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Q1

Fostering targeted group practices as a Core focus for CSCL task and technology design

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Introduction

With increasing diversity in learning contexts and technologies involved when CSCL is adopted, we observe not only different foci and goals being pursued, but also diversity in what counts as social interaction and collaboration, and even in what is the unit of interest for the investigation of learning. For example, unit of analysis and levels of description are both important when deciding on a study focus.

We publish in this issue the first in what we hope will be a steady stream of squibs in the ijCSCL journal, which is intended to stimulate discussion and controversy that may advance scientific interdisciplinary work in CSCL. The squib and the four full articles in this issue provide a rich tapestry for us to examine this methodological and epistemic diversity in the CSCL research community and how these may contribute to productive debates and discussions to advance the field.

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CSCL as studies of group practices by student teams

In this first squib, Gerry Stahl, the former editor-in-chief, proposes a methodological focus on "group practices" in CSCL, rather than on individual mental representations or cultural practices. Stahl draws on design-based research in collaborative learning of mathematics. The squib argues that one can understand how to design CSCL support for collaborative mathematics by analyzing the adoption and enactment of practices by small groups in research studies. Findings from such studies can then "systematically inform the design, testing, and refinement of collaborative-learning software, curriculum, pedagogy and theory. CSCL can be re-conceptualized as the design of technology to foster the adoption of group practices by student teams." Since this is the first squib we hope that it will start a productive discussion about how to advance the CSCL field.

The coupling effect of different online *venues* on joint problem solving

Alterman and Harsch report on a study of a class of 116 students in an undergraduate course on Internet and Society as they engage in collaborative writing assignments in small groups of five to seven students. Each of the 19 teams completed four collaborative writing projects, one on each of four assigned books, and alternating between wiki-based and blog-based collaborative writing. The authors refer to the collaboration in their study as "loosely coupled" as both the wiki (first and third book) and the blog (second and fourth book) environments are asynchronous. For the first and third books, there was a careful assignment of roles given to the members of a group. Each student had to write a 500-word summary for one of the chapters and be a discussant for another chapter. Each team then had to submit a 1000-word summary of the entire book on wikitext, and team members could discuss using the talk page, which functioned like a GoogleDoc. For the second and fourth books, there was no role assignment and each student had to submit a 1000-word editorial on one of the issues raised in the book in a blog environment. There was a draft phase when students work independently and a comment phase for them to give feedback to others, and then to finalize their own editorial after reviewing peer comments.

In the case of online asynchronous collaboration because of a lack of spatial or temporal co-presence, Alterman and Harsch observe that there is a tendency for participants to economize on their collaboration due to the resource implications in carrying out communication and coordination. The authors put forward the conceptual construct of a *venue* for such contexts, which is a virtual space for collaboration that emerges as the participants succeed in negotiating an agreement on the problem(s) and objective(s) for joint problem solving. The nature of the venue depends on the nature of the task design (e.g. whether there is role assignment to members of a group), as well as the nature of the online platform. The paper in particular contrasts the situation where students were to use the wiki for collaboration with the situation where blogs were used. Issues of ownership, identity and participation differed within these different settings.

The construct of "venue" is central to this study. It is apparent that different venues afford different collaboration practices. A designed learning environment can only truly become a collaborative learning space (or venue), when students succeed in realizing or adopting the group practices intended by the course designer. This study should be seen as a line of recent studies that contribute to understanding what it takes to establish mutual efforts to solve tasks and problems (e.g., Arnseth and Krange 2016; Dillenbourg et al. 2016; Järvelä et al. 2016). Q3

Divergent collaboration in open-ended tabletop learning environments

Most studies of CSCL explore learning in contexts where the collaboration centres around common goals, and it is often assumed that productive collaboration requires shared objectives and convergence in understanding. The paper by Tissenbaum, Berland, and Lyons on the other hand, investigates collaborative learning in situations where the goals and objectives of those involved in the situation are divergent, as in the case of museum visitors. The authors put forward a framework for recognizing and coding collaboration and divergent learning—Divergent Collaborative Learning Mechanisms (DCLM), and used it to analyze the interactions among visitors as they conduct explorations on an interactive digital tabletop exhibit in a museum. Using the framework, the authors are able to show collaborative learning taking place among visitors within and across the naturalistic visitor groups that were interacting with the exhibit during the same period of time, while holding divergent conceptions and pursuing divergent goals.

