Combining individual and group-level perspectives for studying collaborative knowledge construction in context

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Abstract

The aim of this article is to identify concepts and methods for studying collaboration in context. The article presents a two-level methodology designed to combine individual and group-level perspectives for the evaluation of collaborative knowledge construction in student groups. The group-level analysis is focused on the students’ negotiation processes. A self-report questionnaire gives insight into students’ short-term impressions, meaningful activities and personal meanings attached to different activities. Empirical examples of the analysis of a teacher student group illustrate the applicability of the methods used in investigating the mediating influence of context on collaborative activity.

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Research on collaborative learning has been criticised for neglecting the broader learning context in which the collaboration is embedded (Crook, 2000). Research has concentrated more on participants’ mental structures than on learning as a situated activity (Stahl, 2002). This type of research has focused on studying the relationship between the cognitive aspects of student interaction and individual learning. Positive results of collaborative interactions have been explained by the notion that peer interaction stimulates the elaboration of knowledge and hence adds individual cognitive gains (Van Boxtel, van der Linden, & Kanselaar, 2000). Thus, the main interest has been in investigating how collaboration contributes to individual knowledge construction, the mental content of individual minds. Yet, contextual aspects are also important in learning since knowledge is constructed reciprocally as part of the interaction between the individual and his/her environment, it is not objectively defined nor subjectively created (Barab, Hay, & Yamagata-Lynch, 2001). Further, it seems evident that individual-level processes of collaboration are necessary, but not sufficient in describing the building of shared understanding, and the analyses must therefore be extended to the group level, as well. This article presents a two-level methodology designed to combine individual and group-level perspectives for the evaluation of collaborative knowledge construction as a contextual phenomenon. This is done through empirical examples of the analysis of a student group participating in a teacher education course in a web-based learning environment.

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1. Theoretical background

The socio-cultural approach to learning, building on the Vygotskian (1978) framework, emphasizes the meaning of social interaction and the meditative role of tools in learning. According to Wertsch (1991), it is not possible to study thinking and cognition independently of the social, interpersonal, cultural, and historical settings. Cognition is a public, social process embedded within a historically shaped material world (Goodwin, 2000) in the sense that it relies on conceptual and material resources and tools that originate from our culture (Bliss & Säljö, 1999).

Understanding collaborative learning requires making sense of the conversation that students engage in and the tools that mediate their learning (Hmelo-Silver, 2003). Therefore, to study collaborative knowledge construction we need to examine group activity in its specific context. However, here the context does not refer to any predefined or objective environment (Goodwin, 2000) that could be treated as types of contextual variables typical in studies of causal relationships. Contexts only include those contextual dimensions that are relevant to the participants in the activity (Linell, 1998). Thus, the participants themselves produce and create the contexts in their joint activity by relying on those aspects of physical, social and cognitive environments that they find relevant in that particular situation and which then become a part of their activity (Goodwin, 2000; Linehan & McCarthy, 2001). Only some contextual resources, or tools, of all potential and available resources are made use of in the production of joint meanings (Linell, 1998). In the study of collaborative knowledge construction, the contextual approach brings the process of tool-mediated negotiation of meanings into the focus of analysis.

Although collaborative knowledge construction is understood as an emphatically interpersonal and contextual phenomenon, the role of an individual should also be taken into account (cf. Stahl, 2002). Crook (2000) points out that the perceived quality of experience is a variable we should study more carefully. He states that the affect that arises from the collaborative activity is related to the circumstances of the collaboration. Crook (2000) proposes a more ecological approach to the study of collaboration. Ecology refers here to the immediate environments within which a collaborative activity is supported — the resources and tools available. The situation evokes more or less positive/negative emotional reaction in us. In turn, this reaction is relevant to the motivation of greater or lesser task engagement. Taking this perspective, it becomes important to understand how individuals interpret the context, how they participate in producing the contexts of joint activity and what the dynamics between individual interpretations and collaborative activity are.

2. Aims of the study

The aim of this article is to identify methods for studying the process of collaborative knowledge construction as a contextual phenomenon and to combine both group- and individual-level perspectives in this analysis. Special attention will be paid to the applicability of the selected methods for analysing the role of the context and also to their restrictions and possible modifications.

