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Approaching institutional contexts: systemic versus dialogic research in CSCL

Hans Christian Arnseth · Sten Ludvigsen

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Abstract The research literature in CSCL has rarely addressed the question of how institutional contexts contribute to constituting the meanings and functions of CSCL applications. The argument that we develop here concerns how the institutional context impacts the use of CSCL applications and how this impact should be conceptualized. In order to structure the argument, we introduce a distinction between *systemic* and *dialogic* approaches to CSCL research. We develop our argument by working through a selection of relevant studies belonging to the two perspectives, and conclude that not enough attention has been given to the emergent characteristics of activities where CSCL tools have been introduced. This is particularly the case in studies belonging to a systemic approach. Our basic argument is that a dialogic stance can provide important insights into how institutional practices shape the meanings and functions of CSCL tools. A dialogic perspective provides opportunities for making sense of learning and knowledge construction at different levels of activity, while at the same time retaining sensitivity to the mutually constitutive relationship between levels.

Keywords CSCL · Institutional practices · Context · Theory · Methodology

Introduction

A common interest in CSCL research is to study how different kinds of computer artifacts *can* and *do* scaffold learning as part of collaborative activities. This mutual reference point inevitably directs our analytical attention to discourse, simply

H. C. Arnseth (✉)
Institute of Educational Research, University of Oslo, PO Box 1092, Blindern, 0317 Oslo, Norway
e-mail: h.c.arnseth@ped.uio.no

S. Ludvigsen
Intermedia, University of Oslo, Oslo, Norway

because it is the most important medium through which thinking develops and is made observable (Mercer, 2000). Here we use *discourse* as a generic term indicative of all forms of talk and text. For this reason, it has been an important aim for many CSCL researchers to design for and investigate the forms of discourse that are crucial for the development of thinking (see, for example, Hakkarainen, Lipponen, & Järvela, 2001; Mercer & Wegerif, 1999). This research has generated many important insights into the structures and functions of discourse that are beneficial for learning, including how CSCL artifacts contribute to *structuring* such discursive practices (Baker, Hansen, Joiner, & Traum, 1999; Edelson, Gording, & Pea, 1999; Muukonen, Lakkala, & Hakkarainen, 2005; Scardamalia, Bereiter, & Lamon, 1994; Roschelle & Teasley, 1995; Suthers & Hundhausen, 2001).

Seeing that, how the institutional contexts into which CSCL tools have been introduced actually impact their use has not been a particularly important topic in CSCL research despite the recognized centrality of discourse (see Lipponen, 2001; Arnseth, 2004). This provides us with a rationale for critically examining this issue in more detail.

In order to grasp the institutional contexts of CSCL activities, we need a certain conception of *how* the relationships between discourse, learning, and technological tools on the one hand, and the context in which they are used on the other, can be conceived theoretically and pursued analytically. Our argument concerns how this relationship has been and perhaps should be conceived in CSCL research. The point is that differences in analytical practices have consequences for the generation and assessment of findings, for what we consider to be productive in terms of learning, and for how we as researchers can contribute to fostering the development of educational practices. However, it is also important to consider whether there might be any points of convergence across approaches, particularly relating to normative criteria for fostering effective CSCL environments.

In order to structure our argument, we introduce a distinction between what we term *systemic* and *dialogic* approaches to CSCL research (Dillenbourg, 1999; Linell, 1998). This distinction cuts across any neat separations between theories commonly employed in CSCL research—such as sociocultural or cognitive theories of learning and thinking—in that it directs our attention more explicitly to issues dealing with methodology and analytical practice. For example, even though many studies claim to adhere to more social and cultural approaches in theory, how the meanings and functions of CSCL tools are actually constituted in practice are rarely demonstrated analytically (Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003). As we will show, employing this distinction enables us to make observable how particular aspects of our object of inquiry—participants interacting with or through tools in an organised setting—is either made available or unavailable for analysis.

In order to provide a general context for our argument, we will first highlight some key findings in the CSCL field without necessarily discriminating between the technological tools, theoretical perspectives, or methodological designs employed. In the second section, the distinction between systemic versus dialogic approaches is defined and worked out in more detail. In the following two sections, we have chosen a few significant studies in order to work through the analytical and methodological argument being put forward. We then analyze an excerpt of data from our own research in order to provide a practical demonstration of the usefulness of our approach. Finally, we discuss the implications of the different

approaches including how together they might contribute to establishing a more well-founded body of knowledge as regards the effectiveness of CSCL.

A brief overview: successes and failures of CSCL

Numerous CSCL studies demonstrate the positive effects of CSCL tools on the quality and amount of social interaction and other features of the teaching–learning process. Moreover, theoretically derived hypotheses regarding the impact of information and communication technology (ICT) supported collaboration on learning have been supported by empirical evidence (Lehtinen, Hakkarinen, Lipponen, Rahikainen, & Muukkonen, 1999).

