FROM MULTIPLE PERSPECTIVES TO SHARED UNDERSTANDING: A SMALL GROUP IN AN ONLINE LEARNING ENVIRONMENT

From Multiple Perspectives to Shared Understanding: A small group in an online learning environment

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The aim of this study was to explore how learners operating in a small group reach shared understanding as they work out joint research questions and build a theoretical framework and to identify the resources and tools they used in the process. The learners' own interpretations of their group activities and learning were also taken into account. The data, consisting of group discussions and the documents produced by the group, were subjected to a qualitative content analysis. The group members employed a variety of resources and tools to exchange their individual perspectives and achieve shared understanding. Summaries of relevant literature laid a foundation for the group's theoretical discussions. Reflective comparisons between their book knowledge and their personal experiences of online interaction and collaboration were frequent, suggesting that such juxtapositions may have enhanced their learning by intertwining the content to be mastered and the activities entailed by this particular content.

Keywords: *Computer-supported collaborative learning; Knowledge building; Peer interaction; Shared understanding*

Introduction

Computer-supported collaborative learning (CSCL) has attracted growing interest in higher education (Strijbos, Kirschner, & Martens, 2004). CSCL can be seen as a promising way of promoting teaching and learning practices in educational settings (Lipponen, Hakkarainen, & Paavola, 2004). At its best, it can enhance interaction between learners, enabling them to share and distribute knowledge and expertise among group members in online learning environments (Strijbos *et al.*, 2004). However, merely offering learners a setting for joint activity does not necessarily lead to a successful learning situation (Kreijns, Kirschner, & Jochems, 2003). Discussions in online learning environments are often superficial, and the discussion threads tend to be short (Joiner & Jones, 2003; Mäkitalo, Salo, Häkkinen, & Järvelä, 2001; Stahl, 2002). In other words, knowledge building is a rare phenomenon in online learning environments.

Because of the complexity of the phenomenon, there is a variety of theoretical approaches to CSCL (e.g. Lipponen *et al.*, 2004; Stahl, 2004). However, two main theoretical perspectives on collaboration have emerged, based on Piaget's (1977) and Vygotsky's (1978) ideas respectively (see Lipponen *et al.*, 2004). The Piagetian

viewpoint focuses on the cognitive processes of individuals. According to Piaget, knowledge construction takes place when learners adjust their own cognitive knowledge structure to the current context by restructuring their knowledge or revising their concepts or by generating new knowledge. Piaget's ideas have been adopted by the socio-constructive approach.

Vygotsky's (1978) ideas, again, were taken up by the socio-cultural approach, which highlights the nature of knowledge building and the roles of artefacts in collaborative knowledge building processes. Therefore, if we are to understand learning we must explore how people adapt the artefacts of action and thinking available in their own culture and society (Säljö, 2001). According to Stahl (2005), socio-cultural perspectives indicate that learning and cognition are possible both at the level of groups and communities and at the level of individuals. The approach taken in this study is based chiefly on Vygotsky's ideas of collaboration, which foreground interaction between learners and the ways in which they build shared understanding and knowledge by using different artefacts and resources.

Learners engage in collaborative activities because they want to produce something as a means of achieving cohesive explanations based on previously

exchanged contributions and integrate concepts and relationships as a means of solving

a problem or problems or creating or finding out something (Koschmann, Kelson,

Feltovich, & Barrows, 1996; Roschelle & Teasley, 1995). According to Dillenbourg

(1999), building and maintaining *common ground* of some kind is a precondition of

successful collaboration among learners. The concept of common ground is used to

explain how individuals can share multiple meanings and understandings (Stahl, 2005).

The personal understandings of several distinct individuals must be articulated when

producing *shared understanding* through, for example, discussion about, negotiation

over and acknowledgement of a range of differing views (e.g. Barron, 2000; Beers,

Boshuizen, Kirschner, & Gijselaers, 2005; Bromme, 2000; Clark & Schaefer, 1989;

Dillenbourg, 1999; Koschmann, Zemel, Conlee-Stevens, Young, Robbs, & Barnhart,

2005).

Stahl (2004) describes collaborative *knowledge building* as a cyclical process

where individual perspectives or understandings are made visible. Building a shared

understanding of comprehensible issues involves the expression of individual

understandings by using psychological artefacts such as concepts. In this process,

learners verify and negotiate their individual views so as to reach shared understanding

or group cognition (Stahl, 2005). This negotiated shared understanding becomes the

learners' tacit knowledge, available as a resource for building further new

understanding. Thus, building collaborative knowledge involves analysing and

elaborating any issues at hand through continuous interpretive processes mediated by

linguistic, cognitive, cultural, physical and digital artefacts (Stahl, 2004). This means

also that learning is connected with the situation where it happens and that it should not

be assessed separately from the context created by the learners in this particular

situation (e.g. Koschmann *et al.*, 2005; Chan & van Aalst, 2004).

