Cooperative Learning: Listening to How Children Work at School

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ABSTRACT Cooperative and collaborative learning are recognized as valuable components of classroom learning. However, many questions remain regarding how teachers might structure and guide children’s group-learning experiences. An ethnographic case study of 29 Grade 6 and Grade 7 students who worked in groups over 5 weeks was examined to determine what was learned. Data included audiotape recordings of 6 groups of children working together across 11 work sessions, student interviews, children’s self-evaluations and drawings, and research reports. Findings revealed that when working in groups, children require periods of unstructured time to organize themselves and to learn how to work together toward a mutual goal.

Key words: children’s behavior, cooperative and collaborative learning

Research into children’s behavior in groups and their productivity was pioneered at the University of Iowa’s Child Welfare Research Station toward the end of the 1930s. Working under the direction of Kurt Lewin, an acclaimed experimental psychologist, graduate students Ronald Lippitt and Ralph White undertook a series of experiments in 1938 to investigate how children worked together in groups (Marrow, 1965). Participants chosen for the studies were 20 children who met after school to make papier-mâché masks and to engage in other play activities. The children were divided into three groups, two of which were directed by an adult; each child was rotated through each of the three groups. The results of the experiments proved remarkable. Researchers found that children in an autocratically led group seemed discontented, often aggressive, and lacking in initiative. Youngsters in groups without a leader experienced similar problems: members appeared frustrated and much of the work remained unfinished. In marked contrast, children in groups organized with a democratic leader —someone who allowed the group to set its own agendas and priorities —appeared far more productive, socially satisfied, and demonstrated greater originality and independence in the work they completed.

Although the Iowa studies excited the educational community, the advent of World War II—and its aftermath—greatly interrupted research into how children behaved and learned in groups. Scholarly attention did not again turn toward efforts to understand children’s behavior and learning in groups until the 1970s (Slavin, 1991). Since that time, researchers have come to agree that cooperative and collaborative learning are valuable components of classroom learning (Blumenfeld, Marx, Soloway, & Krajcik, 1996; Gamson, 1994; Kohn, 1991; Webb, Troper, & Fall, 1995) and children are often instructed to “work together” at school (Gamson, 1994; Patrick, 1994; Wood & Jones, 1994). Slavin (1991, p. 71) stated that cooperative learning has been promoted as a solution to “an astonishing array of educational problems” and has been endorsed as a learning strategy by numerous researchers (Burron, James, & Ambrosio, 1993; Wood & Jones, 1994) who have investigated its effects on student achievement (Slavin, as well as on the contexts and ways in which children work together in classrooms (Keedy & Drmacich, 1994).

Definitions for cooperative and collaborative learning, however, are contrary for different researchers and theorists. Vygotsky (1978), for example, viewed collaborative learning as part of a process leading to the social construction of knowledge. Other scholars (Kohn, 1992; Sapon-Shevin & Schniedewand, 1992) considered cooperative learning to be a form of critical pedagogy that moves classrooms and societies closer toward the ideal of social justice. Caplow and Kardash (1995) characterized collaborative learning as a process in which “knowledge is not transferred from expert to learner, but created and located in the learning environment” (p. 209). Others such as Burron, James, and Ambrosio (1993) and Ossont (1993) envisioned cooperative learning as a strategy to help students improve intellectual and social skills.

Context and Task

Despite publication of such studies, many questions remain unanswered about what children do and what they

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discuss when they are directed by teachers to work together in classroom groups. The purpose of the following study was to examine what was learned from a small, ethnographic case study of 29 elementary school students who were observed working together in a Vancouver school over a period of 5 weeks. The case study constituted part of a year-long research study (Mueller, 1998) in which a former elementary teacher and a university teacher–researcher (the author) collaborated to create opportunities for children to engage in scientific inquiry. Specifically, the case study was composed of observations made when a mixed class of Grade 6 and Grade 7 children were organized into six work groups for a 5-week science project and were asked to design an amusement park ride for a class exhibition that was outlined in the following terms:

**Assignment:**

The Pacific National Exhibition (PNE) will be closing permanently at the end of the season. The exhibition has decided to relocate on a parcel of land in the Fraser Valley. The board of executives is seeking innovative ideas from the public to help plan their new facility.