3. Method

3.1. Methodological background

Exploring the role of context in collaborative knowledge construction activities calls for process-oriented methods. Process-oriented research into collaboration is needed to capture the situational dynamics of learning together, which sheds light on collaborative knowledge construction as a temporally evolving context-bound phenomenon. Such analyses not only describe the ongoing activity of the students but also illuminate their past; for example, through the socio-cultural context manifested in different learning practices or students’ prior knowledge about each other, topics, or concepts. The process-oriented approach can also be applied to investigate the dynamic and contextual nature of individuals’ interpretations. Individuals’ momentary thoughts, interpretations and actions are situational in nature and evolve in interaction between an individual and the learning context (Järvelä & Salovaara, 2004).

In this study, the three layers of collaborative knowledge construction — i.e. group-level collaborative activity, context, and individual’s contextual interpretations of the collaboration — are brought together to address the aims of the study. Thereby, the unit of analysis in this study is dually the groups’ collaborative knowledge construction as well as an individual student’s interpretation of the collaborative activity. In the interpretation phase, the different components...
of the analysis are brought together. This kind of approach follows the lines of mixed-method research (cf. Johnson & Onwuegbuzie, 2004). In this design, the mixing of methods takes place at the respective stages of data collection, data analysis, and interpretation. This approach also utilises the means of quantitative research to serve the principles familiar from qualitative studies. These principles include generating a rich holistic description of learning, embedding the research in the contexts and using different types of triangulation (e.g., Miles & Huberman, 1994).

3.2. Participants and context

This study is a part of a larger research project focusing on pedagogical structuring of collaborative learning in higher education (see Järvelä & Häkkinen, 2005). The subjects of the study consisted of five teacher education students studying the pedagogy of pre-school and primary education in a web-based learning environment. The group of five students was selected from among 31 students for detailed analysis in order to demonstrate the methodological solutions of the study. A detailed description of the task is given in Section 4.1.

3.3. Data collection

The data include asynchronous web-based discussion that the students participated in. Another part of the data was generated by a self-report questionnaire (for details see Järvenoja, Volet, & Järvelä, in press), which aims to reveal students’ personal experiences of collaboration in detail by anchoring the individual’s interpretations to particular learning situations. The students answered the web-based questionnaire right after finishing the given task. The questionnaire comprised 12 questions prompting the students to rate their experiences of the challenges they faced in the task. The challenges were assessed on a five-point Likert scale (ranging from 0 to 4). The challenges that the students were asked to evaluate included several aspects of collaboration such as group dynamics, coordination of collaborative action and joint goals (for the exact wordings of the challenges, see Table 4).

3.4. Data analysis

The analysis of the data involved two levels. The first level concerned web-based collaboration processes with a special aim to illuminate the collaborative, contextually embedded negotiation process among the students. The second level of our analyses focused on the individual’s perspective in the collaborative activity.

3.4.1. First level — Analysis of knowledge construction activity in the asynchronous web-based discussion

The analysis of students’ knowledge construction activity was divided into three steps. First, a qualitative content analysis was conducted to explore the thematic network of the messages: what knowledge or information was dealt with in each of the message? In what ways were the messages thematically interrelated? Second, the messages were analysed by their communicative functions. These were adapted from the analytical framework of language functions developed by Kumpulainen and Mutanen (1999). However, these language functions were not used as predefined categories but the specific context of the data was taken into account in interpreting the function of communication. Thus, the communicative functions were contextual in their nature depending on the topic of discussion and interpretations made by the participants involved in these discussions. Thus, they were “shaped by the socio-cultural context of the activity” (Kumpulainen & Mutanen, 1999, p. 456). The functional analysis of web-based messages was focused on the purposes the communication served in the given context. The communicative functions were not identified on the basis of their linguistic form as such. Rather they were identified by their content and form and by the effect and relation these had on discourse. The analysis focused on the nature of conversational exchanges between the students’ messages. Thus, the interpretation of the functions was made partly in relation to one or more other messages. The function of communication was analysed mainly at the utterance level. However, in some cases several utterances served the same function. Similarly, in some cases one utterance served multiple functions. The communicative functions were also used in part in evaluating the quality of collaborative interaction (e.g., Mercer, 1996). The communicative functions found in this study are listed in Table 1.

