Theoretical Foundations of Learning Environments

Edited by

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Contents

8

Socially Shared Cognition: System Design and the Organization of Collaborative Research

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INTRODUCTION

The concept of socially shared cognition plays an important role in our efforts to create and sustain model systems of educational activity. In this chapter, our discussion of socially shared cognition focuses on our ongoing attempts to design, implement, and sustain educational activities in community institutions during the after-school hours. We use the notion of socially shared cognition to discuss two aspects of our work: (a) the organization of learning within educational play worlds called Fifth Dimensions and (b) the organization of collaboration among a team of scholars conducting research on the Fifth Dimension.

Sharing is a Janus-headed concept (Cole, 1991). On the one hand it refers to receiving, using, and experiencing in common with others. On the other hand, sharing also means to divide or distribute something between oneself and others. Both of these aspects of sharing with respect to socially shared cognition are relevant to our research.

First, in the design of the system of activities themselves, we are acting from our assumption that cognition is distributed among such important elements as the participants, the artifacts they use, and the social institutions within which they are housed. Second, as a research collective we share some beliefs and practices, such as an intellectual affinity for the ideas of John Dewey, Lev Vygotsky, and George Herbert Mead, and an agreement to incorporate qualitative and quantitative methodologies into the work of the collective. At the same time we divide up the work between and among members who are on implementation or evaluation teams, or both, located at institutions of higher learning that have different populations, priorities, missions, and locations.

In the joint activities of the research team and in the education and play world of the Fifth Dimension, both senses of sharing are simultaneously

relevant. No two people can ever entirely experience a situation or use a tool in exactly the same way, even as they are cognizant of the fact (which they may communicate to each other) that there are aspects of their experience that can be said to be shared in the sense of held in common.

Viewed in this way, there is an obvious affinity among the various terms used to designate the problematic of this book: To say that cognition is socially shared is to say that it is distributed (among artifacts as well as people) and that it is situated in time and space. Because it is distributed, and its assembly requires the active engagement of those involved, it is to some extent constructed (see also Chapters 3 and 5, this volume).

THEORETICAL FOUNDATIONS: CULTURAL PSYCHOLOGY AND SOCIALLY SHARED COGNITION

The theoretical orientation of our research collective resonates with and encourages diverse research interests, analytic levels, and units of analysis. It also supports interdisciplinarity, regardless of the participant's departmental or institutional affiliation. The intellectual tradition informing our work is elaborated in Cole's (1996) book *Cultural Psychology* and can be summarized in the following list of characteristics he associated with the enterprise of a cultural psychology:

- It emphasizes mediated action in context.
- It insists on a genetic method understood broadly to include historical, ontogenetic, and microgenetic levels of analysis.
- It seeks to ground its analysis in everyday life events.
- It assumes that mind emerges in the joint mediated activity of people. Mind, then, is an important sense that is coconstructed and distributed.
- It assumes that individuals are active agents in their own development but do not act in settings entirely of their own choosing.
- It rejects cause and effect, stimulus-response, explanatory science in favor of a science that emphasizes the emergent nature of mind in activity and that acknowledges a central role for interpretation in its explanatory framework.
- It draws on methodologies from the humanities as well as from the social and biological sciences.

FIFTH DIMENSION: NORMATIVE DESCRIPTION OF THE MODEL SYSTEM

In this section, we provide a description of a generic Fifth Dimension model to show how the theoretical ideals above are embodied in the design of an after-school activity system.

In a prototype Fifth Dimension system (local names for them vary), a dozen or more 6 to 14-year-old children encounter a large variety of off-the-shelf computer games and game-like educational activities. As a rule, the Fifth Dimension area contains a variety of kinds of computers (Mac and IBM;

low end and high end) at a ratio of one computer for every two to three children. The computer games are a part of a make-believe activity system, which transforms the way individual games (or activities such as origami, chess, boggle) are experienced by the children. Task cards or adventure guides accompany each game or activity to help participants get started, to specify expected achievements, and to provide evidence necessary for obtaining credentials as an expert. The task cards also provide a variety of obligations to write to someone, to look up information in an encyclopedia, or teach someone else what he or she has learned.

