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CSCL 2

Carrying Forward the Conversation

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INDIVIDUAL AND COLLECTIVE
ACTIVITIES IN EDUCATIONAL COMPUTER
GAME PLAYING

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THE SOCIAL NATURE OF LEARNING: IMPLICATIONS FOR CSCL

There are two distinct (though not mutually exclusive) views on the role of social context in human learning and development. According to the first view, learning is an individual process, which can be facilitated or inhibited depending on how individuals interact with each other. For instance, the need to communicate an understanding of the problem at hand to other participants in a problem-solving session can force people to formulate their ideas more carefully and, thus, improve reflection and planning (cf. Blaye & Light, 1995).

The second view holds that social context cannot be reduced to a set of external "modifiers." It contends that individual learning and social interactions are different aspects of the same phenomenon. This view is often associated with Vygotskian notions of "inter-psychological" functions and the "Zone of Proximal Development" (or ZPD, Vygotsky, 1978), which are becoming more and more popular in the field of CSCL (e.g., Kaptelinin, 1999; Koschmann, 1996; O'Malley, 1995). Vygotsky claimed that there are always two steps in acquiring a new ability: First, the ability emerges as distributed between people (i.e., it exists as an "inter-psychological" function) and, second, it is mastered by individuals (i.e., it becomes an "intra-psychological" function) (Vygotsky, 1983).

Having acquired a new ability, the individual can contribute more to socially distributed processes. Therefore, intra-individual and inter-individual

functions mutually constitute each other. In other words, not only does collaboration between the learner and other people change some preexisting individual phenomenon, but it also directs and shapes both the general orientation and specific content of individual development. Participation in a collective activity lays the foundation for the next step in individual development or, according to Vygotsky, creates the Zone of Proximal Development, which is defined as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978).

Undoubtedly, these ideas have profound implications for education, including those related to development and implementation of computer-based environments intended to support collaborative learning. The attempts to apply these ideas in the field of CSCL have revealed, however, the need for a more specific and concrete understanding of the mechanisms underlying learning within the Zone of Proximal Development (e.g., Cole & Engeström, 1993; Kaptelinin, 1999). Vygotsky's original definition of the ZPD allows for different interpretations, which imply different strategies for creating computer-based environments for collaborative learning (see Valsiner & van der Veer, 1991).

In an earlier paper entitled "The Zone of Proximal Development: Where culture and cognition create each other" Cole (1985) discussed the unique role of the Zone of Proximal Development as a mediator between individual and social phenomena. According to this analysis, the notion of ZPD can help to bridge the gap between the individual and the social by introducing a mechanism of their mutual determination. In the present chapter we elaborate on this idea by bringing in concepts from Activity Theory, developed by Vygotsky's disciple Leontiev (1978), as well as empirical data collected within the Fifth Dimension project. From our point of view, these data may indicate some specific ways that individual and social phenomena mutually determine each other.

The rest of the chapter is organized into four sections. The first two sections are brief overviews of, respectively, main concepts used in this paper and of the Fifth Dimension project. The third section introduces the "life cycle" of the individual/social dynamics in the Fifth Dimension and illustrates it with a number of examples. Finally, the fourth section focuses on the implications of the study for computer-supported collaborative learning.

INDIVIDUAL AND COLLECTIVE ACTIVITIES

According to Activity Theory (Leontiev, 1978), the human mind can only be understood within the context of interaction between individuals

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("subjects") and the world ("objects"). This interaction takes place at three hierarchical levels: 1. activities, which correspond to human needs and are directed toward objects (i.e., "motives") that can fulfill those needs, 2. goal-oriented actions, which should be carried out to achieve a motive, and 3. situationally determined operations, which should be performed to attain a goal. In human activities, motivation, emotions, goal setting, cognition, and motor processes are integrated into coherent wholes.

Two main ideas underlie Activity Theory. First, the mind does not exist prior to and without activities; rather, it develops as a constituent of human interaction with the world. Activities constitute individuals as subjects by situating them in the objective world. Second, activities are sociocultural in nature. They are determined not by the straightforward logic of biological survival but by various aspects of the sociocultural environment, for instance, norms, routines, expectations, etc., of a specific culture.

There has been a growing interest in Activity Theory in such diverse areas as developmental work research, industrial design, human-computer interaction, and education, including CSCL (see, e.g., Favorin, 1995; Kaptelinin, 1996; Kuutti, 1991; Teasley & Roschelle, 1993).

