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## SHARING PERSPECTIVES IN VIRTUAL INTERACTION: REVIEW OF METHODS OF ANALYSIS

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**Abstract.** The aim of this paper is to describe the methodological solutions made in the studies that are part of the SHAPE research project. The SHAPE project investigates the quality and nature of virtual interaction in a higher education context. The study aims to find out variables that mediate the process of collaboration, particularly the emerging processes of sharing and constructing perspectives in virtual interaction. For conducting these studies we have developed various methods and models of analysis in order to gain better understanding of the process of collaboration in virtual interaction. In this paper, we will make a review of some of the SHAPE analysis methods used in the series of our studies.

### 1. INTRODUCTION

Several studies, including our own, indicate that the quality of meaningful virtual interaction and learning varies (Järvelä & Häkkinen, 2002, 2003; Saarenkunnas, Järvelä, Häkkinen, Kuure, Taalas, & Kunelius, 2000). Collaborative processes are often over-generalized, and any tools for communication and correspondence are called 'collaboration tools' (Roschelle & Pea, 1999). The problem is that if almost any interaction situation is called collaborative, it is difficult to judge whether and when people learn from collaborative situations (Dillenbourg, 1999; Littleton & Häkkinen, 1999).

In research of computer supported collaborative learning typical research methods have been content analysis of networked discussions, different types of discourse analysis or quantitative summaries of computer-generated databases. Some researchers have also used social network analysis methods to visualize students' interaction and roles in computer-supported collaborative learning. They report that a social network analysis is an appropriate method for studying structures of interaction and relationships in a technology based learning environment (Nurmela, Lehtinen and Palonen, 1999). These methods offer insight into the content and quantity of students' networked discussions as well as interaction structures in a general level. However, these methods are not capable of revealing the quality of collaborative processes of the network and the ways, in which collaborators shape each other's reasoning processes, neither do they reveal individuals' personal experiences or interpretations. Consequently, new methods are needed to capture the process of collaborative interaction and its contribution to

learning. Furthermore, these methods should be able to understand the process of computer-supported collaboration as part of the wider social context of the participants.

Due to the increased amount of criticism towards methodological solutions in CSCL research, in this paper we will explicate our own methodological approaches. We will emphasize three critical viewpoints, which can contribute to the more profound analysis of virtual interaction. In this paper, (1) the main methodological challenges and needs for current CSCL research are presented, (2) multimethod approach in our own series of studies is described, and (3) the relevance of the multimethod approach is demonstrated through our three distinct perspectives to data analysis.

## 2. METHODOLOGICAL CHALLENGES

### 2.1. Contextual approaches

The analysis of CSCL settings should go beyond networked interaction by including also the activities of various face-to-face communities into the analysis. While seeking after more operational methodological accounts for capturing e.g. the processes of collaborative learning or community-building, we should bear in our minds that the analysis of collaborative interaction cannot be isolated from the context in which it is embedded. Crook (2000) has also called for the importance of analysing 'narrative structures' instead of isolated speech acts. Furthermore, Stahl (2003) has suggested that individual utterances only make sense within the group context and the shared situation. Therefore, it is important to consider whether and when we want to analyse group discourse as a whole or follow the individuals within the group discourse. The unit of analysis is the whole activity system of tasks, artefacts, interactions, symbols, social practices, roles and community of practice, which absorbs the shared knowledge of the group (Stahl, 2003).

### 2.2. Methodological complexity

It has become evident that the methodological approaches of CSCL research should take into account various challenges that arise from both networked settings and face-to-face situations as well as from both individual and collective levels of data collection and analysis. Furthermore, in addition to describing discourse processes, there is also a need to get insight into the quality of those processes as well as to the learning outcomes reached. Learning and interaction in CSCL settings is not fully understood either if we focus only on measured effectiveness, but also the experienced effects might clarify, for example, engagement into the collaborative work.

In data analysis, both qualitative and quantitative approaches as well as theory-based and data-driven approaches often complement each other. Qualitative methods are well suited for examining students' actions as contextualized events because they can give rich and holistic descriptions as well as emphasize the social settings

in which phenomena are embedded (Perry, 2002; Miles & Huberman, 1994). The use of different methods and several data sets allow the results to converge through triangulation, provide complementary views, and allow the researcher to examine overlapping and different facets of a phenomenon (Tashakkori & Teddlie, 1998). Quantitative methods, on the other hand, can be used for several purposes in CSCL research. For example, they can be used for analyzing questionnaires, log-files and statistics of communication in follow-up settings as well as, on the basis of this, for improving the validity of choosing episodes for detailed qualitative analysis.

