

Some thoughts about theoretical advances in CSCL

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This note contains some immature thoughts based on theoretical and methodological challenges I have struggled with over the last several years. It begins with the theoretical question our team has been trying to tackle, followed by a description of the methodological challenges we faced, and concluding with some reflections on how we may be able to make greater advances in our field as a whole through communal knowledge management efforts to establish mechanisms for sharing of research instruments, analysis tools and data corpora.

Our problem: does argumentation contribute positively or negatively to knowledge building?

Knowledge building as put forward by Scardamalia (2002) and Bereiter (2002) is one influential theory and pedagogical approach in CSCL. It is both an epistemological theory about how knowledge advances in human societies, and a pedagogical approach that envisions learning at the individual level to take place as a side product of the process of collective inquiry efforts to inquire and to advance the state of knowledge. It distinguishes itself from other CSCL theories in that the focus is not on learning per se but on knowledge creation. Further, it emphasizes on the communal aspect of the growth and development of knowledge. Hence the 12 knowledge building principles proposed by Scardamalia (2002) are concerned with socio-metacognitive characteristics of what a knowledge building community should demonstrate and are hence used as pedagogical guidelines for teachers designing knowledge building experiences for their students. The focus of knowledge building is not on the production of artifacts, but on the improvement of ideas. Hence discourse is considered focal to knowledge building, which is amongst the earliest collaborative pedagogy to have adopted computer-supported collaborative learning (CSCL) (Koschmann, 2003a). The collaboration environments, starting with CSILE[®] and later Knowledge Forum[®] has been designed based on the theory of knowledge building to provide the sociometacognitive affordance identified in the 12 knowledge building principles. The indicators that have been used to signify knowledge building are the generation of explanation-oriented questions and deepening levels of explanation. The generation of research questions (e.g., Krajcik & Blumenfeld, 2006) and the construction and evaluation of explanation (e.g. Sandoval & Reiser, 2004) as important aspects of collaborative inquiry have also been adopted by researchers working in the area of inquiry-based learning.

Argumentation is another commonly adopted analytic framework for examining the depth of inquiry in the analysis of CSCL discourse (see e.g., Andriessen, 2006; Andriessen, Baker, & Suthers, 2003). As a form of discourse, argumentation has a sharper focus than the vague and broad concept of collaborative learning (Koschmann, 2003b). The two basic operations involved in argumentation are: 1) justification of one's viewpoints and 2) recognition of opposing viewpoints (Leitao, 2000). There are analytic frameworks differentiating different types and levels of argumentation based on concepts such as argument, counterargument, and rebuttal (e.g., Erduran, Simon, & Osborne, 2004; Leitao, 2000). Moreover, there are studies exploring the effect of pedagogical design on helping students to develop their competence on argumentation, such as constructing good arguments and generating rebuttals (e.g., Osborne, Erduran, & Simon, 2004).

In the knowledge building research community, there is a concern of whether argumentation is intrinsically counterproductive to knowledge building. In a recent paper, Scardamalia & Bereiter (2006) wrote that knowledge building discourse has a set of commitments: to progress, to seek common understanding, and to expand the base of accepted facts. *“By these criteria, argumentation and debate, as currently promoted in schools, falls short. Its emphasis on evidence and persuasion, while admirable in other respects, does not generate progress toward the solution of shared problems of understanding. Knowledge building discourse in the classroom has a more constructive and progressive character”* (p.102). This concern is grounded on their differentiation of two modes of working with knowledge: 1) belief mode, with the major concern of the truthfulness of an idea; and 2) design mode, with the improvement of an idea as the focus. Bereiter & Scardamalia (2006) argue that a distinctive talent for the knowledge society is the capacity to *“work collaboratively with conceptual artifacts in design mode”* (p.702). Based on this differentiation, debate is likely to be classified as an activity in belief mode, as the task of debaters is to prove their viewpoint as right while the other side is wrong. On the other hand, in recent literature on argumentation, it is mainly regarded as a form of interactive discourse situated within collaborative contexts (Andriessen, 2006). The theoretical question underpinning the analysis and visualization to be presented at this workshop is to investigate whether argumentation as a form of discourse can be constructive to knowledge building.

