Learning Communities in Classrooms: A Reconceptualization of Educational Practice

Katerine Bielaczyc
Boston College
OISE, University of Toronto

Allan Collins
Northwestern University
Boston College

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Introduction

In recent years in America there has developed a "learning-communities" approach to education. In a learning community the goal is to advance the collective knowledge and in that way to support the growth of individual knowledge (Scardamalia & Bereiter, 1994). The defining quality of a learning community is that there is a culture of learning, in which everyone is involved in a collective effort of understanding.

There are four characteristics that such a culture must have: (1) diversity of expertise among its members, who are valued for their contributions and given support to develop, (2) a shared objective of continually advancing the collective knowledge and skills, (3) an emphasis on learning how to learn, and (4) mechanisms for sharing what is learned. If a learning community is presented with a problem, then the learning community can bring its collective knowledge to bear on the problem. It is not necessary that each member assimilate everything that the community knows, but each should know who within the community has relevant expertise to address any problem. This is a radical departure from the traditional view of schooling, with its emphasis on individual knowledge and performance, and the expectation that students will acquire the same body of knowledge at the same time.

Why Learning Communities?

As the world becomes more complex, students find themselves unprepared for the challenges, both personal and social. The new demands that society is placing on young people are reflected in a wide variety of reports on education, such as the U. S. Department of Labor's SCANS report (1991) and a recent book by Murnane and Levy (1996), which address the question of what skills and knowledge will be needed for work in the twenty-first century. To summarize their findings, students need to be able to direct their own learning, work with and listen to others, and develop ways of dealing with complex issues and problems that require different kinds of expertise. These, for the most part. are not skills that are currently taught in schools.

So why should we redesign education around learning communities? There are at least three arguments as to why it would be good to do so:

Social-constructivist argument. The "social-constructivist" view of education, characteristic of Dewey and Vygotsky, holds that the theory of individual learning, which pervades schools, is flawed. The constructivist view is that people learn best, not by assimilating what they are told, but rather by a knowledge-construction process. In order for individuals to learn how to construct knowledge, it is necessary that the process be modeled and supported in the surrounding community. This is what occurs in a learning community.

Learning-to-learn argument. Frank Smith (1988) argues that children will learn to read and write if the people they admire read and write. That is, they will want to join the "literacy club" and will work hard to become members. Brown, Ellery, and Campione (1998) argue that there has been a change in the demand on schools, toward a goal of producing expert learners or "intelligent novices." This change has been brought on by (1) increasing knowledge, such that no one can absorb in school everything they will need to know in life, and by (2) the changing demands of work, where technology can carry out low-level tasks, requiring workers who can think abstractly and learn new skills. So given that we want people who know how to learn, it follows from Smith's argument that children will learn to be learners by joining a "learning club."

Multi-cultural argument. The world is becoming more closely integrated through the advent of new communication technologies, and societies are becoming increasingly diverse through mixing of people from different cultures. This requires people to interact and work with people from different backgrounds. To prepare people to live and work amid such cultural diversity, schooling needs to construct a learning environment that fosters students' abilities to work and learn with other people. Each person's contributions must be respected, and the community must synthesize diverse views. This is the type of learning environment that a learning-communities approach promotes.

In summary, the learning-communities approach addresses the needs for students to deal with complex issues, figure things out for themselves, communicate and work with people from diverse backgrounds and views, and share what they learn with others. Therefore educational researchers in America have begun to experiment with different models of learning communities to determine which ways of organizing learning communities are most effective (Brown & Campione, 1994; Collins & Bielaczyc, 1997; Lampert, Rittenhouse, & Crumbaugh, 1996; Rogoff, 1994; Scardamalia & Bereiter, 1994; Wineburg & Grossman, in press).

A Framework for Viewing Learning Communities

The learning-communities approach raises a number of issues about the design of learning environments. We treat each issue as a dimension, along which we will contrast a learning-communities approach with the approach of teachers who emphasize the individual mind and how it develops. Classrooms have changed over the years to involve more social interaction, but classrooms organized as learning communities still differ from most classrooms along these dimensions. These eight dimensions provide a framework we will use to examine three examples of classroom-based learning communities described in the next section.

Goals of the community: In a learning-communities approach the goal is to foster a culture of learning, where both individuals and the community as a whole are learning how to learn. Further, members of the community share their individual efforts

towards a deeper understanding of the subject matter under study. Students learn to synthesize multiple perspectives, to solve problems in a variety of ways, and to use each other's diverse knowledge and skills as resources to collaboratively solve problems and advance their understanding. The intent is for members to come to respect and value differences within the community. In contrast, most classrooms tend to foster a culture in which students are expected to acquire the same body of knowledge at the same time. Rather than an emphasis on diverse expertise and problem solving, there tends to be an emphasis on conformity and on learning particular subjects.

Learning activities: Because the goals focus on fostering a culture of learning, the activities of learning communities must provide a means for (1) both individual development and collaborative construction of knowledge, (2) sharing knowledge and skills among members of the community, and (3) making learning processes visible and articulated. A learning-communities approach tends to use a variety of learning activities, including individual and group research; class discussions; cross-age tutoring; working together to create artifacts or presentations that make public both what is learned and ways of learning; and collaborative problem solving where students take on particular roles toward a common end.