A Wizard

There is a real make-believe Fifth Dimension Wizard, an anonymous electronic entity who lives in the Internet, writes to the children, chats with them via modem, and acts as their patron. The Wizard has a home page and helps the children gain access to the World Wide Web, where they may display their own creative work. The wizard also affords a locus for conflict resolution, helping to mediate typical power relations between children and adults and preserving the mobility of expert and novice roles. Each Fifth Dimension has special ceremonies, such as birthdays for their electronic entity or status passage parties for children when they become Young Wizard Assistants, designating their mastery of the local Fifth Dimension content. These parties often occasion interaction and exchanges with other Fifth Dimension sites in other locales around the country and the world.

The Children

Children typically visit a Fifth Dimension on a drop-in basis. Some children spend 4 to 6 hours per week of their after school time participating in the Fifth Dimension, whereas others may only come once a week for a few hours. Opportunities and constraints vary across locations, seasons, populations, and sites. Girls outnumber boys in some Fifth Dimensions even where larger club setting activities are dominated by boys.

At some locations, adults expect the children to participate regularly in the Fifth Dimension and arrange for them to do so, whereas at other sites children are free to choose if and for how long to participate, with homework, basketball, crafts, reading, or other activities as alternatives. Many children enter the Fifth Dimension directly after school or homework sessions and remain there until their parents or school transportation services take them home.

A Site Coordinator

In our model system, there is a site coordinator who greets the children and supervises the flow of activity in the room. This person is trained to recognize and support the pedagogical ideals and curricular materials that mark

the Fifth Dimension as different — as a different way for kids to use computers, as a different way for adults to interact with children. The site coordinator monitors the balance of education and play in interactions between children and undergraduates. A site coordinator may be employed by the community institution and may have taken university courses that put undergraduates into the community settings, but this not the case everywhere. Arrangements for funding the site coordinator position vary — sometimes the partner university or college research or outreach funds cover the salary to help grow a Fifth Dimension in a setting with modest resources. In other cases, site coordinator salaries can be absorbed into the operating budget of a club.

The Undergraduates

In addition to the presence of a mysterious Wizard who writes to them and pays attention to their progress through the maze, the chief draw for the children is the presence of university and college students in the Fifth Dimension who are there to learn and play with them. In our model, an important feature of the Fifth Dimension is that the participating college students are enrolled in an intensive research methods course focused on fieldwork in the community.

At the University of California (UC), San Diego, the university course associated with student participation is an intensive laboratory class that emphasizes deep understanding of basic developmental principles, familiarity with the use of new information technologies for organizing learning, and methods for collecting and analyzing data on the processes that undergraduates help to put into play. Students are treated as, and act as, junior researchers engaged in participant observation. They write detailed clinical field notes after each session with the children. These notes are read and critiqued by the professor and his teaching assistants.

The class meets twice weekly to discuss assigned readings and to evaluate the scholarly articles students read at the University for their fit with their own field experiences with the children. Students also discuss their work with students in other Fifth Dimension-linked courses in the UC system through the UC system's Distance Learning network. Finally, the undergraduates write papers tracing the development of individual children, the relative effectiveness of different games, differences in the ways that boys and girls participate in the activities, or other developmental topics.

Why After School?

We focus on after-school time for several reasons. First, our research has revealed a broad desire to increase the number of hours per day that children are engaged in academic tasks. Second, the changing nature of adult work has brought about significant changes in the organization of family life that make it difficult for adults to be available for their children's needs for playful interaction or to help with homework until 6 or 7 o'clock in the evening. Third,

after school institutions are generally funded at a low level because they depend heavily on philanthropic giving from the local community. This form of support works well for sports programs, where adults volunteer their time to supervise 25 or so youngsters a few days a week.

In the culture at large, several core after-school institutions, such as Boys and Girls Clubs, Y's, and church clubs, manage loosely supervised, low overhead efforts that provide a safe space, few supervised special activities, and a great deal of free play. The turnover of staff is rapid because only a few members of the institution are paid a full time, albeit low, wage. Often, teenagers who have coached in a sport league are hired to provide programming and supervise the children. These institutions do a great service to the community along many dimensions, and the term *education* is likely to appear in their publicity materials. But educational activity is only fitfully present, as it is expensive to maintain. The Fifth Dimension provides a way to increase the educational programming of such institutions without substantially increasing the costs of operation.

Introducing education into the after-school hours is not an easy achievement. After school is, traditionally, play time. It is the space between schoolwork and homework (which currently amount to about the same thing). But there is a great need to arrange for children, as a part of their playful, after school hours, to engage in the kind of educational activity that might boost their chances of attending college or university.