Originally, Activity Theory was developed as a psychological approach dealing almost exclusively with individual activities (Leontiev, 1978). However, there have been several attempts to extend Activity Theory to cover activities of supra-individual entities, for instance, groups, organizations, and communities. Perhaps, the most well-known new approach to Activity Theory has been proposed by Yrjo Engeström (1987, 1992), who developed the notion of an *activity system* that includes not only individual subjects interacting with objects but communities as well. Therefore, any analysis of a human activity should focus on a three-way interaction among subjects, objects, and communities, mediated by tools, rules, and division of labor (Engeström, 1987). Another approach, proposed by, among others, Arthur Petrowsky (Petrowsky & Petrowsky, 1983) is based on the notion of the *collective subject*. Collective subjects are supra-individual entities (such as groups or organizations) that have their own motives and goals. Therefore, interaction of supra-individual entities with the world can also be interpreted in terms of "subject-object" interactions, and at least some concepts developed within Activity Theory may apply to collective activities.

So far, there has been little overlap between studies of individual and collective activities from the point of view of Activity Theory. Given the basic assumptions of the two above approaches to collective activities, it hardly seems surprising. Both of them, essentially, consider individual activities as component parts of collective ones. According to Engeström, for instance, activities can only be collective. The scope of individual interactions with the world does not transcend the level of actions. In other words,

individuals cannot be subjects of full-scale activities; when their actions comprise an activity, we always find a collective activity. The notion of collective subject implies that individual subjects (and their activities) are completely integrated into a higher-level social structure.

Therefore, existing theoretical accounts of collective activities imply that individual activities (or actions) are subordinated to collective ones. From our point of view, it is important that focus on collective activities does not rule out the need and the possibility to study how individual and collective activities interact to create each other. Otherwise one can easily overlook the fact that such interactions do take place in reality, at either individual or supra-individual level. For instance, an information system can fail even if it fits into the general structure of an organization. If people using the system see it as a threat to their own interests, the system will most probably be rejected (see Grudin, 1990). In other words, a collective activity can be disorganized because of a discrepancy between individuals' goals as determined by the structure of the collective activity and the "personal" goals or motives of the individuals. However, differences between individual and collective activities seem to exist within the subjective plane, too. Requirements and demands of a collective activity, which come into conflict with goals and interests of the individual, may cause serious personal problems.

In our view, contradictions between individual and collective activities cannot be considered an exclusively negative factor. Such contradictions and their resolution are an important mechanism underlying learning within the Zone of Proximal Development. As we discuss in this chapter, such contradictions can result in a revision of individual values, goals, and strategies and, consequently, in creating new forms of joint activity.

In summary, our hypothesis about the mechanisms underlying ZPD is based on the assumption that learners are simultaneously involved in two hierarchies of actions. On the one hand, they pursue their individual goals, and, on the other, together with other people they strive to formulate and achieve goals of collective actions. These hierarchies have to overlap, so that some goals belong to both of them; otherwise people would not participate in collective activities at all. This overlapping, however, cannot be complete, and so the learner has two (or more) potentially conflicting perspectives. Such contradictions can be a driving force behind emergence of new individual activities, actions, and operations.¹ This hypothesis is discussed and elaborated on in the following on the basis of empirical data collected within the Fifth Dimension project.

¹These contradictions do not necessarily take the form of a conflict. The learner, for instance, can simply extend his or her repertoire of activities.

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Objectives

The Fifth Dimension technology came into existence at that time. The conditions for its development (see Cole, 1993). Sustain the outset; and potentially be out of special educational context of the target system.

Setting Design

The target setting includes norms, artifacts, central activities, and created artifacts. The learning process is offering additional (b) "the consequences of providing the performance level in the Fifth Dimension supposed to be. To minimize the Fifth Dimension the system. All resolved by the

Games

A wide variety of knowledge games (e.g., *S*, *Munchers*), logic (e.g., *Shark*). Especially when used

THE FIFTH DIMENSION PROJECT: AN OVERVIEW

Objectives

The Fifth Dimension project was initiated in 1986 as an alternative to the technology-centered approach to educational computer use dominant at that time. The focus of the project was not on technological innovations but on the social context of the use of technology that would provide optimal conditions for children's learning and development (Nicolopoulou & Cole, 1993). Sustainability was one of the guiding principles of the project from the outset; an explicit goal was to design a generic social setting that could potentially be incorporated into existing institutions and could survive without special support from researchers. Computer tools—more specifically, educational computer games—were considered as just a component of the target system.