It should be noted that the learning activities described in a learning-communities approach and those found in most classrooms may share some similarities. However, because the learning activities are used toward different ends, differences arise. For instance, social learning techniques such as cooperative learning and collaborative learning (Cohen, 1985; Damon & Phelps, 1989; Slavin, 1986) can be used to support a learning community's goals, but they can equally well support more traditional learning aimed at inculcating particular knowledge among students. Brown and Campione (1996) contrast the learning activities in most classrooms with those of learning communities in terms of two other factors: that the activities in a learning community operate as a system and their underlying objectives are articulated:

> There are by now many procedures available that were designed to foster thinking. These procedures are part of the teacher's tool box. But the procedures are understood as unrelated tools, not as systems of interdependent activities.... Teachers may, for example, decide to include forms of cooperative learning, the use of long-term projects, a writer's workbench approach, etc. The problem we see is that such an approach ignores the potential power of creating a classroom system of activities that mutually influence and reinforce each other.... There is a purpose for every activity, and nothing exists without a purpose. All members of the community -- students, teachers, parents, and researchers alike -- should be aware of this (Brown & Campione, 1996, pp. 292, 314).

Teacher roles and power relationships: In a learning-communities approach, the teacher takes on roles of organizing and facilitating student-directed activities, whereas in most classrooms the teacher tends to direct the activities. The power relationships shift as students become responsible for their own learning and the learning of others. Students also develop ways to assess their own progress and work with others to assess the

community's progress. In contrast, in most classrooms the teacher is the authority, determining what is studied and assessing the quality of students' work.

Centrality/peripherality and identity: The degree to which people play a central role and are respected by other members of a community determines their sense of identity (Lave & Wenger, 1991). In a learning-communities approach the central roles are those that most directly contribute to the collective activities and knowledge of the community. However, opportunities exist for all community members to participate to whatever extent is possible and students working in peripheral roles are also valued for their contributions. Centrality and peripherality are context-dependent. Certain students may have more to contribute at a given time, so a student's centrality can change over time. As members of a learning community take on different roles and pursue individual interests toward common goals, students develop individual expertise and identities. Because diversity is important, an atmosphere in which students respect each other's differences needs to develop.

In contrast, in most classrooms students work on the same things and are all expected to reach a base level of understanding. Students tend to form their identity through being measured or by measuring themselves against this base level. Centrality tends to mean those who meet and exceed this base level -- those who "get it." Schofield (1995) notes the benefits of such centrality in that teachers typically spend most of their time interacting with the better students. Students on the periphery are then those students needing remediation and extra help -- those that "aren't quite there yet," which diminishes their value to others in the classroom.

In a learning-communities approach there is also the notion of a *community identity*. By working toward common goals and developing a collective awareness of the expertise available among the members of the community, a sense of "who we are" develops. In the absence of a learning culture that builds a collective understanding and views its members as learning resources, most classrooms fail to develop a strong sense of community identity.

Resources: Both a learning-communities approach and many classrooms use resources outside of the classroom, including disciplinary experts, telementors, the Web, etc. However, in learning communities both the content learned and the processes of learning from the outside resources are shared more among members of the community and become part of the collective understanding. A further distinction between learning communities and most classrooms is that in learning communities, both the members themselves and the collective knowledge and skills of the community are viewed as important resources.

Discourse: In the learning-communities approach the language for describing ideas and practices in the community emerges through interaction with different knowledge sources and through co-construction and negotiation among the members of the

community. Also, learning communities develop a common language for more than just content knowledge and skills. The community develops ways to articulate learning processes, plans, goals, assumptions, etc. In contrast, in most classrooms the teacher and texts tend to promulgate the formal language to be learned.

Discourse functions in a learning community as a medium for formulating and exchanging ideas. It serves to motivate the research and reflection in the community by raising new questions and hypotheses, which give rise to further research and understanding (Bereiter & Scardamalia, 1993). Students are expected to provide feedback to each other, and are supported in doing so. In contrast, in most classrooms communication occurs principally between the teacher and students. The discourse functions as a medium for conveying knowledge to students and asking students questions to test their knowledge (Schofield, 1995).

Knowledge: In learning communities the development of both diverse individual expertise and collective knowledge is emphasized. In order for students to develop expertise, they must develop an in-depth understanding about the topics that they investigate. Rich subject matter is important. The topics are not randomly chosen, but rather the depth centers on key principles or ideas in a domain that are generative for understanding a broad array of topics. There is also a circular growth of knowledge, wherein discussion within the community about what individuals have learned leads individuals to seek out further knowledge that they then share with the community. Thus, there is an interplay between the growth of collective knowledge and of individual knowledge, with each supporting the other. In most classrooms the goals tend towards covering all the topics in the curriculum (breadth over depth) and for everyone to learn the same thing.

Products: Dweck (1986) has shown how students who adopt performance goals put their energy into looking good and tend to give up when they fail. But those students who adopt learning goals learn more from their mistakes and pursue learning in the face of failure. One concern is that an emphasis on products may lead students to adopt performance goals, and focus on production values rather than meaningful learning. But, as Bruner (1996) points out, a culminating event or product can act to focus the energy of the entire class on a joint effort, which helps to build community.

In a learning-communities approach, members work together to produce artifacts or performances that can be used by the community to further their understanding. There is sustained inquiry and development of products over months. In contrast, most classrooms tend toward individual or small group assignments with little sharing or collective products. Usually work is produced in short periods of time.

