PART III. THEORY OF GROUP COGNITION

Introduction to Part III: Studies of Collaboration Theory

Consequences of Part II

Chapter 9 proposed a graphical model of knowledge building that identified a number of possible phases, at both the individual and social level. This implicitly raised the question of empirical evidence for such phases. Chapter 10 worried that widespread CSCL methodologies tend to reduce the data of experiments so that much of the interesting, empirical, detailed information about collaborative interactions is lost. In particular, key phases like those identified in the collaboration model become obscured. Chapter 11 suggested a set of theoretical and empirical approaches to overcome this problem, including the application of conversation analysis. The final chapters followed this suggestion and provided a case study of conversation analysis applied to a collaborative moment. Chapters 12 and 13 identified knowledge building and conceptual change at the group unit of analysis in that moment of collaboration. They showed how the shared meaning constructed by the students discussing the computer simulation cannot be attributed to individuals, but is essentially a group cognitive phenomenon. The meaning of the indexical, elliptical and projective utterances is only constituted in situ, across inextricably interwoven utterance, by different people, and tied to the tasks, artifacts and social contexts of which they are an integral part.

The empirical discovery of group cognition begs for a theoretical conceptualization. That is the role of part III. Taking as inspiration and guidance the unique, brief case study from chapters 12 and 13, along with a mix of philosophical insights, it tries to sketch a framework for understanding group cognition and provides a series of reflections to make this notion more congenial to readers accustomed to thinking of individual intentions.

Theoretical Background to Part III

This book has been in gestation for some time. My seminars at the University of Colorado on artifacts and mediation were a start. When I went to Germany for a year to work on BSCL and organize the CSCL '02 conference, I had it in mind to prepare myself for writing a book. While there, I was invited to write a theory chapter for an edited book on CSCL; what turned into chapter 15 below was really an outline of a solo book. This encouraged me to think about working out a more detailed, book-length theory of collaboration.

The following year, settled at Drexel, I began to think about first making my scattered publications available in an organized and accessible way. That led to reworking chapters 1 thorough 12, as well as chapter 15. In effect, this constituted the core of the book that I had in mind, for I discovered that these papers had been pursuing a coherent inquiry without my realizing it. They just needed to be properly pulled together and extended.

Indeed, this makes for a more honest presentation of a theory, for it presents the historical path of inquiry that led to the concept of group cognition.

The other eight chapters and the introductory materials were written specifically for this book, as it became increasingly clear that the compilation of studies had more to say than the sum of its parts. The theoretical aspects of this subject are where I always assumed I would have the most to contribute to the field, given my background in philosophy. They form part III.

Philosophy. The discipline of philosophy in the past century has followed three mainstreams, which for me are best represented by Marx, Wittgenstein and Heidegger; they might be termed critical social theory, common language analysis and existential phenomenology. As I will mention again later, each of these branches of philosophy undertook a fundamental critique of the positivist, objectivist, behaviorist, individualistic, rationalist, mentalist tradition that goes back to Descartes—if not to Plato—and which persists in much of our everyday thinking (folk theories) and scientific methodologies.

As an undergraduate math and physics student at MIT, I was well exposed to positivist attitudes. But I also encountered the phenomenology of Husserl, Heidegger and Merleau-Ponty in philosophy courses from Dreyfus and Todes. I later followed Todes to Northwestern University—then a unique enclave of European thought in the United States—to earn a PhD in philosophy. During this graduate study, I spent a year in Heidelberg attending Gadamer's lectures and two years in Frankfurt studying the roots and heritage of Adorno and Habermas. These were the heady political years of the late 60s, when the classic German universities were transformed into "free universities" in solidarity with the May Days of France in '68 and in the "new left" spirit. During this period of my life, I gained first-hand experience with the different approaches in contemporary philosophy and their practical application within a society in ferment.

In seeking an alternative foundation to rational cogitation, each of the three mainstreams of twentieth century philosophy underwent a "linguistic turn." They each looked to language as the central phenomenon for analysis. Extrapolating from Vygotsky (1934/1986) and Bakhtin (1986a) as well as from Adorno (1964/1973), Heidegger (1959/1971) and Wittgenstein (1953), one can conceive of the mind as fundamentally linguistic. This has consequences, such as viewing thought or meaning making as something that can take place socially, culturally, outside the heads of individuals, primarily in discourse.

