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Schooling as Cultural Process: Working Together and Guidance by Children from Schools Differing in Collaborative Practices

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Contents

I. Introduction

In this chapter, we examine the role of the ubiquitous cultural institution of formal schooling in children's forms of collaboration and assistance with each other. We argue that this

institution, in which US children spend years of their childhood, fosters particular approaches to working together and guidance, in accord with the everyday structures of interaction in the classroom. To examine this idea, we observed the interactions of pairs of children from two public US elementary schools, one with philosophy and daily practices emphasizing collaboration throughout the schoolday and one with a more traditional format involving only occasional opportunities for children to collaborate. We observed how third and fourth grade dyads coordinated their work on several problems and how the fourth grade partners provided guidance to the third graders.

Children's collaboration with each other has become a topic of widespread interest, stemming in part from Vygotsky's (1981) and Piaget's (1977) theories and from cognitive developmental research that indicates that collaboration can shape children's learning (Bos, 1937; Gauvain & Rogoff, 1989; Glachan & Light, 1982; Kruger, 1993; Roschelle, 1992; Tolmie, Howe, Mackenzie, & Greer, 1993). However, this research also shows that collaboration is not necessarily easy for many children from mainstream US cultures. Commentators call for schools to teach children to collaborate, as this is a skill regarded as increasingly important in the workplace; growing literatures examine specific forms of cooperative learning as pedagogical techniques (Carnegie Forum on Education and the Economy, 1986; Human Capital Initiative, 1993; Johnson & Johnson, 1989; Sharan, 1990).

Research on the development of children's means of interacting when working on problems in common has focused primarily on age-related difficulties with collaborative communication (Azmitia, 1996; Ellis & Rogoff, 1986; Ludeke & Hartup, 1983; Patterson & Roberts, 1982; Peterson, Wilkinson, Spinelli, & Swing, 1982; Rogoff, 1990; Socha & Socha, 1994). For example, some child tutors neglect assisting their partners in preparing for the long-term goal of handling a task independently, either simply completing the task for their partners or insisting that their partners figure out the task without guidance (Ellis & Rogoff, 1986; Koester & Bueche, 1980; McLane, 1987; Peterson, Wilkinson, Spinelli, & Swing, 1982; Radziszewska & Rogoff, 1988; Schubauer-Leoni, Bell, Grossen, & Perret-Clermont, 1989).

However, Crook (1994) warned against looking at collaboration solely in terms of individual characteristics such as age, stage, or "skill" in comprehending others' intentions or communicating. He emphasized the importance of development of an "intersubjective attitude" that transcends the characteristics of individuals, as collaborators work toward constructing joint understanding. "If intersubjectivity does become a resource to support collaboration, it is because the conventions, rituals, institutions and goals of organized social life arrange that it should do so" (p. 145). This view calls for a cultural perspective in understanding "the conventions, rituals, institutions and goals of organized social life" that may support people's development of shared understanding for collaborative endeavors.

A. Conventions in the Organization of Cultural Institutions

Our general aim in this chapter is to widen the discussion of shared problem solving to a sociocultural view that emphasizes that individuals become proficient in the practices that are common and valued in the institutions and interactions of their daily lives (Rogoff, 1998). For many middle-class European-American children, solo activity appears to be prioritized in their homes and schools (Matusov, 1998; Mosier & Rogoff, 2001; Rogoff, Mistry, Göncü, & Mosier, 1993). In particular, participation structures in schooling often enforce solo performance in a way that we argue guides children over the years to forms of interaction that seem 'natural' to people who have spent many years in such cultural institutions.

The prevalence of particular discourse and structural features in US classrooms, summarized below, supports the idea that schooling involves cultural practices -- "ways of doing things" that are rooted in participants' beliefs, expectations, traditions, and relations (see Argyris & Schon, 1978; Goodnow, Miller, & Kessel, 1995; Rogoff et al., 1993). In organizations such as schools (or, for example, trade guilds, families, or churches), cultural practices are institutionalized with traditions that are somewhat predictable, normative, and structural. Habitual relations between people become institutionalized as accepted approaches that people come to regard as external to their functioning (Berger & Luckmann, 1966). Shotter (1978) explained:

> The *institutions* we establish between ourselves and others... implicate us in one another's activity in such a way that, what we have done together in the past, *commits us* to going on in a certain way in the future.... The members of an institution need not necessarily have been its originators; they may be second, third, fourth, etc. generation members, having "inherited" the institution from their forebears.... Practitioners of institutional forms need have no awareness at all of the reason for its structure—for them, it is just "the-way-things-are-done." The reasons for the institution having one form rather than another are buried in its *history.* (p. 70)

B. Traditional Schooling's Institutionalization of Ways of Working Together

Our work is based on the idea that schools teach not only the academic curriculum but also cultivate patterns of discourse, in accord with Vygotsky's (1981) notion that higher mental functions are "internalized social relations." We treat collaboration as well as traditional instructional discourse formats as institutional cultural practices (consistent with the work of other scholars, such as Erickson, 1982; Mehan, 1979; Tharp & Gallimore, 1988).

Studies of classroom structure indicate that US public school discourse is commonly organized with:

- a prohibition against students informally helping or even speaking with each other without teacher permission (often considered "cheating");
- the format of "quizzing" in which the teacher asks a known-answer question, a student responds with a simple answer, and the teacher evaluates the correctness of the answer; and
- the use of directive guidance in which teachers ask children to produce actions without explaining their meaning or providing a rationale for the requests.

(See Cuban, 1984; Heath, 1983; Lemke, 1990; Mehan, 1979; Mercer, Edwards, & Maybin, 1988; Minick, 1993; Newman, Griffin, & Cole, 1989; Wells, 1992; Wertsch & Minick, 1990; Woods, 1980.)

Several authors have suggested that children's facility in collaboration may relate to the social structure of particular classrooms that do or do not support collaborative interaction (Cazden, Cox, Dickinson, Steinberg, & Stone, 1979; Cooper, Marquis, & Edward, 1986; Damon, 1984; Sharan & Sharan, 1992). For example, Forman and McPhail (1993) speculated that fourth graders' difficulty in collaboration on mathematical problems may have been because their traditional classrooms provide little support for engagement in the sort of dialogue involved in collaboratively solving problems.

There is suggestive evidence that schooled people use communication patterns of the school outside immediate classroom contexts and constraints (Chavajay & Rogoff, 2001). For example, children who have been asked to teach others in a lab context occasionally use schoolteacher intonations and 'quiz' their partner or withhold information, as if their idea of teaching was based on the notion that schoolteachers regard open provision of information as out-of-bounds (Ellis & Rogoff, 1986; McLane, 1987).

C. Schools with Collaborative Traditions

The idea that schooling can be examined as cultural practice is supported by observations that schools in some communities are structured differently than the traditional US pattern. In some Mexican classrooms serving indigenous communities, a collaborative approach prevails, in which children work together with the teacher's support (Paradise, 1991). Some schools explicitly include instruction in how to collaborate. For example, in some Japanese elementary school classrooms, teachers provide explicit discourse forms for children to build on each other's ideas, providing suggested wordings for offering opinions by first noting agreement or disagreement with a prior student's idea (Toma, 1991).

Similarly, the collaborative school that was one of the settings of the present research includes learning to collaborate with and assist others as an explicit goal of the curriculum, with guidance often taking place in the process of working together with others of varying expertise (Rogoff, Goodman Turkanis, & Bartlett, 2001). In this school, designed as an alternative to traditional schools, collaboration is central throughout the day in children's learning and projects

as well as adults' decision making and guidance. Child and adult participants treat each other as sources of assistance, as they work together in small and large groups.

II. A Cultural Comparison Focusing on Schooling Traditions

In our study, we asked children from the collaborative school and from a more traditionally organized school to work together in pairs to solve several academic problems posed outside of the constraints of their classrooms. We made efforts to organize conditions of the study to be similar and comfortable for the children from both schools. We were interested in how they coordinated their decision making and in how the fourth-grade partner, who was asked to assist the third-grader in learning to handle the problems, provided guidance.

Consistent with sociocultural methods, we examined patterns of differences and similarities, rather than attempting to isolate variables (such as school affiliation or a particular practice within the schools) responsible for the observed patterns. We treated the children's school affiliation as a sort of cultural participation; cultural differences generally involve a constellation of connected practices (see Rogoff et al., 1993, for research strategies for examining cultural patterns.) We aimed to shed light on patterns that may function differently in communities that vary in numerous and structured ways; there are many differences in the two schools' philosophies and classroom structure besides the prevalence of collaboration or traditional instructional discourse patterns.

We did not isolate classroom practices from the practices of the families that form the communities involved in the schools. Attending particular schools is never random, and it was not for the children in the two schools we studied. Although the families in the two schools are of similar social class and the children perform similarly on the school district's standardized tests, there are probably differences between the families that choose one school or another. A primary difference between families selecting the collaborative instead of traditional schools may be in the collaborative school parents' commitment to being involved in the classrooms (they are required to work in the classrooms 3 hours per week per child enrolled). Other differences, for many, include interest in innovative pedagogic practices, collaborative forms of

instruction, and greater religious diversity than is common in Salt Lake City schools (Rogoff, Matusov, & White, 1996).

