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In the framework of videoconference classrooms at local learning centres in Sweden

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Abstract

This article explores the practice of videoconferencing and draws on interaction in class based on ethnographic fieldwork carried out at local learning centres in Sweden. The study is based on participant observations focusing on communication and the role of the teacher in a videoconferencing class. The results of the study shed light on different functions of the teachers' questions such as rhetorical, expanding and provocative. Further, talk in videoconferencing lacks systems of proper back-channel cues and communication often fails as a result of low feedback. The study also shows that there is a lack of balance in the distribution of utterances between the teacher and the students and that interaction is often one-way. The teacher becomes an actor in class reacting against low feedback. Questions and statements posed by the teacher are designed to break through the barriers of mediating technology. Also interaction patterns are impaired by misunderstandings and the practice is described as a learning space imbued with the rationale of communication technology.

Introduction

In recent years, videoconferencing has been established in the context of local learning centres in Sweden to promote adult and distance education in rural districts. This study aims to investigate interactions between participants in the classroom. The videoconference classroom is a socio-technical environment in which communications technology plays a significant role and is an inseparable part of practice. The interplay between physical settings and human actors has been discussed by Comber and Wall (2001), the materiality of schools and workplaces by McGregor (2003) and the impact of material actors in videoconferencing by Lögdlund (2010). This article focuses on

how actors communicate; the different forms of talk between the teacher, students and technicians in videoconference classrooms.

Goffman (1959) explores the identity of the individual and the significance of group behaviour to evaluate the meaning of encounters in everyday life. The dramaturgic perspective views interaction as performance, which is shaped by audience and environment and staged to provide others with impressions that are consonant with the desired goals of the actor. It can be argued that 'virtual teaching practices' may have established a new range of frames of interaction and altered the ways actors present themselves in their interactions with others. Goffman argues an actor wishes to present oneself effectively to minimise a failing presentation. Interactive cooperation with others makes an important contribution to the individual's performance as well as the performance of a group or a team. It can be argued that successful interaction in videoconferencing is dependent on the mutual definition of the situation as a teaching practice holding the premises face-to-face interaction origination from conventional education.

Videoconferencing is a collective of technologies utilized to transfer digitized data in the form of images and audio, including video clips, photographs, music and other information (Wilcox, 2000). It has been argued that the expansion of flexible learning strategies and advances in information and communication technologies have altered the conditions for teaching (Keegan, 2000) and created new learning environments of (Garrison, 2000; Edwards & Usher, 2003). It has also been said that information and communication technologies are components that impact practice (Bijker; Hughes & Pinch, 1987) and learning (Paetcher et al., 2001) by changing relations in space and time. The combination of online communication technologies and traditional face-to-face teaching has been referred to as virtual education by Keegan (2000), on-line instruction by Kearsley (2000) and virtual universities by Barjis (2003).

In studies conducted in the field of videoconferencing, technical equipment is presented as an obstacle to communication. Tyynelä (2004) argues that successful interaction is dependent on good audibility and visibility. Students in videoconferencing must be able to hear what is said and see facial expressions and body language in order to participate. MacKinnon et al. (1995) state that the type and position of the microphones is crucial to communication as well as the position of the monitors and the light in the learning environment. Students report negative attitudes towards the cameras and the sound system (Unander, 1999) and technical disruptions are experienced as annoying and may affect interaction negatively. Knipe and Lee (2002) state that the quality of teaching in videoconferencing is not has high as in traditional classrooms since teaching via a monitor, camera and microphones will always reduce the quality of learning. Waltz (1998) claims that the equipment in videoconferencing has usurped the teacher's pedagogical choices and transferred control of the virtual classroom to technicians, manufacturers and engineers.

The physical distance between students and the teacher in remote settings is one topic in studies carried out in the field of videoconferencing. Knipe and Lee (2002) report that students in remote sites occasionally feel isolated when eye contact is not made with them and questions not repeated to them. Students located at the origin site receive more information and explanations from the teacher than do remote students. Detachment from class causes students to lose concentration and interest in the subject matter. McHenry and Bozik (1995) as well as Unander (1999) report little or no interaction in videoconferencing classes due to students feeling distant from the teacher. It seems as if physical and psychological distance poses potential problems for effective distance learning (Wolcott, 1996) and 'transactional distance' may lead to

communication gaps and the potential for misunderstanding between teachers and the students (Harry, John & Keegan, 1993).

