

Different technologies, methodologies and epistemologies – is CSCL a community or communities?

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At the publication of each issue of the journal, we are pleased to present to readers the latest research papers that have gone through rigorous iterations of review and revision, and we have been using the editorial as a means for us to share what we see as exciting new ideas, methodologies, and breakthroughs contained in the issue. As a totality, the papers in this journal are also part of the evolution and development of CSCL as a field of inquiry. Furthermore, the journal also serves as a venue for the CSCL research community to reflect on progress, developments and challenges in the field. In the 12–4 issue of *ijCSCL*, Wise and Schwarz published the paper *Visions of CSCL: eight provocations for the future of the field*, which is a culmination of a two-year project to chart the future of CSCL as a field through interactions and consultations with individuals, and through designated sessions at ICLS 2016 and CSCL 2017.

The (Wise & Schwarz, [2017](#)) paper was intended to stimulate reflection and discussion in the CSCL community. (Rummel, [2018](#)) responded to Wise & Schwarz through a squib: *One framework to rule them all? Carrying forward the conversation started by Wise and Schwarz*, in which she put forward a taxonomy as a “kernel” for researchers in the CSCL community to jointly build a “comprehensive framework of CSCL support” (p. 128). In this editorial we wish to explore further whether and how the controversies identified by Wise and Schwarz can serve as a useful framework for us to locate these papers and to explore how these studies could be taken forward to advance the field through stimulating multivocal conversations and debates (Suthers et al., [2011](#); Suthers et al., [2013](#)).

There are four papers in this issue, three are reports of empirical studies, two of which are about novel forms of collaborative learning interactions using location-based technology, while the third is about teachers’ facilitation using a specially designed orchestration tool. The fourth paper is a theoretical discussion about collaborative cognitive load theory. In this editorial, we provide a brief description of each paper and highlight how it can contribute to our reflections on one or more of the provocations.

Community technology mapping (CTM): New literacies, new modes of collaborative learning or fragmentation in CSCL?

In the article *Community Technology Mapping: Inscribing Places When “Everything Is on the Move”*, Deborah Silvis, Katie Headrick Taylor and Reed Stevens report on a study of how students develop a new form of digital and spatial literacy, referred to as *locative literacy*, through engaging in informal collaborative digital mapping activity with family members (siblings or care givers) using Google Earth, a freely accessible location-based and digital mapping technology. In this study, they observe pairs of siblings or students working with a family member in the family kitchen to identify on a digital map, personally significant locations they visit, such as a friend’s home or an afterschool activity venue, and to draw out on the map the route they normally take to go from one location to another. The authors refer to the mapping process as inscribing places. Through analyzing each pair’s co-construction process on video together with the corresponding screen capture of the mapping process on the researcher’s computer, they identified that the children have used the mapping technology to make places visible, coherent and mobile.

This study introduces a novel collaborative task and an innovative approach to studying collaboration. How far readers value it as indicative of the future directions of CSCL research may depend on their perspective in relation to some of the controversies in CSCL raised by Wise and Schwarz ([2017](#)). Provocation #2 is on *whether CSCL should prioritize learner agency over collaborative scripting*. In the case of the CTM study, it provided a simple activity structure to the students, and left the rest to the children and their family members to decide on what was meaningful for them to map out. However, the tension here is not simply the value given to the individual’s self-determination, but also the value of CSCL within the broader framework of what counts as valuable learning (Shapiro, Hall, & Owens, [2017](#); Roberts & Lyons, [2017](#)). In cases where scripting is used, there are clear, predefined learning goals underpinning the learning context, and such goals are frequently explicit goals in the formal curriculum. In this CTM study, the authors are interested in exploring a new type of learning outcome, labeled as locative literacy, which can be conceptualized as an emerging human capacity closely associated with the now widely available location-based digital mapping technology.

Does this “locative literacy” qualify to be given the status as a learning outcome as mathematics, language or other common education goals that are addressed in the CSCL literature, or just an idiosyncratic invention of a group of researchers? Since the late 1990s, there have been major education reform efforts in many countries, mostly prompted by the recognition that there needs to be deep changes in the goals and processes of education in order to prepare students for life in a world that is increasingly driven by rapid increases in knowledge and globalization. The issue brought up by Silvis, Taylor & Stevens’ study is not simply whether locative literacy should be considered one of the twenty-first century skills, but whether there should priority be given to the investigation of more formally established learning outcome goals, or to uncovering emerging outcomes.

