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CSCL towards the future: the second decade of *ijCSCL* Q1

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Changes in the leadership of the journal Q2

The Editor-in-Chief, Gerry Stahl, decided some months ago that he wanted to step down as editor. The Board of ISLS launched a call for a new Editor-in-Chief in the fall 2015. After the processes involved in the search committee and the Board, the decision was made that I be appointed as Editor for a period of 4 years.

The CSCL community celebrated Gerry Stahl's achievement as a scholar and editor for the journal in Gothenburg in June 2015. Even though it has been said before on many occasions, it is important to say it again – Gerry has done an amazing job for the community over a 15-year period, building up a world-leading interdisciplinary journal, helping to found ISLS and pursuing his own CSCL research agenda.

At the meeting of the *ijCSCL* Editorial Board in Gothenburg (CSCL 2015 conference), a number of themes were listed as important for the CSCL community to engage with (Stahl 2015). These themes represented classic themes in CSCL, but also new challenges for the community. The challenges were related to how we conceptualize collaboration when the technologies make new forms of collaborative learning possible, and the new methods and techniques that emerge influence both quantitative and qualitative methods.

To continue developing the journal and leadership, we need different competencies among the editors, the Editorial Board and the reviewers. I would especially emphasize that we need key actors in the field with backgrounds in computer science and with new developments in statistics. The Editor-in-Chief and the Executive Editors must cover the different core areas in CSCL. During this spring, I will, together with the Executive Editors, work to expand the Editorial Board.

The journal will continue to take the lead in defining research frontiers about human-computer connections. With a focus on collaborative learning and computer support, the journal has published a wide range of studies in many different knowledge domains. These studies share a core focus (i.e., collaborative learning and computational support), while the domains, contexts and methodologies vary. The journal has a clear strength in that it has

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maintained a strong focus on how to understand and explain collaboration in relation to computational support. (See the *ijCSCL* mission at: http://ijcscl.org/?go=ijcscl .) Many journals in the field publish studies on computers and education as well as computer-assisted learning to address important questions. However, the specific aspects addressed by this journal create a cumulative structure that broader, thematic-oriented journals cannot achieve. The profile of this journal has contributed to its strong reputation as a high quality, interdisciplinary journal in the fields of learning sciences and educational research.

Learning research has been my main interest the last 25 years. Since 1999 when I took part in building up the InterMedia interdisciplinary research center, CSCL has been my main field of research and still is. Today I conduct studies with designs that involve quantitative and qualitative methods (mixed methods). In these studies, interaction analysis of the collaborative learning is included. I undertake studies both in schools and workplace settings.

We have hired PhD Rolf Steier as the new managing editor. He is a post-doctoral fellow at the University of Oslo in the Department of Education. He has his Master's degree from Stanford University in Learning, Design and Technology and his PhD from the University of Oslo within the field of the learning sciences. His research has focused on designing digitally mediated face-to-face learning interactions in formal and informal settings. He will be working with authors in this journal to bring articles to publication.

The Program Committee at the learning sciences conference in Singapore (ICLS 2016) has invited a group of CSCL scholars to present and discuss their visions and strategies for the CSCL community in the coming years. This will create an important basis for my work, together with the editors and the Editorial Board. I will pay special attention to the interdisciplinary directions that CSCL research takes, and maintain the diversity of perspectives and stances as driving forces in CSCL. In the editorial in the September issue, I will present the results from the symposium in Singapore.

CSCL towards the future

In the last editorial, the previous Editor-in-Chief presented his perspective on a decade of publication of CSCL research (Stahl 2015). The editorial provided an excellent overview of important trends in the CSCL field, evident in the history of CSCL itself and related fields of knowledge. This historical reflection about theoretical stances and methodological issues leads to some important observations and reflections that will be part of the agenda in the coming years. I will use some of these reflections as a basis for pointing out some challenges and opportunities for the CSCL field as we enter the next decade.

I found the observations interesting, particularly that CSCL theory has contributed to a high degree of understanding of collaboration in groups, collaborative knowledge building and group cognition, while, to a lesser extent, in technology design and analytic methodology. We can see this as a hypothesis that is based on 10 years of editorial work with the *ijCSCL* journal, and participation in the community. This observation could also mean that the CSCL community needs to develop models that include both group cognition and how each individual participates within group processes. We can have different units of analysis and levels of descriptions, but also conceptualize how individual contributions constitute the group collaborative efforts. It may be easier to design scaffolds for an individual's social and cognitive functions than for the social and content-based scaffolds of small groups and of larger social units, but a full understanding requires both.

Another important observation involves asking what the computer support is designed for and which part of the instructional (pedagogical) design involves collaboration between students and teachers. In many CSCL studies, some social aspects are not part of computational design. In such designs, we want attention to specific features that create meaning potential and regulation for students. However, designing for emerging properties of collaboration is a different challenge. Here the overall instructional design and institutional aspects can be seen as dimensions that influence how the students choose to orient themselves in the collaborative effort.