One issue in videoconferencing is the role of the teacher. Unander (1999) connect the teacher's ability to stimulate and motivate participants to the actual outcome of interaction. The author argues that the language used by the teacher as well as the tone of his/her voice is crucial when it comes to students' attitudes towards videoconferencing. Dupin-Bryant (2004) asserts that the teacher in videoconferencing often takes on a teacher-centred approach due to geographical separation and technological barriers. McHenry and Bozik (1995) claim interaction is the plain responsibility of the teacher and MacKinnon et al. (1995) argue that instructors should sustain interaction of participants by means of dialogue. The teacher must invite participants to interrupt speakers in order to ensure dialogue rather than monologue (ibid.)

The group organisation in remote settings is a subject that has attracted considerable interest. In contrast to individual distance education, group-based videoconferencing makes individuals feel that they belong to a cohort of students sharing the same experiences (Olsen, 2003). Svensson (2002) investigated group behaviour in temporary student gatherings and discovered that communities were established and reformed based on collective negotiations. The roles of the teacher and students were determined in communities adopting typified patterns of communication. Summing up the field of videoconferencing most research done concerns technology. The actual handlings of equipment as well as the fact that communication is mediated among dispersed groups of students are seen as intriguing problems. On the other hand, communication and the role of the teacher are subjects that have attracted less attention. This study takes the perspective of the teacher and seeks to describe how participants talk in videoconferencing classrooms in terms of verbal and non-verbal communication.

Classroom observations

The study is based on participant observations guided by an overt research strategy in which the researcher is identifiable (Hammersley & Atkinson, 2000) and by moderate participation where the researcher does not actively participate in the classroom activities (De Walt & De Walt, 2002).

The study covers both quantitative and qualitative outcomes. The quantitative aspect of communication accounts for the frequency and the allocation of utterances while the qualitative results focus on the character of utterances made in class. The study comprises thirty seven different occasions made between 2003 and 2005 at five different local learning centres. The majority of data were collected at one single location. One typical observation lasted for approximately one hour and was recorded and transcribed similar to the procedure of traditional interviews.

Data used in the study concern two different forms of educational sites; the remote classroom and the origin site. The remote classroom is the physical locality of the local learning centre. In the remote classroom, data were recorded directly on the spot and comprise both the local students' face-to-face communication and the interaction with the teacher and students at the origin site. The origin site is the place where the teacher (and occasionally students) is located during broadcasting. Data from the origin site were recorded from the television set. The observational post alternated between different remote classrooms and all observations made on the spot concerned students

engaged in adult education at upper secondary school level and in undergraduate studies.

The analysis involves different educational contexts; courses provided by the university college as well as adult education provided by the municipality at upper secondary school level. Data embrace the activities in the classroom focusing on the spoken language, gestures and the behaviour of the actors involved such the students, the teacher and supporting technicians. The process of analysing qualitative data involves structuring observations and interpreting findings. The results of the study can be described as a 'condensate' of analyses in which observations were successively interpreted and categorised.

The sample of locations is based on access given by a cluster of local learning centres located in a region in the south of Sweden. The centres collaborated in providing adult education in a region by sharing a set of university courses and by using the same project management. The local learning centres take on an 'intermediary' function as brokers of education in the region (Roos, Dahlöf & Baumgarten, 2000; Roos, 2001; Lögdlund, 2008) distributing undergraduate studies, municipal adult education and in-service training provided by university colleges or other educational arrangers situated at a distance. The centres try to emulate a campus by offering a learning environment not unlike ordinary schools. At the local learning centre, facilities are offered, such as classrooms, studies, a dining-room, libraries and other professional services associated with contemporary educational organisations. The distribution of distance education in local settings is believed to enhance the attractiveness of rural districts, prevent people moving away and promote schooling. Videoconferencing is the core activity of the local learning centre.

Interaction in the videoconferencing classroom

My data show that there are two main types of communication in videoconferencing classrooms that deserve more detailed study: verbal and non-verbal communication. The spoken language involves all utterances made in class addressing students, teachers or technicians. Further, my results show that there are four main categories of utterances significant for the practice of videoconferencing: questions, statements, storytelling and small talk. Goffman (1981) argue that questions are designed to receive answers, being oriented backwards to what has been said and forward to what lies just ahead. In the study, questions have been defined as all utterances requiring a reply. In contrast to questions, statements can be stated as utterances that do not explicitly require an answer. The study also shows that storytelling and 'small talk' are significant for communication in class. Storytelling refers to the anecdotes told by the teacher or by the students during class. Storytelling and anecdotes do not necessarily involve questions, although they often seek some kind of response from the audience. Small talk is the idle talk of the teachers and technicians. Small talk takes place mainly outside the framework of the actual lecture and may involve both questions and statements.

From the teacher's perspective, questions directed at the students usually concern the subject matter. The teacher may pose questions to the students for many reasons; to investigate the students' knowledge, to find an interesting topic or to follow up previous lectures and assignments. Questions could also concern theory or practice and result in factual answers, solving problems or develop imaginative or reasoned ideas.