Part III on the theory of group cognition tries to take into account the various philosophic advances of our time, which have not completely percolated down to our everyday understanding or our scientific methodologies. It attempts to apply these perspectives to the foundational issues of a theory of collaboration. In particular, it strives to bring about a shift from the traditional focus on the individual to a consideration of the small group as the "cell" of analysis. Subjecting the focus on the small group to the linguistic turn, it arrives at a concept of group cognition as group discourse.

Activity Theory. In recent decades, the development of theory has taken place largely within niches of the social sciences: anthropology (critical ethnography), communication (conversation analysis), sociology (ethnomethodology) and psychology (socio-cultural). This has shifted the focus of theory from the traditional lone thinker to broader socio-cultural phenomena. For instance, activity theory (Engeström, 1999) situates the individual firmly in the activity system, which includes not only other individuals, but the

mediating artifacts and the community or societal context as a contradictory whole. Artifacts—whether words or tools—are not taken as simply physical or mental, but as both meaningful and embodied. Individuals and society are not treated as independent identities, but as mutually constituting each other, so that one must take into account both of them in their relations with each other.

Heidegger. The most thorough and systematic critique of the Cartesian tradition was carried out by Heidegger. In my philosophy publications (Stahl, 1975a, 1975b, 1976), I note that the root of Heidegger's tragic political errors was in his failure to take the concrete social context seriously, rather than as an abstract principle of historicity. Despite this, I am still convinced that we have much to learn from his philosophy. For this reason, while in Germany, in preparation for writing a book, I re-read *Sein und Zeit* (Heidegger, 1927/1996) to get a clearer grasp of his actual and potential contributions. Many of Heidegger's insights have already been translated into important principles for software design (Dourish, 2001; Dreyfus, 1972; Floyd *et al.*, 1994; Schön, 1983; Suchman, 1987; Winograd & Flores, 1986). Most of these are based on specific analyses in Heidegger's early work, rather than on his fundamental critique of Western thinking. His writings after what Heidegger calls the "turn" in his "path" open up a rich, but quite different view of artifacts and truth (e.g., Heidegger, 1935/1964), which may prove helpful in thinking about software artifacts to open up realms of collaboration. But the later writings build on Heidegger's critique of Western thought in *Being and Time* and that book's analyses of, for instance, human interpretation and how artifacts have meaning.

The Studies in Part III

Part III tries to introduce a certain theoretical perspective to the reader through a series of essays that come at it from different angles. The idea underlying all of the studies is to focus on the group, not primarily the individual. A science of collaboration for CSCW and CSCL should be centrally concerned with analysis of group interaction, group meaning, group cognition, group discourse, group thinking. It should not insist on reducing these to cognitive states of individuals. Part I concluded that groupware should be designed as a medium for supporting group discourse—not primarily as a smart tool for individual users. Part II argued for analysis of group interaction—and provided an illustrative analysis that did not seek quantitative measures of individual outcomes. Now part III carries the paradigm shift to the theoretical level as a reflection on issues that arose in the previous parts and to help readers overcome the habits of thought that resist the focus on the small group as the agent of collaborative knowledge building. The following questions are raised as part of a reflection on the small-group unit of analysis:

- Can we learn from traditional communication theories and technologies how to support online small groups? (chapter 14)
- Can processes of group cognition and collaborative learning provide a basis for individual cognition and personal learning? (chapter 15)
- Can we identify meaning making and knowledge building at the group unit? (chapter 16)

- Can we understand how group meaning is shared among group members? (chapter 17)
- Can we make learning visible in group discourse, so we do not have to be confined to measuring indirect learning outcomes? (chapter 18)
- Can we say that it is possible for a group as such to think / learn / build knowledge / construct meanings that cannot be attributed to any of the group members individually? (chapter 19)
- Can we develop new conceptions of group discourse that might open up innovative approaches to fostering group cognition? (chapter 20)
- Can we identify rational sequences of reasoning at the small-group unit of analysis, so we can say that the group as such is engaging in high-level thought? (chapter 21)

It is hoped that the view of group cognition that emerges from part III will contribute to the understanding needed to foster computer-supported collaborative knowledge building.

