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In 4 different research projects taking place in our department, students, teachers, researchers, policymakers and policemen are communicating and interacting through shared electronic work spaces between face to face meetings. The students interact about their studies in pedagogy. The teachers, researchers and policymakers interact about ICT in higher education. The researchers are from different universities all over Europe and interact between meetings about their collaborative research project. The policemen interact about drugs and new policy issues in the police organisation. The projects have similar theoretical starting points (social constructivism, knowledge building, shared understanding), as well as their differences. One project is focusing on community building. Another on reaching common understanding through grounding. A third is looking at work place learning and a fourth focuses on intercultural understanding and the role of language.
Data are mainly the protocols of collaboration. In some projects additional data refer to interviews and video protocols. Apart form the interaction data in the virtual work space, also the face to face interactions are analysed.
After an overview of thecontexts and methods of the projects, the paper will present an overview of ways to reach shared understanding and inhibitors of interaction and communication in these various environments.

Introduction

Virtual groups and communities can be found nowadays in various contexts, both in an educational environment and in workplaces. In both these contexts it is about a form of collective learning or knowledge sharing. De Laat and Simons (2003) distinguish three types of collective learning: learning in networks, learning in teams and learning in communities. Here we will focus on learning in teams and in communities, specifically two kinds of communities: communities of learners and communities of practice. We focus on the emergence of communities in the two different contexts mentioned. When learning is the reason why people form a community, we speak of communities of learners. When common work goals are at stake, we refer to communities of practice. This means that communities of learning can exist in both educational and work contexts, but that communities of practice exist by definition only in work contexts (including the work of teachers in education of course).

Communities of learners
Brown and Campione introduced the concept of communities of learners, and Scardamalia and Bereiter introduced the concept knowledge building community.
The approach of communities of learners developed by Brown and Campione (1994) is a pedagogical model that is designed to take advantage of the distributed expertise and cognitive diversity. The approach is focused on adopting the goals, values, beliefs, and forms of discourse characteristic to scientific practice. Conceptual advancement is made by cultivating each members' own expertise. The participants engage in a self-regulated and collaboratively inquiry being responsible for the task as a group (Lehtinen et al., 1999). The participants are apprentice learners, learning how to think and reason in a variety of domains. In a community of learners they try to foster supporting overlapping zones of proximal development that stimulates growth through mutual appropriation and negotiated meaning.

Scardamalia and Bereiter (1992) speak of a knowledge building community when there is a culture of learning that seeks to advance the collective knowledge and in that way that supports the growth of each of the individuals in the community. Schools and organizations that adopt the knowledge building approach have to shift from learning to construction of collective knowledge. This shift involves treating students as participants in a learning organization and not as clients who receive knowledge. The students are therefore engaged in producing knowledge objects that also lend themselves to being discussed, tested, and so forth without particular reference to the mental states of those involved, and where the students see their main job as producing and improving those objects.

Communites of practice

Huysman (in press) observed that learning and working become interrelated when the practice of knowledge sharing helps workers to do their work better and more efficiently. Providing space in the organisation for workers to establish networks can therefore be a powerful way to facilitate workplace learning. Workers tend to form networks of expertise spontaneously: to facilitate individual learning, collaboration and to discuss work related problems together. Sometimes these networks transform into a Community of Practice (CoP). In a CoP, employees, who share a common interest for the field they work in, come together on a regular basis to help each other, solve problems and to share and create knowledge collaboratively (Wenger, 1998). Knowledge sharing and meaning making are two of the core activities of CoPs. It is within this social community structure that workers learn from and develop their practice in a natural way and integrate it with their day-to-day work. Lave and Wenger (1991) described CoPs as groups where learning takes place through a process of legitimate peripheral participation. Wenger, (1999) defines a CoP along three characteristics:

- What it is about - A joint enterprise as understood and continually renegotiated by its members
- How it functions - Mutual engagement that binds members together into a social entity
- What capability it produces - The shared repertoire of communal resources (routines, sensibilities, artefacts, vocabulary and styles) that the members develop over time.