From the students' perspective, questions concerning the subject matter are rarely asked of the teacher or peers during the videoconferencing class. The most frequent

questions posed by students instead concern administrative or routine matters. For instance, the students may want to know the forms of an examination, deadlines for submitting written tasks or the date and time of future broadcasts. The differences in the nature of the questions are significant to videoconference. The teacher lays focus on the content while students are engaged in forms, rules and settings.

Questions and statements

The teacher is an actor who informs, describes and explains the state of matters, circumstances and opinions to the students. As has already been mentioned, a significant amount of the teachers' communication is based on questions. My data show that questions asked in videoconferencing class have different functions. Questions may have a

- rhetorical function
- expanding function
- provocative function
- management function

Some questions have a rhetorical function such as when the teacher asks the students *"do you follow"* or *"can we start now?"* Rhetorical questions are not generally meant to be replied to and the teacher often continues instantly. The intentional lack of response makes rhetorical questions similar to statements. For instance, when the teacher asks a group of students a ticklish question about teacher training *"do you want them to internalise knowledge"*, not waiting for a reply the question transforms it into a statement. Further, my analysis shows that rhetorical questions in videoconferencing may have different purposes. The teacher may pose rhetorical questions in order to mark the structure of the lecture or to conclude or start the next section. Rhetorical questions can therefore be used as 'pacemakers' for maintaining a certain speed of the broadcast.

Other questions posed by the teacher are intended to expand the dialogue. For instance, when the teacher asks the students *"is there anything else you are thinking about"* or when the teacher asks a single student to give his point of view as in the example below.

> Teacher: Roberto can you comment on the election in Chile?

My data show that questions, which are intended to expand discussions and are directed at a specific student, seek to encourage an individual or a group of students to express their perspectives, to create another angle or insert tension into the discussion. 'Expanding' questions may also be used to initiate further discussion among groups of students located at different remote sites.

> Teacher: Does anyone else have something to add?

Some of the teacher's questions take on a provocative form. My studies show how the teacher exhorts the students by trying to provoke them to interact. The provocative questions may purposely give rise to new questions and further discussions related to the subject matter.

> Teacher: No, he had raped and humiliated and forced two women into prostitution. Isn't it good that he was given the maximum punishment?

It can be argued that expanding and provocative questions may be appropriate for videoconferencing in order to overcome distance and break through the barriers of technical resistance. The teacher seeks to influence the students and create interaction despite them being located physically distant. Provocative questions are also used more often by the teacher in videoconferencing than face to face in traditional teaching. This observation reinforces the idea of the provocative function of questions with the purpose of overcoming distance and getting through to the students despite communication being mediated.

Other forms of questions likely to occur in videoconferencing classes concern the management of the class and involve supervising and routine and administrative issues. Supervising questions concern maintaining the task activity or monitoring the students in class. Questions can be admonitory as when the teacher asks students to change seats in order to see them better or when he or she asks the students to turn towards the camera. Supervising questions may involve technical audio equipment such as when the teacher asks the students to move closer to the microphone. Supervising questions are also posed by the teacher to establish contact. For example, the teacher may ask whether a certain location (classroom) is still connected. Supervising questions are asked most frequently in the initial phase of the videoconferencing class and in the event of temporary transmission breakdowns.

One situation when supervising questions are asked is when the teacher addresses and identifies students from one location by using the name of the municipality. This category of supervising questions has a certain nature. The teacher attempts to distribute and direct communication among groups of students in different locations. For instance, the teacher may ask *"What do you answer in Viik?"* or *"Höög, do you have something to add?"* The teacher may also encourage a certain location to respond in order to verify a connection by asking *"Kiisa, where are you?"*. Supervising questions can also be asked in order to confirm the structure of the lecture. These kinds of questions (and statements) occur when the teacher supervises turn taking by addressing a certain location. The following excerpt from a course provided by the municipality illustrates the supervising turn-taking functions that are used in the initial phase of the broadcast.

> Teacher: We'll start in the municipality of Viik with topics of the day. Is there anything you'd like to tell us?

Supervising questions are a management strategy for checking on attendance and distributing cue-taking notes among the interconnected sites. It could be argued that the supervising questions 'communalise' the groups of students and 'substitute' people with places. Local places become identification marks. The students are also recognised by the instructor as a specific group of students from a local place, rather than a group of students. The students seem accustomed to being 'substituted' and they use the name of the district themselves when calling for attention. A region may be defined as any place that is bounded to some degree by barriers to perception. Goffman (1959) argues any individual located in a certain space-time manifold will be in a position to observe the performance and be guided by the definition of the situation which the performance fosters. The students may, for instance, talk about themselves in terms of a specific place both within and outside the immediate practice of videoconferencing.