Mercer (2003) similarly highlights the role of the context in collaborative

activities. According to him, learners should themselves build the foundation, the

context, for their subsequent joint activity (see also Dillenbourg, 1999). Mercer (2003)

argues that the resources available for building a shared context include any knowledge

that those involved might have of *shared history*, to which they can appeal directly or

indirectly. Such shared knowledge functions as *a common frame of reference*; it might

consist of a text or book read by the learners or *collective remembering* where they

discuss their past experiences and their past joint activities (Mercer, 2003). Both Stahl

(2004) and Mercer (2003) point out that in small-group interaction, as the participants

engage in the complex negotiations that make collaborative knowledge building

possible, group meanings become intertwined, in subtle ways, with individual

interpretive perspectives.

Barron (2003) has also described collaboration as involving a

dual-problem space where learners must engage with and develop a content space

(tracking and evaluating their own and other people's epistemic processes) and a

relational space (interactional challenges and opportunities), which are united in *three*

distinct interactional dimensions. In successful collaboration learners firstly address a

common task or problem and build knowledge together by drawing on each other's

ideas and elaborating on them. Secondly, the learners are all equally able to contribute

to knowledge building by listening to one another's ideas, acknowledging them and

developing them further. No idea is turned down without negotiation and reasoned

analysis. Thirdly, during critical phases of the collaborative problem-solving process

every learner's attention should be focused on the task at hand. (Barron, 2000.)

An exploration of how people collaborate on building knowledge and shared

understanding must pay more attention to group-level processes of interaction and

consider also the contextual features present in computer-mediated learning

environments (e.g. Crook, 2000; Mercer, 2003; Stahl, 2004). There are some studies

that concentrated on investigating collaboration in face-to-face situations or in

face-to-face sessions around the computers (e.g. Arvaja, 2004; Barron, 2003; Beers *et*

al., 2005; Jeong & Chi, 1997), but studies which foreground the group as the analytic

unit and look at the collaborative group process extending from the beginning to the end

of an online learning course as a whole are less common. Koschmann and colleagues

(2005) argue that if interactional work is supposed to generate learning, then the process

of interaction and the process of learning should be located within the same discourse.

In investigations of the relationship between learning and interaction, *the felt quality of*

learners' experience of the collaborative activities should be studied in more depth

(Crook, 2000). Chan and van Aalst (2004) consider that too little attention has been

given, in the field of CSCL, to the assessment of learning; moreover, according to them,

both the individual and the collaborative aspects of knowledge building should be taken

into account in this area.

Aims

The purpose of the study was to answer the following questions:

1) How did the small group, step by step, work out their research questions and what

were the collaborative activities, resources and tools that were brought into play in

their efforts to frame a set of joint research questions?

2) How did they, moment by moment, build knowledge to underpin their theoretical

framework and which of the tools and resources used by them did successfully

generate new shared knowledge?

3) What was the quality of the group's final product as compared to the quality of their

group activities?

4) What were the learners' experiences, that is, how did the group members as a group

and as individuals perceive their collaborative activity and learning?

The study was carried out in an authentic teacher education context.

Methods

Participants

This study of interaction between learners in an online learning environment examines

student groups who work at distance throughout a whole course. A team of three

pre-service English teachers were selected for investigation from among six groups

because the group members worked mainly online. The students in this group attended

an online learning course delivered by two Finnish universities, forming a group, at the

beginning of the course, on the basis of their similar interests. All three students, Saara,

Liisa and Tiina (made-up names), had basic knowledge of computers and the Internet.

Saara and Liisa, from the University of Jyväskylä (n=2), knew each other while Tiina,

from the University of Oulu (n=1), knew neither of the other two. She was also the only

one of the three students who had previous experience of online courses. All were

university students of education and English.

Task

The students participating in the online learning course were given the task of

formulating joint research topics in the area of culture and communication and forming

subgroups which collaborated on carrying out a joint research project. The two-month

course opened with a contact session for both of the two teaching groups where they

were made familiar with the content and timetable of the course. They were also

instructed in the use of the Discendum Optima online learning environment. The

learners attended study circles and discussed the main course themes in the online

learning environment. The idea of the study circles was to bring learners with common

interests together and organise them into subgroups working on their own research

topics. At the end of the course there was a video conference where each group

presented their work. The learners also filled out a pre-questionnaire and a final

questionnaire.

The Online Learning Environment

The Discendum Optima online learning environment can be accessed over the World

Wide Web (WWW). This shared workspace was open to every learner on the course;

there they could find all the course information, take part in discussions about the main

course themes during the study circle phase, and work in subgroups. When the

subgroups had been set up, an empty file was created for each group. The groups were

instructed to construct a first page presenting the group members and the group's

research questions. Otherwise the groups were free to create and add different objects,

such as discussion forums, Word and HTML documents, tables, photos and so on. They

could also use the environment's chat function, and net meetings were organised

whenever the students desired.

Data Collection and Analysis

The research data were gathered during the online course. They consisted of

asynchronous written discourse and the documents created by the three student teachers

in the subject group. The written discourse data came from three different discussion

forums set up by the group members. The first discussion forum, Thought Forum,

contained 43 messages, the second one, Talk Time, 88 messages and the third one,

Discussion on Theories, 13 messages, giving a total of 144 messages. Of these 144

messages, 115 came from the group members while the rest (29) were produced by

other learners and mentors. During the online course the members of the group created

54 different objects, including the three discussion forums, new subfiles, and Word,

HTML and PowerPoint documents. Seven learner documents (e.g. Tiina's mind map,

Saara's response to it, three book summaries, the Project Log and the Final Work) were

included in the data analysis, as were the transcriptions of the learners' chat and net

meeting discussions.

