Children's Learning in Laboratory and Classroom Contexts

Essays in Honor of Ann Brown

Edited by
Joseph Campione
Kathleen Metz
Annemarie Sullivan Palincsar

Fostering Communities of Learners and *Knowledge Building*: An Interrupted Dialogue

Marlene Scardamalia & Carl Bereiter
Institute for Knowledge Innovation and Technology
University of Toronto

Editors' Notes: We begin with some personal observations by JCC: It was a delight to read Marlene and Carl's contribution, for many reasons. Most poignantly, it was a reminder of those discussions attempting to reconcile similarities and differences between FCL and Knowledge Forum (KF) / Knowledge Building (KB). I certainly recall being involved in those discussions. I also remember clearly being a more peripheral participant in several others. A typical example: Phone rings, I answer and talk for a while, then, "Ann, it's Marlene." It would now be possible for me to leave, go shopping, have dinner, clean up, etc., content that I would not be missed for quite a while. More often, however, I would hang around to listen to snippets of the conversation and to observe smiles, laughter, and head-shaking occurring at frequent intervals. The discussions were interesting and motivating. They served to make us all think more deeply about the enterprise in which we were engaged and where differences existed. After all, "the devil is in the details", and it was those details that we thought essential to understand and explain. The discussions forced us to focus as well as we could on just those details and to try to understand them for ourselves, hence to communicate them to others: peers, teachers, students, administrators, etc. While Ann and Marlene never reached complete agreement, it was clear that both enjoyed the task and learned (built knowledge?) from it.

Comments by JCC, KEM, and ASP: This chapter differs from the others in the volume in that it undertakes a direct comparison between FCL and an alternative, "Knowledge Building". The chapter outlines an elegant and well-reasoned rationale for the various decisions that Marlene and Carl made regarding the utility of their approach. These are, indeed, choices that program developers are forced to consider, and having developers explain their choices goes a long way toward enriching the conversation. Marlene and Carl, in outlining their rationale, also note that, "The explanation we offer here is one she might well have rejected but would in any case have pushed toward greater clarity." We would go a step farther and assert that Ann, not surprisingly, would have disagreed in some cases, and would have loved to carry on the dialogue. To illustrate with one example, Ann was convinced that a curriculum focusing on the big ideas of an area was essential to maximize the likelihood that the kinds of

discussion and discourse that Marlene and Carl regard as essential to knowledge building would ensue. Indeed, the title of her talk based on APA's 1995 Distinguished Award for Applications of Psychology entitled *Transforming schools into communities of thinking and learning about serious matters*, makes this point clearly, i.e. a focus on "big ideas" is central to supporting a thinking curriculum. In this context, Marlene and Carl's arguments are, as noted, strong ones, and they clearly believe there is good reason for their various choices - else they would not have made them! But they are not the only defensible choices.

As Marlene and Carl note, Ann would have enjoyed countering some of their positions with counterarguments defending her own choices. While never arguing that FCL should not continue to undergo growth and change, Ann was at least happy with its status, and it seems to us that it would be instructive if her voice were also heard. The best way to do this is to allow her to speak for herself. The reasoning underlying FCL is laid out nicely in the article we have chosen to reprint as the first chapter of this volume (Brown, 1994).

Another description and analysis of FCL is contained in the final chapter in this volume. We also believe, without diminishing the contributions of the other authors, that this is the chapter Ann would have most enjoyed reading. She would certainly remember the "FCL graduates" that provided their commentaries, and it is certain that she saw as the most enjoyable aspect of her career the visits to their classrooms, where she took enormous delight in talking to these students about their research, their views on FCL itself, and sharing their feelings of accomplishment.

Contemporary educational approaches, especially those informed by the learning sciences, almost all pursue twin goals of uncertain compatibility. One goal is to insure students' grasp of important ideas. The other is to help them develop as autonomous learners and thinkers. Some approaches may be biased toward the first goal, others toward the second, but generally there is a tension, which may be alleviated by compromise, wishful thinking, or other more adventurous approaches. Ann Brown and Joe Campione clearly opted for an adventurous, inventive approach, aimed at making the goals mutually supportive rather than competitive. Fostering Communities of Learners (FCL) orchestrates an educational process that is focused on the grasping of big, powerful ideas, but that gives students a remarkable degree of responsibility in working with those ideas. We, too, at about the same time, embarked on an approach, "Knowledge Building," that focuses on big ideas and gives students a high degree of agency in working with those ideas. Yet the two approaches have differences that we believe illuminate important distinctions within the large family of social-constructivist approaches in education.