One obvious strategy, made more potent owing to the proliferation of computer-based games and telecommunications, is to arrange for them to learn while playing. Alongside learning fearlessness, strategic thinking, and social responsibility on the soccer field, we arrange for children to sign up for a form of play in which they learn perseverance, the basic content of many valued intellectual domains, and the ability to organize their problem-solving skills in collaboration with others.

In more general terms, we locate our mandate in the following contradiction: There is overwhelming evidence that U.S. children spend less time engaged in academic pursuits than the children of any other industrialized country, by many days a year, hundreds of hours a year. U.S. citizens seem perfectly content with that situation on the one hand, and on the other hand worry about kids learning new technologies, gaining the kinds of knowledge that they need to have to avoid being left behind as we enter the 21st century.

Researchers at the Lab of Comparative Human Cognition have spent more than a decade mediating the problems and situations in the organization of learning environments (whether high or low tech) that cause many children to be deeply alienated from school. The Fifth Dimension allows us, then, to give school-age children an experience of learning that is fun and different from their routines at school. Second, it allows us to do this while providing undergraduates — including those who are preparing for careers as teachers and lives as parents — with nonhierarchical, nonauthoritarian models for promoting learning, initiative, and responsibility. Third, the organizational structure supports sharing between university and commu-

nity partners that allows each to do more with their resources in pursuit of their institutional mandates than they would by acting alone.

The possibilities for development for children, adults, and institutions participating in a Fifth Dimension are situated in a place that supports cooperative exploration of new tasks and new roles. These possibilities are constructed in joint mediated activity around special materials, traditions, technology, and objectives. Responsibilities, rewards, and goals directing participation in the Fifth Dimension are distributed between adults and children, novices and experts, and, of course, the local wizard or wizardess.

EVALUATING THE FIFTH DIMENSION PROJECTS

From 1994 to 1997, the Andrew W. Mellon Foundation extended its initial support for our efforts to fund a network of sites that is now a nationwide Distributed Literacy Consortium connected through the Internet. In order to grow, sustain, and propagate the system, we needed to know how the Fifth Dimension model worked in a variety of contexts, who was benefiting from participation, and what aspects of the model could be adapted to serve the needs of other populations of children, undergraduates, and scholars.

Over the years there has been an ongoing program of evaluation of the efficacy of the Fifth Dimension as an environment for the academic development of children and undergraduates (Blanton, Moorman, Hayes, & Warmer, 1997; Mayer et al., 1997; Schustack, Strauss, & Worden, 1997). In those cases where the social ecology permits, standard experimental-control group comparisons have shown that elementary school children who attend the Fifth Dimension for 15 or more sessions over the course of several months have improved scores on school-district tests of achievement in reading and math problem solving, increased ability to follow written directions, and increased familiarity and capability with using computers.

A Cognitive Evaluation team comprised of both implementers and external evaluators documented improvement in children's demonstrations of verbal, mathematical, and technical ability as well as gains in their abilities to follow written instructions as an effect of Fifth Dimension participation. This team also found evidence that children transfer their Fifth Dimension acquired experience to other problem-solving domains. They showed strong post-Fifth Dimension performance on school-like tasks and, in North Carolina, on the end of grade state-mandated test gain scores (Blanton et al, 1997).

Studies using qualitative methodologies (both case histories of individual children and analysis of teaching-learning interactions) show that children engage routinely in authentic problem solving mediated by basic literacy and numeracy skills in the context of their interactions with the undergraduates and the various computer and noncomputer-based games and associated activities. In addition, analyses of the undergraduate experience indicate that they become adept at guiding the children's learning while, gaining an increased appreciation of, and mastery over, basic theoreti-

cal concepts that are the core of the practicum class that places them at the sites. In cases where the population of children served speaks a language other than English in the home, data indicate that participation in the Fifth Dimension serves to both maintain the growth of competence in the home language and the acquisition of spoken and written English (Gallego, Moll, & Rueda, 1997).

In the analysis that follows, we focus on qualitative evidence of change in individual children over time. These data best illustrate how our use of cultural-historical activity theory incorporates the concept of socially shared cognition.