However, the differences in the children's approaches appear not to be simply due to preexisting emphasis and use of collaborative modes by the children's parents. Many parents from the collaborative school, although they may be interested in collaborative instruction, appear not to bring collaborative discourse patterns with them. Many parents reported that their participation in the school leads them to become more collaborative at home with their children, applying approaches that they learned at the school in resolving problems or enlisting the children's help with chores in a collaborative way that they state is modeled on observing how the teachers interact with the children (Rogoff, Matusov, & White, 1996).

Systematic observations also indicated that many parents do not commonly already use collaborative approaches in their classroom interactions when they join this school -- their instructional approaches seem to resemble their own traditional schooling. In the first few years of engagement as classroom volunteers, parents commonly demonstrate the use of adult-unilateral instruction, and usually show collaborative relations only after 2 or 3 years of weekly participation in the classroom (Matusov & Rogoff, 2001).

A. Our Expectations in the Study

We expected children in the collaborative school to use more collaborative discussions involving transactional dialogue as well as more collaborative guidance embedded in the process of shared problem solving. We expected children with a traditional schooling background to use question-answer-evaluation "quizzing" and directive formats for guidance, based on the interactional formats of traditional schools.

Of course, many aspects of the children's collaboration and guidance were expected to be similar as well, because along with their differences, the children from the two schools also have a great deal in common. The two schools are part of the same school district using the same state 'core curriculum;' teachers in both schools provide explanation and demonstrations of

information and skills — we expected no differences in the children of the two schools in guiding by providing explanations and demonstrations.

In addition, because the children of both schools live in the same European-American middle-class community, we expected a great deal of these children's working together to employ specialized roles in a sort of division of labor. This expectation is based on research indicating that European-American children often offered parallel, unrelated lines of instruction when teaching other children how to play a game, compared with Navajo children, who were more likely to build on each other's comments (Ellis & Gauvain, 1992), and young middle-class European-American children more often interact by dividing resources — taking turns — than do young Guatemalan Mayan children (Mosier & Rogoff, 2001). Hence we expected children from both schools to engage often in forms of collaboration that involve specialized roles, based on their common involvement in middle-class European-American ways.

Thus, we expected both similarities and differences of approach among the children whose schooling provides them with different traditions of working together, in the context of broader similarities in their schools' location in the same school district and community. Our expectation of both cultural similarities and differences is consistent with cultural studies more generally, where documentation of some similarities is an important accompaniment to observations of specific differences in line with cultural practices.

B. Methods

1. Participants and Their Schools

Forty-eight 9- to 11-year-old children were recruited from two public elementary schools in the Salt Lake City (Utah) school district. Twelve same-sex pairs of third and fourth graders (the maximum available) were formed from the collaborative school and twelve pairs were formed from the traditional school. At each school, an equal number of boys and girls participated.

Our information on the collaborative school comes from participant observation as well as from systematic classroom observations and surveys and interviews with teachers, parents,

and students (Baker-Sennett, Matusov, & Rogoff, 1992; Matusov & Rogoff, 2001; Rogoff, 1994; Rogoff, Matusov, & White, 1996). In addition, participants in the collaborative school have described its philosophy and practices in a collaborative volume (Rogoff, Goodman Turkanis, & Bartlett, 2001).

The collaborative school was organized as a parent-teacher co-operative and had functioned as a public school program for 14 years by the time of the study, with 6 or 7 mixed-grade kindergarten through sixth grade classrooms. The program is public, serving the whole school district, and optional, open for families to select. Children represent the range of aptitudes that are usual in classrooms throughout the district.

Learning to work effectively in groups is an explicit part of the collaborative school's curriculum, as indicated in written philosophy statements. During the schoolday, children usually work in various-size flexible small groups with the teacher and/or parent volunteers, and children sometimes work on their own. They often share decision making on projects with classmates and adults; they contribute to adults' guidance (conversing openly with teachers and parent volunteers, as well as with each other) and treat other people as a source of help.[2]

The traditional school was selected for comparison on the basis of being similar to the collaborative school in family socioeconomic status, from a neighborhood like that of many of the children in the collaborative school, and having a traditional classroom structure with learning based mainly on whole class and individual instruction. The selection was based on the advice of school district personnel familiar with the schools, as well as informal classroom observations and interviews with teachers and principals that indicated that this school could be characterized as an excellent school following the usual US instructional format of teacher-run whole-class and individual instruction, with little shared academic discourse between students.

This school, like the collaborative school, had been honored with awards in recent years by the state governor.

Our interviews with children, discussions with teachers and the principal, and informal classroom observations indicated that cooperative learning in schoolwork was seldom employed in the traditional school at this time. Our study was carried out in 1991, a year before the Salt Lake City School District launched "cooperative learning" programs in elementary schools throughout the district. Most of the day in the traditional school involved either teacher/whole class or teacher/ individual student interactions or individual work. Joint projects and freedom to collaborate were rare in the traditional school, as was assistance in learning to work together. Some of the children mentioned in post-interviews that in their classrooms, helping was treated as 'cheating.' This arrangement is consistent with observations of US elementary schools in which students' initiation of communication is controlled by the teacher, with teachers relying on known-answer questions in which they set students questions or tasks, students respond, and teachers evaluate the students and their responses (Cuban, 1984; Mehan, 1979).

Like the families at the collaborative school, families at the traditional school had the option of sending their children to other schools in the district, because the district provided flexibility in attending out-of-neighborhood schools. Most children at the traditional school were from the surrounding neighborhood; middle-class families in Salt Lake City often choose housing on the basis of being close to particular schools. Parent involvement in the traditional school was mainly in PTA meetings, fundraising, and helping with children's homework.

Many characteristics of the children were similar across the two schools, including standardized achievement test scores of the children. Ethnicity of the families at both schools was similar -- predominantly European-American, consistent with the Salt Lake City population at the time. The traditional school draws from a middle- to upper-middle-class population

whereas the collaborative school attracts a more heterogeneous but basically middle-class population. The proportions of students from low-income families (qualifying for free or reduced-price lunches) were 12% from the collaborative school and 6% from the traditional school in 1994, according to figures provided by the Salt Lake City School District.

2. Observing Pairs of Children Working on Out-of-Class Academic Tasks

Each pair consisted of one third grader (9-10-year-old) and one fourth grader (10-11-year-old) who worked together on four assigned problems, with the fourth grader asked to help the third grader learn how to do each problem. The sessions of about 30-40 minutes were videotaped in a quiet room in the school outside the regular classroom.

Because the collaborative school regularly blended age groups in the same classroom and the traditional school did not, we avoided differences in familiarity by not pairing children from the same classroom. In addition, we did not pair children who reported having close bonds outside the classroom. The researcher was not familiar to the children of these grade levels in either school.

The researcher requested the fourth grader to sit next to him (to help distinguish the fourth grader's instructional role) and explained that he was interested in finding out how children help each other learn. He asked the fourth grader to help the third grader learn how to solve the problems, "since you're in fourth grade."

The first problem was an open-ended card sorting problem that involved sorting 18 photographs of household items into any number of groups (using the photographs but not the procedure from Ellis & Rogoff, 1982, 1986: hair blowdryer, typewriter, toaster, scissors (2), knives (2), bowl, cup, bucket, broom, washing glove, mixer, wooden spoon, measuring cup, towels, toothbrush, razor). The researcher gave the 18 cards to the fourth grader, saying "Your job is to help the third grader learn how to figure out which pictures go together so s/he could do

it alone later on. Make sure s/he learns how to do it." The children were asked to group items that they thought "went together," and were not told how many or what sort of groups to make. When the children said they had finished, the researcher asked the third grader to give a name to each group and to explain the rationale for the groups.

The remaining three problems were math story problems, taken and slightly modified from fourth grade math textbooks that were in use in Salt Lake City schools (including these two schools). The teachers reported and our post-session interviews with the children showed that all fourth graders in the study had already done these problems during their classroom math activities and all third graders had not previously engaged in solving these problems. Each math problem was presented on a piece of paper given to the fourth grader:

- "Debbie is going to make sandwiches with either cheese, jam, or roast beef. She is going to use white or brown bread. How many different kinds of sandwiches can she make?"
- "Fifteen students in the fourth grade class sold tickets to their play. The graph shows the number of tickets sold each day for a week. Use the graph to solve the following problems. 1) How many tickets were sold on Wednesday? 2) How many tickets were sold on Thursday? 3) How many more tickets were sold on Thursday than on Wednesday?"
- "Use the data from the map [showing routes connecting 13 imaginary towns] to solve this problem: A family drove from Centerville to visit their grandparents. They traveled 52 miles to get there. Which town do their grandparents live in?" (The solution required adding several distances.)

The researcher instructed the fourth grader, "Your job is to help the third grader learn how to solve these problems. Here's the first one. You can write whatever you want on the page, just make sure the third grader learns how to do it."

For all four problems, children were given as much time as they wanted. The researcher busied himself with paperwork as the children worked, to discourage children's attempts to involve him in problem solving.[3] After the children indicated that they were done with each problem, the researcher asked the third grader to explain each solution.

The fourth graders from both schools usually followed the instruction to help the third graders learn how to solve the problems, by providing guidance or somehow taking the role of helper or director. Those from the collaborative school took a special role in 83% of the task sessions and those from the traditional school did so in 88% (not a significant difference). In the cases in which the fourth grader did not assume a special role, either the third grader took over control of the task or both children tried to solve the problem as equal partners. Of all 96 problems (24 dyads x 4 problems), there was only one in which a fourth grader's guidance was rated as insensitive and none in which a fourth grader looked lost.