Third, Linell’s (1998) notion of contextual resources was used as an analytical tool in studying what resources the students used in their meaning negotiation. Contextual resources refer to those aspects of the potential context that the participants make relevant in the ongoing activity. Linell defines three general categories of contextual resources.
The first category of contextual resources, often called co-text, comprises the participants’ previous actions and discourse that is actively used in the “new act of sense making” (Linell, 1998, p. 132). The second type of contextual resources consists of the surrounding concrete situation wherein the participants act and the resources that from there actualise in their activity. This can include, for example, other persons, objects and artefacts present. While the first and the second categories deal with the immediate contextual resources, the third category covers contextual resources that are mediate and abstract. The third category includes background knowledge, assumptions or beliefs about the things talked about in a given discourse, or about other persons involved in the discourse. It also includes socio-cultural contexts, such as the abstract situation definition or the frame of ‘what is going on’ in the actual situation or the specific organisational context with its regulations and hierarchies. Hence, this first level of analysis targeted primarily the student groups’ knowledge construction, examining it through the network of conceptual relationships constructed in the discourse, and through the resources that mediated the group’s activity.

The thematic analysis and the analysis of the communicative functions and contextual resources were specifically the responsibility of the first author. However, discussions with the co-authors, which were based on excerpts of the analysis, helped to identify ambiguities in the definitions and interpretations of the categories. This contributed to more precise and better-grounded judgements.

Next, we will illustrate our analysis through two web-based messages handling the theme ‘reading comprehension’:

Message 13
More about reading comprehension Elina 16.3.2005
It is important that pupils are given a chance to become acquainted with different texts straight away from the first grade. The more versatilely pupils learn to read different texts the better they understand what they read. Reading different prose texts (adapted to the pupils’ level, of course) poems, plays, etc. will give child diversified readiness to develop reading comprehension skills. At the same time, children are encouraged and taught to seize boldly to different kinds of texts.

-Elina-

[Theme: Informs and justifies why reading different texts is important to the development of reading comprehension (Communicative function: Informative, Justificational), gives concrete examples of different texts (Informative) Contextual resources: Own conception, Curriculum material (web link in the learning environment) (concrete examples)]

Message 17
Re: More about reading comprehension Jukka 21.3.2005
The diversity of texts is very important because then children have a possibility to learn to understand that by different texts one can strive different things (and personally I feel this is an extremely important part of reading comprehension/not).
[Theme: Acknowledges the importance of reading different texts by justifying (Justificational, Elaborative)
Contextual resources: Co-text, Own conception]

But at least as important in the development of reading comprehension is that a child reads much and by his own
will. Good readers are usually motivated to read and this enhances their ability further and this holds true also for the
opposite case. Practice makes a master and hence it would be important that poor readers could find positive experi-
ences in reading.

[Theme: Elaborates the theme development of reading comprehension by bringing in and justifying the importance
of reading a lot and pupils’ own motivation to developing reading comprehension (Elaborative, Justificational)
Contextual resources: Co-text, Own conception]

Our practice class 2C at the Norssi School was, for their age level, a very good class in reading and I believe it was
because reading was considered a positive and joyful thing among the children. And they were willing to use time in
reading. I’ll be back once I’ve read some more material.

[Theme: Justifies the importance of own motivation for reading skills by giving a concrete example (Justifica-
tional), tells that is going to read the material (Organisational)
Contextual resources: Own experience based on practice period]

The thematic analysis of the messages reveals that the students were discussing on the themes ‘means to develop
reading comprehension’ and ‘concrete examples relating to means to develop reading comprehension’. In the first
message, Elina justifies why reading different texts is important to the development of reading comprehension. In
the next message, Jukka further justifies the same issue. Thus, Jukka builds on Elina’s idea. However, Jukka also elab-
orates or extends the theme further by bringing in the importance of practice and students’ own motivation to devel-
oping reading comprehension. Communicative functions also reveal that the messages are related to each other: Jukka
elaborates on the previous message and develops the theme further. The communicative function justifying also re-
veals that the students are not just providing information here but grounding the knowledge offered. The notion of
co-text in contextual resources also supports the fact that the messages are related to each other. However, it is im-
portant to note that co-text is not always directly interpreted in messages with the help of statements such as
“Like you said...”. It can be identified indirectly through a thematic analysis of the messages, when, for example,
some theme is continued and developed further in a subsequent message as was the case in this situation. As regards
other contextual resources in this example, the students leaned mostly on their previous common knowledge about the
issue (own conception), and in Jukka’s case on his experiences from the teaching practice period.