Some commentators have treated FCL and Knowledge Building as conceptually the same, differing only in implementation. That there is compatibility we have no doubt. This was the basis for efforts to join these approaches as part of Schools for Thought (Lamon, Secules, Petrosino, Hackett, Bransford, & Goldman, 1996) and to this day it is the basis for collaboration between Joe Campione and the two of us. But experience in Schools for Thought made limits on compatibility evident, and subsequent discussions, mainly between Ann and Marlene, began to reveal deep conceptual differences. In this chapter we want to explore these differences further. It seems to us that this kind of exploration of differences between near neighbors is essential if educational thought about pedagogy is to progress. As it is, pedagogical innovators of a constructivist persuasion tend to explain their approach by contrasting it with a stereotypic traditional approach, currently labeled "transmissionist." Although this may win approving nods from true and partial believers, it obscures and trivializes differences among innovative approaches and thus degrades dialogue.

Experiences in Schools for Thought provided impetus for a search of similarities and differences between FCL and Knowledge Building. Teachers who were new to both FCL and Knowledge Building had little difficulty combining them procedurally. Teachers experienced in FCL or Knowledge Building, however, rather strongly resisted adopting practices of the other approach. Conversations with Ann often revolved around inklings, intuitions, and laughter; we could not ourselves understand the difficulties we faced in melding our approaches. The discussions were working their way toward an explanation. Ann's death abruptly halted the discussions, but the impetus remained. The explanation we offer here is one she might well have rejected but would in any case have pushed toward greater clarity. It represents an effort to clarify a distinction that has proved difficult for us to understand, let alone get across to people in education. The distinction is between learning and knowledge building. FCL, we shall argue, is a powerful learning model but a knowledge building model is fundamentally different.

DISTINGUISHING KNOWLEDGE BUILDING FROM LEARNING

When we talk about this distinction to educators, most of them assume we are talking about "good" (i.e., constructivist) learning, which we have for some obscure reason chosen to call "knowledge building," versus "bad" (i.e., transmissionist or perhaps rote) learning. That moth-eaten distinction is not the one we are making at all. The distinction between learning and knowledge building is easier to see when we move outside an educational context. Out in the world of what Peter Drucker termed "knowledge work," many people are engaged in producing new knowledge. Their products may be scholarly things like theories, histories, and proofs or more practical things like designs, inventions, and plans.

The common element is that these products constitute new or improved ideas that the community can use in producing more new or improved ideas. This continuing process of idea creation, development, and improvement is what we call "knowledge building." In the process of knowledge building, the knowledge workers naturally learn, and such learning is essential to their careers as knowledge builders, but learning is not what they are getting paid for. It is not their job. Their job is knowledge building.

The reason this distinction becomes less obvious in an educational context is that the students' ostensible job *is* learning. But the distinction between knowledge building and learning is just as applicable in schools as anywhere else; it is only that the priorities are different. In schools, learning is what students typically get rewarded for with grades and diplomas, and any knowledge building they may do along the way is incidental. But imagine a school in which students conceive their job to be knowledge building. Learning, of course, goes on as it does in real-world knowledge building, and it is essential from the standpoint of individual careers, but the *main work* of the classroom community is the production of new and improved ideas. If you can imagine that, then you are imagining a Knowledge Building classroom.

Such a vision might immediately be rejected as unrealistic on a number of grounds. What chance does it have in a society obsessed with individual learning achievement? Can students actually produce new knowledge or can they only play-act the process? And if learning is incidental to the students' own knowledge-creating efforts, how can we ensure that they will learn the right things and acquire valid knowledge — and do so at a rate sufficient to match the fast-paced learning agenda set by curriculum guidelines? These are legitimate questions that we have responded to elsewhere (e.g., Bereiter, 2002; Scardamalia, 2002), but it is not our purpose here to build a case for Knowledge Building as an educational approach. Our purpose, rather, is to use the distinction between learning and knowledge building as a way to highlight important differences that exist largely unnoticed within the large family of constructivist approaches in education.