Another related issue is the relationship between CSCL and emerging outcomes such as locative literacy. In this study, the dyadic interactions provide a valuable

context for the children to make explicit their thinking process under an informal, relaxed atmosphere, giving the researchers access to rich data to gain insight into the inscriptions and the inscription process. On the other hand, if locative literacy were to be considered an important learning outcome in the school curriculum, one may debate whether CSCL should be adopted as the pedagogy of choice under such circumstances? Others may think that an instruction-led approach would be pedagogically more effective or efficient.

The CTM study also impinges on another controversy: Provocation #7, which pertains to whether there is a need for the technology used to be a CSCL environment designed on the basis of robust learning theories. The technology used in the collaborative inscription process is an enterprise digital mapping product for the general consumer, which is not even designed for the purpose of learning. The central tension of this controversy is what counts as CSCL, i.e. what counts as collaborative learning. As Wise and Schwarz ([2017](#)) points out, collaboration does not necessarily take place when there is interaction. One may be able to claim that collaboration has taken place as the interactions were guided by the specially designed CSCL environment. Provocation #7 argues that there is a need to have a precise definition of collaboration and show empirical evidence that such has occurred.

Learning through location-based games design: A scalable educational design for CSCL?

Jo D. Wake, Frode Guribye, and Barbara Wasson's study on *Learning through Collaborative Design of Location-based Games* also engages children in the use of location-based technology in their learning. However, unlike the CTM study, the study was conducted within the context of a formal classroom. The learning activities were carefully choreographed in close collaboration with the class teacher, who taught history. The theme chosen for the game design activity was Bergen's history during World War II, and the pedagogical decisions were designed in accordance with the national competency framework. Students worked in groups to undertake three phases of learning activities: game design, playing a game designed by another group, and production of a media product about the game they played. For the game design activity, students used an authoring tool for location-based games to be played on a smartphone. The methods adopted for data collection was typical of design-based studies: videos, interviews and student generated artifacts.

One of the provocations (#8) raised by Wise & Schwarz ([2017](#)) is whether CSCL research will have any significant impact on education at scale. The provocateur observed that the "CSCL community has mostly constrained its interest to relatively short-term implementations in small-scale and highly designed/constrained contexts" (ibid. p. 453), and that even when the research is carried out in classrooms, they are conducted in partnership with enthusiastic teachers rather than the norm. Given that the Wake, Guribye & Wasson's study was designed with a strong focus on aligning the targeted learning outcomes to the Norwegian national curriculum framework, would it be likely that this will have impact on school education in Norway or Bergen at large? An alternative

formulation of this same question is: what would it take for the outcomes of this study to have an impact on formal education in Bergen, Norway and beyond?

Orchestration and emergence of learning: Mutually facilitative or constraining

We have very different expectations of the music played by an orchestra as opposed to a jazz band. Both differ not only in the number of musicians and instruments involved, but also in the level of improvisation that is expected. In an orchestral performance, the conductor guides the team of musicians to play the predetermined pieces to achieve the effects that have been planned and practiced. There is no conductor in a jazz band. Anyone in the band can lead the interpretation and flow of the piece of music. There can be much more fluidity in the performance process as the musicians interact among themselves and with the audience. Anticipation of emergence is an important feature and the excitement for many who love jazz, either as a performer or as audience in a live performance.

Orchestration is a term that education has borrowed to refer to ways of designing the learning environment and organizing the learning process so that the learners will achieve the intended learning outcomes. Hence, to use the metaphor that Schwarz, Prusak, Swidan, Livny, Gal & Segal's used in their paper in this issue, the music (i.e. the learning outcomes) that results from the carefully designed orchestration system (the SAGLET environment) should be as planned if it is achieving its intended support function. SAGLET was design on the basis of VMT (Virtual Math Teams) environment (Stahl, [2010](#)), which is a well-developed system to support small group collaborative learning of mathematics. VMT does not constrain members of a team in what they do or how they collaborate. However, the problem they are assigned to solve implicitly constrains the problem space. Years of research on students' learning in specific math topics, including observations of student teams tackling such problems together in VMT (Sarmiento & Stahl, [2008](#); Stahl, [2011](#)), provide a mature technology infrastructure and rich knowledge base for the development of a technology system that can detect "critical moments" in a group's progress to provide alerts to the teacher. Schwarz et al.'s study shows that the teacher partner in the study was able to use the system to monitor and give appropriate feedback to the different groups based on the alerts from the system.

