Collaborative Information Practices in Virtual Math Teams

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ABSTRACT

A sequence of inter-related proposals are made concerning how best to study collaborative information behavior. These proposals start by arguing for a clear distinction of three levels of description: individual, group and community. These should have three distinct sciences, theories and methodologies. The small-group level has a certain primacy, from both theoretical and practical considerations. A study of virtual math teams is presented as a possible model of such an approach.

Categories and Subject Descriptors

H.1.1. **Information Systems**; Models and Principles; Systems and Information Theory; General Systems Theory. H.5.3. **Group and Organizational Interfaces**; Collaborative Computing and Computer-supported Cooperative Work.

General Terms

Theory.

Keywords

CSCL, CSCW, collaborative information behavior, group cognition, group interaction.

1. INTRODUCTION FOR THE WORKSHOP

I would like to make a series of proposals concerning how one might approach the study of collaborative information behavior. These proposals are based on empirical research I have been directing for the past six years in the Virtual Math Teams project at the Math Forum @ Drexel University and the School of Information Science. The background and motivation of this project is documented in my book on *Group Cognition* (Stahl, 2006). Major findings from the project by members of the research team and international collaborators are documented in a forthcoming edited volume, *Studying Virtual Math Teams* (Stahl, 2009b). I will be presenting a paper that goes into more detail on my last proposal later in the conference (Stahl, 2009a). My related presentations at previous GROUP conferences and in the *SigGROUP Bulletin* include (Stahl & Sarmiento, 2007; Klamma,

Rohde, & Stahl, 2004; Stahl, 2004a, 2004b, 2003; Stahl & Herrmann, 1999).

2. THREE INTERACTING LEVELS OF DESCRIPTION

The first proposal is that there are three levels of description that should be distinguished for analytical purposes:

1. The individual human agent

2. The small group

3. The community of practice, the linguistic community or the cultural community

These three levels are intimately intertwined and it takes some analytic work to separate them. However, it is generally useful to treat phenomena such as aspects of collaborative information practices as taking place on one of these levels or another. To make an analogy to these social phenomena from the physical sciences, it is like developing three distinct but closely related sciences like physics, chemistry and biology. Each science has its own particular phenomena to study within its own appropriate theories and with its special methods, despite their relations to each other.

3. INDIVIDUAL BEHAVIORS, GROUP METHODS, SOCIAL PRACTICES

Individual information behaviors have been studied extensively, using the perspectives of psychology, learning sciences, cognitive sciences and information science. At the other extreme, *community information practices* have been studied from the perspectives of sociology, critical social theory, activity theory, management and organizational sciences. The connections between these two views is tenuous at best, relying on vague concepts of acculturation or statistical effects. I propose that the solution to their integration lies in a middle level, which has not been extensively pursued as a science in its own right: the level of *small-group information methods*.

4. MAKING THE METHODS VISIBLE IN THE WILD (EXPERIMENTAL METHOD)

One argument for the primacy of the small-group level in the production, discovery, sense-making, negotiation, adoption and diffusion of information is the Vygotskian principle that we generally learn new cognitive methods in small-group interactions (e.g., within our family of origin, peer activities or guided apprenticeships) before we establish them as individual abilities. But from a practical research standpoint, another argument for focusing initially on the small-group level is that things are simply much more visible on that level. With tape recordings, video

capture and (for online interaction) computer logging, interactions in groups can be captured, preserved and analyzed in great detail. The main point is that in order for small groups to interact effectively, the participants must express much of what they are doing visibly for the other participants. This makes the activities and mechanisms of small-group interaction potentially directly visible for analysts. This contrasts strikingly with the case of individual behaviors, where most of the mechanisms are not even visible to the individual. Similarly, at the community level, most practices are hidden in institutions and language. Both individual and community mechanisms can often only be determined through indirect, statistical tests based on theories and assumed variables, rather than observed directly. Where individual phenomena frequently require controlled laboratory settings to make hypothesized indirect causal effects measurable, small-group mechanisms can often be observed in the wild, in naturalistic settings.

5. ANALYZING THE GROUP METHODS (ANALYTIC APPROACH)

The analytic approach to small-group phenomena follows from the visibility of the data. With the advent of the tape recorder, the field of conversation analysis developed to study how groups accomplished various tasks in informal talk-in-interaction. For the first time, it was possible to reliably analyze actual, empirically recorded speech, rather than relying on vague notes or made-up examples. Video analysis provided tools for taking this further, including the incorporation of the study of gesture and the use of physical artifacts. This approach has been particularly widespread in CSCW. Now, computer logging can bring the same analytic power to the study of collaborative information methods, to the extent that they are conducted online using groupware.

6. THEORIZING THE INTERACTIONS (FOR A SCIENCE OF GROUP INTERACTION)

Of course, there has been some analysis of small-group methods of interaction relevant to information behaviors in CSCW, CSCL and various other fields, driven by approaches of ethnomethodology, distributed cognition, actor-network theory and activity theory. But this has not generally been conducted within a theoretical framework that explicitly distinguishes among the three levels set out above, of individual, group and community. This lack of separation of phenomena into three distinct sciences causes endless confusion. Authors speak of community and social practices when they mean small-group methods. Readers insist on psychologizing about what individuals were thinking when it was the group as a whole that was accomplishing something. Granted, a small-group interaction consists of individuals acting with their psychological factors, influenced by community-level norms and institutions. However, if we are going to make theoretical progress in understanding this complicated business, it could help enormously to keep these matters sorted out systematically and to describe processes at different levels appropriately. This might best be accomplished by defining separate sciences and distinct theories.

7. PRIMACY OF GROUP COGNITION (MEDIATION AND STRUCTURATION)

I have come to my current proposals by trying to think about what is distinctive to CSCW and CSCL, to cooperative work and collaborative learning, to that which groupware should be designed to support. I have observed that small groups accomplish cognitive tasks like dealing with information and knowledge in ways that are different from how individuals do so. As I proposed in my introduction to *Group Cognition* [4, p. 16],

> Small groups are the engines of knowledge building. The knowing that groups build up in manifold forms is what becomes internalized by their members as individual learning and externalized in their communities as certifiable knowledge.

8. A TESTBED OF ONLINE COLLABORATIVE INFORMATION PRACTICES (VMT)

The Virtual Math Teams project was designed to provide a naturalistic testbed for studying online collaborative information and knowledge-building methods of small-groups of students. As described in [1], the project provides a tentative model of what a science of small-group interaction might look like. Four dissertations from the project are summarized in chapters 6, 7, 8 and 9 of [2]. They explore how small groups engage in information behaviors and knowledge-building by bridging across temporal breaks between online sessions, by closely coordinating work in different expressive media, by negotiating differences of perspective and by collaboratively seeking and sharing information relevant to their joint tasks. The groups build a joint problem space with dimensions of domain knowledge, social positioning and temporality. They engage in deictic referencing within a co-constructed and shared indexical manifold. They make, respond to and interactively refine proposals that drive their work forward. All of this takes place at the small-group level of description. These are the sorts of phenomena that need to be analyzed by a science of group interaction and need to be accounted for in a theory of group cognition. The analysis of collaborative information methods should play a central role in that undertaking.

9. REFERENCES

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