Setting Design

The target setting was designed as a "model culture," with its own rules, norms, artifacts, and mythology. Collaborative computer game playing is the central activity in the setting. This activity is regulated by a set of specially created artifacts, including (a) "task cards," which structure the game playing process and emphasize the educational component of game playing by offering additional game related tasks and stimulating writing and reflection; (b) "the consequence chart," which determines game playing sequences by providing the child with a choice of available games after a certain performance level in a certain game is achieved; and (c) "the Constitution of the Fifth Dimension," which contains the basic rules of the setting. Children are supposed to play together with undergraduate students attending the site. To minimize the power differences between the children and the adults in the Fifth Dimension, a mythical figure of "the Wizard" was introduced into the system. All conflicts between the Fifth Dimension "citizens" can only be resolved by the Wizard who can be contacted via e-mail.

Games

A wide variety of computer games are used in the Fifth Dimension, including knowledge games (e.g., the Carmen San Diego series), simulation/modeling games (e.g., SimSity, Designasaurus), drill-and-practice games (e.g., Word Munchers), logical games (e.g., Pond, Gertrude's Puzzles), and math games (e.g., Shark). Even arcade-style games (e.g., Choplifter) proved to be beneficial when used in an appropriate context. For instance, task cards associated

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with each game often require that children describe their strategies and write hints to others. Therefore, even a simple, "noneducational" game can stimulate reflection and development of writing skills.

Implementation Strategy

To become sustainable, a Fifth Dimension setting has to obtain necessary resources from external sources on a long-term basis. In other words, it has to meet long-term needs of some institutions. So, the problem was to identify institutions motivated enough to provide necessary support. The specific solution to this problem was establishing a university-community partnership. It was assumed that communities were interested in extending educational opportunities for the children while universities were interested in increasing the quality of undergraduate education. The Fifth Dimension offered a way to meet these needs by combining complementary resources: children, space, and some equipment (community) and undergraduate students to help children learn (university). This strategy proved to be successful. The network of Fifth Dimension sites has been steadily growing and now there are a number of sites in the United States and other countries, including Russia, Sweden, and Finland.

The high ratio of grownups in the Fifth Dimension provides a unique possibility for using the Vygotskian notion of the Zone of Proximal Development in organizing learning processes in the setting.

The Social Setting of the Fifth Dimension in an External Context

Various aspects of learning and development in social context are being studied within the Fifth Dimension project. In this paper we will focus on individual and collective activities, which should be differentiated from other possible levels of analysis, namely the level of the social setting as a whole and the level of "external context."

A comparison of different implementations of the Fifth Dimension model in different institutional environments provides enough evidence for the conclusion that the setting itself is influenced by a higher level context. This context can tentatively be called "external context." In the case of a Fifth Dimension site this external context is usually composed of a research lab, a university department, and a community center. All these institutions provide resources and impose constraints on the setting, while the setting itself provides resources and imposes constraints on collective activities of computer game playing. Also, each of these institutions is primarily interested in one particular aspect of the Fifth Dimension as a whole (e.g., children learning, undergraduates learning, research data). Because specific expectations, criteria, and resources of different institutions are

not the same, the different.

For example, a Mexicano commission model that was an approach was not (including a different the social setting process of adaptation emerges. The various context shapes situation

THREE PHASES

As mentioned previously, collective activities in social context illustrate with examples

Our point of view is two or more hierarchical. Therefore, contradictions ensuing from Such contradictory the other being forced to take part. In the latter in question match be a reasonable to seem clear or attain the outcome of originally expected activity (even if it seem an "inevitable" is. The underlying an activity, which is appropriated to participation in action. Such appropriate learning, either should has accomplished the repertoire of

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not the same, the specific implementations of the Fifth Dimension are also different.

For example, at the first stage of establishing a Fifth Dimension site in a Mexicano community there was an attempt to use the same Fifth Dimension model that was previously implemented in an Anglo community. This approach was not successful. A number of modifications had to be made (including a different name for the setting) to adapt the generic structure of the social setting to the specific external context (Vasquez, 1993). The same process of adaptation takes place every time a new Fifth Dimension site emerges. The variety of the Fifth Dimension illustrates the ways the external context shapes specific implementation of the same concept.