While this particular research question may not be of interest to many CSCL researchers, I believe that this question is typical of a class of research questions that seek to build better models and theories of CSCL on the basis of the varieties of theories and models that have been proposed by learning scientists. So the methodological challenges we describe below may be similarly faced by other CSCL researchers as well.

Methodological challenges we face

Some of the major methodological challenges we face include:

- Lack of a commonly accepted set of high instruments that can be adopted for the key theoretical constructs of our study – Re-use of instruments (such as coding schemes) by different researchers can be an important advancement towards the development of a set of high quality instruments, which unfortunately has not really been happening much in our field. Obstacles to shared analysis instruments include the important role human judgment plays in content analysis and the context dependence of the CSCL settings.
- Reliability challenges – Replicability is the ultimate quality standard for reliability, but would be extremely difficult to achieve in CSCL because of the context dependence of CSCL settings – both of the instrument and of the theory about CSCL underpinning the instrument design. On the other hand, replicability can only be investigated through applying the same instrument to multiple contexts. Further, the application of the *same* set of instruments to different contexts is an important means through which we can seek empirical evidence for how context influences the learning processes and outcomes.
- Productivity challenges – data collected and analyzed in CSCL settings tend to be massive and complex, involving typically contextual information, online and face-to-face interaction data as well as field observation notes, etc. Quantitative analysis of these data, such as frequency counts and social network analysis, generally provided limited insight into the learning process or the outcome. Hence qualitative content analysis is

often employed. However, such analysis is generally requires the time consuming process of coding by highly skilled research personnel to achieve consistent results. This limits hugely the productivity of the researchers involved and hence the scope of their research and the claims that they can make. There is an increasing number of researchers who work on availability of high quality analysis tools (e.g. machine-supported content analysis) and are ready to share with other researchers in the community. However, this is unlikely to catalyze great advancements in the field unless it is accompanied by increased agreement on a number of quality instruments in the field.

- Validity challenges – there are a variety of different indicators used to assess the presence and levels of knowledge building, which applies to different units of analyses. The same is true for indicators for argumentation. Hmelo (2003) has used her own work to illustrate the pitfalls of using only one set of indicators to understand what is going on in learning contexts and argues for the need for analyzing data from multiple perspectives. In fact, our ability to visualize analyses results from multiple perspectives is very much constrained by whether we have the appropriate tools to support our visualization.
- Context sensitivity and dependence of CSCL – if CSCL were to really make an impact on education in practice, then CSCL research conducted in authentic educational settings becomes a necessity, which aggravates the problematic situation in all the challenges described above.

The maturity of a scientific field is indicated by the establishment of sound methodologies, which are widely accepted by the research community in the field, with clear standards of quality, availability of high quality instruments, and replicability of findings. Within the young field of CSCL, there have been over the past ten years a lot of discussions on key methodological challenges in CSCL as well as a healthy debate among researchers on methodological issues and quality standards. However, based on the methodological challenges identified above, I would like to contend that CSCL is still far from being a mature field. The question I would like to ask is: is there a way our community can work together to improve our research productivity and ultimately gain greater advancements in our theoretical understanding and practical implementation of CSCL.

Communal knowledge management of research instrument, tools and data corpora – is this a theoretically sound and practically achievable direction of development?

Strijbos & Fischer (2007) argues that methodological debates as a form of collaborative reflection should be a core aspect in scientific discourse in the area of CSCL as the state of our knowledge is largely shaped by the methodologies used in the field. One way to conceptualize the nature of the challenge described above is to see it as a knowledge management problem for our community. It is proposed here that a communal repository of analysis instruments, tools and corpora can serve to advance the theory and practice of CSCL. The creation of a platform for the sharing and documentation of instruments, analysis tools and corpora will facilitate deeper and more productive methodological debates, as well as methodological collaboration, leading to higher quality instrumentation and methodological innovations through joint efforts in the development of hybrid methodology.