INDIVIDUAL CHANGE AND CULTURAL DEVELOPMENT IN SITU

The following case study is excerpted from a recently completed CD-ROM entitled An incomplete guide and starter kit for the Fifth Dimension. Ray McDermott, Jim Greeno, Mimi Ito, and Vanessa Gack (from the Institute for Research on Learning) gathered videotape and synchronized screen-capture data from several California sites in order to document the microgenesis of learning in the Fifth Dimension. They were especially interested in the way undergraduates and children supplement each others' knowledge base in order to solve problems in the Fifth Dimension.

Case Study: Remediating Number Sense

The undergraduates working with children in the Fifth Dimension are encouraged to stretch their partners' capabilities by providing opportune help and by suggesting tools and strategies for extending budding abilities to solve problems. Rather than provide the answer for children, adult partners are coached by research directors and lecturers on how to remediate a child's relationship to a given content area in a way that eventually helps the child to accomplish the task on his or her own. Remediation, in this sense, can be understood as a shift in the way that mediating devices regulate coordination with the environment.[1]

In the following interaction, an undergraduate newcomer to the project is working with a child on a game that involves identifying the multiples of certain numbers. A graduate student researcher, who has worked in the Fifth Dimension for many years, is observing and coaching the interaction, giving suggestions for the kinds of advice and interaction that would provide tools for the child to determine multiples of 2, 3, and 4.

This case illustrates how effective helping behavior is learned by the undergraduates (through one-on-one coaching with a more experienced adult in the system) and how this influences undergraduate interactions with kids. The game is Number Munchers, which involves "munching" all the numbers that are multiples of a given number. The player's character moves

about the screen full of numbers while being pursued by a "troggle" which can destroy the character.

At the beginning of the interaction, the child, Lisa, has the problem of munching multiples of 2, and the undergraduate provides help in determining what numbers are multiples of 2.

UG = undergraduate, L = Lisa
1 UG: Multiples of two.
2 L: (Munches a two, moves two spaces right then munches another two, then moves one more space for a third two.)
3 UG: Yummy (laughs).
4 L: (inaudible)
UG: Do you? Huh? (inaudible)
5 L: (Skips over an eight and a ten, then munches a two.)
6 UG: Ten, not three, uh oh.
8 L: (Skips over three. Keeps moving her character around the screen.)
9 UG: OK what else does-- Is ten a factor of two, a multiple of two?
10 L: I don't know.
11 UG: If you multiply five times two, you get ten. So ten is a multiple of two. So you can eat all the tens.
12 L: (Passes over some tens.) Should I eat tens?
13 UG: Yes!
14 L: (Eats a ten.)
15 UG: Uh-oh. Great troggle man is coming!
16 L: (Moves her character away, passing over eights).
17 UG: Do you know how to count by two?
18 L: (Shakes her head from sides to side.)
19 UG: No? OK, well even numbers are multiples of two: so ten and six and eight also. They are all multiples of two.

Although she knows that she is supposed to munch 2s (line 2), Lisa is apparently not orienting to numbers that are multiples of 2, such as 8, 10, and 12 (lines 2, 6, 12, 16). The undergraduate provides help in identifying multiples of two, by first posing a direct question — "Is ten a factor of two, a multiple of two?" (line 9). When Lisa answers that she does not know (line 10), the undergraduate proceeds to provide her with an answer, telling her the numbers that are multiples of 2 (lines 11, 19).

Soon the graduate student intervenes, by suggesting that the undergraduate show her how to count the multiples on her fingers or on a number line, introducing mediating devices to help Lisa understand the concept of multiples rather than just be provided with the correct numbers.

GS = Graduate Student
1 GS: Maybe you can show her on her fingers?
2 UG: OK, that sounds good.
3 GS: Or another suggestion would be to write evens and odds on a piece of paper, like on a number line. But that's a hard one to explain.

With the help of the graduate student, the undergraduate picks up on this strategy, and works with the child on developing it, using the number line and her own fingers to count up to each subsequent multiple.

1 L: (Moves around and munches several threes.) Uhhh.
2 UG: And then, what's three plus three? Do you know what three plus three is?
3 L: No.
4 UG: No, OK. (Orienting to the number line and referencing her open hand) Now one, two, three, four, five, six. And then three more fingers, so three and three is six, right?
5 L: (Nods)
6 UG: So you can eat all the sixes too.
7 L: (Moves around the screen, eating sixes.)
8 UG: Uh-oh, red troggle man.
9 UG: OK now, so what's six plus three? So you have six. (Laying out six fingers.) What's three more? (Lays three more fingers out.) How many is that?
10 L: (Moves her hand and lips, but not counting out loud) Seven.
11 UG: No.
12 GS: Count them all.
13 UG: Eight.
14 GS: Go like this. (Leans across the keyboard toward UG and L and taps UG's fingers.) One, two, three, four, five, six, seven, eight, nine.
15 UG: So can you get all the nines?