A PRACTICAL EXAMPLE: TERRITORIALITY IN SEA OTTERS

In a 6th grade FCL class we once visited, a "benchmark lesson" was being conducted on types of adaptation. The instructor defined various types and invited the students to provide examples drawn from their research on different animal species. The concepts introduced were quite advanced for the grade level, and the examples students provided suggested they were not grasping some of the distinctions. However, in the course of the discussion the point arose that male mammals often mark off their territory by urinating and defecating along its boundaries. One student then asked how this could work with sea otters. There

followed a serious, student-driven discussion (without any of the tittering or toilet humor one might expect in an elementary school class) trying to solve the problem of how in the world an animal could mark off and defend a territory in a constantly shifting medium like the ocean.

This discussion was a departure from the plan of the lesson, but the instructor allowed it to go on, even though it used up all the remaining time. The incident can be viewed from three perspectives. From an instructivist perspective it was a digression that interfered with and perhaps defeated the objectives of the lesson. Most constructivists, however, would probably judge the "digression" to have been the most valuable part of the session. We and the FCL instructor were agreed in this judgment. But here is where FCL and Knowledge Building diverge: Within FCL, excursions into student-generated problems of understanding are welcomed but are not designed directly into the activity structures. These excursions are part of what was originally referred to as the "unintended" curriculum — or what Campione has more recently referred to as the "thinking curriculum." In his words, "the content curriculum is necessary in order to enact the thinking curriculum" (personal communication). In Knowledge Building, however, students' posing and collaboratively working to solve knowledge problems is the main point of classroom work. Students' theorizing, reading, writing, experimenting, and discussing are all tied fairly directly to this purpose, with learning a by-product of it.

Within the broad constructivist community, discourse about method tends to center on anecdotes. It has therefore struck us as interesting that the anecdotes FCL educators tend to relate are ones like the otter incident. They are not anecdotes about jigsaw, reciprocal reading, or any of the salient activities of FCL. They are, in fact, the same kinds of anecdotes we relate in trying to convey the essence of a Knowledge Building approach. And, of course, other constructivist educators like to tell the same kinds of stories. This suggests what child-centered educators have long argued (cf. Weber, 1971), that inquiry driven by children's own curiosity and puzzlement represents the high-water mark of constructivist education. It is therefore curious and puzzling that almost all contemporary constructivist approaches structure activities so that this kind of inquiry comes as a digression or exceptional event — even if a very welcome one. This seeming inconsistency reflects important strategic differences between FCL and Knowledge Building.

To illustrate these differences, we may consider how the treatment of types of adaptation might have been handled differently in a Knowledge Building classroom. Let us assume, to have a common ground, that learning the different types of adaptation (anatomical, physiological, and behavioral) was predetermined as a curriculum objective. In the FCL classroom we observed, the benchmark lesson on types of adaptation was preceded by extensive student research on adaptation in different animal species, with knowledge shared through the jigsaw process. This provided the students with a rich knowledge base to draw on in making sense of the adaptation typology. In a Knowledge Building

classroom, prior work would have centered on student-defined problems of explanation. Using a computer-based knowledge building environment, Knowledge Forum, they would have created graphical views to organize their work on these problems, creating notes that put forth their theories, commentaries, research findings, new questions, and the like (see Scardamalia, 2002, for elaboration and examples). In neither approach could the students' research be expected to lead them to the adaptation typology. That is just not the sort of conceptual content elementary school students are drawn to. Hence the need in FCL for a benchmark lesson to bring students into contact with this curriculum objective. In Knowledge Building mandated objectives and curriculum guidelines would be presented to the students as information and reference material, most likely by being entered into a Knowledge Forum view titled something like "Ministry of Education guidelines for learning about adaptation." Students would be encouraged to link to the objectives list any of their notes that were relevant. (The same notes would be organized differently in other views.) In this way there would be a gradual accumulation of theories, ideas, and facts about types of adaptation, and "rise above" notes aimed at synthesis. Students might bring in examples of adaptation that did not seem to fit any of the types and a new type might be posited. Or it might become evident that the space surrounding "physiological adaptation" was nearly empty and this might provoke a discussion about what this term meant and what examples of it could be found.