Analysis of Learning-Community Classrooms

To give a picture of what a learning-communities approach implies for schooling, we describe three exemplary cases of learning communities that have been set up in American classrooms. After briefly describing each of the three cases, we will compare them with respect to the eight issues raised in the Introduction. Then we will attempt to extract general principles for the design of learning communities.

Scardamalia and Bereiter's Knowledge-Building Classrooms

Scardamalia and Bereiter (1991, 1994) have developed a model they call Knowledge-Building Communities. CSILE (Computer Supported Intentional Learning Environments) is the name commonly applied to this model, although strictly speaking it is the name of the computer software they developed, which is used in classrooms that may or may not have adopted the pedagogical model. The essential idea is that students work together to make sense of the world around them and work towards advancing their own state of knowledge and that of the class.

The model involves students investigating problems in different subject areas over a period of weeks or months. As students work, they enter their ideas and research findings as notes in an on-line knowledge base. The software (originally called CSILE, now in a new version called Knowledge Forum) supports students in constructing their notes through features such as theory-building scaffolds (e.g. "My Theory," "I Need to Understand") or debate scaffolds (e.g. "Evidence For"). Students can read through the knowledge base adding text, graphics, questions, links to other notes, and comments on each other's work. When someone has commented on another student's work, the system automatically notifies them about it.

The central activity of the community is contributing to the communal knowledge base. Contributions to CSILE can take the form of (a) *individual notes*, in which students state problems, advance initial theories, summarize what needs to be understood in order to progress on a problem or to improve their theories, provide a drawing or diagram, etc., (b) *views*, in which students or teachers create graphical organizations of related notes, (c) *build-ons*, which allow students to connect new notes to existing notes, and (d) *"Rise Above It" notes*, which synthesize notes in the knowledge base. Any of these kinds of contributions can be jointly authored.

When students feel a note makes an important contribution to the collective knowledge base, they can propose the note for publication. An editorial group and the teacher then decide whether to publish the note. At the end of the school year the class may decide on a selection of notes to remain in the knowledge base for classes that come after them. The goal is to engage students in progressive knowledge building, where they continually develop their understanding through problem identification, research, and community discourse. The emphasis is on progress toward collective goals of understanding, rather than individual learning and performance.

Brown and Campione's FCL Classrooms

Brown and Campione (1994, 1996; Brown, 1992) have developed a model they call Fostering a Community of Learners (FCL) for grades 1-8. The model provides what is termed a "developmental corridor," where the learning community extends not only horizontally across a classroom, but vertically across grades. This makes it possible for learning topics to be revisited at increasing levels of disciplinary sophistication. We will focus here on communities in classrooms, rather than across grades.

The FCL approach promotes a diversity of interests and talents, in order to enrich the knowledge base of the classroom community as a whole. The current focus of FCL classrooms is on the subject areas of biology and ecology, with central topics such as endangered species and food chains and webs. There is an overall structure of students (1) carrying out research on the central topics in small groups where each student specializes in a particular subtopic area, (2) sharing what they learn with other students in their research group and in other groups, and (3) preparing for and participating in some "consequential task" (Scardamalia, Bereiter & Fillion, 1981) that requires students to combine their individual learning, so that all members in the group come to a deeper understanding of the main topic and subtopics. Teachers orchestrate students' work, and support students when they need help.

There are roughly three research cycles per year. A cycle begins with a set of shared materials meant to build a common knowledge base. Students then break into research groups that focus on a specific research topic related to the central topic. For example, if the class is studying food chains, then the class may break into five or six research groups that each focus on a specific aspect of food chains, such as photosynthesis, consumers, energy exchange, etc. Students research their subtopic as a group and individually, with individuals "majoring" by following their own research agendas within the limits of the subtopic. Students also engage in "crosstalk," talking across subtopic groups to explain, ask questions, and refine their understanding. The research activities include reciprocal teaching (Palincsar & Brown, 1984), guided writing and composing, consultation with subject matter experts outside the classroom, and cross-age tutoring. In the final part of the cycle, a member from each of the subtopic groups come together to form a "jigsaw" group (Aronson, 1978) in order to share learning on the various subtopics and to work together on some consequential task. Thus, in the jigsaw, all pieces of the puzzle come together to form a complete understanding.

The consequential task requires the different subtopics to be used together to form a common product or common understanding. The choice of consequential tasks is ideally made by the teacher and students together. In some cases the consequential task might be a bulletin board display, the design of a bio-park to protect an endangered species, a presentation to the community at large, or in some cases a test of students' knowledge. These tasks "bring the research cycle to an end, force students to share

knowledge across groups, and act as occasions for exhibition and reflection" (Brown & Campione, 1996, p. 303).

Lampert's Mathematics Classroom

Lampert (1986, 1990; Lampert, Rittenhouse & Crumbaugh, 1996) taught mathematics to fifth grade students for a number of years, where she developed an approach to teaching that reflected her view of an idealized mathematics community. The class usually starts with a problem posed to the students, which they work on alone or in groups, developing their solutions in notebooks that retain all their work during the year. After 15-20 minutes of work the class as a whole discusses the problem and various possible solutions. Lampert encourages students to discuss different ideas and solutions, so that they develop a deep understanding of the mathematical principles underlying their work.