THREE PHASES OF INTERSUBJECTIVITY

As mentioned previously, we consider interaction between individual and collective activities to be of critical importance for learning and development in social context. In this section we present this idea in more detail and illustrate with empirical data.

Our point of departure is that the same individual can be involved in two or more hierarchies of actions, which can never completely coincide. Therefore, contradictions among interests, values, objectives, and requirements ensuing from different activity structures are practically inevitable. Such contradictions can be resolved either by one activity taking over and the other being discarded (the person abandons collective activity or is forced to take part in it even against his/her will) or by finding a compromise. In the latter case the individual may decide that the collective activity in question matches his/her higher level goals and participating in it would be a reasonable thing to do, even if some aspects of that activity may not seem clear or attractive to the individual. It is important to emphasize that the outcome of such a decision can considerably exceed what has been originally expected by the individual. By actually taking part in a collective activity (even if following its rules and meeting requirements may initially seem an "inevitable sacrifice" people can find out what the activity really is. The underlying logic, implicit meanings and values, and other aspects of an activity, which are difficult to communicate to an outsider, can be readily appropriated by those who have a first-hand experience. In other words, participation in a new activity opens up a possibility for appropriating a new action. Such appropriation, in turn, may have consequences for individual learning, either short-term ones (new action is discarded once the individual has accomplished his/her goal) or long-term ones (new action is added to the repertoire of individual's actions).

In the rest of this section we illustrate interaction between individual and collective activities with empirical data collected within the Fifth Dimension project. More specifically, we give examples of what we call "three phases of intersubjectivity." If the mechanisms outlined above describe learning in social context correctly, then participation in collective activities should go through at least three distinct phases.

At the first phase there is an individual activity and an emerging collective activity. Individuals do not participate in a collective activity yet, but they are involved in establishing a common ground for shared understanding of objectives, procedures, and conditions of their participation. That is why this phase can be defined as "intersubjectivity."

The second phase can be observed when individuals are actually playing computer games in groups. At this phase, which is characterized by established intersubjectivity, both individual and collective activities take place.

The third phase corresponds to situations when collective activities are over but individuals manifest their "residues" in their individual activities or other collective activities. For the lack of a better term, we call this phase "postintersubjectivity." By this we do not imply that intersubjectivity disappears once individuals appropriate collective activities. Undoubtedly, collaboration in long-standing teams can be characterized by both effective appropriation and remarkable intersubjectivity. Rather, "postintersubjectivity" refers to a specific feature of the Fifth Dimension. Namely, collective activities are quite limited in time there. Usually children play different games with different adults when they come to the Fifth Dimension. Therefore, appropriation of a collective activity cannot typically be observed until after the activity is over.

The main source of empirical data about learning and development in the Fifth Dimension are field notes written by undergraduate students after each site visit. A small subset of these field notes are used here to provide examples illustrating the "life cycle" of intersubjectivity.

Phase 1. External Coordination of Individual Activities (Pre-intersubjectivity)

People come to the Fifth Dimension with their individual goals. Children may, for instance, want to play their favorite games, socialize with undergraduate students, or just find out what the Fifth Dimension is about. Undergraduate students may want to learn more about child development, complete course requirements, or have fun playing with children. In the Fifth Dimension people cannot attain their goals alone. The structure of the setting requires that they form teams and get what they want only as a result of coordinated teamwork. In many cases team formation presents no problems,

8. ACTIVITIES IN ED

especially when citizens:

I entered the Fifth Dimension
by Paul. He did not use the
computer. I asked him to
Tami K., 4/20/95

However, in some cases people
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but be uncooperative.

She was quite cooperative
[...] It wasn't like a
automatic reaction
Colleen M., 03/05/95

Even more serious
the rules of the Fifth Dimension

When I said 9/4 is not the answer."
he was not willing to
a ruler out of play
Marilyn Z., 05/17/95

Phase 2. Emergence of Intersubjectivity

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especially when both children and adults are experienced Fifth Dimension citizens:

I entered the Fifth Dimension at about 3:15 and I was immediately approached by Paul. He did not say anything to me, he just pointed at me and then at the computer. I asked him if he was ready to play and he said yes.