Your class has been selected to participate in this unique opportunity. We would like teams of students to create a new innovative ride or redesign an existing structure.

Each submission should include research, detailed drawings, and a simple mechanical model of your design. Please remember that space is limited and your group will have one half of a table top to present your model.

**Timeline:**

1. Research and Sketches (May 14)—one page of research on the mechanics of your model; a clear sketch on 8.5 x 11 paper;
2. Final Drawings (May 17)—a detailed drawing of your design on 11 x 17 paper; diagram should include a title, labels, and scale; this drawing will be used in your final presentation;
3. Models (May 28)—a simple model that demonstrates how the mechanical system works; the model should be displayed on cardboard no larger than half a table top; and
4. Presentation (May 29)—each group will be required to pitch their design to an audience (2–3 minutes); each member of the group should be prepared to respond to questions from the audience related to the mechanics of their selected systems.

Both the classroom and the instructional format were structured to allow children to participate in small-group inquiry for an extended period of time. Projects were outlined to provide opportunities for children to develop portfolios of information and knowledge about science (including research reports, scale drawings, and models) and to provide children with opportunities to make informal and formal presentations.

**Research Framework**

The theoretical framework that bounded this study comprised two parts. In the first part, results of the Iowa study showed conclusively that children in democratically led groups were far more productive in completing tasks than were children in groups that were tightly controlled or leaderless (Marrow, 1965). Moreover, groups that determined their own work methods were characterized by a better spirit among members and were far less susceptible to quarreling and discontent. Both of those findings suggested that groups of children working together in classrooms should be allowed to organize themselves with a minimum of teacher interference. In other words, children should be allowed to work in a self-directed manner. That premise determined that both the teacher and teacher–researcher would assume a supportive but nondirective role in monitoring the science project—and that assistance to students would be provided only at their request.

The second part of the theoretical foundation underlying this research was an ethnographic approach (Britzman, 1991; Denzin, 1997; Ellis & Bochner, 1996). Because prominent writings on cooperative learning are long on prescription (Kohn, 1992; Sapon-Shevin & Schniedewand, 1992; Vygotsky, 1978) but generally short on description, I adopted an ethnographic approach to enlarge the existing state of knowledge about (a) the context in which children learn cooperatively, (b) how they structure their work, (c) how they develop ideas and plans, and (d) how they communicate with each other. Recording and transcribing children’s conversations about the science project, in effect, provided an “on the ground” and detailed view of how children organized themselves to learn and to accomplish a task that they defined for themselves.

That approach to the study emerged over 2 years as the university-based principal researcher (and the former elementary school teacher) worked with a Grade 6/7 teacher in central Vancouver as part of a schoolwide project to improve children’s performance in mathematics and science. Following the successful completion of a small trial project the first year, the teacher and teacher–researcher agreed to undertake a second, longer science project the following year to increase children’s involvement in their own science learning, to bring together elements of technology and science, and to allow for a maximum of children’s expression. The second study furnishes the basis for this article.

**Data Collection**

During the 11 sessions of the 5-week study, I used audiotapes to record six groups of children at work. A Walkman-sized tape recorder and microphone were placed on tables where each group worked to record the six groups simulta-
neously. I also used that method to make audio recordings of conversations with children individually, in pairs, and in groups. Altogether, 36 audiotapes, each 90 min in length, were used to record approximately 54 hr of children speaking about the project. The tapes were later transcribed verbatim into a written record of 99 pages, which was then analyzed. A coding system identified teacher visits to the groups and the language each group of children used when they (a) generated ideas to accomplish the task at hand and (b) organized themselves socially. The number of teacher visits to each group across the life of the project reflected the different needs of the six groups and their demands for teacher assistance.