The approach adopted was qualitative content analysis, which makes it possible to

describe group interactions in a way that captures the dynamic interplay between

participants engaged in long-term collaborative knowledge building and the

construction of shared understanding in an online learning environment and identify the

resources and tools employed by them (see Silverman, 2000). The initial analysis of the

discussion data and the documents involved reading them through a number of times.

For the purposes of this study, two collaborative activities – *framing joint research*

questions and *building a theoretical framework* – were taken under closer analysis.

These two activities were selected because they were significant elements of the group's

teamwork and collaboration. Barron's (2000) idea of *three distinct interactional*

dimensions and Mercer's (2003) idea of *contextual resources* were used as analytical

tools in studying how the learners negotiated joint research questions and how they,

step-by-step, built shared understanding and knowledge. The links between *the group*

activities this involved and such outcomes as *the quality of the eventual group product*

were analysed by comparing instances of similar concepts, terms and ideas occurring in

the different documents. Thus, the aim was also to stress the important role of past

activities in the creation of new artefacts and new contexts (see Stahl, 2002). Further,

the study explored *the learners' collaborative learning experiences* with a view to

interpreting the meaning that the students themselves attributed to their online learning

activity.

Results

The group met mainly in the online learning environment, where they worked together,

discussed their task, and created and added different documents. Additionally, they had

two net meetings. The results section first presents the moment-by-moment

decision-making process where the group framed their joint research questions. This

process entailed making the group members' individual perspectives visible and paying

joint attention to the relevant issues so as to reach a shared understanding of the

research questions. Working out the joint research questions affected also the group's

building of their theoretical framework. Secondly, the section takes a closer look at how

the group put together their subject-specific theoretical framework. Thirdly, it illustrates

the quality of the group's final product and the links between its quality and the group's

collaborative activities. Finally, the section discusses the learners' learning experiences

as a team and as individuals.

Working Out the Joint Research Questions

The first message regarding the research questions was sent by Saara and Liisa (see

excerpt below). They explain how they interpret the terms "communicating thoughts"

and "autobiography". This contribution is mainly a suggestion about what they are

interested in investigating during the course.

> […] What is communicating thoughts? In Finnish it is "ulkoistaa" [externalise] and it could
>
> be explained as spelling out one's thinking: that way they become concrete, and one really
>
> has to think about her/his thinking and thoughts. The meaning of all this is that it helps the
>
> students to understand their own thinking and enables them to observe and comment the
>
> thinking of others. This is necessary for an efficient learning experience.
>
> So, this is all we know about communicating one's thoughts now. But, we would like to
>
> know more. Our topic for the techer training proseminar is learners' autobiographies. They
>
> are a way to think about one's thoughts and communicate them. What we would like to
>
> study from the autobiographies is learning experiences, for example what kind of teaching
>
> has been supporting, and what kind has supressed the student's interests. Another interesting
>
> viewpoint into autobiographies is metacognition: conscious thinking about learning and
>
> thinking. Writing an autobiography supports metacognition in the way that the learner is
>
> encouraged to reflect the learning processes s/he has gone through.
>
> … This project would (hopefully) help us gain some theoretical background for the

proseminar, but also new viewpoints (in the form of the importance of metacognition and

the way communicating thoughts helps metacognition), but it will be also a project of

investigating metacognition in virtual learning environments.

Our questions for this project in this initial phase are:

- What is communicating thoughts more exactly?

- What are the benefits of communicating thoughts in terms of learning?

- How can thoughts be communicated?

- How does the Optima environment support communicating thoughts?

- How does Optima support metacognition?

- How does metacognition enhance learning? …

These are our preliminary views - any others are welcome! … […] (Thought Forum: 1.

What is communicating thoughts?)

The two students get a response from Tiina, whose apparent interest in the same

issue is indicated by her elaboration of Liisa and Saara's ideas on the basis of the

question "What is learning?".

[…] Hi there *Saara and Liisa,

do you think I could join your group? There are some very interesting questions that you

ask -- what actually is communicating thoughts? and how it can be done? and does this all

help people learn? Eventually I might end up asking "what is learning?"

=) […] (Thought Forum: 2. Re: What is communicating thoughts?)

Tiina does not get a reply to her question "What is learning", but she is accepted

as one of the group. After this first exchange the main focus shifts to negotiating about

what kinds of documents the group should create; for example, they discuss the idea of

keeping a joint research diary and naming it Project Log. This distracts the group

members from their basic plan of refining their research questions until Tiina maps out,

in a document, the ideas she has developed on the basis of Saara and Liisa's first

contribution regarding the research questions.

Making individual perspectives visible. The group members have thus found a new way

to share their ideas. Tiina's suggestion that she display her ideas in the form of a mind

map as a separate document is accepted and the document is added to the group folder.