A significant proportion of the management questions concern visual contact between the teacher and the remote classroom. For example, the teacher may ask the students if they can see what is written on the whiteboard (or the blackboard) or if images viewed through image viewer. Question may also have a routine nature. For

instance, when the teacher welcomes the students to the class, asking them how they are or asking them about the local weather. Administrative questions chiefly concern broadcasting times, examination procedures and attendance lists. Finally, all forms of management questions posed by the teacher usually answered by the students.

Statements can be categorised according to the intention of the teacher. Statements made in class can be directly connected to tasks such as factual information or related to ideas and problems. For instance, when the teacher states *"I've used this material in school and I know it works"*, it is a fact and not a question. Statements can take on a supervising mode by telling students what to do, giving feedback or praising efforts made by students. Statements may also have a general nature such as *"let's move on"* or *"let's start now"*. Finally, statements can have a specific character similar to one of the provocative questions.

> Teacher: Hate crimes have increased in the Swedish society. Such crimes are directed at homosexuals, but also religious groups such as Muslims and Jews. These crimes have increased dramatically in the last few years.

As regards, the nature of teacher's statements, it seems that a large number of utterances have a certain open or closed nature. As has been mentioned earlier, the study covers both the remote classroom and the original site. The analysis also concerns different educational contexts: education provided by the university college and adult education provided by the municipality. In the excerpt below, which comes from the remote classroom at upper secondary school level, the teacher is looking for a certain answer that is determined the context.

> Teacher: (…) by now there is plenty written here [whiteboard], which has to be proved right? And I can't hear any of you protesting loudly.
>
> Student: I don't think this is correct at all. Do you want me to explain why?
>
> Teacher: Yes, please.

The excerpt illustrates how the teacher requires a certain response from the students, which limits the scope of possible replies. The reply has to follow the prescribed statement written on the whiteboard, which is formulated in a way that provokes a given response. We can construe this particular question posed by the teacher as restricted or closed to elaborated or spontaneous replies and it can be argued that questions and statements take on a 'productive' or 'counterproductive' character. Productive questions or statements encourage the receiver to elaborate on his or her answer and they may be 'open' to feedback. In contrast, counterproductive questions may not encourage further elaboration since a factual answer, or a short yes or no, will do. In conclusion questions and statements become 'closed' to further feedback. The excerpt above is an example of 'counterproductive' interaction since the teacher sets the frames and the reply has to follow the line of argument displayed on the whiteboard. The question becomes counterproductive in that it does not encourage further arguments and therefore set limits on learning. The closed character of questions also occurs in videoconferencing provided by the university college as a majority of the questions that concern the subject matter are short (brief) and do not encourage elaborated replies. The excerpt below is an example of such a counterproductive question.

> Teacher: Do you think the form is demanding nowadays, to write neatly and correctly?

Student: Yes.

Teacher: Yes, isn't it.

A small part of the teacher's question might be interpreted as being productive and seeking an open reply that cannot easily be falsified. Teachers' productive questions more often than not enhance an on-going discussion or are posed in order to initiate new discussions. Some productive questions may encourage the students to draw their own conclusions.

Teacher: What is a society?

Student: We are the society?

Teacher: Yes, aren't we?

One interpretation based on the data concerns the occurrence of productive questions, which is a consequence of the climate in class as well as the teacher's approach. Productive questions seem to be encouraged by the attitude of the teacher and the climate in the group rather than by individual achievements. The willingness of students to more detailed answers and initiate discussions depends on the specific composition of the group in the remote classroom. New groups and groups consisting of inexperienced students are more careful about giving feedback.

In addition to questions and statements asked in class, the teacher may relate stories or anecdotes. The subject of anecdotes usually concerns the task. Anecdotes commonly characterised by a personal approach, revealing the interests and the experiences of the teacher. It seems as if the teacher tells personal stories in order to encourage others to do the same. The main function of relating anecdotes is to 'break the ice' and get other students to start talking.

Non-verbal communication
A second form of interaction that takes place in videoconferencing classrooms is 'non-verbal'. Goffman (1981) argues that the process of 'ritualisation' of communication involves the movements, looks and vocal sounds we make as the unintended by-product of speaking. Non-verbal communication consists of physical gestures given by the teacher and students. Gestures may, for instance, signal interest or indifference and body language may signify (consciously or not) e.g. fatigue or excitement.

My interpretations of the data show that non-verbal communication occurs parallel with verbal communication, mainly in order to strengthen or modulate messages given verbally during videoconferencing. The teacher may nod approval or make an inviting gesture with his hand that means please go ahead. Gestures may also be used as a communication strategy with some teachers intentionally exaggerating gestures, looks and smiles. Body language becomes a tool used to break through to the students.

