CSCW 2002 Conference – November 16-20 – New Orleans

Workshop 5. Analyzing collaborative activity – Representing field research for understanding collaboration – Peter Jones, peter@redesignresearch.com – Cristina Chisalita, Vrije Universiteit

Analyzing and Representing the Building of Collaborative Knowing

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I have been analyzing a data segment that I call "**A Moment of Collaboration**" for a couple of years. This 30 second digital video clip has been transcribed as 28 verbal utterances. The data comes from a middle school classroom episode where five students and a mentor are learning how to use a rocket simulation to draw scientific conclusions for designing physical model rockets. This particular excerpt is a highly collaborative one, in which the teacher sets up a motivating discourse challenge, the shared understanding breaks down and the students interact intensively to repair the interaction problem. The segment was initially very difficult to understand – largely, it turns out, because of the non-alignment of the references in the highly elliptical utterances. However, it gradually yielded to micro-ethnographic analysis, focused primarily on an analysis of the references in the group discourse.

In the process of interpreting the data, I developed a grounded theory of what I call "**Building Collaborative Knowing**." This theoretical framework incorporates concepts and approaches from a broad spectrum of theories that are influential in CSCW and CSCL, such as situated learning, activity theory, discourse analysis, artifact theory, contextual design, phenomenology, hermeneutics, semiotics, ethnomethodology. I have attempted to integrate these concepts and approaches into a coherent framework for analyzing, representing and understanding collaborative work and learning.

Methodologically, the study of **collaborative learning** is drastically different from that of individual learning, because the participants in a collaboration must make their changing understandings visible to each other – and therefore, potentially available to researchers. Accordingly, what we need to represent are not postulated mental representations, but the **products of group interaction**, such as the specialization of terminology or the generation of written texts and other artifacts.

Philosophically, the intractable problem of defining meaning is addressed by taking the shared situation of the collaborators – their language, activity structures, culture, artifacts and physical surroundings – as a network of tacit meanings that are implicitly referenced by their discourse. These shared meanings must be interpreted by the participating individuals. Thus, there is an inter-play between the shared and evolving context of **meaning** and the **personal perspectives** of the participants – an inter-play that can be observed, represented and interpreted by researchers.

Conceptually, my theory focuses on the social construction of reality through collaborative interactions. A wealth of subtle verbal and non-verbal interaction mechanisms are used to negotiate extensions to the group's abilities and knowing. Aspects of dynamic accepted group knowing frequently coalesce into **physical and symbolic artifacts**, in which the ethereal knowing that exists in spoken discourse gains a measure of persistence. The artifacts may be tools or monuments that embody the knowing in their form and affordances; vocabulary can gain

new connotations, in which knowing is sedimented. The **externalization** of knowing in artifacts preserves the knowing for future uses by the creators, as well as by others. However, new users may need to learn how to interpret the encapsulated meanings – just as the students in my data had to gradually learn how to interpret the meanings designed into the computer simulation of rockets. It is also possible for individuals to **internalize** transformed physical or symbolic artifacts into cognitive artifacts.

In studying collaborative learning and CSCL, we are primarily interested in representing the knowing that gets built. Because participants in collaboration must make visible – i.e., represent to each other – their knowing as an on-going requirement of collaboration, this knowing is potentially made visible for us as researchers as well. This is the methodological key. The consequence is that **representations of field work can be oriented to the products created by collaborators**: artifacts in the broad sense that includes physical, symbolic and cognitive artifacts. For instance, in the discourse about the model rocket simulation, the analysis focuses on the artifacts that are referenced in specific utterances. The collaboration is seen to hinge on the details of the configuration of these artifacts. The terms that gain particular meaning in the discourse ("compare," "different"), together with the artifacts, classroom practices, etc. form the meaningful situation for the students. Research on the students' collaborative learning must be concerned with this situational matrix of meaningful elements; it must represent the key elements and their inter-relations. For instance, a concept map or semantic network might represent part of this, with an activity structure diagram representing another part and a description of physical and computational artifacts yet another.

My interest as a professor of information science who teaches HCI, CSCW and CSCL is how to **design**, **deploy** and **evaluate** software media and artifacts that support the building of collaborative knowing by groups in work-related and educational settings. In prototyping and evaluating groupware, I try to build functionality to support the collaborative mechanisms identified in my theory (like interpretive perspectives, knowledge negotiation and the construction of artifacts) and to explore how users learn to understand this functionality in my software artifacts.

I would be interested in sharing my **case study** of the middle school students and their rocket simulation with CSCW practitioners in a workshop. I would also like to know how such an audience responds to my work-in-progress **theoretical framework** and its implications for representing field work.

My **recent publications** related to this theme include:

Stahl, G. (2000) Collaborative information environments to support knowledge construction by communities, *AI & Society,* 14 , pp. 1-27. Available at: http://orgwis.gmd.de/~gerry/publications/journals/ai&society/.

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Stahl, G. (2002a) The complexity of a collaborative interaction, In: Proceedings of *ICLS 2002*, Seattle, WA. Available at: http://orgwis.gmd.de/~gerry/publications/conferences/2002/icls/ICLS_Stahl.pdf.

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Stahl, G. (2002d) Rediscovering CSCL. In T. Koschmann, R. Hall, & N. Miyake (Eds.), *CSCL2: Carrying Forward the Conversation,* Lawrence Erlbaum Associates, Hillsdale, NJ. Available at: http://orgwis.gmd.de/~gerry/publications/journals/cscl2/cscl2.pdf.

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Stahl, G. (2003a) Building collaborative knowing: Elements of a social theory of learning. In J.-W. Strijbos, P. Kirschner, & R. Martens (Eds.), *What We Know about CSCL in Higher Education,* Kluwer, Amsterdam, NL. Available at: http://orgwis.gmd.de/~gerry/publications/journals/oun/oun_outline.pdf.

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Stahl, G. (2003c) Building collaborative knowing: Elements of a social theory of learning, In: Strijbos, Kirschner & Martens (Eds.) What We Know about CSCL in Higher Education, Kluwer.

Stahl, G. & Sanusi, A. (2001) Multi-layered perspectives on collaborative learning activities in a middle school rocket simulation project, Presented at the *22nd Annual Ethnography in Education Research Forum*, Philadelphia, PA. Available at: http://orgwis.gmd.de/~gerry/publications/conferences/2001/ethnography2001/ethnography.pdf.