For example, CSCL is reported to facilitate task orientation and reflective activity (Cohen & Scardamalia, 1998), reasoning and argumentation (Hoadley & Linn, 2000), mathematical problem solving (CTGV, 1997), student's beliefs about the nature of learning (Hewitt, 2001), and the learning of complex scientific concepts and processes (Roschelle, 1992). Also, in comparative studies of CSCL and non-CSCL students, it is reported that CSCL students outperform non-CSCL students on standardized achievement test scores in mathematics and reading (Lamon, Secules, Petrosino, Hackett, Bransford, & Goldman, 1996).

Furthermore, CSCL is reported to support collaborative knowledge building, including progress in developing deeper understanding, generation of further questions for inquiry, and engaging in collaborative discourse to advance explanations and arguments (Edelson, Gording & Pea, 1998; Scardamalia, Bereiter & Lamon, 1994). In the same vein, it can support students in their establishment of shared understanding as part of collaborative problem solving (Baker et al., 1999; Roschelle & Teasley, 1995; Suthers & Hundhausen, 2001). CSCL is also said to facilitate student's meta-cognitive understanding (Brown, Ellery, & Campione, 1998). To summarize, these studies demonstrate quite clearly that different types of CSCL tools under certain conditions can be a part of practices that produce more effective and productive learning outcomes.

However, disadvantages with CSCL are also reported. Regardless of whether CSCL is used in distributed or co-located environments, lack of discussion, argumentation, and challenging of ideas are common findings (Guzdial, 1997; Hewitt & Teplovs, 1999; Lipponen et al., 2003). This is particularly the case when CSCL tools have been introduced into *ordinary* classroom settings. In these cases, activities have generally been centered on knowledge reproduction and on producing acceptable outcomes with the least collaborative effort. Moreover, ambiguity, disagreements, or diverging ideas are seldom resolved in any productive manner (Arnseth, 2004; Lipponen, 2001). Consequently, it is problematic to make the positive results reported above more generally relevant across contexts. According to Lipponen (2001):

> Although the new technology and the theoretical and pedagogical ideas support each other, the attempt to promote educational use of CSCL technology, and at the same time implement new pedagogical and cognitive practices of learning and instruction, appears to demand the utmost of both

> teachers and students. Many of the technical, theoretical, and pedagogical insights have not been transformed into widely adopted practices of teachers and students (p. 11).

However, as Lipponen (2001) is careful to point out, these rather disappointing findings (at least from a normative point of view) cannot necessarily be attributed to the nature of CSCL tools as such. On the contrary, the failures of technological tools to produce the proposed effects, including the pedagogical models underpinning their design, need to be examined in relation to the context in which they are used (Arnseth, 2004; Ludvigsen, in press). However, as will become clear, context is by no means an uncontroversial concept.

Still, in regard to these *failures*, it also seems necessary to remind ourselves that the majority of CSCL studies conducted in ordinary classroom settings are design and intervention studies, meaning that they are usually carried out over a few days or perhaps weeks at the most (see also Hakkarainen, Lipponen & Järvelä, 2001). Consequently, the CSCL tools in question have not become an integrated part of the long-term development of institutional practices (Wasson, Hoppe, & Ludvigsen, 2003). As a result, the existing features of schools—teaching practices, evaluation practices, or technological infrastructures—are seldom taken into consideration in accounts of findings. If they are referred to at all, they are generally conceived as internalized norms serving as explanations of failures, e.g., that the teachers and students had different goals than was implied by the CSCL tool in question (see Hewitt, 2001). As we will demonstrate in more detail below, however, the actual enactment of these practices has important implications in regard to the *effects* that CSCL tools might have.

To summarize, disagreements between the approaches suggested above mainly concern how the institutional context should be understood and identified within the analytical schemes employed. However, before we go any further, it is necessary to provide more detailed definitions of the approaches we are proposing.

Systemic versus dialogic approaches to CSCL

In order to simplify, we might say that a fundamental tenet of research adhering to a *systemic approach* is its attempt to generate models of how specific features of technological systems affect collaboration, reasoning, functions, contents, and structures of discourse (see, for example, Dillenbourg, 1999). The analytical purpose is not necessarily to develop causal models, but rather to identify the interdependencies between different variables, including how specific features of the technology facilitate students' understanding or ability to solve problems in a variety of knowledge domains (Salomon, 1993; Kirschner, Martens, & Strijbos, 2004). The task for the analyst is to describe and account for the configurations of elements that are most beneficial in terms of some outcome measure of what has been learned. That is to say that the analytical focus is on describing the systematic relations between forms of social interaction, and specific types of support or other contextual factors on the one hand, and qualities of outcome on the other. The result of such an analytical practice is the formulation of a model, or the readjustment of a previous model, which specifies the correlations between the variables

that were defined at the outset and inscribed into the analytical scheme employed. Such a model might state that a CSCL application, together with certain language practices, e.g., requests for clarifications, together are likely to produce positive learning outcomes (see, for example, Roschelle & Teasley, 1995).