Tami K., 4/20/95

However, in some cases team formation does present a problem. A child can be interested in a game and wish to follow the rules of the Fifth Dimension but be uncooperative; for instance:

She was quite confident that she was able to complete the task independently. [...] It wasn't like "go away I can do it myself," it appeared to be more of an automatic reaction for her just to do it herself.

Colleen M., 03/05/94

Even more serious problems emerge if the child does not want to follow the rules of the Fifth Dimension and/or rejects any help.

When I said 9/4 is the answer he said to me, "you are wrong, that's wrong, that's not the answer." He did not even know that you can divide with fractions and he was not willing to pay attention to me while I told him. I even tried to make a ruler out of paper but he did not want to hear how we could use it to help us.

Marly Z., 05/17/94

Phase 2. Emerging Group Identity (Intersubjectivity)

When individuals just start acting together, there is usually little indication of intersubjectivity, even when individual activities are relatively well coordinated. In problematic cases, described in the previous section, lack of coordination makes intersubjectivity even more difficult to develop. However, eventually most groups enter the phase of true collaborative activity.

The change that came over Jonathan was remarkable. [...] He increased his interaction with me 100%. We joked about the game, and he was constantly filling in any missing background noises, cheering his successes, laughing at or berating the enemy.

Michael R., 02/05/94

Collaborative game playing at this stage is characterized by efficient coordination of individual efforts, and this is often associated with strong emotions,

both positive and negative, shared by members of a team. Also, in such cases undergraduate students often use "we" when they describe joint efforts of a team; for example:

We were very careful and suddenly with the move of one square, we completed the puzzle. [...] Jennifer cheered and I was just as excited. There we did it, moved Jennifer on up but with the help of Ben and the Wizard of course.

Marly Z., 05/10/94

Note, that in the above example "we" refers to the team, consisting of a child and an adult, which is contrasted to "external persons," who also contributed to the achievement (i.e., a boy from another team, Ben, and the Wizard). The outcome of the team effort was a "promotion" of the child, Jennifer, to the rank of a "Young Wizard Assistant."

Phase 3. Transfer of Group Experience to Individual Activities (Postintersubjectivity)

From children's point of view, the most important features of collective activities in the Fifth Dimension are, probably, the requirement to follow the rules of the setting and the emphasis on educational activities specified in the task cards. In many cases newcomers to the Fifth Dimension consider meeting these requirements an inevitable price they have to pay for the opportunity to have fun, that is, to just play computer games they like. In the previous sections we gave some examples that illustrate the resistance to what children consider as distractions from having fun and how this attitude can be overcome by involvement in a collective activity. Moreover, most children (at least, on some occasions) start paying attention to the specially designed "side" activities and following the rules of the setting without being prompted to do so.

Henry began to fill out the task card with priority. I was amazed at how much attention he finally decided to give the task card. At every interval when we started playing the game the right way, he'd stop and plot his move and whatever the screen said. One time the screen cleared as soon as he finished a game and he said, "damn I missed it, do you remember the numbers or do we have to play again?"

Marly Z., 05/17/94

Sometimes children even start to take responsibility for the coordination of collective activities.

Christina did very well in this level. She asked me to write the expressions on her task card as she said them out loud to speed up the process.

Nami K., 05/23/94

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Finally, there are numerous documented cases of how participation in collaborative game playing can result in learning outcomes. Children develop basic skills (reading, writing, typing), acquire new facts and problem solving strategies.

It was great playing this game with Matt because I could tell that he was learning from our interaction. Like I said, eventually he could match the clue to the picture on his own. [...] Sometimes in the game, you would run across the same clue or you would end up taking a picture of a robot that you already had a picture of—Matt would remember which pictures he had and he would also remember listening to the clue from before.

Nami K., 05/24/94

CONCLUSIONS

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The analyses in this chapter have two broad implications for the field of CSCL. First, successful learning is promoted when it occurs within authentic activities, that is, when learners attain meaningful goals and are intellectually and emotionally engaged in the tasks they carry out. In this chapter we attempted to demonstrate that this idea, which is currently widely accepted within the CSCL community, applies not only to individual activities but to collective activities as well. In other words, educational benefits of collaboration critically depend on the degree to which learners are involved in their collective activity. Putting children and adults together is a necessary but not sufficient condition of genuine collaboration. Therefore, creating environments for computer-supported collaborative learning should include evaluation and support of authentic collective activities.