3. Categories of Working Together and Guidance

Our rating system focused on holistic patterns of children's working together and guidance. Shared ideas are discernable in close examination of partners' utterances and actions in relation to each other over time, but not within single individuals' isolated utterances or actions (Crow, 1994), because partners co-construct the meaning of their interaction as they work together. Coding sequences of discrete behaviors or utterances would not capture the meaning of children's interactions, which requires judgments with attention to the surrounding moves of both partners as the communication develops. For example, a fourth grader's request to a third grader to try the problem on her own might be a part of quizzing in one context, such as if the fourth grader had just asked a question to which he or she already knew the answer and

withheld helpful information from the third grader to test whether the third grader knew the answer. In another context, a fourth grader's request to a third grader to try the problem on her own might be a part of guidance embedded in collaboration, such as if the fourth grader provided opportunities for the third grader to assume more responsibility within their collaboration and contributed his or her own suggestions as they worked together.

A focus on functional, contextual patterns of interaction is well-respected in lines of research that examine the meaning of interaction rather than the detailed form of individuals' moves (see especially Adamson & Bakeman, 1982; Bremme & Erickson, 1977; Cazden, Cox, Dickinson, Steinberg, & Stone, 1979; Cicourel, 1974; McDermott, Gospodinoff, & Aron, 1978; Mehan, 1979; Rogoff & Gauvain, 1986; and Rogoff et al., 1993; Wells, 1992). Participants in social interaction provide explicit evidence regarding the meaning of their actions to each other, informing each other of their purposes through jointly created discourse and action, including clarifications in cases of ambiguity. This evidence is essential to the achievement of understanding between participants, but also provides researchers with evidence regarding the meaning of actions. Interrater reliability of our analysis (see below) validates that such analysis is not idiosyncratic.

Our rating categories focused on discourse patterns that have been observed in studies of classrooms in traditional schools (quizzing with known-answer questions and directing a learner's actions without providing a rationale) as well as discourse patterns observed in research on joint problem solving and in our classroom observations in the collaborative school (transactional dialogue, and instruction embedded in collaboration).

To provide context for the differences that we expected, we also rated several formats in which we did not expect schooling differences. We expected the children from both schools to work together in specialized division of labor and to provide pure instruction (explanations and demonstrations), because both schools involve many occasions of division of labor and pure instruction and because these are also common in middle-class European-American children's family relations (see Rogoff et al., 1993). We also rated working together with flexible

coordinated action, to see how it would relate to working together in specialized division of labor. Based on the literature, we also rated engaging in nonshared decisions and making unilateral decisions, but we had no reason to expect differences between the two schools in these formats.

The approaches to working together and approaches to guidance are not conceived as independent classes of information. Rather, they have different foci: The approaches to working together focus on the type of involvement of the partners together, whereas the approaches to guidance focus on the role taken by the fourth grader assigned a helping role (with information about the contributions of the third grader required for interpreting the fourth grader's guidance but not serving as the focus of coding).

Approaches to Working Together. The five approaches to working together varied in the extent and nature of collaboration:

Nonshared decisions: children did not share their problem solving. While one of the partners was working on the problem, the other was not occupied with solving the problem (e.g., looking away, gazing blankly, just waiting, or not being allowed to see the materials) or both partners worked on the problem independently without any contact or coordination (e.g., by dividing the worksheet between them and working without showing the partner their solution).

Unilateral decisions: one child worked on the problem with no regard for the other, who observed — problem solving was minimally shared. Unilateral decisions could include taking long turns to work on a problem, with one child working for a while, then the other, without sharing of ideas across time but with both partners engaged with the problem. It was not considered unilateral decision making if the children built on each other's ideas in turn, or if one lectured or supervised the other.

Specialized working together: children coordinated different contributions to the work, by dividing the labor. The job was divided in parts to regulate each partner's active participation in problem solving. The partners coordinated their activity with tacit or explicit role specialization (e.g., one pointed to the route in the map problem and directed the other to

calculate the distances; one asked questions for the other to answer; or one took responsibility for reading the problem or lecturing or supervising the partner).

Working together with flexible coordinated action: partners played interchangeable roles without specialization, but also without building on each other's ideas to seek consensus. Both children worked on the same aspect of the problem (perhaps exploring different ideas) at roughly the same time, attending to the immediate outcome of each other's efforts and adjusting actions to each other. For example, in the card sorting problem, children classified cards using a common framework and were aware of and adjusted to each other's decisions; in the sandwich combination problem, the children used a joint list on which they each wrote down new combinations of sandwiches. Flexible coordinated action did not involve explicitly checking with each other for evaluation of ideas, and did not need to involve fine-tuned adjustment to each other or evidence of shared thinking.

Transactional dialogue: children together examined the problem and possible solutions, building a new understanding collectively. Each child concentrated on the other's ideas as they were offered and the solution came directly from the process of dialogue, with the partners directly addressing ideas to each other, as in Bearison's (1991) "transactional discussion." (The dialogic turns could be accomplished by words or by actions directed to the partner for consideration.)

Both partners checked with each other for evaluation of their own ideas and for feedback. This often led to extensions and development of ideas and a new joint understanding of the problem and, finally, its solution. For example, on the map problem, when one child examined distances to Centerville (by connecting each neighboring city to Centerville with his finger) and noted, "Look, there isn't any city that's 52 miles away from Centerville," his partner agreed, "No," and suggested, "I think we should add two or three distances to get 52 miles." The second child's contribution of new possibilities for a solution of the problem built on the first child's observation. Transactional dialogue did not need to involve equal contribution of ideas from the partners or equal leadership, nor agreement on intermediate steps of shared problem solving;

rather it involved children presenting, testing, and building on each other's ideas and finalizing the solution together.

Guidance Approaches. Only communication by fourth graders that appeared to be aimed at assisting the third graders' learning or performance was rated as guidance -- it involved explaining, offering guiding questions, talking-aloud strategies for the partner's benefit, or demonstrating. Guidance did not need to be effective or accepted by the third grader.

Quizzing. The fourth grader verbally tested the third grader with known-answer questions (e.g., "which of these [displayed cards] belong together?") to focus attention on specific information and/or evaluate the third grader's answer (e.g., "Good job, those cards match!"). Quizzing often involved the fourth grader withholding information from the third grader such as by providing a challenge (e.g., "Think again, there should be another combination [of sandwiches]") or by giving accuracy feedback that avoided giving further information (e.g., "No, that's not it."). However, quizzing could involve some presentation of information for assistance, such as when a fourth grader structured the problem for the third grader's benefit by selecting the right answer and asking the third grader to explain this solution or leading the third grader by means of prompts to see the correctness of the solution.

Directing actions, without rationale. The fourth grader controlled and directed the third grader to carry out the actions of solving the problem without explaining or prompting the learner to seek a rationale (e.g., in the card sorting problem, "Now put the cup and bowl together"). Directing actions did not involve provision of rationale or ideas that represent the whole solution -- it was as if learning comes from actions directed by the teacher, even without understanding.

Pure instruction. The fourth grader provided explicit demonstration and/or explanation and justification of actions to the third grader, who was treated as an audience/observer (e.g., "I'll tell you how," or "See how I do it"). With demonstration, even if there was little or no justification, interaction was still rated as pure instruction if it was clear that the fourth grader's purpose in demonstrating was instructional. An example of pure instruction in the sandwich

combination problem involved a fourth grader explaining the solution for making all possible combinations of 2 types of bread and 3 types of toppings to his third grade partner:

> "OK, brown bread and white bread -- it's 2... And 3 toppings make it 6. OK? Because 2 times 3 is 6... And, let's say, if you had 8 things that had to go with... 4 things. 8 times 4 is... what? 32." Then the fourth grader drew a graph putting all possible connecting lines between an upper row of 8 dots and a bottom row of 4 dots. After counting the 32 connecting lines together with the third grader, he asked, "Get it?" The third grader replied, "Yeah."

Instruction embedded in collaboration. Here, guidance was offered during the process of collaborative solution. The partners worked together with the fourth grader providing explanation, demonstration, or justification in the context of joint action. Instruction embedded in collaboration differs from quizzing and pure instruction because the fourth grader did not need to know the solution of the problem prior to guiding the third grader. [If there was extended didactic instruction (e.g., several paragraphs' worth of explanations or demonstrations), the interaction was not rated here but in "pure instruction."] For example:

> In the map problem, after exploring the map together with a third grader, a fourth grader suggested (while writing numbers), "Now let's add these two distances to see if we get 52 miles," and started adding the numbers while the third grader looked for alternative routes.
>
> In the card sorting problem, another fourth grader said, "Let's pick up kitchen stuff," and the third grader took a card, asking, "Like this cup?" The fourth grader confirmed, "Yes, the measuring cup, the mixer, the toaster" while selecting those cards; the third grader proceeded to help her find more 'kitchen stuff.'