One example of non-verbal communication is the position of the body. In videoconferencing, the teacher is restricted by technical appliances. The teacher has to stay in the centre where he or she is well-lit and in range of microphones and cameras. The position of the teacher in class becomes crucial and he or she has to always remember the positions of the cameras. In education provided by the university college, the teacher may change positions temporally. For instance, the teacher may alternate between standing in front of the audience or sitting behind a desk. However, being able to change position during class is dependent on assistance from a technician. In

education provided by the municipality, the teacher often lacks the full-time presence of a technician and is 'chained' to a single position.

To the category of non-verbal communication we can add all the situations where the teacher displays images (photographs, graphs and charts) with a technical apparatus in order to communicate non-verbal messages. The teacher may also write on the blackboard or the whiteboard instead of using the technology designed for viewing images during videoconferencing. It can be argued that writing by hand, using a whiteboard as a form of communication medium, is a strategy for creating a sense of intimacy. The teacher tries to overcome distance by neutralising the student's experiences of the videoconference situation as a televised broadcast.

It can be argued that the main distinction between videoconferencing and face-to-face teaching is the occurrence of technological shortcomings that make gestures and body language less comprehensible to actors. In contrast to conventional classrooms, physical signs may be vague or even missing during videoconferencing. For instance, students may sit out of range of the camera, the camera may switch perspective suddenly or go temporarily out of focus. Students may also sit in the shade and wear dark clothing which makes them almost invisible to the camera.

In addition to what can be seen in the videoconferencing classroom, some gestures are missing. My data shows that there is a scarcity of 'traditional physical signs' in videoconferencing such as turn-taking cues. For instance, the students seldom raise their hands or wave them to get the teacher's attention.

My study points to verbal communication as the main category of interaction in videoconferencing classrooms. The spoken language dominates communication in a way that may make us risk overlooking sudden pauses and temporary moments of silence in the stream of communication. The lack of interaction, in so far as nothing is communicated intentionally, occurs, for instance, when the teacher leaves the classroom, reads notes or does personal things without involving the students. Some time is also spent waiting for responses in class. Transmission breakdowns can be added to this category of non-verbal communication and the teacher may postpone the broadcast in order to make technical corrections. The temporary lack of verbal interaction is crucial to the maintenance of the videoconferencing class. Silence and stagnation may create dissatisfaction among the participants.

Interaction sequences and communication patterns
Goffman (1981) argues that whenever people talk, they seem to follow the dialogic format as a certain structure based on questions and replies. One utterance is temporally followed by another and they are organised in pairs. In the following, I will shed light on two typical situations that occur in videoconferencing. The first situation is an example of communication that works as intended and the second example concerns a situation when communication fails.

My data show that communication in the videoconferencing class follows a 'triadic pattern' based on adjacency pairs. Typically, the teacher initiates a discussion by asking a question or making a statement and then concludes interaction sequence by giving feedback on students' responses.

Teacher: (…) a certain verdict was handed down in the Supreme Court in Sweden today, wasn't it?

Student: It was about the pastor.

Teacher: Yes, and… [demanding]

Student: He was found not guilty.

Teacher: Yes, he was found not guilty. Thus, it was not a crime to claim that homosexuality is a cancerous growth in society.

From the excerpt above, we learn that the teacher initiates the interaction sequence by addressing a topic of interest in the general public debate in Sweden. The teacher confirms the reply and insists on a follow-up by the student as he/she regards the answers as unsatisfactory. The triadic interaction sequence is finally concluded by the teacher who substantiates the student's reply in order to obtain a full understanding of the subject. The communication follows the predicted structure of adjacency pairs of questions and replies linked in a chain. In videoconferencing a large proportion of talk follows this form of triadic interaction sequence.

Communication structures may fail to complete the triadic interaction pattern. The excerpt below is an example of how the interaction sequence is interrupted and how the communication structure breaks down.

Teacher: In our school there is a filter blocking the information and I don't think… [interrupted]

Student: No, but I also believe it's… [interrupted]

Teacher: …it's possible to visit sites like that. But I'm not sure.