3.4.2. Second level — Individuals’ self-reported interpretations of the collaborative activity

The second level of our analysis focused on the individual’s interpretation on the collaborative activity. The anal-
ysis of the self-report questionnaire involved descriptive statistics of the context-specific challenges of collaboration
that individual students experienced in the task. This information was used to further explain the results derived from
the first, more qualitative type of analysis focusing on the group level. Linking questionnaires to observations that
were used to outline group-level processes made it possible to illuminate students’ individual interpretations within
a particular learning situation, which were not otherwise observable. Thus, the individual-level perspective was used
to complement and validate the interpretation of the group-level negotiations.

4. Empirical examples

4.1. Analysis of knowledge construction activity in the asynchronous web-based discussion

In this section, the analysis of students’ contextually embedded negotiation process is highlighted through one
group’s asynchronous web-based discussion. In the example, the students’ task was to choose a problem relative to
differentiation when teaching reading. They were also supposed to select appropriate teaching methods in relation
to the chosen problem. Finally, they were to produce a lesson plan for the document base. Necessary material was
provided as documents and web links in the learning environment. The students worked on the task within a three-
week period. In the initial analysis after reading the discussion several times, it seemed to comprise two episodes:
‘setting a problem’ (see Table 2) and ‘working on the problem’ (see Table 3).
Table 2
The analysis of the web-based discussion episode ‘setting a problem’