The undergraduate breaks down the concept of multiples into an addition problem (line 2) and then starts to perform the additions on her fingers for Lisa (line 4). The undergraduate first tries simply laying out the additional fingers (line 9), but Lisa does not count them correctly (line 10). Then the graduate student intervenes again, suggesting that the undergraduate count up while pointing to her fingers (lines 12, 14).

As they proceed with the game, they start working smoothly with the finger counting strategy and effectively remediate their activity in a way that coordinates successfully with the game environment. They work between the undergraduate's fingers and the game, counting up to each multiple and then munching that number before proceeding to the next. A few moments later, the graduate student intervenes again to suggest that the undergraduate now encourage Lisa to count on her own fingers.

1 UG: OK, now you need to do eight plus four. Now you have eight. (Lays out eight fingers.) Then four more (Lays out one hand and taps her first finger). Nine.
2 L: Ten, eleven, twelve (L begins looking for twelves). Uhh?
3 UG: Hey! There are no twelves in there!
4 GS: Maybe you can gradually have it so that she does it on her own hands. Cause that's, well, closer to memory that way. Besides, her fingers are so cute.
5 UG: (Laughs.) Cute little fingers. OK what's twelve plus four?
6 L: (Puts her hands on her leg.)
7 UG: Now put down four fingers. Right. Yeah. Then count twelve, thirteen, fourteen, fifteen, and sixteen. So sixteen, that's one six.

The undergraduate lays out her fingers for the next multiple (line 1), and Lisa counts up aloud (line 2). They look for the number in the game and

find that there are none (lines 2 and 3). The graduate student then suggests that they take another step in their use of mediating devices and encourages the undergraduate to have Lisa count on her own fingers (line 4).

Through the course of this interaction, an undergraduate who is new to the club is coached by a more experienced adult in strategies for helping a child perform a task and take more and more responsibility for its accomplishment. It is also a nice example of changes in what is shared (both in terms of the common ground and how the work is divided) that affect what the three actors are able to achieve in the end.

At the outset, the graduate student understands the point of the game, the trouble the child is having, and the utility of a finger-counting strategy. The undergraduate starts with an understanding of the first two of these. Then the undergraduate grasps the graduate student's idea and introduced it into the activity using her own fingers. Finally, the undergraduate involves the child (as advised by the graduate student) in appropriating the strategy by shifting over to using the child's own fingers.

The aforementioned case demonstrates how helping strategies are developed and disseminated informally in Fifth Dimension interactions. It also underscores the role of guided appropriation of mediating devices in augmenting children's capabilities. Other case studies (included on the CD and in recent publications of the team) explore the following: (a) the dynamics of novice interaction in the Fifth Dimension (Gack, 1999; Ito, 1997), (b) the use of language and multiple forms of literacy in the club, (c) the compromises between entertainment, fantasy, and educational game content to support learning; and (d) peer interaction and expert-novice interaction.

In each case we analyzed, we looked for patterns in the division of labor in the learning and decision-making tasks and patterns in the joint appropriation of artifacts and problem space. We now turn to a discussion of the organization of the Fifth Dimension research collective as enabling socially shared cognition.

THE RESEARCH COLLECTIVE: SHARING CORE PRINCIPLES WITHIN AND ACROSS SITES.

The first attempts to generate a list of core principles of the Fifth Dimension model came in Cole's 1986 proposal to the Spencer Foundation. The question driving this work was the well documented failure to thrive of ostensibly successful educational innovations (Cole, 1996). Cole and his colleagues in several states outlined a research program that would apply principles of cultural-historical theory to document and compare the reorganization of activity within context and reorganize relations between contexts in pursuit of a central goal: "creating a new kind of educational activity system which can be taken up and maintained by the community with its own resources. (Cole & Nicolopolou, 1990, p. 1).