Lampert chooses problems that foster deep inquiry and mathematical argumentation by students. Students are encouraged to present different ideas and methods, and to discuss which are correct and why. There is an emphasis on how to resolve mathematical arguments by appeal to logic and evidence. Participating in the mathematical discussions, learning how to make mathematical arguments, and learning the language of mathematics (terms such as "conjectures" and "commutativity") are the central activities in the classroom.

Lampert orchestrates the discussion and picks up on certain ideas, revoicing them so that everybody can understand. She is very much in control and uses various techniques to make sure students participate in the discussion. She opportunistically follows the ideas the students suggest in order to relate them to important mathematical ideas. The students are on an equal footing in the discussions, offering their ideas and discussing other students' ideas and arguments. She carefully orchestrates the discussion to maximize the participation among the students. Her technique of asking students to explain other student's ideas is particularly effective in making them listen to and respect other students. The discussion involves students in a way that fosters understanding of the ideas and principles that the class is developing.

Comparison of the Three Cases

We will compare the three cases in terms of the eight issues outlined in the Introduction. By looking at the similarities and differences between these exemplary cases of classroom learning communities, we can more clearly see the essential characteristics of learning communities.

Goals: All three cases foster a culture of learning, where students come to see themselves as contributors to their own learning and that of the community. The goals in all three cases are consonant with the learning-community goals described in the Introduction. This includes the goals of students learning how to (1) learn and reflect on their learning, (2) become critical thinkers who know how to frame questions and

develop a deep understanding of the issues they investigate, and (3) share their learning and work with others in the community as resources.

Learning activities: While the three cases share the same goals, they involve different learning activities and types of support. In CSILE, students investigate problems and develop theories, contribute written and graphic descriptions about what they are learning to the collective knowledge base, and comment on and respond to other students' contributions. This tends to be accompanied by oral discussion. These learning activities are guided by the software through the different scaffolds (e.g., "My Theory," "What I Learned") and by interactions with other students around their ideas. In FCL, the learning activities center on research, sharing knowledge, and producing joint products. The different activities (e.g., reciprocal teaching, guided writing, cross-age tutoring) each have a structure, which serves to guide the students. Lampert's classroom focuses on problem solving and mathematical argumentation as learning activities. Lampert provides guidance throughout the process, by posing provocative problems and directing discussion toward important mathematical issues.

Teacher roles and power relationships: In all three classrooms, the teacher takes the role of a facilitator. The learning activities and lines of inquiry tend to be driven by student questions and interests. In Lampert's classroom, by comparison with CSILE and FCL, the teacher is much more in control of what students are doing. By leading students in whole class discussion, Lampert supports students in coming to reason and argue mathematically in the ways that she has mastered. The teacher's role in CSILE is not prescribed and can vary widely, depending on the teacher's knowledge and orientation toward a particular unit. As Scardamalia, Bereiter, and Lamon (1994, p. 209) point out "CSILE opens up a significant channel for communication in the classroom that is not mediated through the teacher." FCL falls somewhere in between. Certain activities, such as the benchmark lessons, are closely guided by the teacher or by guest experts. However, students also direct the community's learning, as in one case where students became interested in the question of whether mosquitoes could transmit AIDS (Brown & Campione, 1994).

In both CSILE and FCL classrooms a student may have more expertise in a particular area than the teacher, changing the typical student-teacher power relationship that exists in most classrooms. Ideally, students benefit from the knowledge of their teachers and available experts, but at the same time go beyond such knowledge whenever feasible (Scardamalia & Bereiter, 1991).

Centrality/peripherality and identity: As stated earlier, the central roles are those that directly contribute to the collective activities and knowledge of the community. All three cases also provide a means for all community members to participate in peripheral roles to whatever extent is possible. In CSILE, students can still participate in the community while engaging in peripheral activities, such as reading notes in the knowledge base and making comments on other students' notes. Students' roles begin

to shift as they create notes of their own, either as an individual or in a group. Students begin to play more central roles as they have their notes published or linked to other students' notes. Centrality increases further when a student's notes are chosen to be saved for future generations of CSILE users. In FCL classrooms, students move into central roles when their expertise is required within their jigsaw group, when creating products, or when their individual expertise is called on by the whole community. In Lampert's classrooms, students move into central roles when they contribute to the mathematical discoveries and arguments that the class is engaged in.

Individual identity is developed in CSILE when one's contribution is recognized: other students read, comment, or make links to one's note; one's note is published, or the whole class identifies one's note as worthy of being saved for later generations. In FCL classrooms, individual identity is developed through being responsible for others' learning in contexts, such as jigsaw groups or cross-age teaching. Identity is also developed in contributing one's individual expertise and skills to the public, collective understanding. In Lampert's classroom, individual identity is developed as one's contributions to the class discussions are commented on or built upon, and from the teacher revoicing what one has said.

A major effort in these classrooms goes into ensuring that all students are making contributions to the community and that their contributions are valued by other students. This is accomplished in different ways. CSILE encourages students to investigate issues they care about and so they develop diverse expertise, which serves to make their contributions valuable to other students. In addition, students are taught how to make effective comments on each other's notes, so that their criticism is constructive (Woodruff & Brett, 1993). By setting up jigsaw and reciprocal teaching groups, and jointly-produced consequential tasks, FCL fosters diverse expertise and interdependence, which encourages students to rely on and value other students' work. Students also learn how to give helpful guidance to each other. For example, before students work with each other in cross-age teaching, tutors are trained in tutoring methods (Brown & Campione, 1996). Lampert also uses a variety of stratagems to build a community where all the students respect each other. This includes revoicing what students say so that their ideas are understood by other students, and asking students to explain what other students are saying before they disagree, so that they must listen carefully to other students during the discussion. In addition, she gives feedback to students when they do not listen to and respect other students.