Second, our study indicates a number of factors that should be taken into consideration when setting up environments for collaborative learning. They include:

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Meeting a diversity of interests. People participate in collective activities for a variety of reasons. If collaboration is arranged so that it can accommodate a diversity of individual interests, more people can find it attractive (or the same people can find it more attractive).

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Meaningful outcomes of collaboration. If collaboration cannot help people to reach new goals, that is, if by acting alone they can achieve the same (or better) results, children are less inclined to cooperate or can even find cooperation a nuisance. So, collective activities should be arranged so that learners can attain goals that are difficult or impossible to reach alone.

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Choice. Genuine collaborative learning rarely takes place when people are forced to collaborate and required to follow prespecified procedures.

Positive outcomes of collaboration are usually observed under conditions that ensure that participants take responsibility for their contribution. Therefore, it is important that CSCL systems provide opportunities for the participants to make choices.

Time. Team identities take time to develop. It is a complex process in which emerging identity, improving performance, and smoother coordination mutually influence each other. Therefore, CSCL settings should allow enough time for development of authentic collective activities.

Initial Success. Our data indicate that initial success can greatly facilitate collaboration, whereas initial failures often result in a lack of interest in the collaborative endeavor.

Shared emotions. As mentioned before, authentic collaboration is often associated with strong emotions shared by the participants. A possibility for learners to share their emotions seems to be an important factor of the development of "collective subjects." Because in the Fifth Dimension collaboration is of the "same place/same time" type, it is easy to express and share emotions there. However, in other types of collaborative environments (e.g., distance learning) limited possibilities for expressing and sharing emotions can be an obstacle to genuine collaboration.²

Constructive conflicts. Genuine collaboration does not mean that participants should always agree with each other. Data from the Fifth Dimension document a number of cases where conflicts played a constructive role and resulted in efficient collaborative learning. CSCL environments should not prevent conflicts but rather provide conditions for their constructive resolution.

In this chapter we employed the conceptual system of Activity Theory in an exploration into the nature of learning in the Zone of Proximal Development. We proposed that this learning is determined by an interplay between individual and collective activities. Cultural settings provide resources, affordances, and constraints to involve participants in new collective activities. Although people might enter collective activities for a number of personal reasons, such activities often develop according to their own logic, so that learners have to coordinate two different perspectives—the individual view and the collective view. In the process of such coordination learners can acquire new personal meanings, strategies, and skills.

²The main problem is not that people do not express their emotions in computer-mediated communication (cf. the phenomenon of "flaming"); it is that such emotions can easily be misunderstood, which negatively influences experiencing shared emotions.

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REFERENCE

- Blaye, A., & Light,
of peer interac
Computer supp
- Cole, M. (1985). Th
other. In J. We
Cambridge, UK
- Cole, M., & Enges
G. Salomon (J
Cambridge, UK
- Engeström Y. (1987
research. Helsin
- Engeström, Y. (1990
Orienta-Konsul
- Favorin, M. (1995).
ments. In J. L. S
tional Conferenc
October 17–20,
- Grudin, J. (1990, Se
organizational i
- Kaptelinin, V. (1996)
contexts. In B. I
interaction. Cam
- Kaptelinin, V. (1999
port. *The Journ*
- Koschmann, T. (199
Theory and prac
- Kuutti, K. (1991). Th
European Confer
- Leontiev, A. N. (197
Nicolopoulou, A., &
culture of collat
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REFERENCES