Tiina puts down some ideas which she sees as preconditions for communicating

thoughts and for learning (Figure I; the document on the left).

Fig. I about here

Saara also comments on some of Tiina's ideas in the separate document (see Figure I; the document on the right). This brainstorming was not made visible in the discussion forum, only in the documents. There were references to Tiina's mind map in the discussion forum, but they were more in the nature of comments, such as Saara's message saying that Tiina's brainstorming is a good start for refining their joint research questions.

Saara writes the other document as a response where she develops Tiina's ideas further while also raising new questions, but the group does not take up these ideas in the discussion forum. This could interpreted as an indication that they did not need to specify what these ideas meant because they were drawing on the common knowledge that they had accumulated from similar experiences, in this case from a similar educational background (see Mercer, 2003). On the other hand, the other learners might think that these were simply thoughts made visible with a view to developing them further and assume that the learner who presented them was asking for more comments and ideas to serve as a basis for further brainstorming rather than expecting criticism.

However that may be, the ongoing discussion shows that the group members felt that

they should focus their joint attention on working out the research questions.

Focusing joint attention. The group members believed that they were preoccupied with

too many things at one and the same time, such as organising their work, starting to plan

what documents and tools they needed to keep track of who is doing what, and deciding

how to make their knowledge-building process transparent and visible to the other

learners. The absence of one group member (Liisa) may also have disrupted the

collaborative activities to some degree. Saara decides to make a suggestion about their

future activities which is also a kind of summary of their previous discussion and

actions. All the group members agree that they should collaborate on framing their joint

research questions. For example, both Saara and Tiina ask Liisa's opinion in their

messages.

> **Saara:** [...] Hello there, Tiina and Liisa!
>
> I suggest (and, this is only a suggestion now) that this is how we will proceed with our
>
> topic:
>
> 1) After seeing Tiina's mind map, I suggest that Liisa and *Saara write their response to it.

2) We start refining our research question based on these thoughts and ideas. Thus, we

could discuss here on what we think is important and interesting in terms of

"communicating thoughts". …

3) We need to come up with some kind of a forum to keep track of what we are doing --

maybe so that we have a forum for our findings (theories, researches etc -- you guys know

what I mean) and discussion about that, and another for the practical "keeping in touch", to

know what everyone's doing and what they'll be doing. Tiina, any good suggestions? …

 So, this week's agenda is (and hopefully we'll even get further) could be refining our

research question. Liisa and I will need to be active.

 Let me know if you have any further ideas on how we could work... Liisa, can you get

some of your thoughts (maybe for example what you think is interesting in Tiina's

thoughts) to this CT folder on Wednesday? I'll try to do so. And Tiina, as soon as you see

our comments, please comment back! Let's try to have a question and a further agenda by

Friday? (Thought Forum: 21. What to do next?)

Tiina: […] *Saara, that's a good suggestion for a schedule and a goal for this week.

Liisa, how do you feel about it? […] (Thought Forum: 22. Re: What to do next?)

Reaching a decision on joint research questions. The group members reached a shared

understanding of a set of joint research questions through a demanding negotiation

process which took much time and effort at the beginning of the course. As they worked

towards a decision about their research questions and goals, the learners employed a

variety of tools such as the online learning environment's chat and net meeting

functions and various resources such as documents setting out individual perspectives.

Used Resources in Building Group's Theoretical Framework

As previously illustrated, working out the research questions was a critical step which

the group members took together, discovering a new and better way of making joint

sense of their theoretical framework (see Barron, 2000). In the first network meeting the

group decides to start building their shared theoretical framework by summing up the

relevant books and creating a special forum for discussing the theory, Discussion on

Theories. The book summaries were prepared individually, but the next section shows

how these multiple individual perspectives were made visible and how the group

members collaborated on knowledge building as they pursued shared understanding.

Book summaries representing individual perspectives. The learners started to work out

their joint theoretical framework by considering the book summaries. Their review of

Liisa's summary (of *Interpersonal Communication* by Sarah Trenholm and Arthur

Jensen, 1992) starts with questions by Saara. Then Tiina opens up a discussion of a

summary by Saara (*Inquiry Learning: Overcoming Constraints of Human Intelligent*

Activity by Hakkarainen, Lonka, & Lipponen, 1999). She also starts a new discussion

thread on her own summary of a book (Säljö, 2001) about the socio-cultural approach.

Thus, the summaries prepared individually by each group member were then discussed

online by the group as a whole.

For example, Liisa's summary of Trenholm and Jensen's *Interpersonal*

Communication (see the next excerpt) makes Saara ask a number of relevant questions

about Liisa's outline of the phenomenon of communication and about whether the

group members themselves have, consciously or unconsciously, taken on different roles

while working in the online learning environment. She suggests to Liisa comparing

face-to-face situations with online learning situations. She also points out that

communication is an important element of they course they are attending.

> […]…Now that you've read your book, can you say something about our communication
>
> here. For example, are the roles similar as in (i suppose this book handles) F2F situations?
>
> How do we feel about our roles -- do we think we are dominant even though we aren't or...?
>
> All in all, do you think that we can apply these theories of F2F situations in this kind of
>
> virtual situation?