Coding occurrence and extensiveness of the different approaches. The raters treated each of the four problems as a separate coding unit. For each problem, the raters characterized the extent to which each of the 5 approaches to collaboration and 4 approaches to guidance were used in the dyad's work on the problem. The raters used a scale to distinguish whether each approach was the only one applied to the problem, the approach predominated in duration and/or

importance to the problem solution but another or others were important at times, the approach was used minimally, or it was not used at all. For most problems, each dyad was characterized as using one or two approaches.

Results were identical whether we analyzed the ratings of extensiveness of each approach within each problem or simply examined the occurrence of each approach (beyond minimal use) within each of the four problems. Hence our results report only the occurrence of each approach (beyond minimal use) within each of the four problems.

Reliability of rated categories. All 24 dyads were rated by one person who did not know the design or the questions of this study, and was not aware that we were comparing interactions of children from two different schools. For reliability purposes, 14 dyads (seven from each school; 58% of the total data base) were rated also by the first author. Interrater reliability of occurrence of the approaches to working together and to guidance yielded Cohen's Kappa values ranging from .74 to .88 (except for the variable of fourth graders directing actions without providing any rationale, which almost never occurred). Kappa values in this range reflect "good" to "excellent" levels of agreement (Fleiss, 1981).

C. Two Cases Illustrating the Patterns from the Two Schools

Combined qualitative and quantitative analyses of the videotape data helped us discern that the children from the collaborative school used transactional dialogue and guided during collaboration more than the children from the traditional school, who used more quizzing. In this section, we present a qualitative analysis of two cases illustrating the distinctive patterns of working together and guidance in the two schools. We describe one dyad from each school, along with justification of the ratings of the categories of working together and guidance. We provide these descriptions both to give a more solid feel for how several prototypical cases developed their approaches over the course of dealing with one of the problems, and to illustrate the rating categories defined previously.

Both cases involved pairs of girls, working on the first problem -- card sorting, with the instruction to the fourth grader (“4G”) to help the third grader (“3G”) learn how to figure out

which pictures go together. (This problem was designed to have items that could be classified in multiple ways; it does not have a single 'right' answer.)

Case 1: Dyad from the traditional school. This dyad's approach to working together was rated as *specialized working together*. Throughout the problem, the dyad's joint activity was based on division of labor between the fourth grader -- who presented problems for the third grader and provided guidance -- and the third grader, who was responsible for replying to the fourth grader's quizzing.

This dyad's approach to guidance was rated as *quizzing*. The fourth grader guided by trying to solve the problems in advance of involving the third grader, posing known-answer questions, and testing and evaluating the third grader's knowledge (and giving hints and modifying the questions if the third grader had trouble).

> As soon as the researcher gave the cards to the fourth grader, she started silently putting each card on the table. Then she picked up the electric mixer card, showed it to the third grader, and quizzed her, "OK. What do you use to do this with?" The third grader looked perplexed, "I use…ah…." Then 4G clarified by circling her hand over all the cards, "...out of all of these pictures." That helped 3G, who replied, "Okay," and looked at the other cards spread on the table. She found the measuring cup card and said, "You use one of these... to put it into." 4G approved, "All right," and handed 3G the two cards, "So put these together."
>
> Then 4G picked up the card showing the wooden spoon and quizzed again, "What do you use to do *this*?" 3G identified the bowl card and said, "This!" 4G asked for explicit justification, "Because?" and 3G replied, "Because of stirring." 4G evaluated, "OK."
>
> 4G looked over the cards for a while and continued quizzing, with the toaster card, "What do you use to go with this?" 3G took the card, examined the rest of the cards on the table, and expressed puzzlement, "Hm…." 4G turned the cards right side up for 3G, who continued to hesitate. Then 4G prompted, "OK, what do you eat out of this?" 3G replied with puzzlement, "Toast?" 4G prompted further, "And what do you eat with food usually? What do you drink if you're eating?" 3G smiled, picked up the cup card

and exclaimed, “Oh, yeah!” 4G approved, “OK,” when her hints led to the answer 4G wanted.

4G examined the cards to determine the next pair for herself in advance of asking 3G to find the pair, “And then, let’s see….” After 4G found the pair, her- quizzing continued. She gave 3G the hair blowdryer card, “What goes with this?” While 3G was thinking of what goes with a blowdryer, 4G turned the razor card to look at it. 3G seemed to take this as a prompt, picked the razor card, and replied, “This! Because they’re both used in the bathroom.” 4G approved, “OK,” but with some reservation in her voice as she looked at the rest of the cards carefully, saying “Um, let’s see.” 3G picked up 4G’s uncertainty and said, “No, wait,” and put the razor card back down. Now 4G deviated from her quizzing with uncertainty about the grouping; she paused to solve the grouping for herself and then gave the answer to 3G by taking the towel card, showing it to 3G, and saying, “I think it’s this one because you use towels when you use the hairblower.” 3G enthusiastically agreed with 4G, “Uh huh!” and took the card, putting it with the blowdryer in the growing collection of pairs of cards beside her.

The fourth grader continued the cycle of quizzing the third grader for the fifth and sixth pairs, giving 3G a hint when she had difficulty on the sixth pair, and continuing to evaluate 3G’s answers.

The quizzing routine continued until all cards were paired. However, the criteria for grouping slipped with the last 3 pairs, as not all cards could easily be paired according to their functions. Nonetheless, this dyad chose to overlook problems in their categorization scheme to maintain the question-response-evaluation rhythm of the roles they had been using for 6 pairs (“Which?” “This.” “Good.”). Thus when 4G asked for the card to go with the broom, she accepted 3G’s choice of typewriter with no discussion of rationale and no checking of prior pairs to see if there was a better functional pair. (There was no better option among the remaining 4 cards.) The two children hardly skipped a beat in their rhythm, though brief strange facial expressions marked some dissatisfaction with this pair. The last 2 pairs were formed by being in the same category rather than having a functional relation (2 types of scissors; 2 types of knife). In making this shift, the fourth grader successively transformed her usual question — asking about

the first scissors card, "How do you use this?... What goes with this?... What matches this?" As soon as the last pair was formed, the children turned to the researcher, who asked 3G to explain the groups.

Case 2: Dyad from the collaborative school. This dyad's approach to working together was rated as *transactional dialogue* because the children built solutions together through constant consulting and giving each other feedback; they also used some *specialized working together* as the fourth grader assumed a specialized role in setting the activity -- providing the frames of problem solving, explicating important aspects of the activity, and adjusting the third grader's participation. All contributions of the fourth grader were open for the third grader to observe and participate in. The dyad's approach to guidance was rated as *instruction embedded in collaboration* because all of the fourth grader's guidance occurred as part of the joint activity.

After the fourth grader placed the 18 cards one-by-one on the table and asked the researcher several clarification questions about the goal of the task (to which the researcher replied, "Do what you think best"), 4G turned to 3G, who was watching closely. 4G said "So, we can put them into different categories.... OK, so… like we would have… (picking up cards) scissors, scissors, and maybe razor, because they're all 'sharp' or something ... and maybe the knife." 3G nodded enthusiastically and said collegially, "Okay. That's good." So 4G put those four cards aside, "OK.… This is the 'sharp' category," specifying the category rationale for the third grader and modeling the process during selection of this first group.

Meanwhile, 3G pitched in and began the second group, following the same process. With 4G watching closely, 3G picked up cards and put them into a pile, "Hairdryer… Hmm... Toothbrush… And what else goes into bathrooms?" 4G was looking for an appropriate card when 3G answered herself with enthusiasm, "Towels go into the bathroom!" She put the towel card into the pile and turned to 4G, who replied, "Yeah."

4G provided leadership on the next group, saying, "Kitchen stuff," and the two girls worked closely together, consulting on the items for this group. 3G was very

attentive as 4G looked for an appropriate 'kitchen' card, "We can have knife..." (handing it to 3G), and then 3G chimed in, saying "yeah, butter knife... bowl," as she put these cards in a pile. 4G said "bowl" along with 3G, and then both girls said "cup" as they placed that card together. 3G picked up the wooden spoon card and then hesitated, "You'd find this in a kitchen, wouldn't you?" 4G assured, "Yeah!" and 3G nodded and echoed 4G's "yeah." The two girls each picked out several other cards for the kitchen pile, briefly discussing their appropriateness; at one point 3G checked the cards in the kitchen pile. 4G then checked the cards in the prior 'bathroom' pile, affirming, "Those go together," while 3G pushed the 'kitchen pile' to the middle of the table, indicating nonverbally that the 'kitchen' pile was done. The girls then consulted together to construct a 'cleaning' category.

When the girls noticed that the one remaining card (the typewriter) would not fit their categories, 4G suggested reluctantly that they reconsider their groups, "Maybe we should do some other ones?" and 3G said "Hmm." 4G provided leadership in suggesting a new scheme. She took the hair blowdryer card from the 'bathroom' pile and gave it to 3G, with the typewriter card, announcing, "Electric things." 3G grabbed the 'kitchen' pile to check whether there were other 'electric' items there. 4G supported her, "Yeah, the mixer and toaster from there," and the two moved these items to the new 'electric' category. Then the two girls looked through the remaining piles.

The fourth grader then suggested exploring further possible ways of sorting the cards, "We can do it by… kinds [they are made of]. Like, here's glass.... Here's metal… (putting cards into the new piles), metal, metal, metal…." 3G joined in, making a 'plastic' group, grouping 3 items "Plastic, plastic, and plastic."