The typical mode of interaction between visitors in museums is that of tinkering, whether as individuals or as groups. The tabletop exhibit used in this study was designed to support loosely-coupled interactions: it allows visitors located at different parts of the tabletop to engage in their own explorations, while the physical co-location provides the possibility for them to observe each other's activities and to interact. As typical of tinkering, the goal pursued by an individual or group could change as the activity proceeds. Members of a group that had been exploring jointly could shift from a shared common goal towards individual divergent goals. Individuals and groups might also be influenced by others to shift their goals to become more similar. The authors identified opportunities for boundary spanning perceptions (BSP)—observing what goes on in others' spaces, and boundary spanning actions (BSA)—interacting in others' spaces, both as critical mechanisms for productive divergent collaboration. Interaction analysis was the method used for analyzing joint effort (e.g., Furberg 2016).

Clearly, the design of the interactive tasks and interfaces on the digital tabletop and the physical layout of the museum space were both crucial in bringing about the kind of collaborative learning that took place, despite the absence of a convergent goal. While the domain content for the collaborative learning is built into the interactions between the visitors and the tabletop, BSP and BSA are the key practices that the museum visitors need to adopt in order to engage in productive collaboration in the loosely-coupled learning context. The new environments presented in this work come with new design features and computational capabilities. This contribution adds important knowledge to other recent CSCL contributions about tabletop environments (Dillenbourg and Evans 2016; Higgins et al. 2011). It's important to note that while tabletop environments have been studied in recent years, relatively few of those studies were based on CSCL perspectives or had a clear theoretical stance.

Bodily-material resources for embodied interaction

In most CSCL studies, the use of language is the primary means for learning. However, other means can also be important for understanding how learning occurs, such as gestures and other bodily movements (Enyedy et al. 2015; Jornet and Roth 2015). Many CSCL researchers draw on Charles Goodwin's work (e.g., Goodwin 2000 and many other contributions by both Goodwin and Goodwin and colleagues). The paper by Davidsen and Ryberg explores how two nine-year-old children use bodily-material resources (together with language) as communication, cognitive and shepherding tools while they work together to make sense of the concept of scale. The snippets of bodily-material interactions analyzed in the paper were instances where the children were physically thinking together around touchscreens. The fine-grained analysis adopted in this study further shows that only a small part of the coordination, communication and collaboration involving movements, touches and gestures took place on the touchscreen, while much of that instead happens in the open space between the screen and the children. The authors thus raise the methodological issue that simply recording speech or the digital records of the children's interactions on the screen would not be able to capture the bodily-material modalities of the interaction, which are crucial to the understanding of the collaborative learning process.

The authors highlight that while there was productive collaboration between the two children evidenced by the 66 s of video analyzed, there were also other instances of unproductive conflicts resulting from similar bodily-material interactions in other student pairs. They therefore consider it important to study how the gestures and movements emerge and develop over time, in order to understand how this type of collaboration "skill" develops.

While the authors do not use the construct of group practice to refer to the form of multimodal interactions described in the paper, it is clear that they consider the development of these collaboration "skills" to be integral to successful collaborative learning. It is interesting to note that the students in this study were learning about the concept of scale through 2-D geometric representations, and that the kind of shared practices within the group are in fact very similar to those described in Stahl's squib in this issue: pointing, turn-taking, software usage and geometric construction. It is probably not accidental that very similar group practices are needed for productive collaborative learning in these two contexts because the subject matter domains involved in these two contexts are geometric in nature. In the case of collaborative learning mediated by VMT, the development of the necessary group practices for pointing, turn-taking, software usage and geometric construction has to take place via the digital learning environment rather than through bodily-material interactions in physically co-located collaborative settings. On the other hand, irrespective of the specific collaborative setting, productive ways of working together, or group practices, do not happen automatically, while they are indeed an integral part of the collaborative learning objectives.