The next set of principles appeared in Cole and Nicolopolous (1990) report to the Spencer Foundation summarizing the result of the research from 1986 to 1990. In this document, the researchers' linkages between the idea of sustainability and a pedagogy informed by cultural historical psychology were made clear:

1. To create sustainable systems of educational activity based on a culture of collaborative learning in which play and imagination have a major role;
2. To promote computer literacy and to use computer software to promote cognitive and social skills of 6 to 12-year-old elementary school kids;
3. To make workable models for developing certain forms of community-based, after-school educational activity and a framework for basic research into processes of learning and development;
4. To bring together undergraduates, a site coordinator, special physical space, levels of difficulty, conceptual or physical maze, wizard, and task cards, and to get children involved in their own development; and
5. To create a system of shared rules, undergraduates guiding and facilitating, not directing, a culture of collaborative learning: to feature choice and structure in an impersonal normative system not dependent on individual authority. (pp. 36-42)

Cole and Nicolopolou (1990) noted that the theoretical foundations underpinning this list were drawn from Durkheim, Vygotsky, and Piaget, centering on their shared view that thinking and cognitive development involve participating in forms of social activity constituted by systems of shared rules that have to be grasped and voluntarily accepted (Cole & Nicolopolou, 1990).

Research on Sustainability in Diverse Settings

After the Spencer funding cycle was complete, the Andrew W. Mellon Foundation began to fund a new national configuration of researchers working with the model. Between 1993 and 1996, this group was known as the Distributed Literacy Consortium. The proposal for their research was entitled, "Using new information technologies in the creation of sustainable after-school literacy activities: From invention to maximizing the potential."

We who study sustainability and dissemination hypothesized that differences across Fifth Dimension sites would reflect the mission of a researcher's home institution or departmental affiliation as well as the influence of local norms and values of the target population. Some variations on the model, we assumed, would be harder to sustain than others depending on the types of resources and goals of a particular community. Our assumptions are reflected in the fact that three types of educational institutions were included in the plan. Two large public, two small private, and two midsized state colleges and universities participated, each with researchers based in

either departments of education, communication, or psychology. There was also diversity in the types of community settings where the sites were grown. The mix included Boys and Girls Clubs, a YMCA, a church center, and schools.

After several years, we found that success or failure of sites was not caused by the size or type of college, the discipline of the researcher, or the type of community setting per se. We also noted that the researchers' understandings of the model changed over time as they sought to develop their local systems. Each node developed in a unique way.

Through the shared experience of diversity in development, people within and across node partnerships have come to understand in a deeper way what is central to the enterprise they shared at the level of principle: ideal types in philosophy and pedagogy. This has shown up in everything from the researchers' stances on ingredients for sustainability, to their beliefs about what constitutes a successful activity, to how to measure success. All of these issues were partially held in common, acknowledged as salient categories, and expected to vary in conjunction with local constraints.

Barriers to Sustaining the Shared: Short-Term and Long-Term Strategies

Looking across sites, we see common sources of developmental crises: Short-term goals in daily life at the sites require spot decisions, improvisation, technical patches, and unilateral efforts. They typically require the presence of a source of invisible labor (both in the community and in the university) — invisible because this work is done beyond the call of job descriptions and regular duty by whoever happens to be free to help.[2] Examples of this patching abound: At one site, computers are frequently purchased and replaced with grant funds, yet no durable arrangements for repair and maintenance have been established. At another site, students and staff from the university frequently fill in when community centers have not arranged for staff back-up on sick days or in case of emergency.

Whose Ideas Was This Anyway? This patching and filling in demonstrates an ethic of care and teamwork on the part of the research and implementation team. It delays confrontation that would force problems into the open, while keeping alive the organism grafted onto a community setting. To the extent that the researchers and implementers operate the Fifth Dimension on a reactive, daily, crisis-oriented basis, in community settings that are often run the same way, the conversations are delayed that might bring out contradictions and imbalances in the shared ideas and responsibilities of university and community partners. Such conversations might yield a redistribution of investments and resources necessary to keep the activity going in the long haul.

It is often said that changing institutional norms, especially norms that keep institutions and groups from cooperating to share investments and ownership, is a slow process, like turning large ships. As long as grant funds are secured by the university partners and daily problems are solved by the university researchers, or the pedagogy (mixing play and education, artifact design, the role of the wizard) flows from researchers to the community, the long-term sustainability of these adaptations may be undermined. A goal worth striving for in seeking to design culturally diverse activity systems (see Chap. 4, this volume) from the perspective of socially shared cognition, is a consistent investment and sharing of knowledge, initiative, responsibility, and planning for the future.