### 3. RESEARCH CONTEXT

The methodological development presented in this paper is conducted in the research context of an international teacher-training course that was organized in 1998 and 2001 as part of teacher training programmes in different Finnish and foreign universities. The students' learning task was to construct and comment case-based descriptions in the areas such as learning context or technology in education as well as the change these ideas impose on the traditional teaching and learning practices. Different levels of expertise in peer and mentor collaboration were provided during the learning process in order to apprentice student learning. Students used different asynchronous web-based learning environments for this case-based work (Häkkinen, Järvelä & Byman, 2001; Järvelä & Häkkinen, 2002; Saarenkunnas et al., 2000). On the basis of the first design experiment of the study, an intervention in the form of a pedagogical model was designed for the second design experiment (Häkkinen, Järvelä & Byman, 2001; Järvelä & Häkkinen, 2002).

### 4. MULTIMETHOD APPROACH AND METHODOLOGICAL INNOVATIONS

Since the current methodologies used in CSCL research are not able to capture the theoretical challenges focusing on the process of collaboration, we need new methodological innovations and tools both for data collection and analysis. In the series of our studies, we have aimed to increase both specificity and effectiveness of data collection. With a process-oriented approach and context-sensitive methods different nature of activity and engagement in learning context have been examined. The special methods applied for examining engagement and experienced effects of collaboration will be on-line interviews. Also on-line questionnaire (Järvelä & Häkkinen, 2003; Csikszentmihalyi & Larson, 1987) has been used in the design experiments where students' situation specific interpretations (e.g. reasons for collaboration or the level of engagement) have been measured during the process of collaboration. Participatory observation and video data have been collected of selected collaborative situations where students have been working in certain virtual environment. Also repeated measures for collecting basic information of students' background knowledge and experience have been conducted in different working phases. Continuous data collection includes also computer-generated data of students' activity as well as of collaboration and discussion in virtual environments.

Combinations of quantitative and qualitative research methods were employed in

the data collection of our studies. Quantitative data included: 1) computer-generated usage of statistics that illuminate the nature, time and volume of participation (the amount of messages, replays, frequencies etc.) as well as the distribution of discussions among the users, 2) survey data on subjects' background information, 3) various interviews during the process; 4) transcript data of students discussions, 5) on-line questionnaires of individual interpretations, and 6) video data of face-to-face situations.

The data collected with these methods have been analysed from different viewpoints in our study in order to contribute to more profound analysis of virtual interaction. Next we will focus on three particular points of views. Firstly, the development of theory-based analysis method for capturing perspective sharing will be described. Secondly, more detailed analysis of the process of collaboration particularly focusing on grounding mechanisms will be presented. And thirdly, the method revealing individuals' personal experiences and interpretations is demonstrated.

The focus of analysis and data collection methods used in different sub-studies as well as relevant publications are described in the Table 1.

*Table 1. Summary of SHAPE studies*

<i>Focus of analysis</i>	<i>Data collection methods</i>	<i>Publications</i>
Levels of discussion Stages of perspective-taking	Computer-generated statistics Discussion data	Järvelä & Häkkinen (2002) Järvelä & Häkkinen (2003)
Comparison of perspective sharing in two empirical studies	Computer-generated statistics Discussion data On-line questionnaires	Häkkinen, Järvelä & Byman (2001) Häkkinen & Järvelä (2003) Byman, Järvelä & Häkkinen (2003)
Mechanisms of common ground	Computer-generated statistics Discussion data	Mäkitalo, Häkkinen, Leinonen & Järvelä (2002)
Experienced effects of individual students	On-line questionnaires Interviews	Häkkinen & Järvelä (2003) Leinonen & Järvelä (2003)

## 5. DEVELOPING A THEORY-BASED ANALYSIS METHOD FOR CAPTURING PERSPECTIVE SHARING

### 5.1. *The aim of the method*

In order to understand how the students are able to share perspectives and construct collaborative discussion, we focused the analysis on the level of whole virtual discussion. In our study, Selman's (1980) perspective taking categories were adapted to developing a coding category for exploring the quality of virtual discussion (for more details see Järvelä & Häkkinen, 2003). It was created so that after studying the theoretical basis of perspective taking, the researchers made the

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first draft of the category system so that they discussed the most typical elements of virtual discussion in general and in different perspective-taking stages in particular. The category system was revised after becoming familiar with the data of students' virtual discussions, so that the contextual features of the discussion were involved (See Järvelä & Häkkinen, 2003).