I think that this book was probably a really good one to read, since communication is

probably the most important single aspect of this project: we rely completely on what we

see and read here, this whole project is a one big communication event (if you see what I

mean)! …[…] (Discussion on Theories forum: Message 3. Communication here.)

The group members were making a connection between their own experiences of

online communication and the factual knowledge presented in the book. Such an

approach might have arisen from their interest in reflection on learning experiences, but

it might also have helped them to reach shared understanding, as the following excerpts

show.

Referring shared history. In another contribution Tiina asks her fellow learners to

consider whether they are able to record their learning process and whether it is, in

general, possible at the university level for students to focus on the process instead of

the result of learning, thus placing her idea in a wider context, higher education. The

group members know that they share a similar educational background, studying at

university. Tiina seems to be curious about how her fellow learners experience their

university studies.

Tiina: […] …Do you think that Optima here helps us to record our learning process?

Speaking of which, do you think that studying at the university level gives people enough

opportunities to focus on the process instead of getting a final product done and forgotten?

…[…] (Discussion on Theories forum: Message 6. Thinking, writing and learning…)

Saara: […] …Yes, I do think so. I mean, I come here, and write down some preliminary

thought. Then you guys come and comment, and I clarify my point and we discuss it

further. When we have something to say, we also have the process recorded there.

Everything we do outside shape is lost, however. That's why I think that in this kind of

learning it is very important to try to use this environment as much as possible to put down

the ideas. …[…] (Discussion on Theories forum: Message 7. Thinking, writing and

learning…)

Tiina: […]–and in addition, the ideas put down here help us as a group to "see" where each

of us and we as a group are. …[…] (Discussion on Theories forum: Message 8. Thinking,

writing and learning…)

Replying to Tiina's question about whether the online learning environment helps

them to record their learning process, Saara shifts the focus to the group-work process

and the role of written language and group discussions. Alluding to their joint activities

and her personal experience, she points out that everyone's contribution is needed if the

discussion is to go further. She introduces a new consideration by observing that the

group members' actions outside the online learning environment escape attention. She

also emphasises the importance of exploiting the environment to the full, meaning that

they should use all the resources available in it as thoroughly as possible in making their

ideas explicit. Tiina elaborates Saara's idea a little further by highlighting the roles of

individuals and the group, a move which Saara endorses. As Mercer (2003) and Stahl

(2004) suggest, an appeal to common history or experiences may help learners to build

shared understanding or meaning of some kind. The next example follows a similar

idea, that of creating shared understanding by appealing to shared book knowledge and

joint activities.

Collective remembering based on book knowledge. In the discussion thread *Few*

thoughts on the other book I read Liisa wished to share some of the ideas picked up

from another book regarding computer-supported collaborative learning (see excerpt).

She introduces her ideas and reflects on the group's past joint activities, feeling that in

the light of the book they are important factors in collaborative learning. She thinks that

their group meets the criteria that the book's authors establish as indicators of

high-quality collaborative learning, that is, agreeing on a group task and working on it

together. Liisa refers also to important factors such as interaction, commitment to the

learning process, mutual encouragement, mutual assistance and confidence, and the

creation of a relaxed and calm atmosphere, in her opinion present in their group.

> **Liisa:** […] Marttunen Miika and Laurinen Leena had an article in this book that was
>
> concerning their reseach about: promoting argumentation skills in university: comparing
>
> e-mail and face-to-face studies. In p.19-20 'they had something very interesting and I
>
> quote:' an important quality of collaborative learning is that the task of the group is
>
> commonly agreed and worked on together.
>
> Precisely what me have been doing! […] (Discussion on Theories forum: Message 12. Few
>
> thoughts on the other book I read…)
>
> **Tiina:** […] …Yep. =) And people (students and teachers alike) should remember that the
>
> negotiation on the task is essential for collaboration... and that it may take time. Sometimes
>
> deciding *together* what the task is is the most important 'result' of learning, methinks.
>
> …[…] (Discussion on Theories forum: Message 13. Few thoughts on the other book I
>
> read…)
>
> **Liisa:** […] …They also continue by defining important factors which are: interaction,
>
> committed to the learning process, mutual encouragement, mutual assistance and
>
> confidence and creation of a relaxed and calm atmosphere.
>
> Also things that I think we have managed to fulfill in our group.

Aren't we good or what? […] (Discussion on Theories forum: Message 12. Few thoughts on

the other book I read…)

Tiina: […] Yeah! We're great! We've even been able to create a calm atmosphere ;-), which

isn't always that easy. =) […] (Discussion on Theories forum: Message 13. Few thoughts

on the other book I read…)

Tiina elaborates on Liisa's views and adds that the negotiation of the group task is

another essential factor, which could also be seen as an outcome of learning. Tiina

agrees with Liisa that they have been able to make the important factors described in the

book a reality in their group. The discussion ended with everyone agreeing that the

group was doing well. The information from Liisa's book seemed to offer a standard of

a kind by which to evaluate the group members' collective activities.