CSCL and Design-Based Research are often seen as tightly related. When DBR became an accepted approach during the late 1990s, many CSCL researchers made use of its principles. The classical method (e.g., Brown 1992) was based on pre-posttest design with control groups in naturalistic settings. Some scholars have followed this path. The DBR principles have also been altered towards the use of both experimental and ethnographic methods. In the CSCL field, DBR is an approach that makes it possible to test new technological features and representations (e.g., visualizations) with a clear scope and rigor (Jeong et al. 2014). Q3

Another interesting question to consider is how phenomena like mass collaboration and learning analytics will change the CSCL field. These new social configurations and environments challenge mainstream assumptions about collaborative learning and ask us to reconsider the types of research design and methodologies that will become most productive and influential in the coming years.

In CSCL research, one can identify influential studies that are based on either the cognitive, socio-cognitive or socio-cultural perspectives (Damsa 2014; Overdijk et al. 2014; Cuendet et al. 2015; Enyedy et al. 2015). These different orientations imply that the scholars' analytic attentions are directed towards different aspects of learning and human cognition, and how the computational support enhances the learning activities. The most important difference is how collaboration is accounted for. Within the cognitive and socio-cognitive perspectives, individual processes and outcome measures are normally assessed. The socio-cultural studies have mostly been concerned with the investigation of emerging interactions and practices. Conceptually, one could frame the different units of analysis in CSCL as three interdependent layers—individual, small group and community—all of which are needed to understand and explain collaborative learning with computational tools. The CSCL research community conducts both quantitative and qualitative studies, making use of mixed methods approaches. We explore ways to discriminate between what can be explained by social interactions and by individual students' actions. In order to understand collaboration with computer support, we need experimental studies, quasi-experimental studies, naturalistic studies, randomized controlled trials and use of a wide range of analytic techniques. This means that both experimental and naturalistic settings are required to further explore key issues in the CSCL field.

As a community, we need variation in the units of analysis and levels of description. This is what, in sum, makes the CSCL community a robust and vibrant research field that can contribute to new conceptualizations of computer support for collaborative learning, and empirical evidence that can contribute to more advanced learning activities in schools, higher education, and leisure time. The papers in the issue address several of the challenges emphasized in this introduction.

The four papers in this issue contribute with new insight into:

- How scripted roles can be used to enhance students understanding of knowledge building principles;

- How resistance and perspectival understanding in chat logs support the students' agency to move beyond simple statements;
- How students can move towards formalization of mathematical language in an environment without experts present; and
- How vital teachers can be for scaffolding students' conceptual sense making when students move from a lab experiment towards writing a short report.

Knowledge building and scripted roles

Knowledge building has been a highly influential perspective within CSCL. In this journal as well as the CSCL conferences, there is an accumulated body of knowledge that builds on and extends the original work of Marlene Scardamalia and Carl Bereiter (most recently, Resendes et al. 2015; Chen et al. 2015). The founders of the knowledge-building theory have, of course, also developed original ideas through new theoretical and empirical contributions. Another line of prominent CSCL research is the scripting of specific roles (Fischer et al. 2013). Donatella Cesareni, Stefano Cacciamani and Nobuko Fujita combined these two lines of research in an interesting way to study specific roles and conversational functions within the framework of knowledge building. Their empirical context is undergraduate students in a pedagogy course at the University of Rome. The students are enrolled in a blended environment that exposes them to lectures and on-line activities. Based on their review, the authors designed four roles to support the students' understanding of knowledge-building principles: social tutor, synthesizer, concepts mapper, and skeptic. The assumption was that these four roles would scaffold the cognitive responsibility for building common knowledge in the community.

The authors used a combination of different methods. In one study, they analyzed the role takers and non-role takers based on the number of their contributions to the Moodle environment. In addition, they performed a qualitative analysis of two different groups, one with a high level of participation and one with a low level of participation. In the second study, the focus of the analysis was on role taking and the content of online contributions. Also in this study, quantitative and qualitative analyses were performed. The overall analysis showed that the prescribed roles scaffold the students' cognitive responsibility for building common knowledge. The social role supported organizing the interaction and made it possible for all the members of a group to contribute. The four different roles enhanced the students' ability to move between their personal goals and to contribute to the collective knowledge of the group. When students have scripted roles, they are positioned in the group and can develop their roles further. This supports the metacognitive dimension of the knowledge-building activities. This study and its findings contribute to the two important lines of research in CSCL, and show how one can design a learning environment in a naturalistic context for undergraduate students will inspire other CSCL researchers to test out similar designs.