I obtained additional data from the researcher’s field notes, children’s drawings and research reports, audiotaped conversations with the teacher, audio and videotape recordings of large-class discussions, videotapes of children in group work, and photographs of children participating in the project. Written self-evaluations about what children learned in undertaking the project provided an additional data source for analysis.

At the study’s outset, several students indicated to the teacher or researcher that they were uncomfortable or annoyed with the recording device. The researcher reminded the teacher and children several times that if the tape recorders were too distracting, they would be removed. After the first day, however, only 2 children mentioned the tape recording again over the 5-week project. Some children perceived that audiotaping their ideas was beneficial and, therefore, requested opportunities to re-listen to their discussions. Tape recorders were removed only during the final days of the project, when students were working full time on their models and when materials were scattered around the classroom.

**Purpose of Discussion**

In the following discussion, I examined what children learned from a case study in which Grade 6 and Grade 7 youngsters were asked to work together to create an amusement park ride. The first part of the discussion explores the ways that children used language to define their ideas and activities and to organize themselves in completing the design they proposed. The second part of the discussion reports the responses that children made on the basis of their experience working together in groups, especially as it pertains to learning science and, more generally, to the value of cooperative learning.

**Work-Group Composition and Dynamics**

The class participating in this study was composed of 29 students—16 girls and 13 boys. Nine students in Grade 6 and 18 students in Grade 7 were divided by the teacher into six groups (three groups of 5 students; three groups of 4 students). Data analysis included an examination of the transcript story line, group file folders with sketches, drawings and research notes, as well as the researcher’s field notes and observations. From those sources, I constructed the following portraits of the six groups.

**Group 1:** Two Grade 7 girls and 2 boys, 1 in Grade 7 and 1 in Grade 6, formed Group 1. Because of frequent absences by 1 Grade 7 girl early in the project, most critical decisions about the project were made by the group’s other 3 members. The transcript of group discussions across 11 group work sessions indicates that members expressed diverse ideas and worked diligently to complete the project. Occasionally, sounds of tension and disagreement among group members were evident. A Grade 7 girl, present for all work sessions, took command as the leader of the group, often directing both the discussion and organization of work. The group was successful in their design and modeling of a playground ride, as well as in their presentations, and in the scientific explanations they offered in support of their project.

**Group 2:** Three Grade 7 girls and 2 Grade 7 boys (one boy received learning assistance weekly and the other boy had identified behavioral problems) formed Group 2. The transcript reveals that group discussion was frequently distracted by social talk, although diverse ideas were expressed when their attention turned to the task at hand. A Grade 7 girl emerged as the leader in her frustration to keep the group on track, apart from contributing the largest number of ideas. Two boys rarely expressed their thinking throughout the 11 work sessions. The group appeared incapable of making a decision until the last day. Although the ride they designed was creative, and although they gave a lively presentation, they were unable as a group to exhibit a clear understanding about the science involved.

**Group 3:** Three boys, 2 in Grade 7 and 1 in Grade 6 (received learning assistance weekly) and 2 girls, 1 in Grade 7 and 1 in Grade 6 (English-as-a-second-language [ESL] program) formed Group 3. A Grade 7 girl emerged as a gentle leader from the outset, encouraging group members to voice their thoughts and to remain on task. The transcript indicates that the group explored a wide range of ideas and that all members contributed ideas to discussions, although 1 Grade 6 girl and 1 Grade 6 boy said relatively little during the 11 work sessions. The transcript shows that some tensions were voiced, but under the direction of the leader, the group quickly dispelled points of disagreement. Overall, the group worked together in a coherent manner and helped one another throughout the project. They created a wonderful ride, gave an excellent presentation, and clearly identified the science concepts they addressed.