The results show that during discussions about their theoretical framework the

group members were constantly reflecting on their joint activities. In fact, it seemed that

they integrated their theoretical knowledge into their joint activity. This may have

served learning better by combining the content to be mastered and the activities

entailed by this particular content, thus enabling these two aspects of the learning

process to support each other as the group members assimilated the subject. However,

the goals they set themselves might have contributed to the way in which they

processed the relevant information because their aim was to design an experimental

project where they wanted to share their experiences. This might be one reason why

they pondered over their book knowledge against the background of their experiences

of how communication and learning took place in the online learning environment. At

the same time, the group put together a product, one component of their overall

theoretical framework. This made it possible to consider the quality of the final product

and its links with the group's preceding collaborative activities, such as the group

discussions and other documents.

Comparison Between the Final Product and Activities of the Group

In their final written assignment (called by the group their final work) the group

members sum up all that they have done during the online course. This final written

assignment comprised the following five sections: 1) Getting Started, 2) Organizing Our

Work in Optima, 3) Research Questions and Theories: A Conclusion, 4) Reflections on

Our Feelings and Thoughts and 5) What Have We Learnt? The final document was put

together from different elements, the main sources being the group's joint Project Log,

the group discussions, and the book summaries by the group members. The results show

that the final written assignment represented only a minor portion of their collaboration

and was, moreover, of poor quality compared to their knowledge-building activities as a

whole.

The final written assignment lacks any shared summing-up of the group's

theoretical framework. Instead, they present their research questions and explain how

they were led to build the theoretical framework and make the summaries. They provide

links to the summaries and the theoretical discussion forum, from which they have

copied a few contributions into their final product. These contributions are about

language, thinking and inquiry learning, communication in different situations,

nonverbal communication, and negotiating the group task. The group members might

have presented a few contributions as illustrations of how various issues were

considered during the online course. Instead, though Liisa's proposal of discussing

non-verbal communication for example failed to evoke any response, it was

nevertheless added to the final written assignment.

The final written assignment can be seen as a document offering a short account of

the group's work process. The results show that the group started to build their

theoretical framework in the very first message that Saara and Liisa posted on the

Thoughts discussion forum, defining a number of terms and presenting some

preliminary research questions. The process of building the theoretical framework was

guided also by Tiina's mind map and Saara's response to it. But in their final written

assignment the group members make no mention of these previous discussions or

documents.

The links between the different discussion forums and documents where the group

worked on the formulation of their research questions and theoretical framework are

presented in Figure II.

Fig. II about here

As the figure shows, Stahl (2004) is right in his suggestion that collaborative

knowledge building is a cyclical process. It seems also that once negotiated, shared

understanding becomes the learners' tacit knowledge which can be used again to build

further new understanding. However, the quality of the group's final written assignment

could have been better if it had compared the group's theoretical framework with its

knowledge-building activities during the online discussions. As it is, the document's

analyses of the group activities cast no light on the quality of the group's felt learning

experiences.

Quality of Felt Learning Experiences

As the above data analysis shows, the individually made book summaries seemed to

have an essential role in the process of building knowledge in the theoretical discussion

forum. However, when they reflect on their collaborative activities and learning the

learners first report that they learned mainly how to organise themselves and work as a

group in the online learning environment. The next section describes the learners'

learning experiences first as a group and then as individuals.

The learners reveal, as a group, that the book summaries, which were the main

resources in their theoretical framework, were a minor source of learning. The elements

making up their theoretical framework can be traced back to different resources, such as

the individual book summaries and other documents written from an individual

perspective (Tiina's mind map and Saara's response) and the group discussions. Thus,

few topics from the summaries were taken up during the group discussions, which

might suggest that these two activities, discussing issues and making book summaries,

were quite separate processes. Nor did they summarise these separate activities in their final written assignment, which might give the impression that the group members lack a joint theoretical framework. The lack of a joint theoretical framework might have led the learners to conclude that they were learning less about the theoretical issues than about what they call practical matters (see Jeong & Chi, 1997). As individuals, the group members seemed to have different perceptions of how they had learned in the online learning environment.

As Saara sees it, what she had learned was how one learns in an online learning environment. Tiina feels that she had learned something about collaborative activities, negotiation processes and the demands that working in online learning environments makes on learners. Liisa mainly lists the technological tools she had mastered and talks about what communication seemed to be like in online learning environments and about how she had acted during the online learning course. What she fails to disclose is that she had read more than one book and that she had brought up these books in her contributions to the discussion forums. Given this, it can be assumed that she has learnt more than what she reveals herself as thinking she has.

Afterwards Tiina comments on her learning again by saying that she learnt from the summaries as she made, edited and read them. She adds that the effects might emerge in the longer term, but she feels that the summaries and the discussions helped her to deepen her understanding of learning and thinking. It might be that the learners' self-constructed explanations were important for their learning when they were drawing up individual documents such as summaries of the books they had read or mind maps representing their own ideas (see Jeong & Chi, 1997). In this way, they had to make their own interpretations and understanding visible, which might have enhanced their own thinking and learning (see King, 1999; Webb, 1989).

However, the learners' reflection on their learning experiences reveals that they learnt more through participation in their joint activities than through building their theoretical framework as a group. The close relationship between these two processes, mastering the content to be learned and engaging in the activities entailed by it, may have made it hard for the learners to make out what they had learned about the theoretical aspects of their topic. This might even have reinforced the group members' learning experiences.