Interprofessional learning through video-supported post-simulation debriefings

In many professions, using video data as a resource for learning has become a common approach (e.g., Fanning and Gaba 2007; Murata et al. 2012; Borko et al. 2011). Students can be trained in many different domains via debriefing data from simulations (Hontvedt and Arnseth 2013). The use of videos per se does not ensure that students can identify the key learning issues and achieve the intended outcome goals. To do so requires appropriate pedagogical facilitation (e.g. Borko et al. 2011). On the other hand, there are few systematic studies that investigate the concrete ways in which videos can be used to scaffold collaborative learning and what constitutes effective facilitative questions and instructions. The paper by

Johansson, Lindwall, and Rystedt contributes to addressing this research gap by investigating post-simulation debriefings in a Swedish university hospital involving medical and nursing students, with a focus on interprofessional teamwork. In the simulation scenarios, the students conducted a structured examination of a patient, and in the process, they had to practice teamwork, collaboration, communication, and leadership, including the adoption of a specific communication technique, SBAR, which is well-established within the healthcare profession.

The debriefings focused on what worked well and what could be improved in the scenarios so that students can be aware of which actions and routines had been successful. An important pedagogical goal of the debriefing was to change the students' perceptions of their own performance in the implementation of teamwork and collaboration in the scenarios. The study found that the videos served as an important resource in the learning process by providing a "third person perspective" to what happened during the scenarios. This helped students to differentiate between "appearance" (i.e. how they have performed) and first person "experience" (i.e. how they think they have performed) in those scenarios. A focus on this differentiation during the debriefing process was central to the efforts to convince the students to reflect on their own participation, through the facilitation of the instructor and the input of student-peers.

The study shows that the instructors addressed the goals of interprofessional teamwork, such as collaborating in a calm and structured manner and delivering concise and structured handover-reports, by guiding the students to see the recorded events in a particular way that is relevant for the professions. These "ways of seeing" are thus important aspects of professional practice and forms the foci for the collaborative learning.

Fostering targeted group practices through CSCL task and technology design

The learning contexts and the nature of the collaborations studied in the five articles in this issue are very different from each other. They vary from issues related to Internet and Society (Alterman and Harsch) in undergraduate courses, to interprofessional learning in medical education (Johansson, Lindwall, and Rystedt), to the learning about the concept of scale in elementary schools (Davidsen and Ryberg), to informal learning about electric circuits in museum settings (Tissenbaum, Berland and Lyons), and to collaborative dynamic geometry in middle schools (Stahl).

The level of coupling within these five learning contexts also differed greatly: from collaborating to achieve knowledge building goals as in the case of learning dynamic geometry or the concept of scale, to loose-coupling in the pursuit of divergent goals such as in the museum setting. There was also wide diversity in the nature and role of technology across the various collaborative-learning contexts discussed. In the interprofessional learning through post-simulation debriefing, the only technology used was video taken during the simulation exercises, which served as an artifact for use by the instructor to facilitate the collaborative discourse during the debriefing. In both the museum and elementary school settings, the technology—interactive digital tabletop and touchscreen laptop respectively—served as the medium for domain specific exploration and co-construction, while the communication and collaborative interactions took place in face-to-face settings. In the two other courses (dynamic geometry, and Internet and Society), the collaboration was mediated entirely by the online environment. The former used a web-based environment that was designed specifically for synchronous chat with shared visualization of geometric operations, while the latter used two asynchronous general platforms, wiki and blogs.

All five articles analysed the processes and mechanisms of the interaction involved in the collaborative interactions. Despite the diversities as summarized above, all the articles highlight the presence of specific features or forms of collaborative interactions as necessary conditions for the interactions to be productive. Based on the arguments in Stahl's squib, we refer to these as different forms of "group practices". Small-group practices are a part of social practice in which activities become enacted within groups. The example group practices identified by Stahl involved pointing, problem decomposition, turn taking, software usage, and geometric construction using VMT in the learning of collaborative dynamic geometry. A similar set of group practices was identified by Davidsen and Ryberg from their analysis of the children's collaboration involving bodily-material interactions. The boundary spanning perception (BSP) and boundary spanning actions (BSA) identified by Tissenbaum, Berland and Lyons as core mechanisms for productive divergent collaborative learning can also be conceptualized as group practices for DCLM. Alterman and Harsch identified the successful construction of a "venue" in virtual asynchronous collaboration space to be key to productive collaboration in their study. They described the evolving group practices as the students learned to negotiate an agreement on the problem(s) and objective(s) for joint problem solving on the online platforms, which included navigating the differences in ownership and identity in participation in wikis versus blogs. Johansson, Lindwall and Rystedt examined how instructors helped learners to reconceive their own participation and performance in interprofessional teamwork during post-simulation debriefing. The important group practice involved was the ability to take a third-person perspective in seeing their own or their peer's performance in interprofessional teamwork, and to differentiate observable performance from experienced (or perceived) performance in order to achieve reconceptualization.