In the studies, miscommunication in electronic discussions is an important phenomenon that is analysed. A possible explanation for this could be that correctly interpreting each other's comments takes a lot of effort. Because of the existence of different views, different meanings of concepts and different frames of reference there is a large ‘space for miscommunication’ (Dillenbourg, Traum, & Schneider, 1996). Certain aspects of the medium also attribute to this problem: asynchronous communication permits less turn taking than synchronous, which makes it harder to detect and correct misunderstanding. Apart from that, the medium lacks non-verbal visual clues which means understanding what the other means has to be done ‘at a distance’ and without direct feedback. The medium also doesn't lend itself too well for the thorough reading of texts; the ‘affordance’ is more reactive and associative. Finally the everyday and scientific meanings of the concepts that are discussed can sometimes interfere. The natural mechanism that is used to limit the ‘space for miscommunication’ and create mutual understanding is called *grounding* in study 1. It refers to attempts to find and elaborate common ground.

The four studies summarized below all focus on the way groups of people work and learn together, looking at successful and less successful examples of collaboration and sharing. What seems to determine the success and failure of collaboration in virtual groups and communities?.

Context of the studies

Context of Study 1: communities of students in pedagogy

In this study, miscommunication in electronic discussions is an important phenomenon that is analysed. A possible explanation for this could be that correctly interpreting each other's comments takes a lot of effort. Because of the existence of different views, different meanings of concepts and different frames of reference there is a large ‘space for miscommunication’ (Dillenbourg, Traum, & Schneider, 1996). Certain aspects of the medium also attribute to this problem: asynchronous communication permits less turn taking than synchronous, which makes it harder to detect and correct misunderstanding. Apart from that, the medium lacks non-verbal visual clues which means understanding what the other means has to be done ‘at a distance’ and without direct feedback. The medium also doesn't lend itself too well for the thorough reading of texts; the ‘affordance’ is more reactive and associative. Finally the everyday and scientific meanings of the concepts that are discussed can sometimes interfere. The natural mechanism that is used to limit the ‘space for miscommunication’ and create mutual understanding is called *grounding* in study 1. It refers to attempts to find and elaborate on common ground.
180 first year students pedagogy followed the first trimester course "General Pedagogy", which consisted of weekly lectures by the main teacher and working with smaller groups of 20 students, guided by workgroup teachers.
Apart from this they conducted asynchronous discussions (3 x 2 weeks) with the students from their workgroup. Goal of the discussions was to let the students support each other in reading and interpreting the reading material of the course.
The instruction with each discussion round evolved: it began with a discussion purely aimed at better understanding of the text by asking each other questions about difficult sections, whereas in later discussions the students were also asked to criticize the ideas of the author. An annotation system was used to support grounding. It connected the thread of the discussions to places in the text studied by the students.

Context of Study 2: Ilab, a virtual learning group for teachers, designers, researchers and policy makers

In this project, called iLab, teachers, designers, researchers and policy makers from eight countries discussed with each other the professionalization of teachers in all educational sectors.
Ilab was a virtual e-learning laboratory where experts, policy makers and practitioners from different sectors of education and training were brought together to develop recommendations for national policy makers and guidelines for teacher training institutions covering the key obstacle to the implementation of an e-learning action plan: the training of teachers and trainers in pedagogies for the use of ICT. The activities organised were serving the goal to get information to make a document which will be presented to national policy makers.
Several countries around Europe participated and were clustered in sectors. Each sector (focus group) had to organise a meeting and had to fill in an e-learning action plan. The different sectors were: school-based education; vocational education and training; adult and continuing education; and, university and higher education. The focus lays on what the questions ‘what’ teachers have to now and ‘how’ teachers in university education can be helped to learn about the use of ICT in education.

Here we report on the Dutch part of the iLab-project. In this query we look for successful ways of organising the professional development of teachers in higher education. Two questions were discussed:

- What ICT-competences must teachers have when teaching in higher education?
- What activities are suggested for professionalization and how do they relate with ICT in these professionalization-processes?

Context of study 3: international collaboration between researchers

University staff members seem to be engaged in many different short term and longer term collaborative activities. Academic collaboration projects often set aims for shared outcomes, like a shared vision or policy, co-written books or articles, etc. In order to reach these shared outcomes, these professionals need to communicate and to a certain extent need to be able to understand each other's views on the topic, negotiate about these views, and co-construct shared views.