- Blaye, A., & Light, P. (1995). Collaborative problem solving with HyperCard. In The influence of peer interaction on planning and information handling strategies. In C. O'Malley (Ed.), *Computer supported collaborative learning*. Berlin: Springer-Verlag.
- Cole, M. (1985). The Zone of Proximal Development: Where culture and cognition create each other. In J. Wertsch (Ed.), *Culture, communication, and cognition: Vygotskian perspectives*. Cambridge, UK: Cambridge University Press.
- Cole, M., & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations*. Cambridge, UK: Cambridge University Press.
- Engeström, Y. (1987). Learning by expanding: An activity-theoretical approach to developmental research. Helsinki: Orienta-Konsultit Oy.
- Engeström, Y. (1990). *Learning, working, and imagining: Twelve studies in activity theory*. Helsinki: Orienta-Konsultit Oy.
- Favorin, M. (1995). Towards computer support for collaborative learning at work: Six requirements. In J. L. Schnasse and E. L. Cunnius (Eds.), *Proceedings of CSCL'95, The First International Conference on Computer Supported Collaborative Learning* (Bloomington, Indiana, USA, October 17-20, 1995). Mahwah, NJ: Lawrence Erlbaum.
- Grudin, J. (1990, September). Why CSCW applications fail: Problems in design and evaluation of organizational interfaces. *Proceedings of the CSCW'90 Conference*. Portland, Oregon.
- Kapteinlin, V. (1996). Computer-mediated activity: Functional organs in social and developmental contexts. In B. Nardi, (Ed.), *Context and consciousness: Activity theory and human-computer interaction*. Cambridge, MA: MIT Press.
- Kapteinlin, V. (1999). Learning together: Educational benefits and prospects for computer support. *The Journal of Learning Sciences*, Vol. 8(3/4). pp. XX-XX.
- Koschmann, T. (1996). Paradigm shifts and instructional technology. In T. Koschmann (Ed.), *CSCL: Theory and practice of an emerging paradigm*. Mahwah, NJ: Lawrence Erlbaum.
- Kuutti, K. (1991). The concept of activity as a basic unit for CSCW research. *Proceedings Second European Conference on CSCW (ECSCW'91)*. Amsterdam: Kluwer.
- Leontiev, A. N. (1978). *Activity. Consciousness. Personality*. Englewood Cliffs, NJ: Prentice Hall.
- Nicolopoulou, A., & Cole, M. (1993). Generation and transmission of shared knowledge in the culture of collaborative learning: The Fifth Dimension, its play-world, and its institutional context. In E. A. Forman, N. Minnick, & C. A. Stone (Eds.), *Context for learning: Sociocultural dynamics in children's development*. New York: Oxford University Press.
- O'Malley, C. (1995). Designing computer support for collaborative learning. In C. O'Malley (Ed.), *Computer supported collaborative learning*. Berlin: Springer-Verlag. pp. XX-XX.
- Petrovsky, A. V., & Petrovsky V. A. (1983). Active personality and Leontiev's ideas. In: V. Zaporozhets, V. P. Zinchenko, O. V. Ovchinnikova (eds.) *Leontiev and contemporary psychology*. Moscow: MGU Press (in Russian).
- Teasley, S. D., Roschelle, J. (1993). Constructing a joint problem space: The computer as a tool for sharing knowledge. In S. P. Lajoie and S. J. Derry (Eds.), *Computers as cognitive tools*. Mahwah, NJ: Lawrence Erlbaum. pp. XX-XX.

- Valsiner, J., van der Veer, R. (1991). The encoding of distance: The concept of the "Zone of Proximal Development" and its interpretations. In R. R. Cocking & K. A. Renninger (Eds.), *The development and meaning of psychological distance*. Hillsdale, NJ: Lawrence Erlbaum. pp. XX-XX.
- Vasquez, O. (1993). A look at language as a resource: Lessons from La clase Magica. In B. Arias and U. Casanova (Eds.), *Politics, research, and practice*. Chicago National Society for the Study of Education. pp. XX-XX.
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological functions*. Cambridge, MA: Harvard University Press.
- Vygotsky, L. (1983). The history of higher mental functions. In *Collected Works* (Vol. 3). Moscow: Pedagogika (in Russian, written in 1931).

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ENDING THE CONVERSATION JUST BEGUN

Victor Kaptelinin

Umeå University

Michael Cole

University of California, San Diego

There is an unlovely unfairness in getting so deep, exciting, and thought-provoking feedback and a feeling that a "real" discussion is about to begin at the moment when the discussion is in fact over. It is too late to rewrite the chapter completely and it is impossible to deal in this short response with all the fascinating questions raised in the commentaries. After some agonizing on what we should and should not reply to, we decided to single out the following handful of issues.

Life Versus Theory. Macbeth makes a general point about potential dangers of theoretical generalizations. He points out that theories, essentially, prevent us from understanding the "lived order" of a setting. Also he suggests that descriptions of "how indeed accountable worlds are built from the relentless indefiniteness of our talk and action within and about them" should be used instead of theoretical generalizations. We totally agree that life is infinitely richer than any theoretical accounts, and we feel that in a way we "murdered to dissect" the interaction between a child and an adult who try to negotiate a joint object, when we cut a complex socio-cognitive-emotional process into three stages. Nonetheless, a complete immersion into the everyday life of a setting is associated with certain drawbacks, as well. One of the authors of the paper (Victor Kaptelinin) was involved in the Fifth Dimension for only a few months. However, he discovered very soon that it was almost impossible to explain what the Fifth Dimension is to people "from the outside." Detailed descriptions could get you only that far, and

communication and reflection create a need for generalization, despite the fact that the latter is always an oversimplification.