**Group 4:** Two girls, 1 in Grade 7 and 1 in Grade 6, and 2 boys, 1 in Grade 7 (ESL) and 1 in Grade 6, formed Group 4. The Grade 7 boy was absent for many work sessions, and the Grade 6 boy, who was on medication for Attention Deficit Hyperactivity Disorder, contributed infrequently to group discussions and work sessions. The
2 girls often expressed exasperation that they were left to do much of the work in this group. However, the 2 girls expressed a constant flurry of ideas, and the Grade 6 girl emerged as the leader, directing the flow of conversation and work tasks. It was unclear which design plan this group would pursue until the final work session. Nevertheless, the design for their ride was completed on time, they were well prepared for the presentation, and they furnished a clear scientific explanation about how the proposed ride would operate.

Group 5: Three Grade 6 girls and 2 Grade 7 girls (both ESL) formed Group 5. This was the only all-girls group, and its composition was a function of a larger ratio of girls to boys in the classroom. One Grade 6 girl emerged as the group leader, and, overall, this group functioned smoothly. The transcript indicated that diverse ideas were expressed and debated. One Grade 7 ESL student remained mostly silent throughout all 11 work sessions. Group 5 designed and created a wonderful ride, gave a spirited presentation, and focused on a few key variables in offering scientific support for their amusement park ride.

Group 6: Two Grade 7 girls (1 ESL) and 2 boys, 1 in Grade 7 and 1 in Grade 6, formed Group 6. From the outset, 1 Grade 7 girl assumed the role of group leader, organizing ideas and encouraging participation. Another Grade 7 girl generally remained silent, which meant that the ideas expressed originated with the other 3 group members. Although a wide range of ideas were expressed, work sessions were marked by argumentation and tension. The transcript indicated that the leader frequently experienced difficulty in keeping the group on task, and, in effect, became responsible for making most decisions. Nevertheless, this group created an incredible ride, offered a well-prepared presentation, and thoroughly explained in scientific terms how their ride worked.

Role of Teacher and Teacher–Researcher

During small-group work, both the classroom teacher and the teacher–researcher moved around the classroom listening, asking questions, and supporting group ideas. The total number of combined visits by the teacher and teacher–researcher to each group were recorded as follows: Group 1, 26 visits; Group 2, 36 visits; Group 3, 39 visits; Group 4, 63 visits; Group 5, 46 visits; and Group 6, 30 visits.

In an audiotaped conversation after the amusement park project, the teacher and teacher–researcher comment about the roles they perceived themselves to be playing in the classroom. The teacher recollected as follows:

Well, we were facilitators in the fact that we designed the problem—the challenge. I think in the sense that we were in some ways observers, but observers that had a vested interest in making sure that these projects were successful. So, we offered any kind of assistance or advice or knowledge that we could lend the groups. In some ways . . . I don’t think we steered them, I really think . . . I don’t know . . . it’s hard to define isn’t it.

The teacher–researcher recalled:

Yeah, I mean we listened to the groups. Sometimes they just asked us to come look to see what we think. And sometimes they just wanted to show us what they found out. But we were there. And in some way . . . I think we also orchestrat-ed—you know, we had a sense of what was going on in all the groups and knew when to . . . stop. Let’s just reevaluate. And some of the kids also mentioned that it was really important the way we set it up and got them thinking and then the discussions that we had with them sometimes—the short ones. Got them thinking in a different way. But if I had to honestly tell somebody how I did it, or how we did it . . .

It’s “really difficult,” the teacher observed. “Yeah, because it is evolving,” the teacher–researcher added.

In retrospect, both the teacher and the teacher–researcher acknowledged the difficulty of defining their roles as teachers within the experimental setting, perhaps because of their diverse actions and the fact that many of their activities were reactive in nature, that is, prompted by students’ needs. In comparison with many instructional settings that are inclined to be teacher or curriculum centered, the emphasis in these work groups was centered on students and their approaches toward solving a science problem. The roles of the teacher and teacher–researcher generally remained those of facilitators, observers, and providers of assistance, advice, and knowledge. The teacher and teacher–researcher listened, orchestrated students’ activities, evaluated and reevaluated students’ learning opportunities, and, when deemed necessary, redirected students’ thinking and activities. Overall, the nature of the roles of the teacher and teacher–researcher was more supportive than directive.