Now, what about the otters and territorial marking? We can't assume that the issue would arise in a Knowledge Building classroom anymore than we can assume it would arise in another FCL classroom. It's a low-probability event. But territorial marking, we take it, is not one of the "big ideas" that both FCL and Knowledge Building are devoted to pursuing. The encompassing "big idea" is territoriality. This is a fascinating concept. The FCL students found it to be so, and we would expect the same of Knowledge Building students.

Suppose, however, that some student in a Knowledge Building class did raise the question of how male otters can successfully mark their territory. Most likely it would be pursued in much the same way as in the FCL incident cited — with a flurry of ideas, some related facts, and no real solution. If the issue arose during a whole-class discussion, what occurred might be indistinguishable from what happened in the FCL classroom. However, if it were decided to follow up on the discussion, differences between the two approaches would become evident. In both approaches, we assume, the main concern of the teacher would not be with discovering how male sea otters solve their special problem but with attaining a deeper and more general understanding of territoriality and its adaptive significance. How particular teachers might deal with this objective is of course unpredictable and so all we can do is look at what is most commonly represented in the literatures of the two approaches. In the case of FCL, this would appear to be a benchmark lesson; the teacher, or perhaps an outside expert, would attempt to lead the students through exposition and discussion from their initial focus on the sea otter to the more general understanding. In Knowledge

Building the most favored approach would be theory building and theory improvement. Thus, the students would be encouraged to formulate theories about territorial marking in sea otters, comment on the competing theories, and seek information to improve their theories. Would this lead them to the desired more general understanding of territoriality? E. O. Wilson's *Consilience* (1998) gives reason for optimism. Wilson's argument is that the same deep principles underlie all phenomena, so that if you dig down far enough into any phenomenon you will get to those principles. However, if that did not seem to be happening or happening with sufficient momentum, the Knowledge Building teacher might well use a whole-class discussion to raise the question, "What's the point of marking off territory anyway? How is this adaptive?" A new round of theorizing and theory improvement would take off from that question.

For FCL, learning is the primary goal; for Knowledge Building, learning is the by-product of theory refinement. Are FCL and Knowledge Building, then, two routes ending up at the same point with respect to learning outcomes, or do they arrive at different learning outcomes? That is a question that can only be answered by empirical research, which, in collaboration with Joe, we hope to conduct. The only point we want to make here is that they are in fact two different routes, derived from two different ways of thinking about knowledge and knowledge development.

DISTRIBUTED EXPERTISE, DIALOGUE, AND THE USES OF TECHNOLOGY

Two FCL principles that are also important in Knowledge Building are "distributed expertise" and the centrality of discourse, particularly dialogue (Bereiter & Scardamalia, 2005; Brown & Campione, 1996). The ways of implementing these are interestingly different, however, and these differences reflect the different roles that technology plays in the two approaches. In FCL, the spread of expertise throughout the classroom community is facilitated mainly through activity structures, most notably jigsaw and crosstalk, whereas in Knowledge Building it is handled more casually and opportunistically, with significant support from knowledge building technology, typically Knowledge Forum (Scardamalia, 2003).

How to achieve a spread of knowledge throughout the classroom is a problem faced by all approaches that allow students to pursue different knowledge goals individually or in small groups. FCL's jigsaw activity structure nicely manages the flow of information to achieve this end: Groups are originally constituted to develop extensive knowledge on specific topics; then the groups are rearranged so that each new group contains an "expert" on each of the original topics. In both FCL and Knowledge Building, small-group and whole-class conversations are a means for exchanging and advancing ideas. Because a substantial part of the information flow in Knowledge Building classrooms is addition-

ally mediated through Knowledge Forum, with work in this context tightly interwoven with work in other classroom contexts, it is possible to examine the spread of knowledge empirically. For instance, one can track the spread of domain vocabulary or of key ideas. A picture of the interconnectedness of individual contributions can be obtained through Social Network Analysis (Wasserman & Faust, 1994). Figure 1 shows the pattern produced in one fourth-grade classroom as the students investigated various aspects of light. The small group organization is obvious, with most of the information flow being either within groups or between individuals and the teacher, who occupies the central position in the network.