An Example of Socially Shared Cognition as Research Practice

The following data excerpt illustrates how the assumption that the university partners are in charge of the activity can be challenged through reflective practice and dialogue within implementation teams and between researchers and community members. A community volunteer staffing La Clase Magica, a bilingual, bicultural adaptation of the model, reported a problem with site operation to the project director, via the project listserv:

> Date: Fri, 19 Feb 1999 17:46:51 -0800 (PST)
> From: karla andrade <karlaandrade@yahoo.com
> Subject: conecciones interrumpidas
> To: Mike Cole <mcole@weber.ucsd.edu>
> Cc: LCHC UCSD <xproject@weber.ucsd.edu>
>
> Mike, We had a little problem today at La Clase Magica. We went to
> Muchas Gracias,
> Karla, Lourdes, and Alejandra

Michael Cole replied quickly, inviting his colleague Olga Vasquez, the founding research director of La Clase Magica to respond:

> Date: Fri, 19 Feb 1999 17:52:40 -0800 (PST)
> From: Mike Cole <mcole@weber.ucsd.edu>
> To: karlaandrade@yahoo.com

Subject: Re: conecciones interrumpidas
Cc: xproject@weber.ucsd.edu

Dear LCM friends—

I believe it is really your task to speak to Fran and Laurie. I believe it is a strategic mistake to turn to me to do this task. What do you think, Olga? mike

Honorine Nocon, a LCHC staff member and graduate student researcher, was reading the exchange and responded as well. Nocon worked for over two years to support the formation of a community coalition to address issues of long-term sustainability, including conflict resolution, funding, space use, and programming issues:

Date: Fri, 19 Feb 1999 21:51:06 -0800 (PST)
From: Honorine Nocon <hnocon@weber.ucsd.edu>
To: karlaandrade@yahoo.com, mcole@weber.ucsd.edu
Subject: Re: conecciones interrumpidas

Hi,
At the last Coalition meeting, when the issue of using the computer in the Head Start classroom was brought up, both Fran and Lori were very hesitant about disrupting the custodian's work. The issue in that discussion was that when the room was made available for use of the computer, kids would come in and be playing, etc. I got this from a tape and don't have details, but...it appears that there are some reasons why Fran and Lori are not supportive. It might be good to present the problem, not assuming that it has to be solved by using the big classroom, and asking their help in finding a solution. They have been, and continue to be, very generous to the program. Honorine

Olva Vasquez contributed to the conversation in Spanish:

Date: Mon, 22 Feb 1999 10:20:33 -0800
To: xproject@weber.ucsd.edu
From: ovasquez@weber.ucsd.edu (Olga Vasquez)
Subject: Re: conecciones interrumpidas
Status: RO

Lourdes, Alejandra y Karla,
Yo creo que Mike Cole tiene razon, ?Porque le toca a el resolver problemas que le pertenecen al equipo de la clase magica? El tiene el dominio de la quinta dimension para que preocuparse. Mi estratejia como directora de la clase magica en este etapa de la evolucion del projecto hacido de entregar mas la direccion a ustedes. Tengo fe que ust-

> edes tienen la capacidad y el poder de instituir los cambios necessarios para que la clase magica funcione de una manera favorable a sus preferencias. Me consultaron cuando la idea de que maga se comunicara desde del bano (bathroom)no dio resultado y hablamos de cambiar la conneccion a otro lado de la mission y la clase de head start fue la mas apropiada. Veo que no dio resultado tampoco que se mencionara en el mitin de la coalicion. Ok, tengo que pensarlo un poco mas pero les urjo que sigan independisandose, buscando remedio dentro los recursos y capacidades del grupo de padres de familia.
> Olga

The gist of this message is that Vasquez agreed with Cole that the long-term strategy as she saw it was for site staff to initiate negotiations over the use of space and access. She wanted to think about the issue further but said that ultimately the solution needed to arise from the resources and the abilities of the parents affected by the conflict.

The use of this e-mail data helps illustrate how the parties to the conversation identified the problem as shared and distributed in the particular local history of La Clase Magica. The researchers and staffers tried to form a context-relevant solution in virtual space on the project listserv. Mike, Olga, and Honorine jointly constructed a solution that shifted the situation definition away from one requiring a top-down, individualistic response from the university people, Cole, Vasquez, or Nocon.