Purposes and Language of Work

Analysis of the transcript revealed that students working together used language for two central purposes. First, they used language to express or propose ideas related to the task at hand. Illustrations of this usage included: “You know Bonny had this idea where we could use magnets” “Like bring it up” and “That would be too hard wouldn’t it?” Children’s high level of interest in this project, as well as their high level of motivation, was evident both in the volume and range of ideas they advanced using language this way. Opportunities for students to work in small groups during science activities and to develop a discourse of scientific inquiry appear to be critical for student learning in science. Listening to such discourse may also advance educators’ understandings about how students build knowledge in a group (Tobin, 1990; Wells & Wells, 1992).

Children also used language in a second way to effect social and organizational agreement. To illustrate: “So is that what we are going to do?” “Do you agree?” “Okay, we agree” and “Write that down on paper.” Such comments demonstrated some of the ways that children “operational-ized” their ideas and how they obtained sufficient closure to move forward as a group. Listening to students’ discourse and inquiry in science is important, but it is equally critical.
to be aware of what we are listening for in science. Careful attention to student discussion is necessary to first understand the nature of language used among students in groups (Haussling & Mueller, 1995; Mueller, 1997). Then teachers can begin to encourage students to voice their initial thoughts and to continue their discourse of inquiry. However, it is also necessary to remember that students have learned to use particular language structures in schools. In other words, students have learned that correct answers are desirable and that incomplete or tentative answers are not acceptable. Therefore, creating learning opportunities in science that encourage and require discussion in groups may be an important first step toward fostering student discourse in science.

When an analysis of children’s comments was tabulated (each comment was coded and assigned a category), I found that the language used by the groups to propose ideas accounted for 61% of the children’s expression, and the language used to advance social and organizational consensus accounted for 39% of their expression. Transcript analysis showed that all six groups used language more frequently to propose ideas than to secure social and organizational agreement. Across groups, however, the language used by youngsters varied considerably; certain groups proposed greater numbers of ideas than others did.

Closer analysis of the proposed ideas category provides some indication about how the language of work was used and changed within and across the six groups. Each group had the opportunity to work together in class for 11 work sessions, coded as Day 1 through Day 11. Across all groups, the first three sessions accounted for 87% of all ideas proposed; 49% of the total number of ideas were proposed during the second session. Similarly, data analysis of language used for social and organizational purposes showed similarly that 51% of usage occurred during the first three sessions. Again, Day 2 accounted for the largest single usage of language for those purposes; 29% of the total entries were during this session. Groups varied in the frequency with which they used language for social and organizational objectives throughout the remainder of the work sessions. However, as the project moved toward closure, the use of social and organizational language increased for all groups during the final three work sessions.

Analysis of language also revealed that, not surprisingly, each group organized itself differently—a finding already reported in the literature (Ossont, 1993). However, in proposing various ideas for the design of the project—mostly during the initial 3 days—each of the six groups used a coincident social and organizational use of language to explore how these ideas would be implemented into activities that would allow the project to move toward completion. It is a central notion of the Iowa Studies that social and educational research should take as its scope the full range of human organizations and that such organizations should be examined from interpersonal, group, and intergroup perspectives. The Iowa Studies also were based on the premise that group work should provide individuals with opportunities for personal growth (Marrow, 1965). In other words, acting democratically in a group provides an education in itself (Lewin, 1944).