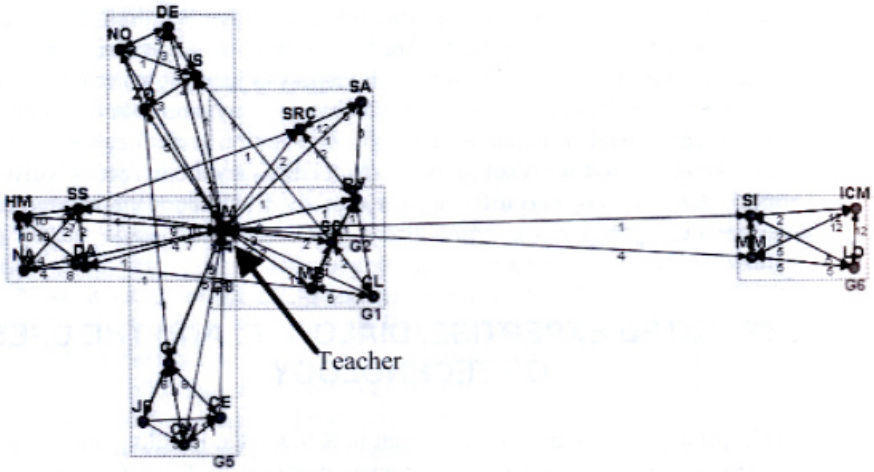

Figure 1. Year 1 note-linking network. Lines between nodes show the direction and frequency of notes linked. (From Zhang, Scardamalia, Reeve, & Messina, 2006).

Although Social Network Analysis was not available at the time, teacher and students recognized the compartmentalization of knowledge that was taking place, and the next year more time was set aside for face-to-face and online dialogue with groups other than their own (Messina & Reeve, 2006). Interestingly, as in FCL, students were able to contribute to the improvement of class procedures. The result, as reflected in online activity, is evident in Figure 2. Distinct groups are still discernible, but there is greater flow of information between groups.

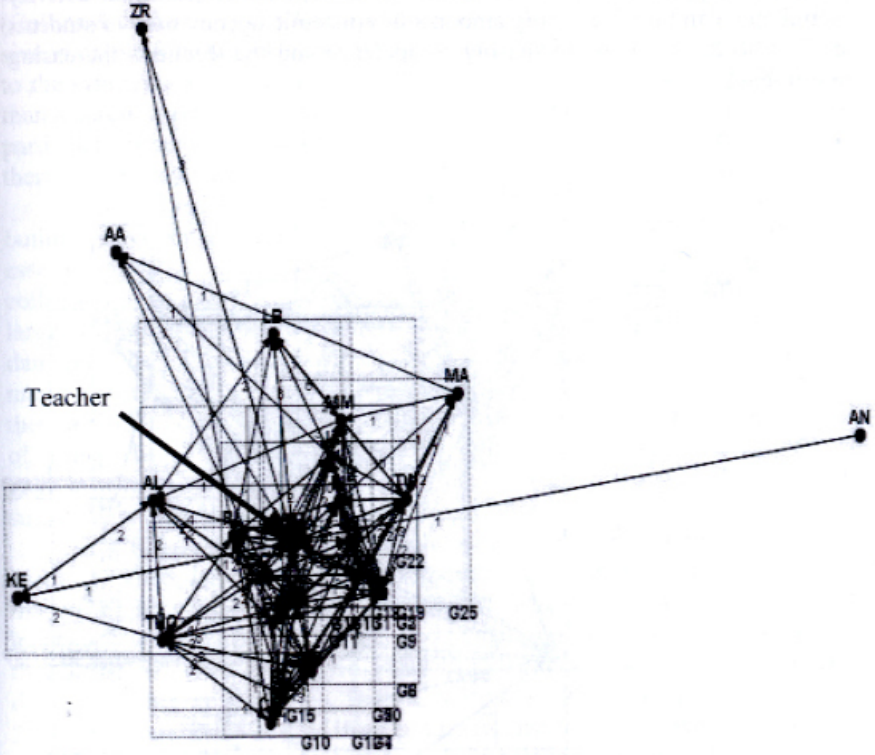

Figure 2. Year 2 note-linking network. Lines between nodes show the direction and frequency of notes linked. (From Zhang, Scardamalia, Reeve, & Messina, 2006).

