Educational Psychology. 74 (5), 642- 655.

Web, N. M. (1988). Peer interaction and learning in small groups. Paper presented at the Annual American Educational Research Association. New Orleans, LA:

Yager, S., Johnson, D. W. & Johnson, R. F. (1983). Oral discussion, group to individual transfer, and achievement in cooperative learning groups. Journal of Educational Psychology. 77, 60-66.

# Appendix A

## *Taxonomy of Verbal Interaction Content*

1. *Procedural (PRO)*

a. *Non- directive* (PND): Comments, suggestions or questions on the group's or an individual's actions.

Example: "Are we supposed to do our own or just turn in one?"

b. *Directive* (PD): An order on how the group or an individual should act.

Example: "No, write the problems front and back."

c. *Attempts at closure* (PCL): Efforts by a student to bring discussion to an end.

Example: "OK, let's take a vote!"

2. *Academic Content- Related (ACR)*

a. *Low- level* (ACL): Providing a simple answer or unexplained idea or reading aloud from familiar text.

Example: "It's spelled, F-R-A-C-T-I-O-N-S."

b. *High-level* (ACH): Explaining a process or metaprocess, or providing justification for an opinion.

Example: "I think this is a much better way to solve the problem."

c. *Requests for academic content* (AC?): Solicitation of information related to the group's academic task.

Example: "What's a cylinder?"

3. *Individualistic (IND)*

a. *Individualistic On- task* (I-On): Utterances indicating that an individual intends to work on the group's task alone.

Example: "I'll do fraction figures since I have drawing paper."

b. *Individualistic Off-task* (I-Off): Utterances that are unrelated to the task and/ or to the group.

Example: "I'm going to the basketball game tonight."

4. *Social/ Emotional (SOC)*

a. Positive affect (SE+): Compliments, empathy, facilitation of the group process.

Example: "Neat idea!"

b. Negative affect (SE-): Insults, criticisms of an individual or his/ her ideas.

Example: "That's dumb!"

## APPENDIX B

Transcript of student talk taken during mathematics instruction (9:50-10:30) at Ricardo Richards Elementary School.

Student 1: "Ok Student 1, start recording the measurements."

Student 3: "Let me see the sheet no man, gosh. I'm doing my copy over."

Student 4: "What did you get for your measurement?"

Student 1: "432 cm. What was yours?"

Student 1: "430 cm. Who did the width of the chalkboard? That's #17."

Student 2: "Me, but Student 3 helped. Your answer is wrong. You said you measured 424 cm."

Student 3: "I checked it over and it's 314."

Student 2: "It's 310 cm."

Student 4: "Don't fight over the answer, and Student 1, don't talk to other people in other groups. 130 cm is the answer for #20."

Student 2: "303 is wrong. It is 310 because from here to here is 100 cm and this one is 210 cm. You know you're not suppose to call the teacher like that."

Student 3: "Wait . Wait, I'm not done."

Student 4: "Ok, #19 is"

Student 2: "Student 3 did #19."

Student 3: "It's 130 cm."

Student 4: "Oh, please."

Student 2: "Yeah, it's only four of us and there are five problems. So, cross out #16."

# APPENDIX C

Transcript of student talk during mathematics instruction (9:50-10:30) at the Ricardo Richards Elementary School.

Student 2: "What to make?"

Student 4: "You have to make 10 pieces. Make 5 lines going down and then make a line going across."

Student 2: "1,2,... 10. Now shade in 6 pieces?"

Student 4: "Yes."

Student 2: "What fraction is that , Student 1?"

Student 4: "Mine your business girl."

Student 2: "You have to show that amount, 3/10."

Student 4: "Let her do it herself. Color in your 6 pieces, Student 2."

Student 2: "3/10, Student 1."

Student 1: "May I lend the crayons?"

Student 4: "I did it like Student 1."

Student 2: "Why?"

Student 4: "Because its good. Don't you remember that you and I have the biggest job in the group?"

Student 2: "Could I do it like this?"

Student 4: "Beautiful. Do you want me to check the one with the blue? Here, Oh God! Look at #8. Is it correct? Let me see. Sign your name behind the paper. OK, let Student 1 sign her name. Student 1, sign your name."

Student 1: "Here."

Student 2: "Those jellybeans taste good. Erase your name from this sheet. Only Student 1 and I should have our names on 3/10. Don't forget to put it away. All of us have it ok."

Student 4: "Student 4, you're doing it so fast nobody could even see."

Student 2: "So, if we have 3/10, put the dot in front of the 3? Ok, I've got it ."

Student 4: "Write the decimal. Let's work good Student 2 so that we could get more jellybeans."

Student 2: "So, put the period over here?"

Student 4: "What did you write?"

Student 2: "I wrote 1/10. What's your fraction?"

Student 4: "4/10"

Student 2: "Do your stuff."

Student 4: "You're wearing gym clothes? She could have left it like that you know, but she went and erase it."

Student 2: "That's ok."