This process of negotiation towards shared views, is what we propose to be the core of collaboration and of learning. It is in this negotiation process that people need to reflect upon their own and others views and sometimes extend, change and create views, in order to achieve a shared position towards their activity. This process seems challenging, especially when it concerns groups with socio-cultural boundaries like multiple nationalities, disciplines, institutions or subcultures. In these heterogeneous groups, people can have strong differences in backgrounds, positions, and world views from which they act and speak. In these situations it is more likely that misunderstandings and disagreements emerge during their communication. A relevant question for the success of collaboration is how these different views and their interplay find expression in the process of negotiation about understanding and agreement and the development of shared views. Insight in these interactions in academic work is useful to contribute to our theoretical understanding of how shared views are emerging and developing. This is a necessary first step towards finding ways to support academic collaboration, concerning the development of shared views. Thereby the focus of support could be on equality in contribution of the different views, or on activating new or silent views that could stimulate negotiation. Moreover, support could focus on stimulating efficiency of the negotiation.

This study focuses on an international academic collaboration project, and specifically the process of developing shared views. Due to the complexity of this process caused by the many differences expected between the participants, we want to account for the socio-cultural context of the participants and of the group as a whole. The latter refers to the context in which the group originated, and the way the participants entered this group. Second, we want to consider the social processes as dialogical in nature.

The case study that is presented here, concerns an authentic project group that is intensively followed in time, during 2 years. This case consists of an academic European research project within the educational sciences. This project was funded by the European commission. Five different institutions, or ‘partners’ were represented. Of each partner, two or three participants worked in this project, with a total project group of 14 internationally active participants. They collaborated for two years, with the general aim of formulating advise for educational policy. The project was initiated and designed by one of the partners which was the project leader during the project. There were both national as well as international activities. By use of a virtual work environment, all participants discussed, coordinated and managed their activities and posted achieved results in the form of documents, or presentations. The project group organized six

meetings with all the partners for about three days, and one preliminary meeting between only two of the partners.

Context of study 4: communities of practice with the Dutch police

The Dutch police operate like many other organisations in a dynamic and rapidly changing environment. Police work has grown more complex, for instance due to more and frequently changing laws and regulations. It is important to carefully manage these changes so that all police officers have the same up-to-date knowledge about their work. The police strive for controlled development through understanding the changes in the working environment. Within the police organisation there is a strong division between various domains. Within these domains, knowledge is shared with the aim to develop and create new standards to be implemented throughout the organisation. Because of this, the organisation relies on the skills and knowledge of their workers to produce standardized products and services. It is important to make the flow of knowledge interactive. Knowledge management needs to create opportunities for sharing knowledge by creating relationships between the workers. Networking serves the process of keeping up to date: to solve work related problems and (in doing so) creating new knowledge that could be re-used throughout the organisation. Within these expertise networks, members share and appropriate tacit knowledge with the aim of sustaining and developing their own practice. To foster these relationships and to stimulate networked expertise the Police Education and Knowledge Centre created a nationwide intranet. Its structure is based on three pillars, the Police Knowledge Net (PKN), the Police Discussion Net (PDN) and the E-Campus. This makes it possible for learning and working to meet and become integrated in the workplace.

Large organizations, like the Dutch police force (50.000 employees), deal with a wide range of specialized knowledge, which needs to be updated and adapted frequently. However, police officers do not often work together in a physically shared space. They discuss work related problems during ad hoc meetings, coffee breaks and by telephone. Police officers throughout the country tend to keep close contact with one another and this is how CoPs spontaneously emerge within certain areas of expertise. They acknowledge the need to share knowledge to solve shared problems and to generate new standards. Providing CoPs with ICT-tools like PDN and PKN can be an advantage in bringing officers together. PDN for instance facilitates communication between participants of (existing) CoPs and helps them to stay in touch. It offers the possibility of collaborating online over time and space. Due to these developments, there is a growing number of CoPs trying to manage their networked expertise. Recent developments are the existence of hybrid networks where both operational as well as professional knowledge is shared and discussed in CoPs. This interaction is of great value because integrating working and learning highlights the importance of tacit knowledge and recognizes that work experience leads to organisational and educational innovation. The example presented below will address how police officers have established CoPs in which knowledge is shared, created and appropriated around problems and issues that matter in their work. The example concerns a CoP that works in drugs prevention by using the PDN to exchange and generate knowledge