Driven by his sense that students could take even greater responsibility, with the next year's class Mr. Messina abandoned grouping and its attendant subdivision of problems altogether. Instead, he posed the top-level goal — to gain an understanding of light — and let students formulate their own subproblems and encouraged them to group, regroup, or work independently according to their interests and the progress being made. The result, as shown in Figure 3, is a densely interconnected network, with scarcely discernible groups, and with the teacher no longer central to the pattern of information flow. An analysis of Knowledge Forum database content and pre to posttest results indicates that this highly distributed pattern yielded superior overall progress in building knowledge about light (Zhang, Scardamalia, Reeve, & Messina, 2006). This highly unstructured and opportunistic approach might not be suitable for all teachers, but at least one other teacher moved toward it, independently and with the same knowledge building principles in mind, and with equally impressive results. We trust even more teachers will adopt it now that there is a clear model and positive research results. The point is that with a supportive technology, teachers can

try different approaches without having to disrupt an orchestrated activity structure and can turn increasing amounts of epistemic agency over to students according to the students' increasing competence and the teacher's increasing comfort level.

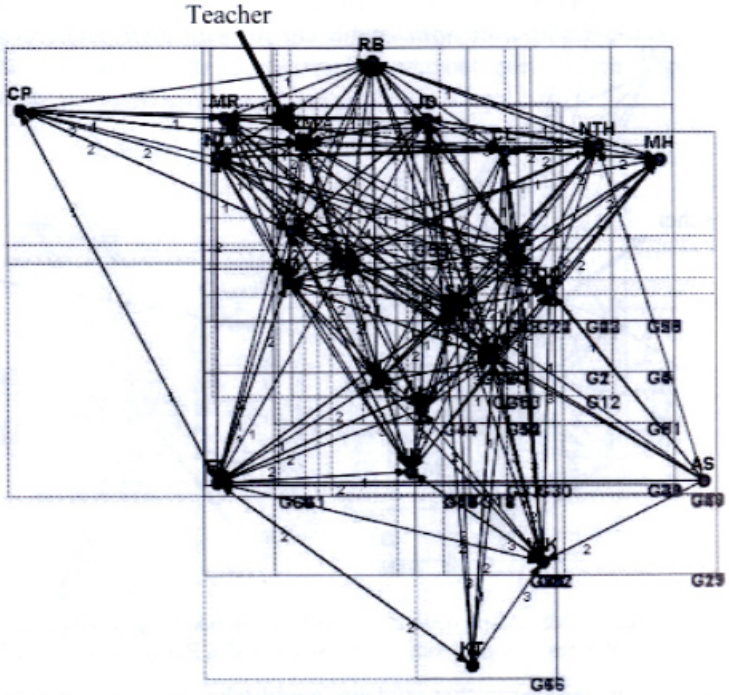

Figure 3. Year 3 note-linking network. Lines between nodes show the direction and frequency of notes linked. (From Zhang, Scardamalia, Reeve, & Messina, 2006).

Partly as a result of their social composition (one teacher, many students), classrooms are much better suited to discussion than dialogue. Following the MIT Dialogue Project and Peter Senge (1990), we define dialogue as discourse that aims to rise above the initial knowledge and belief states of the participants, whereas discussion serves more diverse purposes of conveying knowledge, airing opinions, and settling differences. It is little wonder, then, that classroom discourse tends to rely on substitutes for genuine dialogue: question-answer recitation, debate and mock trials, and varieties of brain-storming in which students spout ideas or opinions and the teacher records and classifies them on the chalkboard. Conventional discussion software does not favor dialogue either, being much better adapted to brief exchanges of the question-answer or opinion-response variety. A crucial process in dialogue is synthesis (as in the classic dialectic: thesis, antithesis, synthesis). If any synthesis occurs in the classroom,

the teacher is likely to provide it, either directly or through Socratic questioning (Collins & Stevens, 1982). Conventional discussion software, of the kind pervasive in online forums and learning management systems, is extremely frustrating to the synthesis-seeker. If there is any structure to the message sequence, other than a chronological one, it is a downward branching structure that leads off into particulars rather than upward to syntheses; and once discussion threads separate there is no handy way of linking ideas that appear in different threads.