<table>
<thead>
<tr>
<th>Message (sender &amp; heading)</th>
<th>Theme of discussion</th>
<th>Function of communication <em>(in parenthesis)</em></th>
<th>Contextual resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ella Working plan</td>
<td>Suggests reading the background material <em>(Organisational)</em></td>
<td>Own interpretation of the task assignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggests selecting the LVP method <em>[learning to read through sign language]</em> for the task, gives information <em>(Suggestive, Informative)</em></td>
<td>Own experience on methods LVP and LPP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compares it to the LPP method <em>[learning to read through speaking]</em> suggesting it to be similar <em>(Comparative)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggests a working plan <em>(Organisational)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Elina Re: Working plan</td>
<td>Clarifies the task assignment by suggesting “shouldn’t we select some problem on teaching to read that we handle through the method we select” <em>(Clarificational, Suggestive)</em></td>
<td>Co-text, own interpretation of the task assignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comments on the LVP method and asks for further information <em>(Evaluative, Interrogative)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggests taking both methods, uses Ella’s justification *(they are similar) <em>(Suggestive, Justificational)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agrees on working plan <em>(Judgmental, Organisational)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td>3. Elina Re: Working plan</td>
<td>Clarifies the task assignment further by referring to the written task description “… problem relating to differentiation in teaching reading…” <em>(Clarificational)</em></td>
<td>Co-text, task description on the web</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggests a problem: “How to differentiate teaching from skilful pupil’s point of view” <em>(Suggestive)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggest reading the course material <em>(Organisational)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ella Re: Working plan</td>
<td>Answers about LVP without elaboration *(similar as LPP) <em>(Responsive)</em></td>
<td>Own conception</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disagrees about task assignment “My interpretation is as follows: we read the material links through, select one method, collect all the details, and collect it as a whole document” <em>(Counter argumentative)</em></td>
<td>Co-text, own interpretation of the task assignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asks clarification about the word differentiation <em>(Interrogative)</em></td>
<td>Task assignment,Co-text</td>
<td></td>
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<tr>
<td></td>
<td>Gives own interpretation by reflecting on different methods <em>(Reasoning, Elaborative)</em></td>
<td></td>
<td></td>
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<tr>
<td>5. Elina Re: Working plan</td>
<td>Suggests using the both methods as in message 2 <em>(Suggestive)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disagrees about task assignment “I still think we should select a problem which we could look through that method on teaching to read” <em>(Counter argumentative)</em></td>
<td>Co-text, own interpretation of the task assignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Criticises the ambiguity of task assignment <em>(Evaluative)</em></td>
<td></td>
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<tr>
<td></td>
<td>Tells that is going to work in weekend, suggests doing the task quickly <em>(Organisational)</em></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Wonders where the rest of the group are <em>(Social)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Ella Re: Working plan</td>
<td>Asks for a problem suggestion from other group members <em>(Interrogative)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Liisa Re: Working plan</td>
<td>Suggests deciding the problem relating to differentiation after reading the material <em>(Organisational)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agrees with taking the two methods <em>(Judgmental)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suggests deciding the problem after reading the material <em>(Organisational)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Elina Problem suggestion</td>
<td>Suggests reading comprehension as a problem <em>(Suggestive)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Justifies by referring to a book where LPP is mentioned as a good method for enhancing reading comprehension <em>(Justificational, Informative)</em></td>
<td>Co-text, course material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asks others’ opinion about the problem <em>(Interrogative)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wonders again where the rest of the group are <em>(Social)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Liisa Re: Problem suggestion</td>
<td>Agrees with the problem suggestion <em>(Judgmental)</em></td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tells that is going to read the material <em>(Organisational)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Answers that there should be still two other group members <em>(Social)</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Elaborates the theme ‘different methods for teaching to read’.
<table>
<thead>
<tr>
<th>Message (sender &amp; heading)</th>
<th>Theme of discussion</th>
<th>Function of communication (in parenthesis)</th>
<th>Contextual resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Elina More about reading comprehension</td>
<td>Informs and justifies why reading different texts is important to the development of reading comprehension (Informative, Justificational)</td>
<td>Own conception</td>
<td></td>
</tr>
<tr>
<td>14. Ella Re: More about reading comprehension</td>
<td>Tells about troublesome life events (Personal)</td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td>17. Jukka Re: More about reading comprehension</td>
<td>Acknowledges the importance of reading different texts by justifying (Justificational, Elaborative&lt;sup&gt;a&lt;/sup&gt;)</td>
<td>Co-text, own conception</td>
<td></td>
</tr>
<tr>
<td>18. Anna Re: More about reading comprehension</td>
<td>Acknowledges the importance of motivation by giving a concrete example on how to keep up motivation for reading (Elaborative&lt;sup&gt;b&lt;/sup&gt;)</td>
<td>Co-text, own experience based on practice period</td>
<td></td>
</tr>
<tr>
<td>19. Elina Re: More about reading comprehension</td>
<td>Comments the concrete example given in the previous message (Evaluative, positive)</td>
<td>Own opinion</td>
<td></td>
</tr>
<tr>
<td>20. Elina About the Jämsä article</td>
<td>Justifies the usage of analytical methods by giving a direct reference from the course article (Justificational, Informative)</td>
<td>Course article by Goodman &amp; Gollasch (web link in the learning environment)</td>
<td></td>
</tr>
<tr>
<td>21. Elina About the aims</td>
<td>Provides information on official aims relating to reading comprehension, definition of reading comprehension and concrete examples of different texts (Informative, Elaborative&lt;sup&gt;a,b&lt;/sup&gt;)</td>
<td>Curriculum material, co-text</td>
<td></td>
</tr>
<tr>
<td>22. Ella LPP/LVP — method</td>
<td>Disagrees with Elina’s interpretation about the analytical methods (M20) (misinterprets Elina’s message) and gives own interpretation (same as Elina’s) (Counter argumentative)</td>
<td>Co-text, own interpretation of the course article</td>
<td></td>
</tr>
<tr>
<td>23. Elina Re: LPP/ LVP — method</td>
<td>Agrees with Ella’s interpretation by giving clarification (Judgmental, Clarificational)</td>
<td>Co-text, own interpretation of the course article</td>
<td></td>
</tr>
<tr>
<td>24. Jukka Re: About the aims</td>
<td>Acknowledges the aims of curriculum concerning reading comprehension and demonstrates how they showed in practice by giving concrete examples from his practice period (Elaborative&lt;sup&gt;b&lt;/sup&gt;)</td>
<td>Co-text, curriculum material, own experience based on practice period</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reflects on aims in curriculum: agrees on importance of reading different texts, applying understanding to other subjects (Elaborative&lt;sup&gt;b&lt;/sup&gt;), importance of reading a lot; the practice class as an example of the efficiency of the methods used (Justificational)</td>
<td>Co-text, own conception of school curriculum, own experience based on practice period</td>
<td></td>
</tr>
</tbody>
</table>
4.1.1. Interpretation of episode 1 (Table 2)