Student: Yes, but… [interrupted]

Teacher: OK, we are waiting for two more students (…), but I think we'll start anyway. [changing subject]

In the excerpt, the teacher tries to argue, not in the form of questions anticipating a certain reply, but in the form of statements. Communication is still organised in adjacency pairs and the student tries to reply to the teacher's statements, but his/her feedback is not getting through. The teacher continues his statement 'unaware' that the student trying to say something. Finally, the teacher changes subject abruptly. We can interpret the excerpt as an example of communication failure due to a number of possible reasons. For instance, we cannot exclude the possibility that the teacher chooses to ignore the student in order to maintain the pace of the lecture. On the other hand, there is a technical failure if the teacher actually does not hear the student. In any case, the student is left dissatisfied and the communication sequence may be confusing to other participants. It can also be argued that the excerpt above is an example of a communication failure due to the lack of proper requirements of the communication system. Goffman (1981) claims that the speaker needs to know whether his message has been received and understood, which is based on the recipient's abilities to acknowledge the accuracy of the message sent. Feedback in the form of 'back-channel' cues, such as facial gestures, is needed to know whether we have succeeded or failed to get our message across.

Videoconferencing seems to lack proper back-channel cues in many respects, which may 'delay' the messages sent and result in misunderstandings. The lack of cues conveys what we may interpret as 'substituting' conversations. The following example, recorded during the initial process of the broadcast, displays a bouncing of more or less

relevant questions and statements between the teacher, technicians and support personnel.

1st technician: Are you the teacher?

Teacher: Yes, at least I'm working as a teacher. But personally I don't know. [laughing]

1st technician: I can't reach Kinda

Teacher: No, I've noticed that

1st technician: Nobody has phoned from there… so I don't know

Support personnel: I can give them a call and check it up for you

1st technician: I mustn't lose their IP number in any case

2nd technician: You have to push the remote control to get rid of the slide

Support personnel: Now there's something other than an image

Teacher: Yes, I can see and hear you

Support personnel: You're visible, at least here in Holm

Teacher: Yes, hello, hello

Teacher: Are you having trouble in Holm?

Support personnel: Yes, we've had some trouble. Now it's working anyway. Let's see what's happening with the others

Teacher: Okay, our technician has left. It isn't good but thanks anyway [ironically]

The communication structure described above can be interpreted as 'manifold'. The principal line is delivered by the teacher while a second line ensues from the discussion of the technicians. The questions and statements asked by the support personnel figure in between. Initially, the technicians involve the teacher by asking him a question and then continuing to discuss the problems of connection, IP numbers and slides with each other. The teacher and the support personnel believe they are part of the technical discussion. In fact, the technicians have already left. This is not discovered until later.

It seems that a large amount of talk is needed and that 'overacting' replaces the lack of body language and facial expressions. This form of substituting small talk seems important for verifying what has been said and for clarifying misunderstandings. In addition to small talk, the excerpt also illustrates the 'manifoldness' of the communication structure in which different conversations take place simultaneously. The excerpt exemplifies how jokes can be ignored and how statements can be given in non-chronological order. It seems that the communication pattern is out of order due to the lack of back-channel cues and questions and statements are delayed in time.

Distribution of utterances in the videoconferencing classroom
Of all the utterances given on seventeen different occasions in the university college's courses, only a small proportion (3%) of the total number are given by the students. On some occasions, no more than two or three questions were asked during a 1-hour lecture

and occasionally students were completely silent during a full session. The lack of feedback applied mainly to the situation in the remote classroom. As regards the origin site, where the teacher was present, the activity of the students was slightly higher (8%). The distribution of utterances between the teacher and the students was 92 percent, respectively, of the total number.

In education provided by the municipality, the degree of interaction between actors in the classroom setting is generally higher than in courses held by university colleges. Based on observations on twenty different occasions in the remote classroom, the students were likely to account for almost one third of the communication (28%). The number of utterances given by students in classes at the origin site was higher (37%). The distribution of utterances between the teacher and the students is 75 and 25 percent, respectively.

Based on the quantitative results of the study, we can conclude that the degree of interaction between the students and the teacher is generally 'weaker' (lower) in courses provided by the university colleges than in adult education provided by the municipality. In courses held by the university college, the teacher rarely asks the remote students questions and likewise the students are not likely to 'interrupt' the session with reflections, comments or questions. Although communication in adult education provided by the municipality shows the same pattern as in higher education, the feedback is more extensive and interaction more comprehensive both at the origin site and in the remote setting.

The frequency and distribution of utterances in class show that the communication where the teacher addresses a single individual is most common. However, the direction of communication may shift from a single pair to involving several actors. For instance, the students can address statements and questions to the teacher, to other students in the classroom or to other groups of students located in another remote classroom. The initiative passes from the teacher to the students, occasionally as a result of interruption, and discussions are intersected by new perspectives, ideas or related topics. Communication becomes multi-oriented, in all directions. Multi-oriented communication is usually spontaneous and more often than not initiated by the students. Multi-oriented communication between groups of students in separate locations rarely occurs (1-2%). when multi-oriented communication occurs, the teacher still monitors the subject, the direction of the discussion and the length of comments. Communication never stops being supervised by the teacher even though he/she does not participate in discussions.