Mediated communication and knowledge construction in chat logs (online-asynchronous discussion group)

A particular type of study in CSCL involves analysis of an asynchronous discussion group (Wise et al. 2014). The study by *SoonAh Lee and Kwangok Song* uses resistance and perspectival understanding as its key concepts. These concepts are used to explore how participants in undergraduate courses in psychology participate in asynchronous discussions about learning theories. The methods that were used are descriptive statistics and discourse analysis. The relationship between resistance and perspectival understanding resembles classical themes in educational psychology, like cognitive conflict and different forms of alignment. The concepts make it possible to weave together cognitive and social processes. The term resistance refers to the idea that students come to teaching and learning activities with ideas, intuitions, beliefs, assumptions and knowledge that need to be cultivated through dialogue and other activities. A dialogue between students will involve multiple ideas. Resistance also goes beyond cognitive mechanisms; it involves emotions and attitudes in the collaborative efforts. Through conversations, the resistance can become part of what is at stake in dialogue and it is possible for the participants to become aligned both socially and conceptually.

Alignment is a concept that is used in different traditions in social science and psychology. Terms like perspective, stance and frames can be seen as part of a foundation for different forms of alignment. These concepts go back to authors like Goffman and to recent work from Q4 van de Sande and Greeno (2012). The authors take a sociocultural perspective and see mediation and use of language as foundational for the learning processes. In the analysis, descriptive statistics are used to analyze messages with and without resistance. The results show that there are more messages without resistance then with resistance. However, it is the resistance messages that create most messages with perspectival understanding. This implies that it is the resistance messages and the perspectival understanding that together create the conditions for elaboration, deepening and new insights into the knowledge domain. The development of the students' knowledge emerges through the threads as part of the course. For the CSCL community, the findings are relevant because they point out important social and cognitive functions that could be computer supported, and instructors can use such insight to revise their courses and the activities.

Group cognition and mathematics

The analysis of the move from visual to more formalized knowledge in a field like mathematics is a contested area in learning studies. The virtual math team (VMT) environment embeds a multi-user dynamic-geometry application (GeoGebra) in a collaboration space. *Diler Öner*'s paper follows a line in CSCL that was established by Stahl (2006, 2009, 2013, 2016). This research tradition has given us new insight into how students might learn mathematics collaboratively in and outside school (Oner 2013). The instrumented VMT environment makes Q5 it possible to analyze the students' actual moves towards formalization in their mathematical reasoning. The question that is analyzed in the article by Öner is if—and how—computer support can help students make the moves towards formalization without having a teacher or a more knowledgeable peer present as part of the activities. The mathematical tasks are supported by the design of the VMT environment. In order to learn geometry, students manipulate and construct dynamic, interactive diagrams that incorporate theoretical properties of geometrical objects and their relations. The diagram is directly accessible to the students, but the theoretical properties are not explicit. The analytic concepts in the study are key words, visual means, routines and narratives—all features of mathematical discourse.

The article is a case study of three students who worked collaboratively to solve a geometrical construction problem. The selection of data is based on the principle of analyzing extreme cases that one can most readily learn from. In the case-study literature and design-based research, this is one of several analytic strategies used to improve the technical and instructional design of an environment (in this case, the VMT environment and its dynamic-geometry curriculum).

The findings are interesting and resemble other analyses of students involved in mathematical discourse in instructional settings (e.g. Saxe et al. 2015). Sometimes the students lack the technical vocabulary, yet based on detailed analysis, they can be shown to move towards formalizations of their arguments. The study shows that it is possible to design advanced environments that can support the development of mathematical understanding, even when domain experts are not present. Such environments can be seen as complementary to other forms of instruction. Case studies like this cannot, of course, be generalized to a population, but make a contribution of understanding and analytic generalization that other scholars can build on in their design and empirical analysis.

The teacher role in CSCL settings

In CSCL, different participant configurations form an important area of study. These can involve student-student groupings that are stimulated by tools, or students-tool-teacher interactions. These interactions in specific combinations can be an important aspect to consider for supporting learning. In the paper by *Anniken Furberg*, these types of interactions are part of the analysis. The teacher's support for the students' conceptual understanding is emphasized. One of the important findings in this study is that CSCL designers have a tendency to leave gaps between the technical and social design of the environment. The implication is that students struggle to connect what they do in a lab experiment and the concepts that they need to learn to develop their science literacy.

This case study builds on the design of the SCY (Science Created by You) environment (de Jong et al. 2012). The design of the environment is based on inquiry principles for learning science (Sinha et al. 2015). The descriptive statistics of students' help-seeking practices creates the background, while the interaction analysis makes it possible to follow the students' sense making in coordination with their teacher. The domain that the students work within is genetics, considered to be a very complex domain to understand, or what we call, a hard-to-learn problem (Hmelo-Silver and Azevedo 2006). The students work part of the time in lab settings, making use of tools required for the DNA analysis. The technical procedure that students undertake is a gel electrophoresis experiment.

By focusing on help seeking from students, the author is able to show that the students in this case ask more about the conceptual issues than about how to follow the procedure. Other studies have shown the opposite, that the teachers often use a lot of time and effort on social regulation. The conceptual struggle for students is related to connecting and identifying the right technical vocabulary. The move from procedure to formalized concepts is often a longer path to take than we anticipate. The cognitive proximity between procedures and concepts needs to be considered in the technical and social design. It is also important to note that the students in the SCY environment were able to engage in productive conceptual dialogues.

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We look forward to seeing you in Singapore in June!

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