Conclusion

The purpose of this study was to find out how a group of three students reached shared understanding and built knowledge in an online learning environment as they worked out their research questions and constructed their theoretical framework and what were the tools and resources that they used in the process. The research task included also an examination of the quality of the group's joint product as compared to their knowledge-building activities and an analysis of the group members' perceptions of their collaborative learning situation. The learners' own interests, backgrounds and contexts affected the way in which they shared their individual perspectives and operated as a group in the online learning environment. However, the results suggest that negotiations over joint goals and activities were an essential aspect of the collaborative learning situation.

The group built knowledge through a cyclical process (Stahl, 2004). The learners' shared knowledge became the group's tacit knowledge, reused to build new understanding. Thus, their synthesis of theoretical knowledge and group interaction shows also that they accepted the book knowledge as representing an authoritative standpoint at the same time as they held their own ideas and thinking in little esteem.

The learners' own expectations and assessments showed that they had adapted to

academic culture, where concepts and theories play a major role.

Research on computer-supported collaborative learning faces the methodological

challenge of keeping track of a group process where there are always tacit assumptions

and knowledge not shared in visible ways as group members interact in an online

learning environment. For example, the group studied here created a great many

documents whose link with their collaborative knowledge building was visible only if

the topics covered in them were brought up in the group's discussion forum. As Clark

and Schaefer (1989) observe, the basic rule in communication is that shared

understanding has been reached unless there is evidence to the contrary. This means that

explorations of mutual understanding and knowledge should focus either on

misunderstandings between learners and on the processes where these are cleared up or

in moments where there is no evidence suggesting a lack of shared understanding.

These moments where learners seem to achieve shared understanding without asking for

or offering positive evidence of having truly gained it, could be investigated, for

example by interviewing the learners and analysing their interpretations about their

shared understanding and knowledge. The learners in the group examined here

communicated mainly within the online learning environment, at the same time as they

belonged also to their own classroom context in their home universities. Observing

learners in the classroom context might produce valuable information about the

different factors which may affect learning and interaction in various learning contexts

(see Arvaja, 2004).

As regards the pedagogical aspect, the group members created a joint project log

where they continuously evaluated their group processes and their own experiences of

and feelings about their collaborative work. According to Jeong and Chi (1997), a

shared representation of some sort achieved between collaborating learners seems to be

one of the mechanisms that explain how people learn through collaboration. The group

studied here linked their evaluation activity to the learning process itself, which may

have enhanced their learning and collaboration. A stronger focus on assessing both the

individual and the group aspects of knowledge growth and group participation and

interactions might help learners to work and learn together efficiently (see Chan & van

Aalst, 2004).

From the viewpoint of teacher education, the learners' own perceptions of their

learning indicate that the group members did learn valuable things as future teachers,

such as the basic preconditions for collaborative activities in online learning

environments. These experiences might have amplified conceptual changes in their own

thinking about learning in general and especially in their own views, as teachers, of

collaborative learning and online learning environments in particular. It has been argued

that collaborative learning and online learning environments represent a new

educational culture not easy to adapt to our current culture of education (Hakkarainen,

Lipponen, & Järvelä, 2002). By offering pre-service teachers a chance to themselves

explore a new cultural approach of this kind as learners might encourage them, when

they are themselves teaching their future students, to experiment with these various

methods and tools. In this study, the learners' own experiences taught them how to

guide fellow learners towards the goals and support them in collaboration in online

learning environments. These future teachers wishing to make use, in their classrooms,

of a new educational culture should be seen as potential collaborators with researchers

involved in and designers constructing online learning environments.

Acknowledgments

References

Arvaja, M. (2004). *Contextual resources in the process of negotiating meanings in a web-based history project.* Manuscript submitted for publication.

Barron, B. (2000). Achieving coordination in collaborative problem-solving groups. *Journal of the Learning Sciences, 9*(4), 403-436.

Barron, B. (2003). When smart groups fail. *The Journal of the Learning Sciences, 12*(3), 307-359.

Beers, P.J., Boshuizen, H.P.A., Kirschner, P.A., & Gijselaers, W.H. (2005). Computer support for knowledge construction in collaborative learning environments. *Computers in Human Behavior, 21*(4), 623-643.

Bromme, R. (2000). Beyond one's own perspective: The psychology of cognitive interdisciplinarity. In P. Weingart, & N. Stehr (Eds.), *Practicing interdisciplinarity* (pp. 115-133). Toronto, Canada: University of Toronto Press.

Chan, C.K.K., & van Aalst, J. (2004). Learning, assessment and collaboration in computer-supported environments. In J.-W. Strijbos, P.A. Kirschner, & R.L. Martens (Eds.), *What we know about CSCL: And implementing it in higher education* (pp. 31-50). Boston: Kluwer.

Clark, H.H., & Schaefer, E.F. (1989). Contributing to discourse. C*ognitive Science, 13*(2), 259-294.