The dyad handled several ambiguous items by sharing problems and discussing possible solutions. Often the girls appropriated each other's solutions in solving ambiguous cases (where an object had both metal and plastic). Sometimes it was the third grader who provided the solution accepted by the dyad. At times, 4G appropriated and transformed 3G's reasoning and applied it to another ambiguous case. The fourth grader had a special guiding role in explicating and justifying solutions to these emergent problems.

The children reviewed the 6 new groups together, with the fourth grader leading in naming the groups and the third grader contributing.

4G proposed making another sorting by color, and 3G agreed enthusiastically. They continued the pattern of their work, sorting the cards into 8 groups by color, watching and checking each other's placements. Then 4G offered the lead to 3G to suggest another way of sorting, "Now what do you want to do?" But 3G replied, fidgeting a bit, "I don't know." 4G suggested, "Hm… [We could do] which ones have wires?" 3G said "Okay," and counted the objects with wires. 4G suggested several other criteria for sorting (shapes and whether the objects had handles) and the two sorted together by each criterion in turn. Finally, the researcher asked 3G to explain the (last) sorting.

As can be seen in these two cases, the dyads used rather coherent and distinct approaches to working together and guidance. The character of the dyads' approaches developed over the course of problem solving in ways that fit with the practices of their schools.

D. Regularities of the Dyads' Approaches to Working Together and Guidance

In this section, we examine the regularities of the approaches to working together and guidance, across all the dyads in all four problems. Because there were no significant main effects for problem or interactions between problem and school factors in repeated measures ANOVAs with problem as a repeated factor, all further analyses were based on values combining the four problems.[4]

Approaches to working together. Table 1 shows the mean number of problems (of the four total problems) in which the dyads demonstrated more than minimal use of each category of working together. The most common approach used by the children from both schools was specialized working together (and there was not a significant difference between the children from the two schools in the average number of problems in which they worked together with specialized roles). All dyads from both schools used specialized working together more than minimally, and many from both schools used this approach extensively.

Insert Table 1 about here

The next most common approach for the children with a collaborative schooling background was transactional dialogue, the most shared form of decision making, in which partners built on each other's ideas. The children from the collaborative school were judged to use this approach on significantly more problems than were children with a traditional schooling background (see Table 1). In addition, we noted that nine dyads from the collaborative school used transactional dialogue more than minimally for at least some of the session, whereas only two dyads from the traditional school did so.

The other approaches to working together -- nonshared decisions, unilateral decision making, and flexible working together -- were seldom used in either group, with no significant differences between the two groups in use of these approaches.

Approaches to guidance. Table 2 shows the mean number of problems (out of four) in which dyads demonstrated more than minimal use of pure instruction, quizzing, and instruction embedded in collaboration.

In the traditional school, as expected, dyads were judged as engaged in quizzing (asking known-answer questions to test understanding, often evaluating the responses) in significantly more of the problems, on average, than were dyads in the collaborative school (see Table 2). Our analysis also showed that ten of the twelve dyads from the traditional school used quizzing more than minimally, whereas only three dyads from the collaborative school did so.

Insert Table 2 about here

Instruction embedded in collaboration, the most collaborative form of guidance, was judged to have been used by the children from the collaborative school in significantly more of the problems than by children from the traditional school (see Table 2). We also noted that seven dyads from the collaborative school engaged more than minimally in instruction embedded in collaboration, whereas only two dyads from the traditional school did so.

"Pure instruction" was employed more than minimally by about half of the dyads from both schools (six dyads with collaborative schooling and five dyads with traditional schooling), with no significant difference between the schools in the number of problems in which pure instruction was employed (see Table 2).

Directing actions without providing rationale almost never occurred (and thus is not included in the Table). Out of all 4 problems for all 24 dyads, there was only one problem in which one fourth grader directed the third grader's actions without providing a rationale. It was surprising that neither group engaged in direction of the third grader's actions, because previous studies (Ellis & Rogoff, 1986; McLane, 1987) have found that peer instruction may involve a focus on task completion rather than on increasing the learner's overall understanding of the problem and its rationale.

Dyads that used transactional dialogue often embedded instruction in collaboration. It is informative, but not surprising, that dyads that used instruction embedded in collaboration also often used transactional dialogue in working together. Considering all 24 dyads from both schools, 11 of the 14 dyads employing instruction embedded in collaboration (including those who did so to only a minimum extent) also used transactional dialogue, (Cramer's $\underline{V}$=.50, $\underline{p}$<.05).[5] Both instruction embedded in collaboration and transactional dialogue were predominant in the collaborative school. These findings are consistent with the collaborative type of discourse encouraged in the collaborative school that could be expressed both as collaboration through transactional dialogue and as instruction embedded in collaboration.

III. Discussion of the Findings: Culture of Schooling in Shaping How Children Work Together and Guide Each Other

Consistent with the idea that participation in schools with varying practices may contribute to shaping the formats of interaction, the children with a collaborative schooling background more commonly built on each others' ideas through transactional dialogue and more commonly embedded their instruction in collaboration than did the children with traditional schooling experience. In contrast, the children with a traditional schooling background

predominantly used a 'quizzing' form of guidance based on asking known-answer questions and withholding information to test learners' understanding, consistent with guidance often used by teachers in traditional schools. These results, supporting the idea that children learn more than curriculum content in their involvement in the teaching and learning practices of their school, are consistent with the view of schooling as a cultural process.

In this section, we discuss educational practices relating to the differences that we observed, and argue that schooling is a central cultural contributor in children's learning how to collaborate and to assist each other in learning. We also examine similarities in the approaches of the children from the two schooling backgrounds. Then we discuss questions of whether one approach is better than another — which requires consideration of what they might be better for. Finally, we argue that children's learning and collaboration needs to be considered in the ecological niches in which they both learn to participate and in which judgments of value are nested.

A. Educational Practices Producing Cultural Differences

Differences in children's approaches to working together and to guidance, outside their classrooms in our experiments, resembled differences in their everyday classroom practices. This finding supports the view that participation in schooling amounts to a form of enculturation, extending beyond the classroom situation. Children with experience in a school organized around collaboration more often built on each others' ideas in problem solving and provided guidance in ongoing collaboration; whereas children with experience in a traditional classroom structure used the traditional teaching format of known-answer question/ response/ evaluation sequences.

The contrast is clear in two brief examples from the card-sorting problem. In the first example, a dyad from the collaborative school used transactional dialogue and instruction embedded in collaboration.

> The fourth grader picked up two cards -- knife and bowl -- and suggested combining cards as "kitchen stuff," while the third grader picked up the yellow hairdryer and yellow washing gloves and suggested organizing the cards by color. Then 4G noticed the

> different potential strategies and said, "We can do it by kitchen, by color..." 3G interrupted him, "...by size, by material..." 4G ended (with excitement), "yeah, we can do it in many ways. Let's… let's try to find all of them!"

These children built on each other's ideas through transactional dialogue as they broadened the definition of the task by deciding to find all possible systems of classification, and the fourth grader provided commentary that helped to guide the problem definition as the children developed it together.

The second example illustrates how children with a traditional schooling background often used guidance involving quizzing, temporarily withholding information to test the third graders' knowledge or asking questions not to get information but to lead the third graders to a correct answer.

> A fourth grader from the traditional school pointed at the toothbrush card and asked the third grader, "Where in your house do you keep a toothbrush?" 3G answered, "In the bathroom." 4G kept quizzing, "So where're you gonna put this card?" 3G pointed at a group of cards and responded, "With the bathroom stuff." 4G evaluated 3G's answer, "That's correct. Put it with the bathroom stuff."

Thus, children whose classrooms prioritized working independently of others, with teachers structuring the classrooms in traditional fashion -- presumably frequently quizzing the children with questions with known answers, providing hints to move children closer to the right answer, and evaluating replies -- more commonly employed quizzing in out-of-classroom helping of another child.

These differences in the children's approaches to working together and guidance were accompanied by broader differences in the children's attitudes and values regarding collaboration with other children and with adults — supporting the idea of cultural, not just behavioral, differences in the children's approaches. In interviews subsequent to our observations, many children from the traditional school indicated a belief that when a more knowledgeable person does not know how to solve a problem in advance, guidance is impossible, whereas children from the collaborative school indicated that a more knowledgeable

person can guide by demonstrating his or her ways of approaching the problem. Students' help to each other unsanctioned by the teacher was viewed as cheating by children from the traditional school but as a resource for learning by children from the collaborative school. The collaboratively schooled children tried to involve the researcher in their thinking twice as often as did traditionally schooled children, consistent with differences in their classroom experience — in the collaborative school, adults are potential partners and resources for help, whereas in the traditional school, adults often give students a task as a test in which engaging with the adult in problem solving is illegitimate.

The totality of differences in the children's approaches, attitudes, values, and relations constitutes differences in cultural practices situated in the two school institutions. Through participation in these cultural practices, children learn how to initiate the practices, assume appropriate social roles and identities, and become members of the communities of practice. These cultural practices of organizing formal education are, in their own turn, embedded in local communities, broader societies, and belong to political, economic, social, and cultural realms.

B. Cultural Similarities Across the Two Schools

The broader settings in which the two schools are embedded not only support differences between their cultural practices but also similarities. The schools are not opposites, standing apart on all dimensions.