In accordance with this approach, the institutional context would mark something that *surrounds* the activities in question and that constrains or perhaps facilitates in specific ways what the participants do (see also Cole, 1996). Having said that, institutional norms and rules are also internalized by teachers and students, and they can, for example, be identified through the use of questionnaires or interviews. Furthermore, their (cor)relations with specific technological affordances or outcome measures can be determined through statistical analysis.

In research adhering to a dialogic approach, on the other hand, the focus is on how the meanings and functions of discourse, tools, and knowledge are constituted in social practices (Säljö, 2000). According to Linell (1998):

> ...dialogism regards every cognitive and/or communicative act as an "answer," as *responsive* to something (often only implicit) in the contexts. A contribution to dialogue, whether a single utterance or a lengthy spate of talk, is made coherent by being related to some (often implicit) issue ("quaestio") of current relevance; the contribution must be rendered accountable (by the actor or the analyst) in relation to the ubiquitous meta-question "why that now (to me etc.)" (pp. 35–36).

The meanings and functions of one *variable* cannot be treated as distinct and separable from the others. On the contrary, the different elements mutually shape one another, and their meanings and functions are results of local negotiation and sense making. Thus, rather than being separable nodes in a network of relations, they become mutually laminated onto one another in and through social interaction. As such, social interaction with artifacts in an organized setting becomes *the* site where these processes are made available for study (see also Middleton & Brown, 2005). Thus, in order to understand how CSCL tools, pedagogical models, and knowledge are made sense of, including their possible effects on the pedagogical practices in question, we as analysts need to carefully scrutinize the sequential unfolding of activities along different time scales (Lemke, 2000). This is because any action is responsive to what happened before and at the same time it projects possible responses in the future (Linell, 1998). Therefore, instead of treating social interaction as a relatively neutral intermediary between cognitive and external contextual variables, it is brought into the center of analytical attention (Säljö, 2000; Wells, 1999; Wertsch, 1991). It is *here* that the meanings and effects of CSCL tools become available for study.

Of course, this kind of research can also identify genres and structures whose general relevance goes beyond the immediate situation, as well as being able to construct models of the kind of CSCL uses that are likely to be most effective and productive. However, instead of treating models as explanations of and templates for action, they are conceived as resources for action (Suchman, 1987). That is to say, their potential usefulness is established in dialogue with other features of the setting that the participants need to manage as part of their day to day activities (see Kvale, 1996; Rystedt, 2002).

In terms of how the institutional context is understood, the principal analytical ethos is to start with examining what students and teachers actually do (Säljö, 2000). This does not rule out any concern about examining the historical genesis of the artifacts or practices in question or the specific institutional arrangements having to do with technological infrastructures, division of labour, or specific institutional rules and regulations (see Mäkitalo & Säljö, 2002). The point is that this contextual framework is not seen as determining local practices. On the contrary, they are actively oriented to, reproduced, or resisted in and through action (Arnseth, 2004). Still, depending on the unit of analysis and level of description preferred, either individual's changing participation in dialogue or institutional orchestrations of learning could be highlighted in the actual analysis (Valsiner, 1994; Valsiner & Van Der Veer, 2000; Ludvigsen, in press).

To summarize, the aim is not to understand how different variables covariate, but rather to understand how the meaning of *knowing*, *knowledge* and *artifacts* is constituted in dialogue between participants, who through their actions are responding to various contextual features of the setting and are thereby making them relevant.

After having provided more elaborate definitions of the approaches, there is a need to demonstrate their consequences for analytical practice more clearly.

A systemic approach to CSCL research

In order to provide a detailed critique of research belonging to the systemic approach, we will focus primarily on discussion and inquiry types of CSCL applications. The reason for limiting ourselves to these kinds of tools is partly practical. In formal learning institutions, applications of this kind have existed for some time and they are generally available for use outside of design projects that are rather limited in terms of scope and dissemination. Computer-Supported Intentional Learning Environment (CSILE), for instance, was one of the first applications designed to support collaborative learning. Moreover, together with its various implementations such as *Knowledge Forum* and *WebCSILE*, it is one of the few applications that has been widely used and tested in ordinary educational settings over longer stretches of time (Miyake & Koschmann, 2001). Therefore, to provide a critical discussion of some of this research seems particularly relevant because the tool might have become more attuned to developing institutional practices.

In addition, according to Lehtinen et al. (1999) there is substantial empirical evidence for the fact that CSILE facilitates higher-order cognitive processes, regarding, for example, the ability to read difficult texts, the quality of developed questions, and the depth of explanation and problem solving in mathematics. Still, there is a need to unpack this evidence in a bit more detail.