Table 1. The Distribution of utterances in videoconferencing class	Percent (%) of student communication
University college (17 observational occasions)	
- origin site	8
- remote classroom	3
- distribution between teacher and students	92/8
- multi-oriented communication	2
Adult education (20 observational occasions)	
- origin site	37
- remote classroom	28
- distribution between teacher and students	75/25
- multi-oriented communication	1

Table one shows that the teacher addresses the majority of the questions and statements to the students. The teacher becomes the main character. The teacher-centred approach has been observed by Knipe and Lee (2002), Dupin-Bryant (2004) and Unander (1999), who consider a lack of interaction in class as a problem in videoconferencing. However, the actions of the teacher are not the only factor that affects the interaction in videoconferencing and my interpretation of the data points to a number of additional factors. First, my interviews with students shows that those who are experienced in handling the technology or those who are used to the teaching methods in videoconferences are in general more active in class than students who lack experience. Similar to the results of Unander's (1999) studies, I discovered that students who are experienced also have a more positive attitude towards the technology of videoconferencing.

> It's intriguing and it's fun to try new things. In small villages it's great not to have to travel to the city in order to study. [Student in upper secondary school]

Second, interaction increases if the students and the teacher have met before face-to-face, or if they know each other from other situations outside the videoconference classroom (for instance, in other courses).

Third, my studies show that the expectations of the students are important for how interaction in videoconferencing takes place. Not knowing beforehand that videoconferencing will be used as a teaching method may result in general dissatisfaction.

> It's not a proper forum for discussions at all. No, it's not enough… I don't know. It takes a lot of courage to make oneself heard. [Student in upper secondary school]

Fourth, it seems that all the actors, both students and teachers, need to learn how to communicate using videoconferencing systems. Knowledge about how videoconferencing really works in practice seems to be an important factor when it comes to increasing interaction.

Fifth, the teacher's knowledge and experience affect how he or she acts in class. My observations show that teachers who are used to the technology of videoconferencing behave more confidently in class. Experienced teachers also make better use of Technical equipment and seem to be more sensitive to the expectations of the students.

> It all depends on the teacher in videoconferencing. If the teacher can get the students interested or not. Else it will… I mean he is not present in class after all. [Student in upper secondary school]

Discussion

In order to further break down the nature of the questions and statements, communication can be categorised in different functions such as rhetorical and provocative. Kumpulainen (2001) argues that communication can be interrogative, such as when the teacher poses questions to the students, or informative when providing information. My study shows that the interrogative function of communication is more likely to occur in videoconferencing provided by the municipality. As mentioned earlier, the degree of interaction is less comprehensive in the university college settings,

which is also consequence of the interrogative communication function. However, there are situational circumstances to take into consideration. The interrogative nature of communication that occurs in the municipal setting is primarily a consequence of a slower pace. The teacher often allows for plenty of time to wait for the students to reply. This is not the case in courses provided by the university college where the pace is higher.

Another cause of extended interrogative communication has to do with the presence of students or not. In settings with an audience (the students) the teacher's attention is more often than not focused on students in the physical classroom. The audience present face-to-face seems to have a higher priority than students located in the remote classroom at a distance. My studies show that communication is more likely to maintain an interrogative function if actors are present at the same location. Questions addressed to students in the remote settings may instead have a somewhat informative or rhetorical character. Taken as a hole, the interrogative function of communication occurs primarily in municipal education and in situations where the teacher is present.

My analysis shows that some questions take on a character that may be significant for videoconferencing. The 'expanding' and 'provocative' questions serve to force the receiver to further explanations, to develop different perspectives on a subject or simply to stir the imagination of the students. Argumentative questions are designed to receive feedback and are used in order to capture the interest of the students. My analysis also shows that a large number of questions have a closed character that does not support discussions in the same way as open questions and statements do. Kumpulainen (2001) argues that argumentative discussions are more effective in fostering the student's critical thinking. It has also been said that discussions that serve to stimulate and support 'higher-order thinking' throughout the curriculum are preferable (Cazden, 2001). In videoconferencing, a large number of questions are dismissive, i.e. they do not encourage further interaction. Once again, videoconferencing risks becoming a one-way televised lecture.