In all three cases a community identity is also developed. In CSILE this comes from all students building a common knowledge base, and from students working together to examine their collective knowledge base and to decide what should be passed on to future generations. In FCL classrooms, community identity comes from participating in the creation of joint products and through experiencing how the subgroups of the class work together. In Lampert's classroom this comes from the whole class working

together in depth on math problems, engaging in mathematical argumentation with each other, and coming to a common understanding of mathematical principles.

Resources: In all three cases, the students come to view each other as legitimate resources for learning. Another resource that is common to all three cases is the collective knowledge and skills that the community is developing. The teacher is also a resource, although in Lampert's classrooms the teacher is a more central resource than in the CSILE and FCL classrooms. Lampert provides a deep understanding of mathematical issues and skills in mathematical argumentation, which she uses in selecting problems and guiding students' discussion.

FCL and CSILE classrooms bring in resources from outside the classroom in whatever ways possible. Because students are investigating questions in depth, they often come upon issues that are beyond the classroom community's expertise to answer. Therefore, FCL encourages students to find resource people that can help with the questions they are investigating, to learn from students in cross-age tutoring interactions, to communicate with telementors about issues, and to find information on the Web. FCL's benchmark lessons often bring in experts from the community. This resource contributes not only to the students' learning, but also to the teacher's professional development. "With increasing exposure to the visitor's lessons, the classroom teachers learn more about the content area and increasingly come to take over responsibility for benchmark lessons" (Brown & Campione, 1996, p. 299).

Scardamalia and Bereiter (1994, 1996) have begun to develop a new type of relationship between students and outside resources in the CSILE model. They envision a knowledge building society where both adults and students work in a common knowledge base. To illustrate how they see such a society functioning, suppose that fifth and sixth graders are working on the problem of "How does electricity work?" and that museum curators are working on an exhibit about electricity. Then the curators might investigate the student's knowledge base to see what interests them or confuses them about electricity. Similarly, the students might follow the ongoing development of the exhibit discussions in the knowledge base, making comments on what they find interesting and what they don't understand. Further, scientists involved in the exhibit might contribute to knowledge building by providing useful comments on or links between students' notes. Students might also learn from observing the thinking processes exhibited in adult discourse in the knowledge base.

Discourse: All three cases encourage public discussion of issues among students. This is one of the central ways that a learning community expands its knowledge.

The CSILE system emphasizes a discourse of formulating problems, constructing theories, and bringing questions, comments, and new information to bear on them. The labels on the notes guide the students in making contributions (e.g., "My Theory", "I Need to Know"). In producing notes about what they have learned, students are

encouraged to use both written and graphical discourse. Communication in CSILE is asynchronous, which may allow students to express themselves more clearly, since they are not able to rely on immediate context in making their points clear (Bereiter & Scardamalia, 1993). An interesting aspect about the use of written discourse in CSILE is that the basis for determining a student's status tends to be different from that in face-to-face settings. Because a great deal of classroom interchange is in written form, qualities such as clarity, persuasiveness, and inventiveness come to dominate over forcefulness, looks, and popularity, which usually determine status in face-to-face settings. In CSILE, students are also encouraged to critique each other's work by reading and commenting on their notes. Students are taught how to use these different genres effectively. For example, in order to get students not to make superficial comments, students are taught to identify both the strengths and weaknesses in other student's work.

Similarly, FCL emphasizes students engaging in questioning, explaining, and constructive discussion of issues, both in written and oral modes. Students work in groups to formulate questions that they pursue in their research. They write up their findings for the other students and these writings form the basis for reciprocal teaching sessions with the other students in the class. In the crosstalk and jigsaw sessions students discuss what they have learned and make comparisons with what others have learned. Brown and Campione (1996, pp. 305, 319) claim that "dialogue provides the format for novices to adopt the discourse structure, goals, values, and belief systems of scientific practice. Over time the community of learners adopts a common voice and common knowledge base, a shared system of meaning, beliefs, and activity that is as often implicit as it is explicit... Ideas are seeded in discussion and migrate throughout the community."

Lampert emphasizes mathematical argumentation in her classroom, in order to teach students how to reason mathematically. One challenge to this approach is that students find this emphasis on argumentation at odds with their desire to get along with other students and not to criticize them (Lampert, Rittenhouse & Crumbaugh, 1996). As Lampert and her colleagues point out, it is very difficult for adults to separate criticism of ideas from criticism of the person, so it is not surprising that students find argumentation uncomfortable. With the teacher's guidance and with experience and modeling by other students over time, students learn how to argue about ideas effectively without personalizing the criticisms.

Knowledge: The three cases differ as to how much they encourage people to develop common knowledge as opposed to diverse knowledge. Lampert strives for common knowledge among all participants. Lampert encourages students to help each other in their groups, and in the group discussion of problems she works toward the goal of everyone understanding the ideas discussed. With CSILE, on the other hand, students are encouraged to go off in depth in their own direction to develop expertise. Some students may focus on one aspect of a topic and other students on another aspect.