Chapter 14, group communication. The theory part of the book opens with a general review of communication theory. This is partially a consequence of the emphasis in part II on conversation analysis and partially a reaction to the linguistic turn in theory. Chapter 14 uses the momentum generated by parts I and II to launch into an analysis of traditional theories of communication and what they can offer for understanding the phenomenon of collaboration. This chapter relates the theory of communication to the needs of groupware design and to theories of learning. It then extends the analysis of communication to begin to cover computer-mediated collaboration.

Chapter 15, group theory. This is a lengthy attempt—yet condensed, considering the subject—to present the elements of a social theory of collaboration. The abstract nature of this undertaking at times suggests an exaggerated level of generality. It is important to keep in mind that the suggested theory is specifically intended to apply to instances of small-group collaboration, such as the group of students seen in chapter 12, from which this analysis is in fact derived; the relations of the individual would be much different to a person who is reading alone, to a student sitting in a lecture or to a designer working with a client. Even keeping in mind the restricted scope of the theory, it seems that much of what is most important, and perhaps most apparent, in the relation of an individual to a group does not manage to come to word in this study. For instance, although it is not stressed in this chapter, it becomes clear in chapter 13 that as the group of students working with `SimRocket` builds its collaborative knowledge about the list structure, it simultaneously, in parallel, makes sure that each group member also builds a corresponding understanding. Thus, the group view of the list is only taken to be established when the most intransigent student finally acknowledges, "I see. I see. I see." So, group cognition processes often enforce parallel individual cognitive processes. It is hard to separate out conceptually the two aspects of the one subtle process.

Chapter 16, group meaning. Here, one element of chapter 15 is taken up and expanded upon: the relation of meaning and interpretation in collaboration. Again, it is important to note that the scope of the analysis of the relation of group meaning to individual interpretation is only intended to apply to situations of small-group collaboration. The general question of the meaning of meaning is vast. This study is only meant to propose a distinction within the theory of collaboration, that the term *meaning* be here reserved for use when the unit of analysis is the group and that *interpretation* be

used in reference to individual cognition. This does not reduce it to an arbitrary distinction—it still seems to be a rich and useful clarification.

Chapter 17, group cognition. This study confronts the question of what could possibly be meant by the phrases *group cognition* or *shared meaning*. It considers a number of alternative interpretations that seem to be implicit in the current literature. Then it addresses the popular discussion of *common ground* as a way of explaining shared meaning. The usual understanding of common ground is criticized as an attempt to reduce a group phenomenon to a sum or overlap of individual cognitions.

Chapter 18, group visibility. The methodological question of how to observe and analyze group meaning making is taken up in this chapter. First, it is important to distinguish the researchers studying the phenomenon from the agents involved in the studied activity. An approach to video analysis is proposed, based largely on the examples in part II. Policies governing this methodology are adopted from ethnomethodology.

Chapter 19, group thinking. The question, "Can groups think?" is reminiscent of the 50-year-long debate in artificial intelligence about whether computers can think. Consideration of three major arguments about computer cognition by Turing, Searle and Dreyfus concludes that it is misleading to speak of computers as thinking. However, applying the same arguments to collaborative small groups suggests that it is just as reasonable to attribute cognition to these groups as to their individual members.

Chapter 20, group worlds. This speculative chapter reflects on the role of discourse as the agent of group cognition. In a sense evoked by Heidegger's later work, the discourse that takes place among group members in their activity situations opens up a world of meaning out of which new group meanings and shared knowledge emanate. To support effective collaboration, we need to design socio-technical mediating artifacts with social practices that can foster the emergence of productive worlds of group discourse and cognition.

Chapter 21, group discourse. The concluding chapter looks at an example of online group chat taken from research that is just starting. A preliminary analysis of collaborative methods of doing math online suggests a research agenda of empirical research guided by the issues raised in this book and focused on analyzing computer-mediated discourse as thinking at the small-group unit of analysis.

Part III ends by introducing a preliminary analysis of computer-supported collaborative knowledge building in a math chat room. Its purpose is to indicate a direction for further empirical exploration. Within a design-based approach, this also means further software innovation and experimentation. This book does not end with a final word, but with a call for a serious investigation of group cognition that goes significantly beyond the scope of this text and requires an international collaborative effort. The cycle of design, analysis and theory illustrated in this book needs to be iterated on a larger scale.