Not surprisingly, children from both schools frequently used specialized roles in working together. The prevalence of specialized working together, in which children assume different roles in a division of labor, fits with other research with children of this cultural heritage (Ellis & Gauvain, 1992; Mosier & Rogoff, 2001). In contrast, division of labor in problem solving was less common in indigenous Mayan family groups in which an adult had spent few or no years in formal schooling; these groups usually engaged in a more fluid multiparty form of collaboration (Chavajay & Rogoff, 2001).

Similarities in approaches to guidance were also expected and found in the extent to which the fourth graders from the two schools provided pure instruction (explanation and

demonstration). This approach was used in both schools. The children from both schools also were similar in rarely engaging in nonshared or unilateral decision making or in flexible working together.

It was unexpected that the children from both groups almost never directed the third grader without providing a rationale regarding the purpose of the actions. We had expected that fourth graders from the traditional school would more often employ this approach, based on literature describing classroom teachers' direction of children's actions without providing a rationale.

There are many potential sources for similarities, including the children's membership in middle-class European-American populations from similar neighborhoods in the same city and the children's parents' background in traditional US schooling. Other sources of similarity include both schools' commonalities in meeting state core curriculum requirements, school district mandates, required standardized testing, and many features in common (such as the use of math textbooks — indeed, the same math textbook). Similarities could also be accounted for in terms of our procedure, which, for comparison purposes, was standard across the two schools — perhaps prompting the children of both schools to act similarly in some ways.

C. Is One Educational Approach Better than the Other? Better for What?

It is tempting to try to judge which of the schools or which set of practices is better. However, in our view, the key question requires consideration of which is "better" for what? Is it better for learning how to participate in activities that prioritize solo contributions and quizzing or is it better for learning how to participate in collaboration? This is ultimately a question of diverse cultural values (Matusov, 1998). Different communities in our society struggle (often through political and ideological means) to promote different practices and institutions based on their diverse values.

The value of learning to participate in different discourse formats. One could argue that cultural practices that support children in learning both types of discourse format may be

most advantageous for children's adaptation to future settings (see Rogoff et al., 1993). From the standpoint of the present, it would appear that US children are likely to be called upon to collaborate skillfully as well as to engage in quizzing forms of discourse and solo activities such as in standardized tests. However, the future itself is a dynamic and uncertain process defined by its past, current, and upcoming participants (Griffin & Cole, 1984), embedded in the life of the whole society.

Questions of the value of collaboration and of testing are clearly connected with political and economic struggles that will contribute to defining the future. The cultures and communities prioritizing collaboration and testing are different and to some degree antagonistic to each other. (They also have different power in US society — one of the cultures is mainstream.) What can be viewed as collaboration in one culture may be viewed as cheating in another culture. What can be viewed as guidance through quizzing in one culture may be viewed as rejection of collaboration in another culture. Determining whether one approach is better than the other, or even whether learning to participate in both is preferable, requires value judgments regarding the roles of both collaborative and solo formats in the communities and institutions of the future.

Our study itself both reflects and contributes to a struggle among different communities, social institutions, economic interests and cultural values for defining the future. We, like the adults in the collaborative school and many other educators and researchers, would argue for the importance of children learning how to collaborate with others for success in other settings of their lives — a skill that until recently was not seen as important in traditional US schooling. Learning how to engage in the quizzing discourse format promoted in a traditional school (without necessarily believing it is a desired form of guidance outside of the setting imposed by the mainstream institutions, see Wertsch, 1999) may also contribute to success in some key US institutions, as they are currently structured. However, judgments of which practices are valuable must take into account both the changing nature of institutions and the cultural, political, economic values reflected in arguing for one approach, the other, or both together.

The value of different discourse formats for learning school subjects. Beyond the question of learning to participate in differently organized communicative formats, some readers may ask, "Which form of instruction best teaches school subjects like math?"

Answering this question is not merely an empirical issue but one that involves cultural values regarding quality of learning and goals of development (both cognitive and communicative), as well as the definition of doing mathematics itself. For example, doing mathematics can be defined as an individual demonstrating well-defined math skills on demand of a more authoritative person. In this case, traditional schooling may have an advantage over collaborative schooling. However, if the definition of math practice includes collaborative efforts to solve open-ended math problems, then collaborative schooling may have an advantage. As seen in the examples we presented, children in the collaborative school commonly explored the card-sorting problem in greater depth, considering alternatives in an open-ended fashion that would be a disadvantage in a timed test but which provided greater engagement with the process of classification.

Similarly, Butler and Ruzany (1993) pointed to differences in the norms of schools and broader communities to account for differences in kibbutz and urban middle-class Israeli children's approaches to learning. Kibbutz children explained their own (and other children's) glances at peers' work in terms of wanting to learn from another child's efforts (e.g., "I wasn't sure what we were meant to do, so I wanted to check," "If you see what other kids do you can get new ideas," p. 536). In contrast, urban Israeli children explained that they (and other children) looked at other children's work to be able to compare and assess their own ability ("to see whose design was best, whether mine was as good as his, and so on," p. 539). Butler and Ruzany suggested that the cooperative emphasis in the kibbutz environment may encourage children's motivation to learn and to offer and seek help in the face of learning difficulty, whereas the urban school's competitive environment, individual work, and normative evaluations may discourage intrinsic motivation, encourage children not to seek help from each

other (with worry that trying to learn from others will be regarded as cheating), and "convey the message that performance does not count if it is not achieved alone. (p. 540)."

Each schooling approach seems to be valued within its local community, serving different ends. However, most means of assessment of children's learning are based on the form of adult-child interaction that prevails in traditional U.S. schooling, with quizzing of children on an individual basis by adults who do not otherwise enter into the problem-solving process. Assessment of learning is often based on speedy solo responses to large numbers of items on demand, rather than exploration and understanding of ideas in depth, building understanding together with other people.

The testing situation — where a tester or experimenter giving a problem does not participate in solving it — is less close to the relationships of the collaborative school, where adults (teachers as well as experienced parent volunteers) often participate collaboratively in activities with children (Matusov & Rogoff, 2001). This was evident in the collaboratively schooled children's more frequent attempts to involve the researcher in their thinking, compared with the traditionally schooled children, although the researcher attempted to avoid involvement with the children's problem solving in order to serve as a tester. In addition, teachers in the collaborative school often report that in standardized tests, children find it difficult to stop helping each other figure out problems.

The usual psychological methods for measuring learning fit traditional schooling's definition of learning, which attempt to isolate students from others to examine knowledge and skills (Matusov, 1998; Rogoff, 1998). However, substituting an assessment of cognitive development designed for the collaborative school would not be appropriate in the traditional school, and using separate criteria for the two schools would raise the classic cross-cultural issue of conceptual equivalence of measurement (Cole, Gay, Glick, & Sharp, 1971; Cole & Means, 1986; Sears, 1961).

The issue of how to appropriately assess learning is one faced by the US educational system as a whole (Committee on Developments in the Science of Learning, 1999); it is an

especially prominent issue in comparisons of math skill across nations with differing educational priorities and in judging the effectiveness of educational innovations within the US. An interesting question for future research is to examine how the practices employed in research, as well as in educational institutions, may give differing views of the ways that children collaborate with and guide each other — and learn.

D. Development of Children and Institutions in Ecological Niches

Our findings distinguished out-of-class interactive patterns of students that fit the character of instruction cultivated by two cultural institutions. However, it is clear in our discussion of challenges in comparing the value of the approaches that the particular practices are not themselves independent of values, goals, and practices of related institutions and cultural traditions. The philosophies and practices of the two schools, as cultural institutions, function in the context of many differing educational and social priorities, and different involvement of families and larger communities. The children's participation in distinct cultural practices in their classrooms is likely associated with other related and important practices that may also relate to the children's approaches to collaboration and guidance.

To examine the ecological niches in which the different approaches to collaboration and guidance fit, it would be interesting to investigate the stability of the interactive patterns in varying contexts, corresponding to distinct communities of practice (Lave & Wenger, 1991). In particular, the dynamics of patterns resulting from circumstances that are unusual for the immediate ecological niche are likely to be revealing (see Bell, Schubauer-Leoni, Grossen, & Perret-Clermont, 1990; Schubauer-Leoni, Perret-Clermont, & Grossen, 1991; Siegal, 1991). We would expect a dynamic pattern of adjustment, for example, if our study were repeated with dyads in which one of the partners has a collaborative schooling background and the other has a traditional schooling background. In such circumstances, we anticipate that children's communication would require dynamic adjustment because they would not be intuitive and comfortable with each other's instructional and interactional formats.

However, even within the settings that we observed, the dynamic aspects of cultural practice may be seen in the variations between different dyads within the same school. The distinctive patterns of working together and guidance that we observed were not uniform within the dyads from each school. For example, a few children from the traditional school used transactional dialogue and a few children from the collaborative school demonstrated the quizzing type of guidance.

Children from both schools are familiar with formal schooling through its portrayal in books and television. Likewise, children from both schools have experienced a variety of instructional formats other than those in their elementary school — including those used in their families, preschools, church schools, and scouting organizations. Individuals often participate in more than one cultural community, and cultural communities and institutions are themselves dynamic, with aspects that build on and borrow from other settings (Rogoff, in press).