Through reading each other's notes and producing a database for which they are collectively responsible, they form a common understanding.

FCL supports diverse expertise in that it has each research group study a different topic, and each member of the group become expert in a different aspect of the topic. But FCL also strives for common knowledge through different mechanisms, such as crosstalk, classroom discussions, consequential tasks, and students sharing their expertise. The activities are also structured to ensure that students know who has what expertise. So, if a question arises with respect to a problem they are working on, they know who to ask for help.

All three cases help students to develop meta-knowledge about both the subject matter and the learning processes they are engaged in. In CSILE the development of higher-order views of the community's work, together with the "What We Have Learned" notes and "Rise Above It" notes, encourages students to engage in a type of "meta-discourse." That is, students engage in discourse about the discourse in the knowledge base where they reflect on their own and on the community's progress in understanding. FCL grows out of a long line of research on metacognition and the development of activities that foster reflective learning practices (see Brown & Campione, 1996). The learning activities in FCL classrooms are meant to create an atmosphere of reflection on learning and encourage articulation of learning processes. For example, in completing a public performance, students reflect on what they have learned and set priorities -- "What is important to know? What is important to teach? What of our new found knowledge do we display?" (Brown & Campione, 1996, p. 295). In Lampert's classrooms, students are frequently asked to explain what another student is thinking or to articulate the idea one is arguing against prior to making a proposal of one's own. Such activities require students to examine the ideas of the community, to compare proposals, and talk about knowledge and understanding.

Products: As mentioned earlier, a concern with students developing products is that such an activity may lead students to adopt performance goals and focus on production values rather than meaningful learning. Scardamalia and Bereiter (1991) have always been concerned with keeping students focused on learning goals, but they have incorporated into CSILE the publishing of notes and the handing on of published notes to future classes. This acts as a kind of culminating product that can serve to focus the community's work. FCL emphasizes consequential tasks, where students work on a project that requires all the diverse expertise that different students have acquired. FCL also has students give presentations and exhibitions for a wide variety of audiences, such as parents, community members, and younger students. So there is an emphasis on products that bring together different strands of the students' work and that reach outside the classroom. In Lampert's classes, students produce a journal with their individual work, however the class does not produce any physical collective products.

One final point concerns the idea of the collective knowledge of the community as a product. While in all three cases the members of the community share a certain level of common understanding, differences exist between the three cases in terms of the level to which the collective knowledge is objectified. In CSILE there is a complete written database, which embodies the community's knowledge and forms a repository that can be inspected and reflected upon. In FCL the collective knowledge is expressed orally, which produces no repository, and also through artifacts and public performances, which provide records of the collective knowledge. In Lampert's classes, all discussions are oral, leaving no tangible record of the shared, collective knowledge. The only written record of what was learned is in the individual students' journals, which do not reflect the collective understanding and are not shared resources.

Principles for the Design of Effective Learning Communities

In considering these different cases, we have tried to encapsulate what we have learned from them into a set of principles for the design of effective learning communities.

Community-Growth Principle: The overall goal of the community should be to expand the community's knowledge and skills. To maximize its learning, the community needs to take advantage of the knowledge of all its members and what they learn. The goal is for individuals to constantly gain new knowledge and to share among themselves. By pooling knowledge from each individual, the community can expand its collective knowledge.

Emergent-Goals Principle: The learning goals of the community should be co-constructed with the students and come out of the activities and questions that arise, as students carry out their investigations. The teacher must be sensitive to the needs, interests, and abilities of the individual students. The goals therefore should reflect what the students know and help them build on both their strengths and weaknesses. The students spawn goals of their own as the learning community evolves and they take over more of the work of the community. In this way collective goals are emergent.

Articulation-of-Goals Principle: The teacher and students should articulate the goals they are pursuing and the terms by which they will judge their success. This allows all members of the community to have a clear idea of the goals and of the criteria by which they can tell if they have reached their goals. All the students should develop the ability to judge if the goals have been met.

Metacognitive Principle: Metacognition involves (1) monitoring one's thinking processes, (2) being aware of what one knows and doesn't know, and (3) reflecting on what one has learned (Brown, Bransford, Ferrara & Campione, 1983). In terms of monitoring, the community should keep asking itself what its goals are and if what it is doing will help it reach them. The community should also try to identify at regular intervals what it knows and does not know. Finally, in terms of reflection, the class can

look back at what it has done (for example, at its products and performances), and evaluate what was learned and how well they did.

Beyond-the-Bounds Principle: The community should attempt to go beyond the knowledge and skills within the community and the resources easily available to them. They should try to make sense of things for themselves and welcome new approaches and challenges. They do not want simply to regurgitate what they find in their resources. They should seek ideas that challenge what they believe, by soliciting diverse opinions and views on a topic. They should not just try to find support for their current beliefs.

Respect-for-Others Principle: Students need to learn to respect other students' contributions and differences, and to feel safe in speaking up and giving their own ideas. The more everyone is heard, the more sources of knowledge there are for expanding the community's knowledge. When only one or two students are heard, then the learning of the community is limited to what those few students provide and develop. The rules for respect should be clearly enforced and articulated.

Failure-Safe Principle: We often learn from failures, so that to the degree a learning community accepts failures and does not try to assess blame, then it fosters a more experimental approach that allows failures to occur as the community learns. Often the failures will be collective failures. There must be a sense that failure is okay, and that taking risks and an experimental approach will lead to more learning. Reflection without blame, can help to ensure that the community learns from its mistakes.