In all four studies, the emergence of the necessary group practices for productive collaborative learning are an important part of the learning process. Further, these group practices are not considered as something that would automatically happen. The design of the learning environment, including the learning technology and the learning task(s), as well as the instructor facilitation play an important role in fostering the emergence of these group practices. All the authors emphasize that analysis of social interaction and collaboration of dyad and group practices will systematically inform the design, testing, and refinement of CSCL environments and practices. This also includes curriculum in specific domains, pedagogy, and theory. We hope that the four full-length articles and the squib in this issue will contribute to lively and productive debates on these critical issues to advance the field of CSCL.

References

Arnseth, H. C., & Krange, I. (2016). What happens when you push the button? Analyzing the functional dynamics of concept development in computer supported science inquiry. *International Journal of Computer-Supported Collaborative Learning, 11*(4), 479–502.

Borko, H., Koellner, K., Jacobs, J., & Seago, N. (2011). Using video representations of teaching in practice-based professional development programs. *ZDM Mathematics Education, 43*(1), 175–187.

Dillenbourg, P., & Evans, M. (2016). Interactive tabletops in education. *International Journal of Computer-Supported Collaborative Learning, 6*(4), 491–514.

Dillenbourg, P., Lemaignan, S., Sangin, M., Nova, N., & Molinari, G. (2016). The symmetry of partner modelling. *International Journal of Computer-Supported Collaborative Learning, 11*(2), 227–253.

Enyedy, N., Danish, J. A., & De Liema, D. (2015). Constructing liminal blends in a collaborative augmented-reality learning environment. *International Journal of Computer-Supported Collaborative Learning, 10*(1), 7–34.

Fanning, R. M., & Gaba, D. M. (2007). The role of debriefing in simulation-based learning. *Simulation in Healthcare, 2*(2), 115–125.

Furberg, A. (2016). Teacher support in computer-supported lab work: Bridging the gap between lab experiments and students' conceptual understanding. *International Journal of Computer-Supported Collaborative Learning, 11*, 89–113.

Goodwin, C. (2000). Action and embodiment within situated human interaction. *Journal of Pragmatics, 32*, 1489–1522.

Higgins, S. E., Mercier, E., Burd, E., & Hatch, A. (2011). Multi-touch tables and the relationship with collaborative classroom pedagogies: A synthetic review. *International Journal of Computer-Supported Collaborative Learning, 6*(4), 515–538.

Hontvedt, M., & Arnseth, H. C. (2013). On the bridge to learn: Analysing the social organization of nautical instruction in a ship simulator. *International Journal of Computer-Supported Collaborative Learning, 8*(1), 89–112.

Järvelä, S., Kirschner, P. A., Hadwin, A., Järvenoja, H., Malmerg, J., Miller, M., & Laru, J. (2016). Socially shared regulation of learning in CSCL: Understanding and prompting individual- and group-level shared regulatory activities. *International Journal of Computer-Supported Collaborative Learning, 11*(3), 263–280.

Jornet, A., & Roth, W.-M. (2015). The joint work of connecting multiple (re) presentations in science classrooms. *Science Education, 99*(2), 378–403.

Murata, A., Bofferding, L., Pothen, B. E., Taylor, M. W., & Wischnia, S. (2012). Making connections among student learning, content, and teaching: Teacher talk paths in elementary mathematics lesson study. *Journal for Research in Mathematics Education, 43*(5), 616–650.