An important direction for developmental research is to focus directly on discourse practices and other traditions in institutional and cultural settings themselves, rather than to focus so exclusively on individuals in situations presumed to be independent of particular cultural and institutional traditions. To address the question of how children learn interactional patterns in their participation in cultural communities, research needs to address more explicitly the development and functioning of children's institutional and cultural participation. This requires developmental research to attend to children's functioning within their everyday settings, and in addition, to study how children's settings, such as schools, function as cultural institutions that have their own dynamics, development, and communication practices.

As a step in this direction, we have investigated the collaborative school's everyday practices not as "background" to children's use of different interactional patterns outside of the classroom, but as phenomena in which individuals learn through participating with others in sociocultural activities that themselves develop (Matusov & Rogoff, 2001; Rogoff, Goodman Turkanis, & Bartlett, 2001). More generally, a greater awareness of the history and values of ubiquitous forms of schooling, and other institutions in which children participate, would help

bring to light the unexamined cultural practices in which children participate on an everyday basis.

Indeed, we would argue that a great deal of developmental psychology is the study of children's learning to participate skillfully in the formats that are valued in the institutions and cultural practices of their everyday lives. If researchers become more aware of the institutional traditions of our lives and those of the children we study, we will be able to make more sense of our observations of human development.

In sum, our study suggests that children learn more than the content of their lessons; they learn means of social engagement that may serve rather different social structures and also learn what are considered appropriate modes of interaction for specific institutional contexts. This study contributes to sociocultural work in which human development is examined in terms of changing participation in activities within cultural institutions involving systems of values, goals, and patterns of communication (Fullan, 1993; Hargreaves, 1995; Rogoff, 1998). This is a shift from considering human development simply as age-related individual skills, or conceiving of contexts such as schools as collections of stimuli or pedagogical techniques. Our findings are consistent with the notion that people develop by participating in diverse and overlapping complex cultural systems with associated practices and philosophies.

REFERENCES

Adamson, L. B., & Bakeman, R. (1982, March). Encoding videotaped interactions: From counts to context. Paper presented at the International Conference on Infant Studies, Austin, TX.

Argyris, C., & Schon, D. (1978). Organizational learning: A theory of action perspective. Reading, MA: Addison-Wesley.

Azmitia, M. (1996). Peer interactive minds: Developmental, theoretical, and methodological issues. In P. B. Baltes & U. M. Staudinger (Eds.), Interactive minds: Life-span perspectives on the social foundations of cognition. Cambridge: Cambridge University Press.

Baker-Sennett, J., Matusov, E., & Rogoff, B. (1992). Sociocultural processes of creative planning in children's playcrafting. In P. Light & G. Butterworth (Eds.), Context and cognition: Ways of learning and knowing (pp. 93-114). New York: Harvester-Wheatsheaf.

Bearison, D. J. (1991). Interactional contexts of cognitive development: Piagetian approaches to sociogenesis. In L. Tolchinsky (Ed.), Culture, schooling, and psychological development. Norwood, NJ: Ablex.

Bell, N., Schubauer-Leoni, M. L., Grossen, M., & Perret-Clermont, A. N. (1990). Transgressing the communicative contract. Paper presented at the meeting of the Society of Research in Child Development, Seattle, WA.

Berger, P. L., & Luckmann, T. (1966). The social construction of reality. NY: Doubleday.

Bos, M. C. (1937). Experimental study of productive collaboration. Acta Psychologica, 3, 315-426.

Bremme, D., & Erickson, F. (1977). Relationships among verbal and non-verbal classroom behaviors. Theory into Practice, 5, 153-161.

Butler, R., & Ruzany, N. (1993). Age and socialization effects on the development of social comparison motives and normative ability assessment in kibbutz and urban children. Child Development, 64, 532-543.

Carnegie Forum on Education and the Economy. (1986). A nation prepared: Teachers for the 21st century. New York: Author.

Cazden, C., Cox, M., Dickinson, D., Steinberg, Z., & Stone, C. (1979). "You all gonna hafta listen": Peer teaching in primary classroom. In W. A. Collins (Ed.), Children's language and communication: The Minnesota symposia on child psychology (Vol.12, pp. 183 -231). Hillsdale, NJ: Lawrence Erlbaum Associates.

Chavajay, P., & Rogoff, B. (2001, submitted). Schooling and traditional collaborative social organization of problem solving by Mayan mothers and children.

Cicourel, A. (1974). Cognitive sociology. New York: Free Press.

Cole, M., Gay, J., Glick, J., & Sharp, D. (1971). The cultural context of learning and thinking. New York: Basic Books.

Cole, M., & Means, B. (1986). Comparative studies of how people think: An introduction. Cambridge, MA: Harvard University Press.

Committee on Developments in the Science of Learning. (1999). How people learn: A report of the National Research Council of the National Academy of Science. Washington, DC: National Academy Press.

Cooper, C., Marquis, A., & Edward, D. (1986). Four perspectives on peer learning among elementary school children. In E. Mueller & C. Cooper (Eds.), Process and outcomes in peer relationships. San Diego, CA: Academic Press.

Crook, C. (1994). Computers and the collaborative experience of learning. London: Routledge.

Crow, B.K. (1994). Conversational episode structure. In R. L. Conville (Ed.), Uses of "structure" in communication studies. (pp. 155-184) Westport, CT: Praeger.

Cuban, L. (1984). How teachers taught: Constancy and change in American classrooms 1890-1980. New York: Longman.

Damon, W. (1984). Peer education: The untapped potential. Journal of Applied Developmental Psychology, 5, 331-343.

Ellis, S., & Gauvain, M. (1992). Social and cultural influences on children's collaborative interactions. In L. T. Winegar & J. Valsiner (Eds.), Children's development within social context. (Vol. 2, pp. 155-180). Hillsdale, NJ: Erlbaum.

Ellis, S., & Rogoff, B. (1982). The strategies and efficacy of child versus adult teachers. Child Development, 53, 730-735.

Ellis, S., & Rogoff, B. (1986). Problem solving in children's management of instruction. In E. Mueller & C. Cooper (Eds.), Process and outcome in peer relationships. San Diego, CA: Academic Press.

Erickson, F. (1982). Classroom discourse as improvisation. In L. C. Wilkinson (Ed.), Communication in the classroom (pp. 153-181). NY: Academic.

Fleiss, J. L. (1981). Statistical methods for rates and proportions. New York: Wiley.

Forman, E., & McPhail, J. (1993). A Vygotskian perspective on children's collaborative problem-solving activities. In E. Forman, N. Minick, & C. A. Stone (Eds.), Contexts for learning: Sociocultural dynamics in children's development. (pp. 213-229). New York: Oxford University Press.

Fullan, M. (1993). Change forces: Probing the depths of educational reform. New York: Falmer Press.

Gauvain, M., & Rogoff, B. (1989). Collaborative problem solving and children's planning skills. Developmental Psychology, 25, 139-151.

Glachan, M., & Light, P. (1982). Peer interaction and learning. In G. Butterworth & P. Light (Eds.), Social cognition: Studies of the development of understanding. Brighton, UK: Harvester Press.

Goodnow, J., Miller, P. & Kessel, F., Eds. (1995). Cultural practices as contexts for development. San Francisco: Jossey-Bass.

Griffin, P., & Cole, M. (1984). Current activity for the future: The Zo-ped. In B. Rogoff & J. V. Wertsch (Eds.), Children's learning in the "zone of proximal development" (Vol. 23, pp. 45-64). San Francisco: Jossey-Bass.

Hargreaves, A. (1995). Changing teachers, changing times: Teachers' work and culture in the postmodern age. New York: Teachers College Press

Heath, S. B. (1983). Ways with words: Language, life, and work in communities and classrooms. Cambridge, MA: Cambridge University Press.

Human Capital Initiative (1993, October). The changing nature of work. APS Observer, Special Issue.

Johnson, D. W., & Johnson, R. T. (1989). Learning together and alone: Cooperative, competitive, and individualistic learning (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Koester, L., & Bueche, N. (1980). Preschoolers as teachers: When children are seen but not heard. Child Study Journal, 10, 107-118.

Kruger, A. C. (1993). Peer collaboration: Conflict, collaboration, or both? Social Development, 2, 165-182.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge, UK: Cambridge University Press.

Lemke, J. L. (1990). Talking science: Language, learning, and values. Norwood, NJ: Ablex.

Ludeke, R., & Hartup, W. (1983). Teaching behaviors of 9- and 11-year-old girls in mixed-age and same-age dyads. Journal of Educational Psychology, 75 (6), 908-914.

Matusov, E. (1998). When solo activity is not privileged: Participation and internalization models of development. Human Development, 41, 326-349.

Matusov, E., & Rogoff, B. (2001, submitted). Newcomers and oldtimers: Educational philosophies-in-action of parent volunteers in a community of learners school. Unpublished manuscript, UC Santa Cruz.

McDermott, R. P., Gospodinoff, K., & Aron, J. (1978). Criteria for an ethnographically adequate description of concerted activities and their contexts. Semiotica, 24, 245-275.

McLane, J. (1987). Interaction, context, and the zone of proximal development. In M. Hickmann (Ed.), Social and functional approaches to language and thought. San Diego, CA: Academic Press.

Mehan, H. (1979). Learning lessons: Social organization in the classroom. Cambridge, MA: Harvard University Press.