Structural-Dependence Principle: The community should be organized such that students are dependent on other students' contributions in some way. It is important to have a valid reason for students to work together that makes sense to the students, such as a common task that requires their joint effort. If students are working on a task and they need another student's help, it makes that student important to them. This fosters both respect for the other student and that student's self esteem. This validation of differences is lost in traditional schooling, because it tries to ensure that everyone is always learning the same thing.

Depth-over-Breadth Principle: The students have sufficient time to investigate topics in enough depth that they gain real expertise in the topics. This is necessary to foster a sense of their own expertise and to support meaningful discourse among the students. Ideally the depth should center on important ideas that are generative for understanding a broad array of topics. It is critical for students to get beyond memorizing knowledge and procedures, in order for students to care about what they are learning and to develop a sense of how to learn.

Diverse-Expertise Principle: Students develop the areas in which they are most interested and capable, with the responsibility that they share their expertise with the

other students and the teacher. By developing diverse expertise, the community can deal with problems and issues that are too difficult for any individual to handle. A learning community continually discusses ideas and examines its progress in understanding, so that what an individual learns is not just from the activities that they themselves carry out, but from all the activities that different members of the learning community engage in. This is fundamentally different from "learning by doing," as it is commonly understood. To most people, the phrase implies that individuals learn from what they themselves do. What occurs in a learning community is "collective learning by doing," where participants also learn from what others do. What is learned by individuals is what "gets into the air" of the community.

Multiple-Ways-to Participate Principle: In order to advance its collective understanding, a learning community has a variety of jobs it needs done. Students may be more or less interested and adept at different activities, so that there should be a range of activities in which they participate. The different activities should support the multiple learning goals of the community, such as formulating questions, gathering knowledge, sharing knowledge within the community, presenting their knowledge to the outside world, and reflecting on what they have learned. Students will take on different roles in the various activities, such as researcher, expert, co-investigator, monitor, interpreter, moderator, etc. The community needs to value all roles and their contributions, and not regard some roles as inferior.

Sharing Principle: There needs to be a mechanism whereby knowledge and skills gained by different individuals is shared throughout the community, so that each student is both a learner and contributor to the community knowledge. Unless something enters into the collective knowledge of the community, it does not serve the common good. Many communities lack adequate ways of sharing knowledge and practices, so that members often end up doing a poor job, because they did not know that some other member had the expertise they could benefit from. So it is important to share knowledge, not simply so that everyone profits from what each individual learns, but also so individuals know who to go to when a difficult problem arises.

Negotiation Principle: Ideas, theories, procedures, etc. are constructed by a negotiation process among members of the community, and arguments among them are resolved by logic and evidence (Collins, 1998). Argumentation is necessary for finding better solutions or understandings, because the learning community needs to identify errors and misconceptions that inevitably arise. But students usually do not like to participate in argumentation, since it makes them uncomfortable to criticize others (Lampert, Rittenhouse & Crumbaugh, 1996). There needs to be ways to model and to coach participants on how to critique other people's ideas without personalizing the critique, by trying to separate the ideas from the person. There is a variety of stratagems for depersonalizing critiques (e.g., focusing on the strong aspects of work as well as the weak aspects; couching comments in terms of what to change, rather than what is

wrong, etc.) that students need to develop to make interactions in a learning community effective.

Quality-of-Products Principle: The quality of the products produced by the community should be valued both by the community itself and by outsiders to the community. In particular the students need to think highly of the goals they are pursuing, and the knowledge and products they are producing. There must be standards that the community agrees upon as to what makes for good quality work, and these standards must be tested against the outside world. One way to do that is to bring in different audiences to judge the work, such as parents, community members, and other students.

Conclusion

The idea of learning communities in classrooms will grow as we try to address the needs of being able to reason through complex issues and problems, direct one's own learning, communicate and work with people from diverse backgrounds and views, and share what one learns with others.

A key idea in the learning-communities approach is to advance the collective knowledge of the community, and in that way to help individual students learn. This is directly opposed to the approaches found in most schools, where learning is viewed as an individual pursuit and the goal is to transmit the textbook's and teacher's knowledge to students. The culture of schools all too often discourages sharing of knowledge, by inhibiting students talking, working on problems or projects together, and sharing or discussing their ideas. Testing and grading are administered individually. When taking tests, students are prevented from relying onother resources, such as students, books, or computers. The whole approach is aimed at ensuring that students have all the knowledge in their heads that is included in the curriculum. Thus the learning-community approach is a radical departure from the theory of learning and knowledge underlying schooling.

The development of the learning-communities approach reflects a more widespread change in our understanding of education. Educational thinking in America has long been dominated by the psychologist's point of view, starting with Thorndike and coming down to us through behaviorists, such as Skinner and Gagné, and more recently cognitive psychologists, such as Bruner and John Anderson. This dominance is beginning to change as anthropological and Vygotskian influences have begun to "enculturate" educational thinking. The cultural view emphasizes that learning is a social and cultural enterprise, expressed in Smith's (1988) terms as, "We learn from the company we keep." Learning in this view is coming to belong to a community of practice (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). The idea of learning communities is the culmination of this view as applied to schooling.