For the 20 years that we have spent designing and redesigning a knowledge building environment, we have tried continually to devise ways to foster processes of synthesis — creating "rise-above" notes that draw together ideas from a collection of notes, views that provide graphical means of organizing ideas into larger wholes, and flexible ways of linking any note to any other note (Scardamalia, 2002). None of these devices guarantee synthesis: A rise-above note may be merely an itemization or summary of ideas; a view may be merely a thematic picture. But in the hands of a teacher who truly appreciates the value of "rising above" existing states of knowledge and understanding, students engage in what outside observers credit as genuine dialogue, with the kind of results that genuine dialogue is intended to produce.

The differences in treatment of dialogue in FCL and Knowledge Building seem to reflect differences in developmental history and infrastructure rather than differences in principle. An important though little recognized divide in the learning sciences is between those who favor explanation-seeking dialogue and those who favor argumentation. Ann was on the side of explanation-seeking dialogue, as are we (Coleman, Brown, & Rivkin, 1997; Scardamalia & Bereiter, 2006; compare Bell, 2002). Both programs involve extensive classroom discourse; Ann and Joe have always been favorable to Knowledge Forum as a discourse medium and indicated they would like to use it if suitable hardware were available. Both FCL and Knowledge Building took root in schools in the 1980s, when networked educational computing was in its infancy. However, we had the benefit of a window of opportunity afforded by a brief period during which the Province of Ontario led the world in educational computing infrastructure. Thus we were able to start experimenting with CSILE, the forerunner of Knowledge Forum, at a time when e-mail marked the summit of network technology in most schools elsewhere. Now that the necessary infrastructure is in place in schools throughout the industrialized world, it seems to us that constructivist innovators ought to begin insisting on technology that supports distributed expertise and collaborative knowledge-building dialogue.

CAN ANY PRINCIPLED APPROACH SCALE UP?

Most of the time in most classrooms the focus is neither on learning nor on knowledge building but on the immediate task or activity. Ann bemoaned this reductionism. Reciprocal teaching, which she intended should evolve into liter-

ate discussion, was too often carried out as if its purpose was to master the reciprocal teaching routine itself. And so a prior question is whether normal classroom activity can be focused on cognitive goals — or is it inevitable that cognitive goals will at best influence the choice and conduct of activities but seldom if ever be foregrounded? One of the principles of FCL is "metacognitive environment" (Brown & Campione, 1996), which means that cognitive goals should have a place in the attention of both students and teachers. Although FCL and Knowledge Building may differ as to what goals should be foregrounded, they are alike in giving long-range cognitive and epistemic goals a high place.

In time-bound activities, however, it is natural to focus on proximal rather than distal goals; in teaching, this means goals of activity management and task completion. The management problems facing the classroom teacher are often so compelling and unrelenting that attention is bound to be drawn to goals that can be achieved in the next minute or fifteen minutes or week, rather than goals that span a month, a year, or a developmental stage. So it is important to ask of any high-aspiring educational approach both how successfully it can resist degradation and what kind of remnant can be expected to survive when degradation does occur. These are questions we do not see being asked in the educational literature. Instead the literature (particularly the constructivist literature) consists of ideal descriptions, sometimes accompanied by an acknowledgement that successful implementation may require considerable professional development or perhaps a better world. Questions of durability, resilience, and residuum are worth asking about any educational innovation. Considering FCL and Knowledge Building in light of these questions may be especially illuminating.

To put the issues more positively, the challenge is to foster a principled rather than a procedural approach to teaching, in the face of strong pressures that tend toward the procedural. Clearly enunciated principles have served to justify all the characteristics of FCL and link them to major themes and ideas in the learning sciences (Brown & Campione, 1996). We have aimed to compensate for the absence of activity structures by enunciating principles that we hope will prove cogent for academics and practitioners alike, as well as being within the grasp of young students (Scardamalia, 2002). Nonetheless, working from principles, especially in the absence of specific activity structures, has proved exceedingly difficult for knowledge building pedagogy. If you set out a principle that is clearly on the side of the angels, people will tend to find grounds for claiming they are acting in accordance with the principle already and it will essentially be ignored. If the principle strays too far from the familiar, people will claim it irrelevant to their context. Ann used to lament what is fundamentally the same problem, with a different slant. Practitioners would be confident that by visibly using the FCL activity structures they were in fact "doing" FCL, even though there was no evidence of a "metacognitive environment" or pursuit of deep content knowledge.