For example, Hewitt (2001) did a comparative case study of two grade six Human Biology units, each taking place over 6 weeks, where, each day, thirty minutes were allocated for work with CSILE and thirty minutes for research. In his analysis he relies on an interview with the teacher in addition to the content of the CSILE database. The first unit represented the teacher's initial efforts to develop a knowledge-building community, while the second took place two years later. According to Hewitt (2001), the teacher had by this time developed instructional strategies that were closer to the normative pedagogical ideal embedded in CSILE.

The results from the first unit were disappointing (Hewitt, 2001). First, even though students followed the teacher's instructions there was a lack of collaboration. Second, there was a lack of conjectures, meaning that the students rarely shared their theories and assertions with others. Third, the plans that the students produced were weak and focused on topics rather than process. Fourth, the gathering of information was poor, meaning that students examined broad areas rather than specific problems, which resulted in a gradual accumulation of knowledge without any discrimination. Fifth, the students produced too many questions that were left unanswered and, moreover, they rarely referred back to their questions during their activity. Therefore, the questions played a minor role in structuring the activity. These findings resonate with the ones reported above relating to CSCL applications that were introduced into ordinary educational settings.

To assess collaboration, Hewitt examined each note in the database in order to determine whether it explicitly or implicitly referred to other notes. Only 15% of the notes fitted this rating, and about two thirds of this particular collection of notes was considered superficial in content. However, Hewitt does not provide any criteria for categorizing a note as being collaborative or not. Thus, it is not made explicit what is entailed by the categories *implicit* and *explicit*.

According to Hewitt (2001) this lack of collaboration might reflect that the students not understanding the nature and purpose of CSILE (Hewitt, 2001, p. 23). According to him, the students "...seemed to perceive the program as an environment for project-based work where their main objective was to seek out and replicate information from texts" (2001, p. 23). Even though the explanations provided by Hewitt seem very reasonable, he provides no evidence concerning how the activity proceeded. As such, the inferences about student perception of CSILE is simply asserted rather than demonstrated analytically. As we will show, this is an effect of the analytical scheme employed.

In contrast to the first unit, the second Human Biology unit fit the goals of CSILE to a larger extent because by this time the teacher had developed a set of strategies for facilitating discussion (Hewitt, 2001). The analysis of the database showed that the number of collaborative entries increased from 15% to 43%. Moreover, the percentage of messages rated as conjectures—messages that contained the tag *My Theory*—rose from 1% to 37%. Hewitt concludes that the change in activity patterns was mainly due to the fact that the teacher changed the focus from task completion to developing understanding. This is a very interesting finding indicating that when CSILE becomes more attuned with developing teaching practices, it is used more productively and effectively. However, the change of instructional practices is inferred only on the basis of an interview with the teacher. What is more, a change in student reasoning and problem solving is inferred on the basis of a specific thinking-type tag attached to their messages.

To summarize, Hewitt identifies a change in activity patterns, a change that he attributes to the development of teaching practices. This change in activity patterns is again linked to more productive reasoning. As such, even though he does not provide any correlational analysis, his research strategy is to describe a set of systemic relations. The development of teaching practices is a result of the fact that the teacher is able to align his practices with the CSILE design, and this is treated as an effect of his ability to internalize the CSILE pedagogy. Thus, how the changes in

practice develop in tension or in conjunction with the institutionally appropriate and authorized ways of doing learning and teaching is treated as analytically uninteresting by fiat.

In our view, these are general problems with studies that use content analysis of a CSCL database combined with interviews, surveys, or social network analysis as the only sources for making inferences about changes in teaching and learning practices (cf. Lipponen et al., 2003). That is to say, the nature of teaching and learning is predefined at the outset and, by the same token, how participants themselves actively establish contexts for learning is simply disregarded as analytically uninteresting (Jordan & Henderson, 1995). Thus, even though a *systemic* research strategy makes it easier to determine correlations between variables and to make systematic comparisons across datasets, it makes us miss on crucial aspects of the key object of inquiry for CSCL research.

A dialogic approach to research on CSCL

In order to demonstrate a dialogic approach, we will briefly address a few of the most relevant studies. The studies are also selected in order to illustrate differences in analytical practices within a broader dialogic framework. According to Stahl (2001), studies embedded in such a framework have not been particularly prominent in CSCL research (but see more recently Arnseth, 2004; Ivarsson, 2004; Ludvigsen, in press; Stahl, 2006). The types of ICT applications used in the studies discussed below are not necessarily comparable with one another or with discussion and inquiry types of tools. Neither have their use within the institutions in question been cultivated over long stretches of time. However, in this context we believe this is not a major problem as our aim is to compare systemic and dialogic research practices and not empirical findings as such. Still, for future research it is crucial to pursue dialogical research strategies over longer stretches of time in order to determine how productive uses of CSCL tools actually develop. At this point, such research designs are very rare.