Crook, C. (2000). Motivation and the ecology of collaborative learning. In R. Joiner, K. Littleton, D. Faulkner, & D. Miell (Eds.), *Rethinking collaborative learning* (pp. 161-178). London: Free Association Books.

Dillenbourg, P. (1999). Introduction: What do you mean by "collaborative learning"? In P. Dillenbourg (Ed.), *Collaborative learning: Cognitive and computational approaches* (pp. 1-19). Oxford: Pergamon.

Hakkarainen, K., Lipponen, L., & Järvelä, S. (2002). Epistemology of inquiry and computer-supported collaborative learning. In T. Koschmann, R. Hall, & N. Miyake (Eds.), *CSCL2: Carrying forward the conversation* (pp. 128-156). Mahwah, NJ: Lawrence Erlbaum.

Hakkarainen, K., Lonka, K., & Lipponen, L. (1999). *Tutkiva oppiminen. Älykkään toiminnan rajat ja niiden ylittäminen* [Inquiry learning: Overcoming the constraints of human intelligent activity; in Finnish]. Porvoo, Finland: WSOY.

Jeong, H., & Chi, M. (1997). Construction of shared knowledge during collaborative learning. In *the Proceedings of the Conference on Computer-Supported Collaborative Learning (CSCL '97)* (pp. 124-128). Mahwah, NJ: Lawrence Erlbaum.

Joiner, R., & Jones, S. (2003, August). *Co-ordination and collaboration strategies employed in face-to-face and online discussions*. Paper presented at the 10th European Conference for Research on Learning and Instruction (EARLI), Padova, Italy.

King, A. (1999). Discourse patterns for mediating peer learning. In A. O'Donnell, & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 87-115). Mahwah, NJ: Lawrence Erlbaum.

Koschmann, T., Kelson, A.C., Feltovich, P.J., & Barrows, H.S. (1996). Computer-supported problem-based learning: A principled approach to the use of computers in collaborative learning. In T.D. Koschmann (Ed.), *CSCL: Theory and practice of an emerging paradigm* (pp. 83-124). Hillsdale, NJ: Lawrence Erlbaum.

Koschmann, T., Zemel, A., Conlee-Stevens, M., Young, N., Robbs, J, & Barnhart, A. (2005). How do people learn? Members' methods and communicative mediation. In R. Bromme, F. Hesse, & H. Spada (Eds.), *Barriers and biases in computer-mediated knowledge communication: And how they may be overcome* (pp. 265-294). New York: Springer.

Kreijns, K., Kirschner, P.A., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: A review of the research. *Computers in Human Behavior, 19*(3), 335-353.

Lipponen, L., Hakkarainen, K., & Paavola, S. (2004). Practices and orientations of CSCL. In J.-W. Strijbos, P.A. Kirschner, & R.L. Martens (Eds.), *What we know about CSCL: And implementing it in higher education* (pp. 31-50). Boston: Kluwer.

Mercer, N. (2003). *Words and minds: How we use language to think together* (2nd ed.). London: Routledge.

Mäkitalo, K., Salo, P., Häkkinen, P., & Järvelä, S. (2001). Analysing the mechanisms of common ground in collaborative web-based interaction. In P. Dillenbourg, A.

Eurelings, & K. Hakkarainen (Eds.), *European perspectives on computer-supported collaborative learning. First European Conference on Computer-Supported Collaborative Learning* (pp. 445-453). Maastricht: Universiteit Maastricht.

Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures* (A. Rosin, Trans.). Oxford: Blackwell.

Roschelle, J. & Teasley, S. (1995). The construction of shared knowledge in collaborative problem solving. In C. O'Malley (Ed.), *Computer supported collaborative learning* (pp. 69-97). New York: Springer-Verlag.

Silverman, D. (2000). Analyzing talk and text. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed.), (pp. 821-834). Thousand Oaks, CA: Sage.

Stahl, G. (2002). Contributions to a theoretical framework for CSCL. In G. Stahl (Ed.), *Computer support for collaborative learning: Foundations for a CSCL community. Proceedings of the Conference on Computer Supported Collaborative Learning 2002* (pp. 62-71). Hillsdale, NJ: Lawrence Erlbaum.

Stahl, G. (2004). Building collaborative knowing: Elements of a social theory of CSCL. In J.-W. Strijbos, P.A. Kirschner, & R.L. Martens (Eds.), *What we know about CSCL: And implementing it in higher education* (pp. 53-85). Boston: Kluwer.

Stahl, G. (2005). Group cognition in computer-assisted collaborative learning. *Journal of Computer Assisted Learning, 21*(2), 79-90.

Strijbos, J.-W., Kirschner, P.A., & Martens, R.L. (2004). *What we know about CSCL: And implementing it in higher education*. Boston: Kluwer.

Säljö, R. (2001). *Oppimiskäytännöt. Sosiokulttuurinen näkökulma* [Learning practices. A socio-cultural perspective] (B. Grönholm, Trans.). Helsinki, Finland: WSOY.

Trenholm, S., & Jensen, A. (1992). *Interpersonal communication* (2nd ed.). Belmont, CA: Wadsworth.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Webb, N. (1989). Peer interaction and learning in small groups. *International Journal of Educational Research, 13*(1), 21-39.