With the help of the themes one can detect what knowledge students construct and how the pieces of information in different messages relate to each other, i.e. whether and how the students are building on each other’s messages. This first episode mainly involved two female students — Ella and Elina — negotiating about the meaning of the task assignment (Messages 1—5). As can be seen from the themes of discussion, Ella and Elina have interpreted the task assignment differently. What they agree on is the selection of the methods for the task (Messages 1, 2 and 5), but on the interpretation of the whole task assignment, ‘selecting the problem’, they disagree. For Ella, selecting the methods is ‘the problem’ (Messages 1 and 4), whereas Elina thinks the problem should be selected in addition to methods (Messages 2, 3 and 5). Finally, Ella asks other members’ suggestion for the problem (Message 6) and Elina offers a suggestion (Message 8). Thus, Ella implies that she accepts Elina’s interpretation of the task.

From the function of communication we can see that the students are reasoning and negotiating meanings by suggesting, clarifying, counter arguing and asking questions. Also the organisational function is frequent in the discussion, which is natural as the students are planning their activities in the beginning of the task. A contextual resource they draw on is the written task assignment, on which they base their task interpretation and to which they also refer directly (Message 3). Co-text in this case refers to the negotiation process where the students build their reasoning on each other’s messages. Thus, the other person’s message serves in part as a resource for one’s own interpretations.

What is interesting from the collaboration point of view is that while there are five members in the group, only Ella and Elina are negotiating about the task assignment and setting the problem. At the end Liisa only comes to agree on the selected methods (Message 7) and Elina’s problem suggestion (Message 9).

4.1.2. Interpretation of episode 2 (Table 3)

The theme (Theme c; ‘different methods for teaching to read’) raised for discussion in the first episode is given quite little attention in this second episode. We can see that only Ella and Elina are focusing on this theme later on (Messages 20, 22, 23). Ella disagrees with (Message 22) Elina’s interpretation based on the course material (Message 20). However, it turns out that Ella actually interprets Elina’s meaning incorrectly and as a result Elina clarifies her meaning (Message 23). As earlier in the ‘setting a problem’ episode, again these two students have different interpretations of the issue at hand and the function of communication is related to negotiation about interpreted meanings.

In the rest of the messages within the second episode ‘working on the problem’ three students — Ella, Jukka and Anna — are addressing the theme ‘reading comprehension’, which Elina suggested earlier as a problem (Message 8). In Message 13 Elina suggests a way to develop reading comprehension (reading different texts). In Messages 17, 18 and 24, the theme is further elaborated by Anna and Jukka and new aspects are offered: reading a lot and student motivation (Message 17), own interest in selecting books (Message 18), and the importance of practice in every subject area (Message 24). In some of these messages also concrete examples are given in support of these different aspects (Messages 17, 18, 21, 24, 26). Thus, two issues are elaborated in discussion: means to develop reading comprehension (Theme a) and concrete examples on how to support those approaches (Theme b). However, at no point of the discussion are these two themes relative to reading comprehension addressed from the viewpoint of methods, even though it
was the aim of the task given by the teacher and also the aim negotiated and accepted by three students in the first episode. The method theme (Theme c) and the reading comprehension theme (Themes a and b) were discussed separately and by different participants.

The function of communication in this episode is mostly to provide information and to elaborate the two sub-themes (Themes a and b). Thus, the collaborative activity is characterised by cumulative knowledge construction instead of exploratory one (Mercer, 1996). That is, in this case the students build positively but uncritically on what the other person has said. They are constructing shared knowledge through shared perspectives. However, they contribute to well-grounded knowledge by justifying their statements. As the function of communication indicates, there is no visible meaning negotiation about the concept of reading comprehension itself or the issues related to it. Hence, the students’ interpretation about the issue at hand seems to be commonly shared. There are no contradictions in the discussion that would reveal breakdowns in understanding. As implied by the contextual resources used in the discussion the students obviously have convergent conceptions and general knowledge about the issue at hand owing to their similar earlier experiences from the practice period as well as their earlier background knowledge, which might derive from formal teacher education. However, the students elaborate this shared theme (reading comprehension) indicating that they are constructing knowledge based on their unique experiences and conceptions.

