

Theoretical Foundations of Learning Environments

Edited by

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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 theoretic-

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