Methods

Method of Study 1: communities of students in pedagogy

1) Protocols of collaboration. All 180 students were divided into 18 discussion groups, which sequentially conducted 3 discussions with a 2 week duration each, resulting in approximately 1800

messages. From this data, dialogue analysis with a coding scheme will score which activities students undertake to understand and to be understood. Activities that go from 'creating conditions for' (such as social activities) to being 'results of' grounding (such as the relevancy of answers) are scored. Since this instrument limits itself to visible and explicit activities within the online discussion, it will be complemented with:
2) Evaluation forms. These will shine some light on the perceived level of mutual understanding in the discussions and they will reveal some of the invisible grounding activities and investments such as rereading messages and articles before answering questions. 101 evaluation forms were returned.
3) Focus groups. These will be used for better insight in the outcomes of the evaluation forms and they will identify relevant context variables such as differences associated with in workgroup teachers (such as pedagogy or the motivation of students) and software strengths and limitations. Four focus group interviews were conducted.

Method of Study 2: Ilab, a virtual learning group for teachers, designers, researchers and policy makers

The methodology used for iLab on European level was primary based on the 'focus group' method. Multiple groups discuss over time on a subject and produce a statement or document on this subject. These groups differ in composition of expertise or view
The time schedule of iLab in the Netherlands was as follows. We organized a focus group meeting in September 2002 and discussed about what teachers have to learn about ICT in education and how they can learn this. Another subject of this meeting was how to organize to answer these questions over 6 months using the virtual iLab platform FirstClass. In March 2003 the second F2F meeting was organised. In this meeting, the participants were asked to discuss the results of the on-line discussions and to produce suggestions for policy making on teachers' professionalization on ICT in Higher education.

Focus group meetings

The first focus group meeting took place in September 2002. In this F2F meeting, the participants had to think in pairs about theme's they would like to discuss/talk about over the internet. They had to formulate three subjects for what teachers have to know about (the use of) ICT in higher education and three forms for teachers to learn all this. Then they had to work in groups to discuss their individual findings, had to reach consensus and present three subjects of 'what' and three forms of 'how' on a flip-chart. Now, a market place was organised in which participants had to walk around and assess the subjects and forms presented of the flip-charts. The three subjects and four forms that were valuated most, formed the input to formulate working statements.
The first three months, October, November and December, the subjects of professionalization were discussed virtually in First Class and in the remaining months, January, February and March, the forms of professionalization. Within every subject, the participants got three or four weeks to reach more or less a mutual understanding about the question and consensus.
We used the following rules and requests for the participants:

- Every theme has its own thread, which lasts for three or four weeks. After that, another theme stands central for three or four weeks. The participants were asked to respond in these subject specific threads.
- Post short (readable) messages with one subject in stead of long (unreadable) messages with multiple subjects.
- A week before the end of a discussion, the e-moderator makes a summary which hopefully leads to a revival of the discussion.
- The moderator concludes a discussion theme after the three or four weeks but it is not 'forbidden' to post an additional message after this time.

After the four months, the participants indicated that they experienced some difficulties in participating. Therefore we changed and added some rules.

- to bring more focus to the discussion, the participants had to write a (part of a) educational policy design to professionalize teachers. Any feedback was suggested as part of an additional educational policy design.
- Two participants were asked to be editor of the final policy design document. Every part of a design had to be compromised by the participants. By doing this, we hoped on more discussion/participation.

The second focus group meeting was organised in March 2003.

Interview
In order to get some background information of the participants, each participant was planned to be interviewed by telephone. An interview took about 20 minutes.
Topics were the personal working backgrounds of a person related to ICT, the experience in ICT in research and/or education, visions on education and for teachers how to learn this, opinions on the past discussions and some concluding remarks.