In this episode, the notion of co-text as a contextual resource implies that the previous exchange is used as a basis for further elaboration on the theme. We might argue that also agreeing with or commenting on someone’s statement could be called co-text as the previous message is reflected. However, Linell’s (1998) notion of co-text as ‘new act of sense making’ is in our analysis interpreted to include only instances where some theme or topic is developed (e.g., elaborative function) or reasoned (e.g., clarificational function) further in relation to some previous message(s). Therefore, the frequent occurrences of co-text in this episode verify, for their part, that the students are constructing knowledge.

Another aspect to contextual resources is to look at what is not used for knowledge construction. In this example, there is only a little theoretical conceptualisation on the themes ‘reading comprehension’ and ‘methods’. The students refer to course material in rather few messages and from the potential and available resources offered in the web-based environment the students mostly refer to rather practical and superficial curriculum material instead of more theoretically oriented material. Hence, the knowledge constructed is based mainly on common and practical knowledge and this creates a ‘it makes sense’ type of atmosphere. The students seem to employ a kind of everyday discourse strategy, which helps individuals make inferences about what other people mean, and rely on the expectation that it ‘makes sense’, and thereby also help them avoid conflicts and disagreements (Linn & Burbules, 1993). The students’ activity is framed by this abstract situation definition (Linell, 1998) of ‘perceived sensibility’. Altogether, it seems that in this episode the students are more ‘strengthening what is already commonly known’ instead of ‘learning something new’.

4.2. Individual-level analysis by means of a self-report questionnaire

In this study, a web-based questionnaire was employed to evaluate the participants’ self-reported perspective in the web-based activity. Although the collaborative knowledge construction activity seems quite smooth and productive, from the analysis of the self-reported challenges we can see that the students experienced several challenges in the group work (Table 4). The most frequently reported challenges in the group are related to group members’ commitment to collaboration (M = 3.00) and their differing goals of the project (M = 2.33). As the relatively high standard deviations indicate, there are, nevertheless, clear differences in individual students’ ratings with respect to different challenges. This is also demonstrated in the group members’ individual interpretations of the challenges faced during the collaborative learning tasks (see Fig. 1). This information can shed some light on the group’s collaborative activity.

In this example case, the students experienced their group work rather differently. While Elina and Ella had fairly similar experiences of the challenges and found differing goals and incompatible styles of working as a challenge for their group’s collaboration, Anna and Liisa, for their part, did not experience too many challenges in the collaborative activity. The major challenge recognised by all of the students concerns group members’ commitment.

4.3. Incorporating the two levels of analysis

Students’ individual interpretations of the collaborative knowledge construction are also discernible from the qualitative analysis of the students’ discussion. There are clear differences in how the students participated in the
discussion and this is also shown, in particular, in their self-reports of the actual engagement in the collaboration. The most active participants (Ella and Elina) also reported more challenges than the rest of the group (see Fig. 1). Their concern of the differing goals for the task, as seen in individual interpretations, was addressed in the discussion as shown in episode 1, particularly in Messages 4 and 5, where they clearly disagreed about the task assignment (see Table 2). All the students felt the lack of commitment as a challenge in their activity (Fig. 1). Elina, who was the most active participant, found this a major challenge. This can also be seen in the discussion in the first episode, where she was wondering about the inactive participants on two occasions (Messages 5 and 8). Having different standards of work, which Elina considered another major challenge, might relate to the same phenomenon: uneven participation. Interestingly enough, also the least active participant, Liisa, found the lack of commitment as a big challenge, as if feeling guilty of her own inactiveness.

The self-report data support the view that in their collaborative discussion the students were building on each other’s messages. None of the students regarded that their different styles of interacting (challenge 4) posed a challenge for their collaborative work. In fact, their interaction leaned very much on ‘everyday discourse strategy’ as stated earlier (see Table 3). Neither the qualitative analysis of the web-based discussion nor the self-reported challenges indicate any actual instances where the content was negotiated critically and thoroughly. Rather, both these sources support the view that the collaboration is mainly smooth and uncritical. However, both Ella and Elina found differing understanding of concepts/task (challenge 11) as a minor challenge. This can relate to the misunderstanding they had about the concept ‘analytical methods’, as shown in their discussion (Table 3; Messages 20, 22 and 23). This might also relate to differences in the perceived goals of the project, which both of them named as a major challenge.