In accordance with a dialogic approach, CSCL applications are not treated as a variable where their relationship to other variables can be determined statistically. On the contrary, the analytical concern is with how computer applications provide a context for social interaction.

Important contributions in this regard have been made by Mercer and colleagues (see, for example, Mercer, Phillips, & Somekh, 1991; Mercer & Wegerif, 1999; Mercer et al., 2003). For them, thinking is conceived as a form of communication where knowledge forms part of what the talk is about; that is, it becomes part of arguments, disputes, explanations, clarifications and so forth (Mercer, 2000).

In their research, they have put considerable emphasis on making what they term the *ground rules* for talk explicit to learners. Put simply, ground rules refer to "the implicit norms which govern the spoken interactions between teachers and pupils, and which generate its familiar and distinctive patterns" (Mercer et al., 2004, p. 4). According to them, *exploratory talk* is particularly productive for the development of joint thinking (Mercer & Wegerif, 1999). Exploratory talk is characterized by the mutual development, discussion, and reflection upon ideas and problems. Furthermore, it is a continuous and mutual accomplishment by participants engaged in collaborative activities.

In a comparative case study of collaborative activities involving the use of an educational computer program called Kate's Choice, Mercer et al. (2004) found that the discourse of the class where exploratory talk had been nurtured as part of a specific program was very different from that of a control class where the same software was used. Kate's Choice is a kind of interactive narrative, designed in order to facilitate moral reasoning. According to Mercer et al. (2004), the children asked one another task-focused questions, provided reasons for statements and challenges, considered several positions before making decisions, and agreed on a solution before acting on the computer program.

In contrast, in the control groups the child controlling the mouse made decisions without consulting others in the group, the choice of the most dominant child was usually accepted, arbitrary decisions were made without considering alternatives, and children spent very little time on each decision before moving on to the next step in the program (Mercer et al., 2004). Interestingly, the findings generated in the control group are similar to the ones mentioned above concerning the introduction of CSCL applications into ordinary classrooms.

Their findings suggest that if computer-supported collaborative group work is complemented with certain language practices, the computer provides a good framework for collaborative learning (Mercer et al., 2004). That is to say, students used the prompts made available by the tool as an opportunity to engage in exploratory talk.

However, as Mercer & Wegerif (1999) are careful to point out, the fact that the tool supports learning is not due to its design as such, but to the language practices in which it is entrenched.

Mercer & Wegerif (1999) argue that exploratory talk is an analytical category that they find useful for examining the relationship between talk and thinking. However, as they themselves acknowledge, it is not always easy to distinguish between different forms of talk in practice. Therefore, we as analysts still face the practical problem of identifying exploratory talk in what students and teachers do. By employing such a category we might miss out on how the talk actually emerges and how different aspects of language use co-constitute exploratory talk. Moreover, it makes it difficult to examine the diverse ways that participants' actions are produced in response to certain normative orderings made relevant by the situations in which they act. Therefore, focusing exclusively on productive talk and interaction makes it difficult to analyze how developing discursive practices also demand changing institutional practices.

In contrast, Crook & Light (2002) make institutional practices into a focal point for study in regard to the challenges involved in facilitating learning with ICT. Their concern is with the dynamics between *everyday practices* and *the practices of study*, something which is made relevant when students enter into their first year at university. An important question concerns whether computers might serve to re-mediate more traditional modes of academic communication, such as lectures, seminars, and tutorials. According to Crook & Light (2002), in order to facilitate processes of enculturation into academic practices, universities provide scaffolds that sustain activities such as:

> ...engaging with exposition, orchestrated discussion, research, systematic annotation, the focused reading of text, and a variety of other directed

activities that many students may not find easy to mobilize and manage independently (p. 174).

According to them, these practices of formal study are closely interrelated to practices that students are familiar with and which are well rehearsed as part of their everyday life. In short, they find that developing new practices with ICT is very difficult, something which is not due to students' lack of familiarity with the technology. On the contrary, they argue that the tools and their associated practices are not particularly well attuned to already existing practices. In regard to virtual seminars, for example, they report that the productivity of the interaction was dependent on whether the discussion was extensively moderated by tutors (Crook & Light, 2002). On the other hand, the asynchronous character of the interaction did not seem very productive for students. The authors argue that this was because it is too different from talk in seminars which, according to them, often go well because they are grounded in the everyday practice of speaking. However, they are careful to point out that the medium is not intrinsically problematic and such practices might become productive over time. However, this is dependent upon them being cultivated as part of various institutional practices, e.g., doing web-based tutoring on students assignments, etc.

Their basic argument is that formal learning can be very difficult, but that this is made easier by the fact that formal learning emerges out of practices with which students are already familiar (Crook & Light, 2001).