The learning-communities approach also fits with the growing emphasis on lifelong learning. While in this paper we have emphasized the role of learning communities in classrooms, this view of learning can naturally be extended beyond the classroom walls. In addition to children, there is every reason for a learning community to include parents and members of the wider society. With the addition of computer networks it becomes possible to include scientists and other professionals, as well as students around the globe, in communities that are trying to understand and deal with social and political ideas and issues (Collins & Bielaczyc, 1997; Scardamalia & Bereiter, 1996). Children will benefit greatly from interacting with more adults in learning situations. Thus, the learning-communities approach offers a way to end the isolation of children in schools and integrate their learning with that of the wider society.

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References

Aronson, E. (1978). *The jigsaw classroom*. Beverly Hills, CA: Sage.

Bereiter, C., & Scardamalia, M. (1993). Surpassing ourselves: An Inquiry into the nature and implications of expertise. La Salle IL: Open Court.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions. *Journal of the Learning Sciences; 2* (2), 141-178.

Brown, A. L., Bransford, J. D., Ferrara, R. A., & Campione, J. C. (1983). Learning, remembering and understanding. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology* (4th ed.), *Cognitive development* (vol. 3, pp. 77-166). New York: Wiley.

Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-270). Cambridge, MA: MIT Press/ Bradford Books.

Brown, A., & Campione, J. (1996). Psychological theory and the design of innovative learning environments: On procedures, principles, and systems. In L. Schauble & R. Glaser (Eds.) *Innovations in learning: New environments for education* (pp. 289-325). Mahwah NJ: Lawrence Erlbaum Associates.

Brown, A., Ellery, S. & Campione, J. (1998) Creating zones of proximal development electronically. In J. G. Greeno and S. Goldman (Eds.) *Thinking practices*. Mahwah NJ: Erlbaum.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Bruner, J. S. (1996). *The Culture of education.* Cambridge, MA: Harvard University Press.

Cohen, E.G. (1986) *Designing groupwork: Strategies for the heterogeneous classroom.* New York: Teachers College Press.

Collins, A. (1998) Learning communities: Comments on papers by Brown, Campione and Ellery and by Riel." In J. G. Greeno and S. Goldman (Eds.) *Thinking practices*. Mahwah NJ: Erlbaum.

Collins, A. & Bielaczyc, K. (1997) Dreams of technology-supported learning communities. In *Proceedings of the Sixth International Conference on Computer-Assisted Instruction*. Taipei, Taiwan.

Damon, W. & Phelps, E. (1989). Critical distinctions among three forms of peer leaning. *International Journal of Educational Research, 13*(1), 9-19.

Dweck, C. (1986) Motivational processes affecting leaning. *American Psychologist, 41*(10), 1040-1048.

Lampert, M. (1986). Knowing, doing, and teaching multiplication. *Cognition and Instruction, 3*(4), 305-342.

Lampert M. (1990) When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal. 27*(1): 29-63.
Lampert, M., Rittenhouse, P. & Crumbaugh, C. (1996) Agreeing to disagree: Developing sociable mathematical discourse. In D. Olson & N. Torrance (Eds.) *Handbook of Education and Human Development.* Oxford: Blackwell's Press, pp. 731-764.
Lave, J. & Wenger, E. (1991) *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.
Murnane, R. J. & Levy, F. (1996) *Teaching the new basic skills*. New York: Free Press.
Ong, W. J. (1982) *Orality and literacy: The technologizing of the word.* London: Routledge.
Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and monitoring activities. *Cognition and Instruction, 1*(2), 117-175.
Postman, N. (1982). *The disappearance of childhood*. New York: Delacorte.
Rogoff, B. (1994) Developing understanding of the idea of communities of learners. *Mind, Culture, and Activity, 1*(4), 209-229.
SCANS Commission (1991). *What work requires of schools: A SCANS Report for America 2000*. Washington, DC: The Secretary's Commission on Achieving Necessary Skills, U. S. Department of Labor.
Scardamalia, M. & Bereiter, C (1991). Higher levels of agency for children in knowledge building: A challenge for the design of new knowledge media. *Journal of the Learning Sciences*, 1(1), 37-68.
Scardamalia, M. & Bereiter, C (1994). Computer support for knowledge-building communities. *Journal of the Learning Sciences*, 3(3), 265-283.
Scardamalia, M. & Bereiter, C (1996) Engaging students in a knowledge society. *Educational Leadership,* 54(3), 6-10.
Scardamalia, M., Bereiter, C., & Lamon, M. (1994). CSILE: Trying to bring students in world 3. In K. McGilley (Ed.) *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 201-228). Cambridge MA: MIT Press.
Scardamalia, M., Bereiter, C., & Fillion, B. (1981). Writing for results: A sourcebook of consequential composition activities. Toronto: OISE Press/ La Salle, IL: Open Court.
Schofield, J. W. (1995). *Computers and classroom culture*. Cambridge, UK: Cambridge University Press.
Slavin, R. (1986). Learning together. *American Educator*, Summer, 6-13.
Smith, F. (1988) *Joining the literacy club*. Portsmouth NH: Heinemann .
Wineburg, S. & Grossman, P. (in press) *Phi Delta Kappan.*
Woodruff, E. & Brett, C. (1993, November) Fostering scholarly collaboration in young children through the development of electronic commenting. *Research in Education*, No. 50, 83-95.