A danger of an immersion into a setting can also be illustrated with a comment of Macbeth's. He rightly points out that the fact that a child wants to complete a task independently does not present a problem from the point of view of our theoretical account. The reason why the chapter qualifies it as a "problem" is an unreflected transfer of experiences of a person involved in everyday activities of the Fifth Dimension, where kids working independently were considered as a "problem" because of local norms and attitudes at the setting.

In our view, the contradiction between the indefinitely rich everyday life and theoretical constructions is a fundamental, unavoidable, dialectical one. Even though we agree with Macbeth on the limitations of conceptual constructs (in general), it is hardly possible to be limited to "instructive descriptions," no matter how rich and insightful they are. There is a real and present need to make theoretical generalizations if one does not limit himself or herself to observations, interpretations, and understanding only, but one has to act, as well. The "lived order" of the world in which the Fifth Dimension has been invented and is being implemented, evolved, localized, etc. requires theoretical generalizations as a tool of action.

Intersubjectivity. Perhaps, the choice of "intersubjectivity" for the purpose of differentiating among three stages in the life cycle of collective activities is not perfect. As Macbeth points out, "intersubjectivity" has a very broad meaning, and one can claim that phenomena that can be called intersubjective take place as soon as people are engaged in any type of communication, even at the stage that we call "pre-intersubjective." It is true that "intersubjectivity" can mean different things. According to Webster, "intersubjective" can be defined as "1. Connecting or interrelating two consciousnesses or subjectivities. 2. Existing between, accessible to, or capable of being established for two or more subjects" (*Webster's Third New International Dictionary*. Merriam-Webster, 1993, p. 1883). Therefore, it can have a variety of meanings: (a) subjective phenomena that exist between two or more "consciousnesses or subjectivities," (b) anything that somehow relates two or more subjects, or (c) objective phenomena that several subjects agree upon. We use this word in the first of the above meanings and, accordingly, do not equate coordination of individual activities with intersubjectivity. If each of individuals is following his or her familiar routine but there is no subjective phenomena that exist between the individuals, then there is no intersubjectivity in the meaning in which we use this word. Once again, this usage can be criticized, but at the moment it is difficult for us to find a better alternative. "Common understanding," "task engagement," and the other alternatives we considered and eventually discarded seem to be limited in the

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sense that they do not take into account collective action or only deal with certain aspects of individual activities. However, the fact that we do not see a better option now does not mean it does not exist! Perhaps, it does but we just have not succeeded in finding it so far.

Individual Versus Social Activities. The criticism that we separate "individual and social activities" appears to be a misunderstanding. We differentiate between individual and collective activities, both of which are social in nature.

Emerging Collective Activities. McDermott and Greeno find problematic our interpretation "...that collective activity was absent at the beginning and somehow came into being where it had been absent. Instead they believe that the adult-child pair were functioning collectively from the beginning, and one of the things they accomplish involved learning how to be coordinated better as a pair." From our point of view, there is no disagreement between the chapter and the commentators in that collective activity is a developing entity and in the Fifth Dimension collective activities have life cycles. For each collective activity it is possible to identify a point of time in the past when this activity had not yet existed. It is much more difficult to indicate the exact point where a collective activity begins (e.g., when a child and an adult introduce themselves to each other?, when they decide what they are going to do next?, when they start a game?). So, when one says that a pair starts functioning collectively "from the beginning," it might be a little problematic to define what "the beginning" is. Therefore, in our view the comment does not indicate a theoretical disagreement between their view and the one presented in the chapter, but rather it emphasizes the importance of establishing operational criteria for various phases of collective activities. We agree that development of such criteria should have a high priority in applications of Activity Theory in the area of CSCL.

Unfortunately, space limitations do not allow for a discussion of many important ideas formulated in the commentaries by Macbeth and by McDermott and Greeno. Some of them, for instance the strategy for an analysis of individual and collective activities, outlined by McDermott and Greeno, deserve a special discussion.