The relevance of this study in regard to our argument is that their analysis makes visible how the productivity of computer-supported activities is dependent on its fit with already established institutional practices. Thus, developing productive CSCL environments also entails changing institutional practices—the institutionally appropriate ways of doing teaching and learning. Still, a problem with Crook & Light's (2001) study is that they do not provide any detailed analysis of how these practices actually converge, diverge, or are enacted in social interaction. In order to develop our argument even further it is therefore necessary to provide an analytical example in order to demonstrate how the relations between knowledge construction, computer artifacts, and institutional concerns can be analyzed in some detail. In our example, the institutional context is analytically accounted for by what the participants display an orientation to and manage in and through their actions.

An analytical example from our own research

The excerpt we analyze is taken from the DoCTA NSS project (Design and Use of Collaborative Telelearning Artifacts, Natural Science Studios). In this project we introduced the CSCL application Future Learning Environments 2 (FLE2) into a classroom setting and we adopted the progressive inquiry model (PI) as the main design principle (Muukonen, Hakkarainen, & Leinonen, 2000). The categories the students were supposed to use in their knowledge construction were: *problem*, *my working theory*, *reliable knowledge*, *uncertain knowledge*, *comment*, *meta-comment*, and *summary*. These categories are modified versions of the ones found in FLE 2,

which is a discussion and inquiry type of CSCL application similar to CSILE (Ludvigsen & Mrch, 2005).

Generally, students displayed a certain difficulty with categorizing their notes both in terms of what categories they should use and how the categories could be used as scaffolds for the development of their arguing and understanding (see Arnseth, 2004).

In excerpt 1, the three girls—Sara, Anne, and Lene (S, A, and L in the excerpt)—who are all sharing one computer, are talking about what kind of category they should use as a description of a message in FLE2. The episode happened at a stage in their activity when they were engaged in *knowledge building* and used the categories embedded in FLE2 in order to develop their arguments.

How might we go about identifying parts of the context toward which the girls are displaying an orientation to in this excerpt? For example, in what ways is the CSCL application part of this context, and what is more, how can we identify particular institutional responsibilities having to do with how they deal with knowledge? What are the challenges in terms of developing more productive practices? Of course, in order to make substantial claims, we would need to examine how students used categories across groups and over time. Moreover, in order to make sense of their talk, we would also need to know something about the tool and the pedagogical ideas embedded within it. In this instance, this excerpt is used as a resource for illustrating a particular analytical practice.

Excerpt 1	
1. A:	eh:: relia
2. L:	No insecure knowledge,
3.	...
4. A:	No,
5. S:	Reli:able knowledge.
6. L:	=No it is not,
7. S:	It is reliable knowledge that one
8. L:	=It is not eh just because he says so.
9. S:	It is insecure knowledge.
10. L:	It is a bit different when it says that it was eh a survey,
11. A:	Why don't we just take that blue one (.) the white or
12.	something? One of those. (.) Process commentary. [pointing at
13.	screen]
14.	...
15. A.	It is not uncertain knowledge either you see? (...)
16. A:	...
17. A:	Which one did you take?
18. L:	Process commentary.
19. A:	yeah.
20.	...
21. A:	(...) white.

In the first few lines of the excerpt Anne and Lene disagreed on how they should categorize a particular knowledge object. In line 1, Anne expressed that they should use the category *reliable knowledge* while in line 2 Lene responded by saying that they should employ the category *insecure knowledge*. Anne produced another disagreement token in line 4. The particular knowledge object they were discussing is

an excerpt of a newspaper interview with a professor who is sceptical of the use of gene testing. In line 5 Sara joined their discussion and displayed agreement with Anne.

We can infer that the CSCL application structures their interaction in at least two senses. First, the practical task that the students encounter, which is to categorize a fragment of knowledge they have found in an additional text, is made relevant by the categories in FLE2. Thus, the system of categories that is inscribed in the technological system makes certain actions relevant on the part of the users (Goodwin, 1997).

However, it does not necessarily imply that they offer reasons for their choice, or to put it differently, the application does not determine how they go about categorizing. As such, choosing a category is very much a practical problem for the students. Furthermore, whether they are able to use the categories as scaffolds in their activity is, among other things, dependent on whether they challenge each other's ideas and whether these challenges are taken up and responded to by others.

Second, the tool makes available a whole set of categories, and it is not easy to distinguish between them because they do not mutually exclude one another. This is because any knowledge object can be categorized in a number of different ways.

In line 8, Lene provided a reason for her claim stating that they should not use the category *reliable knowledge* "it is not eh just because he says so." This account is interesting because it questions whether the validity of a statement should be assessed simply on the basis of the authority of the person who claims it. As such, it is an account that questions uncritical copying of knowledge from authoritative sources. In dialogical terms, this account could be a starting point for a more elaborate discussion of the epistemological status of the texts that the students were going to use in order to substantiate their claims. However, the opportunity for elaboration that is made available by this account was not taken up in the following talk. Sara did not challenge Lene to explain why it should not necessarily be treated as valid knowledge in line 9. Instead she suggested a different category. Another category that is available and which also might be considered relevant is *uncertain knowledge*. Here Sara simply readjusted her position in their joint discussion and displayed agreement with Lene's previous accounts in lines 2 and 6. That is to say, Sara inferred that the text in question should be given a label which is consistent with Lene's critique. The category *insecure knowledge* is an available category that can accommodate this critique and still be able to do the work required. Lene provided a more elaborate reason in line 10 where she stated that it is "(...) different when it says it was eh a survey."