Method of study 3: international collaboration between researchers

In order to follow complex processes of actions and interactions an in-depth qualitative study of the activity and discourse is conducted. Data is gathered about all activity and discourse by means of storage of the electronic communication (e-mails and virtual documents) and the face-to-face communication (video-taped meetings) between the participants of the social systems. The socio-cultural surrounding of this activity and discourse is accounted for in additional interviews. First, these interviews elaborate on the relevant histories and views of the different participants, connected to, for example, their institution, previous projects and educational background. Secondly, the historical context of the group itself is highlighted in terms of the existence and nature of former relationships between the members and the origin and motive of the project.

The focus of the analysis is on the negotiation processes between the different views that interact. The chronological perspective is central to the whole analysis. Since this process is difficult to depict, the explicit moments of (mis)understanding and (dis)agreements are used as the starting point for analysis. The analysis takes several steps.

After storing and observing the individual and collective actions and discourse, critical moments are selected throughout the project. These are moments with explicit references to (mis)understanding and (dis)agreements (e.g. using terms such as “understand”, “different views”, “my, your, our perception”). The specific moments of (mis)understanding and (dis)agreements about the central topics have been mapped in chronological order.

After this, the positions and voices of all the members within these negotiations are explored and if possible identified by an interpretation, of both the discourse around that critical moment, and the additional background material in the interviews. The focus of this exploration and interpretation are twofold. It uncovers how the individual positions are negotiated through time, and it addresses the question if there are shared views emerging related to a particular issue. In the last step of the analysis, all the descriptions of the various issues have been compared to search for possible patterns in the negotiation of positions that do or do not lead to shared views.

Method of study 4: communities of practice with the Dutch police

This CoP consists of 46 members who are conducting drugs related investigations throughout the country. Due to the need for fast communication around emerging questions within the field, they decided to use the Police Discussion Net (PDN) to share knowledge and propose immediate questions. Data were the protocols of the questions, answers and discussions posted trough the police discussion net. A discussion space provides ideal possibilities to study interaction patterns between the members of a network. However, insight in communication patterns within a certain network alone is not enough. The content of the discourse must be taken into account. This way information can be gathered about the nature of the discourse.

Results

Results of study 1: communities of students in pedagogy

Whether discussions “worked” or not seemed to relate especially to the workgroup teacher the students had. The workgroup teacher of the group that conducted very constructive discussions was open and flexible towards the new technique (she was also the youngest one), was not too much present during the discussions, but probably did make a strong link between the workgroup meetings and the electronic discussions.
The discussions in this group were very soft (in contrast to for example a sharper debate) and social ("I'm not sure, but the answer could be that... . Is this of any use to you?"). This element could be an important condition for students to be confident to share their preliminary and low-level meaning making of the text and to come to a constructive discussion.
Another success factor seemed to be the visible relevance and usefulness for students. Its should be simply visible and clear that the virtual environment offers new possibilities that can help them understand or communicate.
A fail factor formed the lack of implementation in the course by the workgroup teacher. The group whose discussions never really 'got going' had to discuss the text, while they weren't yet supposed to have read it. This was a group from a teacher that wasn't at all keen to take part in this experiment (but didn't want to object her superior).

Results of study 2: Ilab, a virtual learning group for teachers, designers, researchers and policy makers

Participants had a hard time to log in, post a message, react on other messages, etc in the virtual platform. The second half of the planned time for discussion, no messages were posted. In the interview, the participants pointed out that there were several reasons for their absence. These varied from: ‘too busy with other more important things’, ‘the environment is not very user-friendly or available’, ‘people don’t react on each other and therefore it is pointless to discuss’.
We tried to intervene by proposing some concrete writing actions, but it was too late. It all happened on short notice (a few weeks before the last meeting) and the participants became silent.
What became clear as a success factor was the idea that such virtual platforms must be part of daily work. It must not be *experienced* as ‘extra’ and therefore time-consuming. It is important that they *see* how to use the platform in daily work.
So, we conclude that the success of a virtual platform used depends on how is being moderated in relation to the needs of an individual participant and the needs of the group as a whole.

Results of study 3: international collaboration between researchers

As was noted in all the interviews, the participation in an European project seemed to be based on a motivation to learn from each other, by understanding more about the countries that were represented by the different partners in the project. This was also noted to be the attractive aspect of participation in European projects in general. At the same time the difficulty of negotiations, in terms of time consuming discussions, was described.