### Table 4
Students’ experienced challenges in the collaborative task

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Example group (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>1. Our goals for the project were different</td>
<td>2.33</td>
</tr>
<tr>
<td>2. We had different priorities</td>
<td>1.67</td>
</tr>
<tr>
<td>3. We seemed to have incompatible styles of working</td>
<td>2.00</td>
</tr>
<tr>
<td>4. We seemed to have different styles of interacting</td>
<td>0.00</td>
</tr>
<tr>
<td>5. People in our group did not connect very well with one another</td>
<td>2.00</td>
</tr>
<tr>
<td>6. Not everyone was fully committed to the group project</td>
<td>3.00</td>
</tr>
<tr>
<td>7. People had very different standards of work</td>
<td>2.00</td>
</tr>
<tr>
<td>8. Group members were not equal</td>
<td>1.33</td>
</tr>
<tr>
<td>9. Some people were easily distracted</td>
<td>1.67</td>
</tr>
<tr>
<td>10. Our ideas about what we should do were not the same</td>
<td>1.00</td>
</tr>
<tr>
<td>11. We differed in our understanding of the concepts/task</td>
<td>1.00</td>
</tr>
<tr>
<td>12. Our conceptions of how to organise the work varied</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Fig. 1. Example of the group’s self-reported challenges in the task. *Data from group member 5, Jukka, was missing.
A cross-examination of the data shows that the same aspects of collaboration are illuminated both in the group-level and in the individual-level analyses. What remain unclear, however, are the specific processes that mediate the individuals’ situational interpretations and group-level activities in an ongoing activity.

5. Discussion and conclusions

Collaboration in computer-mediated discussion has been typically evaluated by analysing and assessing the cognitive quality of discourse on individual messages (e.g., Gudzial & Turns, 2000). However, interaction that gets high ratings in terms of the number of high-order speech acts reveals little about the process of collaboration, as this kind of analysis discards the content and nature of knowledge construction that takes place in interaction (Stahl, 2002).

The present study aimed at developing methodologies for studying collaboration on the basis of what takes place between the participants in computer-mediated discussion. A two-level methodology was designed to combine individual and group-level perspectives for the evaluation of collaborative knowledge construction during a web-based teacher education course and to explore the influence of context on students’ collaborative activities.

The combination of an analysis of communicative functions and contextual resources enabled exploring the process of collaborative knowledge construction, e.g. the nature and content of discussion between the participants and the role of context in this activity. The study illuminated the situated nature of learning (Wertsch, 1991). The knowledge construction activity was grounded in wider contexts and mediated during the discussion by contextual resources such as instructional materials, prior experiences and background knowledge, for example.

The individual-level analysis focused on individuals’ interpretation of the collaborative activity. The analysis was helpful in validating the findings of the group-level analysis. In addition, the analysis illuminated possible reasons for engagement, or the lack thereof, in the collaborative activity. However, this analysis was not able to reveal individuals’ situational interpretations during the activity and how these might shape the meaning negotiations of the group. Thus, a future challenge is to study the mutual relationship between the collective and individual notions and to examine the situated dynamics of learning together; how the knowledge construction is mutually enhanced by both individual minds and collaborative efforts (cf. Barab et al., 2001).

Pedagogically, it is important to see that even though different groups work at the same tasks, the groups’ and individuals’ activity and meaning negotiations may differ extensively (see Arvaja & Hämäläinen, 2005). The present methodology offers tools for detecting possible reasons for these differences by revealing the influence of concrete and mediated contexts on collaborative activities. In turn, this helps identify critical points for structuring learning and teaching activities — that is preventing too various interpretations of the context. On the other hand, another challenge in structuring is how to avoid suppressing different ‘voices’ in the collaborative activity, and thus, to take into account the unique history of individuals.

Despite many new innovative ways to support human cognition and learning with technology, the problematic nature of investigating human learning still remains: it is always a matter of complex interaction of cognitive and social factors, motivational and emotional aspects and the features of the learning context (Crook, 2000). After all, one fundamental issue in these analyses is what kind of social interaction can be called collaborative and how the collaborative opportunities and individual abilities are matched. This issue has not yet been well elaborated in the current models of collaborative interaction analyses nor in the model of contextual analysis we propose. One should be careful to avoid over-analysing collaborative learning, or overly reductionist approaches to the study of rather complex communication settings (Hmelo-Silver, 2003). It is obvious that the data from multiple sources as well as individual and group-level perspectives call for a mixed methodology in order to gain better understanding of the dynamic and diverse contexts of collaborative learning.

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References