At first a preliminary analysis of each discussion was conducted and the types of messages were grouped into the following categorizations: Theory / New point, Question / Experience / Suggestion / Comment. In the second phase of the analysis graphs were drawn, which demonstrate the progress of discussion, dynamics of different types of messages, mentors' role and cross-referring in each discussion. The graphs were researchers' analytic tools, which facilitated formulating three groups of all the discussions: high-level discussions, progressive discussions and low-level discussions. Finally, the specific analysis of a stage of perspective taking in discussions was conducted. The particular attempt was to find out what stage of perspective taking occurs among the students in virtual discussion. In this aim we utilized Selman's (1980) model outlining a social cognitive developmental model of five distinct stages with increasing abilities to take into account alternative viewpoints (undifferentiated and egocentric - differentiated and subjective role-taking - self-reflective / second person and reciprocal perspective - third-person and mutual perspective taking - in-depth and societal-symbolic perspective taking).

### *5.2. What was found out?*

This analysis helped us to characterize different levels of discussions in terms of sharing perspectives in virtual interaction. It seems that perspective-taking theory gives an opportunity to examine networked virtual discussions profoundly. Our studies (Järvelä & Häkkinen, 2002, 2003; Häkkinen, Järvelä & Byman, 2001) indicate that high-level discussions involved communication with the highest stage of perspective taking, while low-level discussions were mostly egocentric and superficial. It can be concluded that participants in networked virtual communities have possibilities to mutually negotiate about different views if sharing perspectives is pedagogically scaffolded. The method worked as a tool to specify the elements of the level of whole networked discussion but it does not really tell anything about individual learner or about more detailed mechanisms related to the process of collaboration. Therefore, complementary analysis methods were needed.

## 6. ANALYSING THE MECHANISMS OF COLLABORATION: FOCUS ON GROUNDING PROCESSES

### *6.1. The aim of the method*

In order to understand collaborative processes in virtual interaction there is a need to be able to identify the specific mechanisms, which help in building and maintaining common ground. This presupposes the development of methodological accounts that are able to capture the way in which individuals construct shared understanding,

knowledge, beliefs, assumptions and pre-suppositions (Brennan, 1998; Clark & Schaefer, 1989). For this purpose, we developed a method that is partially based on Järvelä's and Häkkinen's (2003) model for analysing the types of messages and the levels of discussions (see the previous section). This method was modified for this study, and further development focused on more detailed analysis of the type of feedback that the participants gave to each other (Mäkitalo, Häkkinen, Leinonen & Järvelä, 2002). A common form of feedback can be just a signal that the message is read and comprehended (Baker, Hansen, Joiner & Traum, 1999). According to Brennan (1998), grounding process requires that partners are able to seek the evidence of each other's understanding, as well as to provide evidence about their own understanding. In addition to this, the aim in this study was to analyse feedback as an evidence of how others react to sender's messages on the attitudinal level.

In this study we approached the written discussion data by using different methods in different stages. Using previous analysis the discussions were grouped into two different categories: progressive level and deeper level discussions. This gave us the opportunity to explore what kinds of mechanisms of common ground are related to the deeper level discussions. Content analysis of the messages involved many levels: the level of individual messages, interrelationships between two or more messages, and the level of the whole discussion. Finally, the types of feedback and the levels of discussions were compared.

#### *6.2. What was found out?*

The results indicate that in deeper level discussions the participants used more feedback than in lower level discussion. In deeper level discussions, students more frequently used supporting feedback. Supporting feedback meant that the respondents expressed their support since the issue was important or they wanted to give personal support to the addressee. In light of these results, it seems that supporting feedback might have a positive impact on the process of collaboration. According to Wegerif (1998), the creation of a sympathetic sense of community is a necessary first step for collaborative learning. As the results show, it is important that participants include in their replies social cues to encourage their fellow students to participate in the discussion.

The analysis method used in this study needs further elaboration because of the focus given to single sentences although the whole message could also be regarded as a feedback. On the other hand, the message includes more specific elements, which is significant to the grounding processes in collaborative activities. Further studies in this field should go beyond single sentences and focus on how these specific elements are manifested in the context of full messages and the proceeding of whole discussions.