Our guess, based on some but probably not enough observation, is that when FCL and Knowledge Building degrade, they degrade to pretty much the

same thing. They degrade to the traditional school "project" or "research paper," which consists of facts collected on some topic and organized into a presentation. Although present-day versions are likely to involve computers and the use of Web resources and PowerPoint presentations, the procedures remain the same as those set out in 1950s handbooks (e.g., Warriner, Mersand, & Griffith, 1958; compare Carty, 2005).

"Degrade" is a somewhat misleading term, for it suggests decline from a previous better state. In our experience with Knowledge Building, what goes wrong is usually wrong from the beginning. It seems to be characteristic of pedagogical innovations in general that many teachers who claim and perhaps sincerely believe they have adopted them have in fact continued in their old ways with only superficial adaptations if any to the new approach (Cohen, 1989; Tyack & Cuban, 1995). Consequently, getting started is a crucial problem for FCL, Knowledge Building, and any other innovation that involves a major change in pedagogy (Whitcomb, 2004). The role of explicit procedures in dealing with this problem is itself a strategic problem crying out for controlled research. The more explicit and distinctive the procedures, the easier they are to institute; and in this regard FCL has it all over Knowledge Building. But adopting procedures without having internalized the principles can lead to a dead end, as Ann lamented. Among promoters of Knowledge Building there is considerable disagreement about the best strategy for getting started. A number favor some kind of "starter" unit in which explicit steps are laid out, the idea being that once teachers see knowledge building happening among their students they will be able to continue on their own. Some even advocate starting with familiar kinds of projects and gradually shifting them in the direction of Knowledge Building. The two of us have continued to maintain that principles should come first — that grasp of these principles, along with access to examples drawn from successful Knowledge Building classrooms, is the best way to ensure that real knowledge building will occur. The goal is to engage teachers and students directly with these principles (e.g., collective cognitive responsibility, idea improvement, rise-above, epistemic agency, real ideas and authentic problems) — engaging them not only as users but also as designers of applications and improvers of the principles. This is looking promising. We are now seeing student inventions and analyses of knowledge building based on the students' understanding of the principles.[1] Students' insights into these principles suggest that a principled-based approach is possible. Whether it will ever be as strong as the approach Ann and Joe have established, with activity structures as intermediaries for a principle-based approach, is an important issue we plan to explore, in collaboration with Joe Campione.

[1] A video is available showing inner-city elementary school students discussing the performance of a grade 2 class in light of knowledge building principles and data obtained using analytic tools. As of September 28, 2006, this video was available at http://video.ikit.org/innovators2006.

If it is true that when implementations of FCL or Knowledge Building fall short the result is conventional project-based learning, this is not a disaster. The traditional project provides practice in a task, producing a library research paper, that (although rarely called for in real life) is likely to be required all the way through schooling, even in graduate school; and, depending on the topic and the approach, it can result in acquiring and retaining substantial knowledge. One of us remembers an assignment back in the fourth grade: to choose a bird, collect information on it, and make an oral report to the class. The bird chosen was the scarlet tanager; and when, 65 years later, one actually appeared at our window, it was instantly recognized, with great pride and delight. If some teachers successfully implement FCL or Knowledge Building while others — perhaps even the majority — get no farther than a slightly enriched version of the traditional project, this would count as a net gain for educational reform. And it is possible that those who do grasp the larger vision will be able to help their colleagues grasp and pursue it as well.

We do believe, however, as Ann and Joe have also emphasized, that it is important for teachers, and for students as well, to grasp pedagogical principles at a deep level. For this purpose, as in all concept learning, contrasts are essential. The contrast between constructivist learning and the stereotype of "drill and kill" pedagogy has outlived its usefulness and needs to be replaced by contrasts among nearer neighbors. We hope this chapter will be seen as contributing to a new page in comparative pedagogy and not as an arguing for or against either of the approaches discussed.

In retrospect, it is easy to see that FCL and Knowledge Building teachers could not simply incorporate each others' procedures. Rather than again attempt integration, Joe Campione, Carl, and Marlene plan, as a next step, to explore levels of learning and epistemic invention in FCL and Knowledge Building classrooms, with teachers sharing common curriculum goals. We've yet to establish the design for this work, but we are committed to keeping the conversation alive. It represents one of the great joys and challenges of our scholarly lives, and arguably the single most important conversation for our efforts at Knowledge Building.

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