My study shows that there is an unbalanced distribution of utterances between the teacher and the students where the teacher is responsible for most of the communication. This unequal situation is apparent in courses provided by the university college as well as in adult education provided by the municipality. The main reason is low feedback from the students. As pointed out by McHenry and Bozik (1995) and Unander 1999, it seems as if videoconferencing suffers from low response from students in class. Based on my quantitative data, videoconference has become a televised broadcast and the idea of interactive mediation has been weakened. It has also been argued that videoconferencing strives to span scattered actors and reproduce the experience of interaction as naturally as possible, viewing interaction as a highly desirable component of a teaching-learning process (MacKinnon, et al., 1995). The lack of feedback as well as transmission breakdowns makes a learning situation critical in videoconference. Goffman (1959) finds that the definition of the situation projected by a particular participant is an integral part of a projection that is fostered and sustained by the intimate cooperation of more than one participant. Videoconferencing simulates face-to-face interaction, but what maintains the image? Failures in self presentation may ruin the performance of the teacher or the student, but more importantly failures may ruin the common definition of the situation. What would happen if students re-define the situation? Would they leave the classroom if they apprehend videoconference as a one-way televised lecture?

Furthermore, it can be argued that the triadic communication pattern is a way of enabling the teacher to control the structure and content of the lesson. Goffman (1981) argues that the triadic communication pattern is a collective meaning-making process in which the parties collaborate. In videoconferencing, the teacher may maintain the triadic communication pattern in order not to lose the initiative, control and pace of the lesson i.e. broadcast.

The act of substitution is common among participants in videoconferencing. Teachers frequently address students by using the name of a place and students respond in the same way. Students also identify themselves according to places, rather than as individuals, to facilitate interaction and make communication run smoothly. It seems as if personal identities merge with places, which is sometimes a practical necessity in order to maintain order during the broadcast.

The videoconferencing system seems to lack fundamental communication requirements. In order to better understand the intention of the question, the addressee needs to interpret the tone of the voice as well as the body language. Mehrabian (1971) states that facial expressions are important in order to fully comprehend and interpret communication and increase the precision of messages. Goffman (1981) argues for the need of turnover signals, which are a means of indicating the end of messages and the taking over of the transmitting role by the next speaker. In the event of more than two people communicating, the participants need next speaker selection signals. Cues are not available in videoconferencing in the same way as in face-to-face communication. It can be argued that in videoconferencing, physical signs may be vague or even missing. Nor can the participants sense the atmosphere of the remote classroom, which makes interaction more difficult for all the actors involved. What may be achieved in class is what Goffman (1981) calls a 'working agreement' in which actors accept the shortcomings of communication. In conclusion, conveying expressions in videoconferencing is more complicated than when teaching face-to-face regards trying to break through the technical barriers.

Several scholars argue that the teacher is responsible for interaction (e.g. Dupin-Bryant, 2004; Unander, 1999). In the videoconferencing practice, several remote classrooms are linked to the primary teaching site, which means that the teacher has to consider not only the students present in classroom, but also different groups of remote students as well. For instance, the teacher, being located at a distance, is not able to see all the participants and cannot know whether students are present or not.

Videoconferencing is a complex teaching situation to which we must add the complexity of mediating technology. Waltz (1998) sees the teacher as an actor left powerless in the hands of engineering. My results show that technology is important. For example the teacher does not pay attention to remote students to the same extent as he or she does to students in the primary teaching site and the interaction pattern breaks down into a number of situations as a consequence of the technical medium. The videoconference's learning space can be described as a web of interrelations between people, the environment and technical artefacts that are processed and given life by means of learning activities. These interrelations are characterised by technical superiority over human actors, and the different forms of talk presented in this study are an example of how technology impacts, changes and controls interaction.

Finally, one may ask oneself if the communication pattern described in this study is typical in videoconferencing or if it is dependent on certain conditions or specific teachers? One may also debate the results of the study based on development of educational technology. The value of data is mainly to make visible the nature, extent and direction of communication in videoconferencing. The varying conditions in classes

make my results difficult to generalise to other situations than my specific sample. For instance, the number of students in the classes varied between different observations and the teachers used different approaches during the duration of the study. In conclusion, this study is not conclusive, but an example of how actors talk in videoconferencing. This study shows the impact of technology in videoconference. It can be argued that whenever technology is used in educational and social settings as a mediating tool of communication interaction is influenced one way or another. Observations made some years ago in videoconference classrooms in Sweden are as much relevant to understand the relation between material objects and people as subsequent studies focusing any technical design applied in distance education. In general virtual universities and distance education are seen as a solution to growing education demands of the knowledge society. The rapid implementation of Internet accelerates this trend. The emergence of local learning centres in Sweden and Europe is based on networking of actors striving to provide access to learners. However, it can be argued that the implementation and the design of educational tools are critical for learning outcomes (Knowles, 1989; Boud & Felletti, 1997; Boud & Garrick, 1999) and it can be discussed if the conditions for learning in videoconference are favourable for learning. Research still need to investigate how knowledge is produced in virtual universities settings and how knowledge is included in artifacts and material settings. The role of technology is often missing in educational studies.

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