## 7. EXPERIENCED EFFECTS OF INDIVIDUALS

### *7.1. The aim of the method*

One of the common methods in CSCL research deals with analyzing the patterns of participation and discourse (Hewitt & Tevlops, 1999; Lipponen, 2001). However, the method does not usually reveal what makes some participants of virtual learning community more active and productive, while others take part in virtual interaction at long intervals. It seems evident that people acquire knowledge and patterns of reasoning from one another but for some kinds of shared knowledge, individually rooted processes play a central role (Resnick, Levine & Teasley, 1991). It is also clear that individuals have qualitatively different ways to participate in learning communities (Cobb, 1999). Therefore, in addition to the analysis of participation as quantitative phenomenon or participation structure, it is also important to examine the level of individual students in CSCL settings (Leinonen & Järvelä, 2003). This level of analysis can either focus on assessment of individual learning outcomes or experienced effects and interpretations of participating into a learning community. In our studies, we developed a method for capturing the latter one with the aid of on-line questionnaire that was repeated three times during each on-line course. The aim of this questionnaire was to give the participants a possibility to express their interpretations and experienced effects of working in the on-line learning community. With the aid of multiple-choice questions and content analysis (Chi, 1997) of open questions, the experienced effects were evaluated.

### *7.2. What was found out?*

The results indicated that the participants had a fairly positive impact of group working for their own learning, but more modest interpretations of their own contribution for the group (Häkkinen & Järvelä, 2002). For more actively participating students there was also a tendency to evaluate the impact of group for their own learning in a more positive way.

The most typical arguments for students' positively experienced effects of participating in the on-line learning community were grouped into three categories: cognitive achievements, perspective-taking and argumentation (Häkkinen & Järvelä, 2002). The following quotations by students are based on the content analysis of open questions.

#### **Cognitive achievements:**

"Changing thoughts and ideas with other teacher students broadens my own thinking. Group working remarkably clarifies understanding of given tasks and problems. It facilitates learning when we can handle the possible problems and unclarity in a group." [Finnish female student, pre-service teacher education, University of Oulu]

#### **Perspective-taking:**

"I get a lot of new perspectives and realize that others' viewpoints and thoughts can be very different and even contradictory with my own ones." [Finnish male student, teacher trainee majoring in English Philology, University of Jyväskylä]

#### **Argumentation:**

"When I get a counterargument for my own argument, I immediately have to consider the reliability and persistence of my own perspective. I have to justify my own

position.” [Finnish male student, pre-service teacher education, University of Oulu]

This method also revealed interpretations concerning the necessary prerequisites for successful collaboration. Most of the experienced prerequisites were related to the engagement, commitment and individual responsibility. The following examples are based on the content analysis of open questions.

”Yes, if an individual is motivated to solve the problem and is committed to outline and solve the problem.” [Finnish male student, pre-service teacher education, University of Oulu]

”Responsibility for my part of the work also makes me work harder because I don’t want to let the others down. It depends on my own activeness as a director of my own case and as a commentator of others’ cases.” [Finnish female student, teacher trainee majoring in English Philology, University of Jyväskylä]

The adequate use of methods revealing individuals’ personal experiences and interpretations can act as one of the main methodological approaches. However, in our studies we used this method to support and complement the methods described in previous sections. The method was still promising, and we have developed it in our further studies (Häkkinen & Järvelä, 2003).

## 8. DISCUSSION

Based on the series of our empirical studies and methodological development, it seems evident that interaction processes are not inherently situated in a virtual environment, nor is knowledge construction derived exclusively from writings or notes on the web. Virtual interaction and learning should not be considered only in global networks, but should be seen in a broader social context including face-to-face communities.

It also seems clear that some discussions in virtual environments lead to more effective learning than others. However, mere description of activities and discourse processes do not help us to understand why this happens. There is a need to find out variables that mediate discussions, and new ways to separate discussions in categories that relate to quality. Methodological innovations are also needed for more profound analysis of the kind of strategies and specific mechanisms people employ in an effort to establish common ground and reciprocal understanding in virtual interaction. In addition to collective levels of analysis we should also consider the knowledge acquisition of individual students in CSCL environments into account. Methods should be developed not only for capturing processes and outcomes of learning, but also experienced effects and individual interpretations of participation in CSCL settings. These are some of the questions that we have tackled and continue developing in the series of our studies.

## 9. NOTES

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