The previous analyses of the discourse suggest that the negotiation processes of (mis)understandings and of (dis)agreements are in reality often interwoven, and therefore it is not always possible to conclude about the one or the other process. Sometimes people negotiate about a disagreement, but during the discussion they notice to have misunderstood each other. Or, in some cases, only one of the participants notices a misunderstanding.

In general, in the case it seems difficult for people to understand and thereby agree with each others views. Communication in professional groups is a very fast process, in which the question what someone really meant is often neglected. It requires time and attention for someone to realize someone else's position. Whenever this is present, it is possible to take other positions into account in, for instance, making decisions. Further, what appeared as a discussion about a certain topic seemed to reflect a negotiation of different conceptual understandings and standpoints, informed by different world views. If world views of each other are not partly understood or agreed, discussions on the topics seemed to rehearse itself.

Results of study 4: communities of practice with the Dutch police

This results show that the interaction between the members is rather centralized. The members cluster around those members considered to be at the core of the CoP. There are no subgroups and most of the members are somehow involved within the discourse. To study the nature of the discourse 177 messages that were shared in the period of January until June 2001 were coded into 3 phases of communication: sharing or communication of information, discovering / exploring concepts and negotiation / co-construction. Most of the communication (72%) between the members of the CoP corresponds to Phase 1 (sharing or comparing information). This was expected because the purpose of this CoP is information sharing and discussion of work related problems. New trends related to drugs cases are being shared between members. Different work experiences sometimes lead to discussion in which participants seek to further explore, support or identify statements of other members. This is indicated by the 20% that corresponds to Phase 2 (discover / explore concepts) . Only 8% of the messages were coded as phase 3 (negotiation / co-construction). This shows that the members are occasionally negotiating the terms they use and collaboratively are trying to solve a work related problem.
The challenge this CoP faces is how to transform their mainly tacit knowledge into organisational standards so that it can become accepted as formal explicit knowledge. The PKN institution provides knowledge brokers and content managers to assist the CoPs to formalise their knowledge in order to submit it to an assigned group of specialists who research and teach this particular domain. Once the expert group has given its approval, it will go to a so-called policy board, which formally validates the knowledge before it is disseminated through the PKN and E-Campus.
A success factor in this case was the commitment of the participants arising form the common interests they all had in their daily work. The community was an answer to needs people had. Thus, there were close connections with their work. A fail factor in this case seems to be that the discussions remain rather confined to the first and occasionally the second phase of sharing, because of the lack of structure and guidance. The transfer to the collective third phase did not occur and proved to be difficult. The interactions were mostly of question answer types.

Participants were satisfied with this, but from the perspective of collective learning there remains more to be done.

Success and fail factors

Implicitly or explicitly we encountered the following success factors:

Success factors
The person of the guide
Openness for new ways of working
Flexibility
Link between interactions and work / study in other setting
Safety
Constructiveness
Visibility of usefulness
Use of platform in daily work environment
Connection with direct work interests
Time to understand another persons' position
Commitment from work interests

Fail factors
Lack of commitment of teacher
Absence of connection between interactions and study obligations
Problems in logging in
Lack of reactions of other participants
Timing of interventions
Quality of interventions
Mixture of disagreement and miscommunication
Lack of structure and guidance
Remaining at to low levels of communication because of missing agenda

Are these the same for the different contexts? Although of course contexts may make a huge difference, it is our impression that it is mainly the relation of the interactions that are supposed to take place that make the difference. Is interaction useful for the participants in their work or study or is this unclear? Another factor that is similar in all four cases is the need for an explicit agenda / structure / guidance. Timing of interventions seems to be an important factor in several of the cases too. On the other hand there are of course differences between the cases. One important difference is the automaticity of the connection to work or study. In some cases there is an automatic connection, in other it has to be constructed, monitored and maintained. When there is this automatic connection, other problems may occur, for instance such a deep involvement that negotiations become so dominant that sharing becomes difficult. Moreover, pressure to collaborate and perform collectively, may also hinder sharing and collectiveness. Finally, in certain cases (study 1 for instance), there is an automatic guide, whereas in other cases guidance is more distributed over the participants (case 4).

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