Their having a talk with Fran and Laurie, the Head Start staffers, might be an effective intervention but only in the short run. Using the e-mail list forum makes the suggested alternatives public for all members of the project to consider. A redistribution of roles and investments is invited and signaled here by all, especially in the use of Spanish, by Olga. This is the first language of many members of La Clase Magica, and her use of Spanish suggests that a long-term strategy requires the affected people to take up the challenge of institutional politics for themselves.

Developments like those hinted at in the e-mail exchange begin to move the parties involved into a strategy for long-term sustainability that must be negotiated by each node in the consortium. There are recent, promising developments. The formation of coalitions like the one mentioned previously — the Solana Beach Coalition for Community Education — provides a structure for reflective practice for the community members. These can be a resource for building toward a future, like the weekly meetings held by university team members who move between and discuss their university and community roles in running the activity.

The e-mail exchange created a space for questioning the long-standing default assumption that the reflective practice, crisis management, or improvement of La Clase Magica was to be initiated by people from the lab or by Olga. Collectively, the research group and the site staff were able to

remember their long-term, shared goal of sustaining the project in an effective bit of socially shared, electronically mediated cognition.

CONCLUSION: SOCIALLY SHARED COGNITION AS A RESOURCE FOR CHANGING THE RELATIVE CONTEXT OF INTERPRETATION OF THE ACT

Similar to the findings from the aforementioned case, we notice in explicit, formalized, reflective statements about core Fifth Dimension principles that our collaborators have confronted and addressed the reality of multiple contexts for interpretations of their actions, interactions, and activities. In some cases, the implementer or the researcher deliberately contributed to the molding of a new context or the location of a new audience for our work by recasting or reordering descriptions of our priorities and principles.

In other cases, the components of a Fifth Dimension came into and out of prominence in a particular setting as it was transforming. These transformations appeared as changes in the context for interpreting the work at hand. Changes in the core principles or understandings about sustainability at one site influence the collective view that development is a change in the relative context.

Both the fact of a division of labor and of something held in common support the ability to shape the relative context in which actions are interpreted. We are able to move up and down in levels of analysis, invoke wider networks of significance, or focus on multiple aspects of the project (research, teaching, service, technology, literacy) because there is so much going on in the Fifth Dimension.

In one sense, then, no list of core principles guiding Fifth Dimension activity can exist independently of the knowledge that the list must change as the site lives, because living things change, and the contexts for their interpretation change even faster. Each researcher and implementation leader makes choices about research designs, funding structures, and the names (e.g., La Cláse Mágica, Club Proteo, Fifth Dimension, Magical Dimension) and contents of their efforts, reflecting the diversity of assumptions and goals they bring to the table.

We talk about family resemblances in comparing attributes of the Fifth Dimension adaptations over time rather than replication or franchising. Across the network of adaptations, members of this collective agree to the utility of certain components or goals in making the programs they run in various community centers recognizable adaptations of the Fifth Dimension. Members also agree to disagree about other aspects of the model or else find it awkward to insist on recommending ideas because of limited local resources or opposition to the ideas.

However, after several years, members of our research collective have clearly persisted in their sharing of several core assumptions about the model system that each has adapted, for example, the use of features such as com-

puter technology, the internet as an organizing force, the mix of play and education, the presence of undergraduates as researchers and helpers at the site, and the use of maze and task cards; these features have endured across time and place.

The two kinds of sharing we discussed earlier in this chapter have a good deal to do with the embrace of difference approach we value for sustainability. The diversity across the system both in terms of the content of the activity and the different priorities of implementers, researchers, children, parents, undergraduates, and community leaders is an important part of the experience of socially shared cognition. The way any particular implementation team adapts the Fifth Dimension artifacts and metaphors is intimately bound with the director's teaching and research goals. Ultimately, the fate of the activity truly lies in the cumulative rewards or frustrations that the children, undergraduates, community site hosts, parents, and implementers experience in the Fifth Dimension as compared with other ways they might invest their time and energy for learning.

For the students of sustainability, where someone succeeds, we all are allowed to learn about what is possible and what a particular node has achieved. When a site fails to thrive, we know it could easily be our turn next if we cannot draw lessons from the failure. This information can help us interpret the experiences of other nodes and reflect upon our own choices.

NOTES

1 The authors of the case study text are Ito, M. Gack, V. McDermott, R. and Greeno, J. Institute for Research on Learning..

2 Honorine Nocon is making a formal study of altruism in community settings and the importance of voluntarism in the dynamics of sustainability for her dissertation.

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