In retrospect, the fact that Day 2 emerged as the session of highest language usage for all groups was likely conditioned by the teacher’s request for information about “what each group is thinking about.” Particularly, the teacher’s instruction that each group was expected to present their “ideas in progress” in written form by the conclusion of Day 2 clearly spurred the groups to entertain numerous ideas about the nature of their projects during the second work session.

Children’s Reflections During the Project

At the end of the first week, the researcher met briefly with four of the six groups to determine how they felt about the project and how they thought it would turn out. Three of the four groups expressed excitement regarding the amusement park challenge, whereas a fourth group indicated that the project would be too difficult to complete. All four groups reflected on their ability to work together. One student remarked: “I learned a lot about working with an idea and building on it when a problem comes along.” Group 5 reported feeling “very comfortable with their group members” because they had worked together earlier in the year. Group 2, in contrast, reported that they were unsure about how cooperatively the group would function because they had not worked together previously. One Group 4 member clearly stated a desire “to be in a different group” and expressed a fear of ending up doing all the work. Group 6 members expressed the difficulty they were encountering in talking things out and listening to one another because they all talked at once.

Acting on an observation from the first interviews that 2 children from each group voiced their ideas while the others remained silent, the researcher changed the interview strategy at the end of the second week by interviewing pairs of students from each group. During the second round of interviews, group members generally reported that they had a better idea of what they were doing. In some instances, children offered a sketch to explain how their amusement ride would work and to describe the materials they required to assemble the models. Discussion during the second interview sessions suggested that group members were thinking through their scientific explanations. When asked about how their particular group was working together, members in each group intimated that they were working things out and declared a genuine interest in their projects. Nevertheless, children from all groups generally reported that certain group members did not participate as much as others.

Children’s Reflections After the Project

On completion of the project, self-evaluation and interview data also were collected to gauge children’s reflections
on the nature of what they had learned. Children completed written self-evaluations on the same day as their final presentations. Ten days later, 2 children from each group were reinterviewed in pairs.

The self-evaluation component asked children to “describe what you learned while working through this project.” Their responses to the request generally fell within four categories: (a) acquisition of scientific knowledge or content, (b) acquisition of practical skills, (c) acquisition of group cooperation skills, and (d) learning to enjoy the challenge of science. Fourteen of 26 youngsters, or 54% of participants, reported improvements in their knowledge of science. To illustrate, 1 child wrote: “I learned about the steam engine and how it works.” Similarly, 14 out of 26 children, or 54% of participants, also reported learning how to apply science in practical ways through the use of project materials. In this regard, 1 student observed: “I learned how to make strong enough supports.” Eleven out of 26 participants, or 42% of the children, reported learning about group cooperation. “I learned if you don’t get the perfect group—and some people slack off—to keep going,” 1 child wrote. Finally, 9 of 26 children, or 35% of participants, observed that their learning was linked directly to the enjoyment they found in taking part in the project. One participant remarked: “I really enjoyed this project because it was fun and challenging.”

The postproject interviews likewise proved revealing. During those sessions, the researcher interviewed 2 children from each group using their self-evaluations as a guide to the questions posed. Much of the postproject discussion focused on children’s responses to questions about group learning in science and about their experiences with project work in general.

Children reported emphatically that they learned better when they were able to “do something” in contrast to “just reading the textbook” and “answering questions at the end of each chapter.” From their responses to interview questions, it was apparent that, although the students were only in Grade 6 or Grade 7, they were already dissatisfied with the predominant instructional pattern that centers on textbook learning and answering chapter questions or worksheets. One Grade 7 girl explained, “We’re not using textbooks and doing dumb experiments. We are really doing something, and we are learning from our mistakes. It’s not like reading about stuff and memorizing it. We actually do research and have to really find out stuff.”

In comparison, the children said that “hands-on” project learning was far more exciting and real. Children’s comments were especially illustrative in this regard. One child observed: “I really learned a lot—I didn’t think I could figure it out, like I could know that much information, learn or understand that much about it—but I do.” Another offered: “When you do it you remember it” because “it’s not like just reading about it.” One girl remarked: “We learned by going through the process” and “I would say, not everything works the way it’s supposed to.” One boy said: “It was like a scavenger hunt and we needed to figure it out.” Overall, in their solidly positive responses to activity work, children also appeared to recognize that they were not only learning science “but some math and other things.”