An important point that needs to be emphasised is that deciding upon a category is connected with the practical management of disagreement within the group (Muukonen et al., 1999). Thus, the choice of the category *insecure knowledge* might enable the group to manage disagreement, something which is an important concern for participants in collaborative encounters such as this. However, even though this category might enable them to solve this particular problem, it is not treated as adequate by Anne who offers a set of alternatives in lines 11–13. At first she suggested "the blue one," which is *uncertain knowledge*. However, she also offered two other alternatives; "the white one," which is *meta-comment*, and the category

comment or "process commentary" which is the exact formulation she employed. She provided a reason for offering these alternatives in line 15.

Even though the system of categories structures their interaction, the students make use of them to manage their practical concerns, which in this case was to categorize a piece of knowledge, taken literally, without necessarily providing any reasons for why they have selected a particular category. We might say that they understand their task as involving the collection of arguments and to categorizing them in accordance with the template of categories made available by the artifact. Moreover, the tool is interpreted and constituted in order to fit this concern, which is about how they can go about finding facts that support their case and whether these facts actually qualify as facts and can be given the category *reliable knowledge.* However, in this particular case, this concern conflicted with internal group dynamics.

In general, there was a preference for this category, because it does some important work. On the one hand, it qualifies their accounts as credible and as more robust against rebuttal (see Arnseth, 2004). On the other hand, it also labels their accounts as being in accordance with their task, which was to produce reliable accounts grounded in authoritative knowledge. By employing this category students are able to manage their responsibilities for doing institutionally relevant actions. However, in order to analyze how students made sense of their task, we would also need to look into how the task is introduced and, subsequently, how this is taken up or resisted by the students. As such, the actual meaning of the task would be an *effect* of local negotiation.

Institutionally relevant actions are not fixed and immutable. On the contrary, even though the teacher did not challenge them here, there might be other episodes where he or she could request an explanation of why their arguments were reliable. Still, there is no guarantee that the students would take up and respond to this challenge. They might use evasive strategies and argue that they had done their task appropriately (Arnseth, 2004).

In this excerpt, through some form of minimal collaborative effort, a choice of category was made in line 18. The category they ended up with was the category *commentary*, a category which was not disputed by anyone within the group. However, it is also a category that was not necessarily relevant. This is due to the fact that the category *commentary* should ideally be a comment regarding the development of their knowledge-building activity. However, in this case the preference for agreement within the group made them use this category since it was uncontroversial.

Against this background, we can see that developing teaching and learning practices with CSCL tools is by no means straightforward, as a number of interrelated factors constitute such practices. That is to say, it is dependent on whether the students are able to make sense of the tool and see it as relevant. Moreover, the teacher needs to challenge the students and help them to make sense of their task, including how the tool might facilitate their work. As we have shown, the meanings and functions of the application are by no means self-evident to students. This is closely intertwined with what is constituted as institutionally appropriate ways of dealing with knowledge.

The concern that the participants in this excerpt were dealing with was to decide and agree upon a category that, for all practical purposes, could be used as a

description of their note. This task was institutionally embedded, in the sense that they were accountable for doing the task in a particular way. Institutionally there was a preference for the category reliable knowledge, that is to say they were supposed to develop their arguments so that they became more valid. However, as shown in the excerpt, this task was intertwined with internal group dynamics and issues having to do with the management of disagreement. The initial disagreement within the group was dissolved by invoking an uncontroversial category that the group could agree upon, but which, from a normative perspective of knowledge building, was not necessarily a relevant description of their note. However, in this case the preference for reaching agreement took precedence over the need for understanding the relation between some category and a knowledge object.

Concluding remarks and future steps

At this point in the development of CSCL as a field of research it is reasonable to ask whether there are any possibilities for convergence across approaches. We do not believe that the approaches discussed here can be reconciled in any simple sense. On the contrary, as we have demonstrated, they are to a certain extent incommensurable as they pursue very different analytical strategies. However, this does not mean that they cannot learn from one another. Acknowledging their differences, the approaches might inform one another in providing directions for future CSCL research. That is to say, research belonging to the systemic approach provides important findings in terms of what works and what does not across contexts, including how the effectiveness of CSCL applications might be systematically related to the previous experiences of students and teachers or features of the institutional context.