Mercer, N., Edwards, D., & Maybin, J. (1988). Putting context into oracy: The construction of shared knowledge through classroom discourse. In M. Maclure, T. Phillips, & A. Wilkinson (Eds.), Oracy matters. Milton Keynes, UK: Open University Press.

Minick, N. (1993). Teacher's directives: The social construction of "literal meanings" and "real words" in classroom discourse. In S. Chaiklin & J. Lave (Eds.), Understanding practice: Perspectives on activity and context. Cambridge, MA: Cambridge University Press.

Mosier, C., & Rogoff, B. (2001, submitted manuscript). Privileged treatment of toddlers: Cultural aspects of autonomy and responsibility.

Newman, D., Griffin, P., & Cole, M. (1989). The construction zone: Working for cognitive change in school. Cambridge, UK: Cambridge University Press.

Paradise, R. (1991). El conocimiento cultural en el aula: Niños indígenas y su orientación hacia la observación [Cultural knowledge in the classroom: Indigenous children and their orientation toward observation]. Infancia y Aprendizaje, 55, 73-85.

Patterson, C., & Roberts, R.. (1982). Planning and the development of communication skills. In D. Forbes & M. Greenberg, (Eds.), Children's planning strategies: New directions for child development. San Francisco: Jossey-Bass.

Peterson, P., Wilkinson, L., Spinelli, F., & Swing, S. (1982). Merging the process-product and the sociolinguistic paradigms: Research on small-group processes. Paper presented at conference on "Student diversity and the organization, processes, and use of instructional groups in the classroom," Wisconsin Center for Educational Research, Madison, WI.

Piaget, J. (1977). Les operations logiques et la vie sociale. In Etudes sociologiques (pp. 143-171). Geneva, Switzerland: Librairie Droz.

Radziszewska, B., & Rogoff, B. (1988). Influence of adult and peer collaborators on children's planning skills. Developmental Psychology, 24, 840-848.

Rogoff, B. (1990). Apprenticeship in thinking: Cognitive development in social context. New York: Oxford University Press.

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. Mind, Culture, and Activity, 1, 209-229.

Rogoff, B. (1998). Cognition as a collaborative process. In D. Kuhn & R. Siegler (Eds.), Cognition, perception, and language [Vol. 2, Handbook of child psychology (5th ed.) W. Damon (Ed.)]. pp. 679-744. New York: Wiley.

Rogoff, B. (in press). The cultural nature of human development. New York: Oxford University Press.

Rogoff, B., & Gauvain, M. (1986). A method for the analysis of patterns, illustrated with data on mother-child instructional interaction. In J. Valsiner (Ed.), The individual subject and scientific psychology. NY: Plenum.

Rogoff, B., Goodman Turkanis, C., & Bartlett, L., Eds. (2001). Learning together: Children and adults in a school community. New York: Oxford University Press.

Rogoff, B., Matusov, E., & White, C. (1996). Models of teaching and learning: Participation in a community of learners. In D. Olson & N. Torrance (Eds.), Handbook of education and human development: New models of learning, teaching, and schooling. London, UK: Basil Blackwell.

Rogoff, B., Mistry, J. J., Göncü, A., & Mosier, C. (1993). Guided participation in cultural activity by toddlers and caregivers. Monographs of the Society for Research in Child Development, 58 (7, Serial No.236).

Roschelle, J. (1992). Learning by collaborating: Converging conceptual change. Journal of the Learning Sciences, 2, 235-276.

Salt Lake City School District. (1993-94). Insights: Annual report to the community. Salt Lake City, UT: Salt Lake City School District.

Schubauer-Leoni, M. L., Bell, N., Grossen, M., & Perret-Clermont, A. N. (1989). Problems in assessment of learning: The social construction of questions and answers in the scholastic context. International Journal of Educational Research, 13 (6), 671-684.

Schubauer-Leoni, M. L., Perret-Clermont, A. N., & Grossen, M. (1991). The construction of adult-child intersubjectivity in psychological research and in school. In M. von Cranach, W. Doise, & G. Mugny (Eds.), Social representations and the social bases of knowledge. Bern, Switzerland: Hans Huber Verlag.

Sears, R. R. (1961). Transcultural variables and conceptual equivalence. In. B. Kaplan (Ed.), Studying personality cross-culturally. New York: Harper & Row.

Sharan, S. (1990). Cooperative learning: Theory and research. New York: Praeger.

Sharan, Y., & Sharan, S. (1992). Expanding cooperative learning through group investigation. New York: Teachers College Press.

Shotter, J. (1978). The cultural context of communication studies: Theoretical and methodological issues. In A. Lock (Ed.), Action, gesture, and symbol: The emergence of language (pp. 43-78). London: Academic.

Siegal, M. (1991). Knowing children: Experiments in conversation and cognition. Hillsdale, NJ: Lawrence Erlbaum Associates.

Socha, T. J., & Socha, D. M. (1994). Children's task-group communication. In L. R. Frey (Ed.), Group communication in context: Studies of natural groups (pp. 227-246). Hillsdale: NJ: Erlbaum.

Steward, M., & Steward, D. (1974). Parents and siblings as teachers. In E. Mash, L. Handy, & L. Hamerlynck (Eds.), Behavior modification approaches to parenting. New York, NY: Brunner/Mazel.

Tharp, R. G., & Gallimore, R. (1988). Rousing minds to life: Teaching, learning, and schooling in social context. Cambridge, UK: Cambridge University Press.

Tolmie, A., Howe, C., Mackenzie, M., & Greer, K. (1993). Task design as an influence on dialogue and learning. Social Development, 2, 183-201.

Toma, C. (1991, October). Explicit use of others' voices for constructing arguments in Japanese classroom discourse. Paper presented at the Boston University Conference on Language Development, Boston.

Vygotsky, L. (1981). The genesis of higher mental functions. In J.V. Wertsch (Ed.), The concept of activity in Soviet psychology. (144-188). New York: Sharpe.

Wells, G. (1992, September). Re-evaluation of the IRF sequence: A proposal for the articulation of theories of activity and discourse for the analysis of teaching and learning in the classroom. Paper presented at the Conference for Sociocultural Research, Madrid, Spain.

Wertsch, J. V. (1998). Mind as action. New York: Oxford University Press.

Wertsch, J., & Minick, N. (1990). Negotiating sense in the zone of proximal development. In M. Schwebel, C. Maher, & N. S. Fagley (Eds.), Promoting cognitive growth over the life span. New York: Lawrence Erlbaum.

Woods, P. (1980). Pupil strategies: Explorations in the sociology of the school. London: Croom Helm.

Yager, S., Johnson, R. T., Johnson, D. W., & Snider, B. (1986). The impact of group processing on achievement in cooperative learning groups. Journal of Social Psychology, 126, 389-397.

Table 1

Mean number of the 4 problems (and standard deviations) employing each category of Working Together more than minimally

Approach to Working Together	Collaborative school	Traditional school	F (1,22)
Nonshared decisions	1.08 (1.00)	.75 (.97)	0.7
Unilateral decisions	.66 (1.23)	.83 (.94)	0.1
Specialized working together	3.17 (1.03)	3.17 (1.19)	0.0
Flexible working together	.25 (.45)	.33 (.49)	0.2
Transactional dialogue	1.58 (1.08)	.67 (.78)	5.7, $p < .05$

Table 2

Mean number of the 4 problems (and standard deviations) employing each category of Guidance more than minimally

Approach to Guidance	Collaborative school	Traditional school	F (1,22)
Quizzing	.83 (1.19)	2.00 (1.41)	4.8, $p < .05$
Pure instruction	1.00 (1.35)	1.08 (1.16)	0.0
Instruction embedded in collaboration	1.00 (1.04)	.17 (.39)	6.7, $p < .05$

Endnotes

[1] This work began when all three authors were affiliated with the University of Utah, and continued while the first and third authors were at the University of California at Santa Cruz and when the third author was at the University of Delaware.

[2] The practices of the collaborative school differ in a number of ways from many approaches to "cooperative learning" pedagogies. A collaborative approach prevails in this school between adults and children, as well as among children. Adults as well as children enter in and help each other out in the children's activities, with a collaborative philosophy in which mutual assistance is expected (Matusov & Rogoff, 2001; Rogoff, Goodman Turkanis, & Bartlett, 2001). The collaborative approach of this school includes close adult involvement and teacher-led instruction in the context of children's ongoing activities.

[3] Analysis of the videotaped sessions shows that the researcher treated the dyads from the two schools similarly -- he followed the verbal script 100% of the time in both schools, focused instructions on the fourth grader in 100% of the sessions at both schools, and avoided giving any hints to the children for 92% of the requests in each school.

[4] There were no main effects of gender. Although there were some significant interactions of gender and school, the sample sizes per cell (n=6) were so small that we regard the interactions as uninterpretable. Entering gender in the ANOVAs testing school effects did not affect the findings regarding differences between schools.

[5] The other relations between approaches to working together and to guidance are less informative: Instruction embedded in collaboration co-occurred with the ubiquitous specialized working together (in 14 of 14 cases of instruction embedded in collaboration) with almost no correlation, presumably due to the widespread use of specialized working together. Instruction embedded in

collaboration seldom co-occurred with flexible working together, which very seldom occurred (in only 1 of 14 cases of instruction embedded in collaboration).