No less favorable were children’s responses to the advantages of group learning. One child explained: “I think learning to work in a group is really good; I don’t always like it but it’s a good skill to have; like when you get older you’ll have to work with groups and it’s more fun.” Others spoke about the benefits of learning “how to cooperate and work with other people.” Several acknowledged that they learned more because of their audiences as “the presentations really forced us to know our stuff.” “When you learn stuff without help you are really proud of it,” another reported. Still others noted the importance of “doing it ourselves and learning from our mistakes.” Such comments, when taken as a whole, suggest the rich diversity of learning opportunities that children see attached to projects in which they work together.

In identifying what they learned, youngsters also identified three criteria for effective group work, notably that (a) sufficient time should be allowed to participants in cooperative learning projects to talk and work their ideas out, (b) to listen and to exchange ideas with others, and (c) to present what they have learned to each other and to an outside audience. At the end of the amusement park project, the teacher asked youngsters to comment about their learning experiences. Some of their spontaneous responses are recorded as follows:

**Jade:** “I really enjoyed working this way. We didn’t have like tests at the end, but really it was tougher than a test ’cuz everyday we had to find out something new and be able to explain it. We really learned a lot.”

**Celia:** “The whole thing was like a test with no right or wrong answers. We learned along the way. It was really fun this way. Sometimes it was hard because groups didn’t work out that well. But we learned how to work.”

**Darren:** “I think the projects were really neat. It will be a total shock for the Grade 7’s because we’ve heard that in high school all you do is write tests and memorize textbooks. We won’t get to do anything anymore that is fun.”

**Sina:** “We’re really lucky. People always say to me you’re really lucky ’cuz you get to do things in your class. In high school we don’t get to do anything. People say your class is so lucky even people in elementary say that from other schools.”

**Divu:** “I think this is the best class in science I’ve ever had. We actually got to do things ourselves. We have to figure out how then.”

**Ria:** “You have more fun when you learn this way. This way you learn every time you do a little part.”

**Sina:** “When I’m actually into doing something I really want to understand it. When I’m reading a textbook it’s really boring and I don’t want to understand it.”

Without a doubt, “listening to students communicate about their science adventures provided important insights to
Ross and I about the nature of students’ learning” (Mueller, 1998, p. 95).

Several other findings from this case study are also worthy of note. First, a girl emerged as group leader in all six groups, a finding which in itself prompts far-reaching questions about gender and subject material, social leadership, and the role that language competency may play in classroom relationships between boys and girls. Second, despite obvious problems that some groups encountered in working together, all the groups found ways to cooperate to the point where they could complete the requirements of the project. Third, self-evaluations provided by the children were valuable to the teacher and sufficiently accurate to be used later—and in conjunction with other sources—as a reliable source of information for assessment purposes.

Finally, observations from this study suggest that the teacher plays a central role in setting up the conditions for collaborative learning, even though it appears on the basis of other studies (Martens, 1990; Rodriguez & Tingle, 1994) that many teachers feel uncomfortable with this approach despite documented positive effects of cooperative learning. Part of the discomfort has been attributed to the fact that some teachers require support in learning how to become facilitators and how to allow students to work and learn together (Barclay & Brebeny, 1994; Caplow & Kardash, 1995; Keevy & Drmacich, 1994; Martin-Kneip, Sussmann, & Meltzer, 1995). Welch (1998) recommended that teacher education programs should develop courses and field experiences to introduce prospective teachers to cooperative and collaborative classroom methods. In this study, observations on the teacher’s instrumentality in shaping the learning environment for children in science classes strongly support Welch’s recommendation.

REFERENCES