However, this kind of research does not provide any detailed information on how changes in teaching and learning practices actually come about and are negotiated in dialogue among participants responding to various normative features of the setting. In order to analytically make sense of this, there is a need to examine the sequential unfolding of activities along different time scales. Consequently, in order to gain further insights into the complexities of CSCL, we need both approaches, but it is important to keep in mind that they are useful for different purposes since they make different aspects of students' CSCL activities available for study.

Having said that, there is a need to spell out in detail what the points of convergence between the approaches might be. In and through our discussion, we believe that we are able to identify two fruitful points of convergence, discussion, and argument across these approaches.

As mentioned previously, in their comprehensive review, Lehtinen et al. (1999), argue that there is substantial evidence for the fact that CSCL environments, under certain conditions, bring about knowledge-seeking patterns and higher-order-thinking skills. However, these findings have not been replicated when CSCL tools have been introduced into more ordinary classroom settings (Lipponen, 2001). Consequently, Lipponen (2001), for example, argues that the productivity and effectiveness of CSCL applications is closely related to social and cultural aspects of the settings in which they are introduced. In the same vein, but focusing more explicitly on processes of cultural transformation, Crook & Light (2002) demon-

strated the complexity involved in developing the cultural practices of learning and teaching with the support of ICT at the university level. As such, research demonstrates quite clearly that *there is a need to take the institutional context into account*. This constitutes one point of convergence.

On the other hand, Crook (1998), for example, emphasized that CSCL environments can be beneficial for learning if students articulate their thinking and express their ideas so that limitations in understanding become accessible and publicly available (see also, Arnseth, 2004; Krange, in press; Rasmussen, 2005). This is a necessary process for revision and elaboration of ideas (Ludvigsen & Mørch, 2003, 2005; Stenning et al., 2002). Thus, regardless of the particular approaches employed, there seems to be some shared understanding of what it is that affords learning, regardless of whether learning is conceived as "internalization" or "changed participation in social practices." In the learning sciences, many different concepts are used to characterize such productive learning practices: for example overcoming cognitive conflicts and epistemological break downs, (re)framing of the activity at hand, re-establishing mutual understandings, responding to challenges by teachers and fellow students, and joint exploration of problems. All of them point to the fact that *students need to engage in transformative dialogue in order to develop more advanced problem-solving, reasoning, and arguing in regard to relatively complex curricular content*. Put simply, disagreements concern *why* it is that certain forms of collaboration and discourse are considered to be beneficial for learning. Despite these disagreements this constitutes the second point of convergence.

As we have demonstrated, however, these two points are closely related. That is to say, the historically developed practices of education are constitutive for the meaning and function of CSCL tools. Scardamalia & Bereiter (1996, p. 252; see also Hewitt, 2001) identify four characteristics of schooling that inhibit the development of student expertise. First, schooling still remains focused on individual student learning. Second, schooling deals mainly with demonstrable skills and formal knowledge that students are expected to memorize. Moreover, it is mainly the teacher who organizes lessons, asks questions, and summarizes activities. Third, to a great extent the learning objectives remain invisible to the students. That is, they are transformed into specific tasks and the procedures for accomplishing those same tasks. Fourth, the organization of the exercise of expertise is available only to the teacher and no mechanisms are provided for passing on the teacher's expertise to students. That is to say, educational practices are still grounded in a *transmission model* of learning and on a *mind-as-container* metaphor (Lakoff & Johnson, 1980), where, more or less, it is the individual student's responsibility to make sense of the teacher's instructions (Säljö & Bergqvist, 1997; Säljö, 2000). As such, facilitating learning with CSCL also entails changing these institutional practices. In order to understand how such changes come about, we also need to pay attention to the sequential unfolding of activities in time.

Our main argument is, therefore, that *we need to examine more closely how the meaning and functions of CSCL applications are actually constituted in practice*. In the CSCL community, research adhering to a dialogical framework can provide fruitful accounts for the temporal dimensions of learning and knowledge construction. As we have shown, this is crucial for understanding why CSCL applications fail or succeed. Paying close attention to the sequential organization of interactions might also enable us to understand how we can better facilitate learning with CSCL,

in the sense that we can generate systematic knowledge about the forms of support that are likely to have the proposed effects on student talk and actions. However, in line with the *dialogical* approach, these effects are not infallible. On the contrary, they need to be (re)produced in and through social interaction.

Transcript symbols

=	absence of a discernible gap
(.)	short pause
...	untimed pause
(...)	omitted or inaudible talk
?	marks rising intonation
,	continuing intonation
[ ]	clarifying information

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AUTHOR QUERIES

AUTHOR PLEASE ANSWER ALL QUERIES.

Q1. Edelson, Gording & Pea (1998) and Crook & Light (2001), Munkanen et al. (1999) were cited in text but not provided in reference list. Please check.
Q2. Please provide publisher information of Hewitt and Tevlops.
Q3. Please update bibliographic information if has already been published.
Q4. Please provide volume number.