The authors use the term *emergence* to refer to "a process during which new ideas arise, that may lead to conceptual gains". To guide the conceptual learning process through social interactions, (Damşa & Ludvigsen, [2016](#)) identified the production of object drafts as key moments that would serve as the trigger points for further trajectories of epistemic development. Regarding Wise and Schwarz's provocation #2 on learner agency, the students' learning activities in this study were not scripted. However, there is strong guidance given to the students through the tasks and the teacher's intervention. The usefulness of the orchestration system in supporting the teacher's facilitation and intervention are predicated on the group learning process being predictable, thanks to the real-time learning analytics and alerts provided by SAGLET, which is underpinned by

strong assumptions about appropriate learning behavior and correct answers. There is emergence in terms of the diverse ways in which groups of learners navigate through the learning tasks (Furberg, Kluge, & Ludvigsen, [2013](#)), but the solution space is more or less predictable, which is very different from the nature of emergence in the other two papers discussed earlier. Both the process and products of learning in the CTM and location-based games design studies were unpredictable, and the students were able to exercise a much greater level of agency in those two studies.

While one may debate about what counts as emergence in student learning, as we have done here, it is clearly the case that there are important knowledge and core concepts that need to be learnt, in addition to the more generic capabilities often referred to as twenty-first century skills. Learning mathematics through collaborative learning in groups using the SAGLET environment is likely to be a more pleasurable and deeper learning experience than through direct instruction. It is interesting to note here that the SAGLET environment is realized through fine-grained, near real-time data and computational analysis to support collaboration, as advocated in Wise and Schwarz's provocation #6. On the other hand, it is still not clear whether such a system would be easily promoted for adoption by most mathematics teachers.

Cognitive load and collaborative learning

Kirschner, Sweller, Kirschner and Zambrano's paper is a theoretical treatise that argues for the extension of the cognitive load theory to collaborative learning contexts to "generate principles specific to the design and study of collaborative learning". The authors also claim that this collaborative cognitive load theory will be able to explain why CSCL does not always work. The paper takes a strictly information processing model of learning and sees working memory capacity as a primary factor influencing learning outcomes. Complex terminology and intricate descriptions are provided on the layers of processes involved in collaborative learning, highlighting how one's learning may benefit from having access to a larger collective working memory, but could also suffer depending on the group's experience in being able to work effectively together since part of the working memory will have to be devoted to transactive activities involved in the collaborative process. The authors consider collaborative learning as "an instructional intervention" and advise teachers to think explicitly about the cognitive properties of the students, task characteristics and group composition to decide on whether collaborative learning should be adopted at all.

This paper is very different from the other three papers in this issue in many ways. The most fundamental difference is captured by Wise & Schwarz's provocation #4, with this paper being on the analytical end of the epistemic spectrum while the other three are on the interpretive end. According to Jeong, Hmelo-Silver & Yu's ([2014](#)) analysis, only around 11% of the papers published between 2005 and 2009 was underpinned by an information processing theoretical framework, while the most popular theoretical frameworks associated with CSCL were constructivism (33%), socio-cultural theories (25%), and social psychology (15%). It is worth noting that while these latter three theoretical

frameworks are distinct from each other, they are not mutually exclusive or incompatible, even though the emphases are different. On the other hand, there is no apparent epistemological alignment between an information processing approach and these other three theoretical frameworks popularly adopted in CSCL research. The editorial policy of this journal is grounded on the quality and rigor of the paper, and not on theoretical grounds. We firmly believe that theoretical and methodological diversity are essential to advances in CSCL. It is our hope that the co-habitation of different approaches in this journal will stimulate debates and fruitful discussions. One of the motivations for the journal to create the squib format was precisely to serve as a venue for scholarly interactions to achieve productive multivocality and avoid co-alienation. We look forward to receiving squib submissions that would help to further our mission in this direction.

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