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*Published in:*  
Proceedings of the 12th European Conference on e-Learning

*Publication date:*  
2013

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Ørngreen, R., & Mouritzen, P. (2013). [Teaching Desktop] Video Conferencing in a Collaborative and Problem Based Setting. In M. Ciussi, & M. Augier (Eds.), *Proceedings of the 12th European Conference on e-Learning* (pp. 360-368). Academic Conferences International (ACI). <http://www.academic-publishing.org>

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# Proceedings of the 12th European Conference on e-Learning

**SKEMA Business School  
Sophia Antipolis  
France  
30-31 October 2013  
Volume Two**



**Edited by  
Mélanie Ciussi and Marc Augier**

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Many thanks to the reviewers who helped ensure the quality of the full papers.

These Conference Proceedings have been submitted to Thomson ISI for indexing. Please note that the process of indexing can take up to a year to complete.

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E-Book ISBN: 978-1-909507-84-5

E-Book ISSN: 2048-8645

Book version ISBN: 978-1-909507-82-1

Book Version ISSN: 2048-8637

CD Version ISBN: 978-1-909507-85-2

CD Version ISSN: 2048-8637

Published by Academic Conferences and Publishing International Limited

Reading

UK

44-118-972-4148

[www.academic-publishing.org](http://www.academic-publishing.org)

# [Teaching Desktop] Video Conferencing in a Collaborative and Problem Based Setting

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**Abstract:** This paper presents experiences from teaching video conferencing for learning and collaboration, and discusses the challenges and potentials of applying a collaborative and problem-based learning (PBL) pedagogy. The research is an action research study, and we as researchers, educational planners, teachers and assistant teachers wanted to find ways in the design for learning that enables the learners to acquire knowledge about the theories, models and concepts of the subject, as well as hands-on competencies in a learning-by-doing manner. In particular we address the area of desktop video conferences. We studied 3 subsequent years of a master program module on video conferencing, and the changes it has undergone. The participants work in groups and each group has the task of designing a short one hour (45min) educational design of their own choice. The students have to try out and evaluate their educational design and their role as teachers in this video conference setting. The students reflect on their experiences and designs in a blog and the group collaboratively hands in a reflection paper online. Both blog posts and reflection papers needs to relate to the literature of the module. Our analysis shows that the students experiment with various pedagogical situations, and that during the process of design, teaching, and reflection they acquire experiences at both a concrete specific and a general abstract level. The desktop video conference system creates challenges, with technical issues of delay and sound problems, where different embodiment and space-design influence the learning process. However, we also find that the PBL-setup inspires the students to apply theory into practice and to reflect on their own practice, furthermore the collaborative approach support the feeling of trust which is crucial when building on a competence as personal as teaching.

**Keywords:** desktop video conferencing, competence development, problem-based learning (PBL), problem-oriented project-pedagogy (POPP)

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## 1. Introduction

Video conferencing is a strategic choice for many organizations, as administrators hope for cost-effective teaching and collaboration over distances. This leaves many teachers and professionals with new challenges. With this research we focus on stepping further than traditional online lecturing and webinar formats, to collaboration, problem- and project-orientation, and further develop aspects of the concept tele-presence and -experience for this setting. Consequently, this paper is cross-disciplinary involving the fields: video-conferencing for learning, PBL methods, and collaborative learning.

*Video-conferencing for learning:* The purpose of the module under investigation is to give students insight and experience with the use of video conferencing for learning and collaboration in both educational and work contexts. The primary video conference technologies applied are various desktop video conference systems. The learning goal is that students will be able to critically assess the needs and requirements for tools for different types of activities, with emphasis on knowledge of interaction, communication, and cooperation. (Kear et al. 2012) report on a number of positive effects of using a web conference system, but they also discover that tutors find it more difficult to improvise in web conference systems compared to traditional face-to-face teaching. As researchers in the field we have observed and participated in numerous sessions that used a less interactive form, with the teacher(s) taking the dominant role. This can be very suitable in some situations, but given the learning objectives of this module, we needed another pedagogical approach of collaboration and exploration, and as the Master in ICT and Learning (hereafter called MIL) is a PBL inspired education, this was a natural place to start.

*PBL and collaborative approaches:* (de Graaff & Kolmos 2007) outlines several PBL variances and give a historical outset for the project orientation of PBL on which the MIL education is based. Project orientation can vary, depending on whether the students are given a task, a predefined problem to work on, or the students themselves define the problem area, the definition of the problem to work on, as well as the method and theories to apply. (Savin-Baden 2007)) identifies a number of ways to work with PBL that shows its great variety: from working on solutions to a problem in a somewhat teacher defined way to whole educations that

apply problem orientation. Aalborg University identifies itself as a PBL-university, applying the recognized Aalborg Model (Kolmos et al. 2006) that integrates the PBL-thinking with what is known as problem-oriented project-pedagogy (POPP) (Kolmos et al. 2006). The project-orientation at Aalborg University does not necessarily entail collaboration. The projects can be individual, however in POPP the overall paradigm is social constructivism, focusing on knowledge sharing among peers. Within this line of PBL and POPP, new thoughts has emerged on how to combine these in digital supported learning processes (Dirckinck-Holmfeld 2009).

The ability to improvise during a teaching session is much needed in a PBL setting, where control is given to the participants: *"Participant control implies that the institution or the teacher cannot fully guide or control the learning process. Problem formulation is always a leap in the dark. It is the subsequent theoretical and empirical enquiry that really displays the results of the collaborative learning situation."* (Dirckinck-Holmfeld 2009, p. 4). Given the amount of literature on how difficult it is for some teachers to foster interaction and give up control, our research focus has been to develop a learning design that enables us as teachers to facilitate learning in a PBL/POPP manner, allowing for the necessary interactive but also unforeseeable events (see for example Hedestig & Kaptelinin 2005, Majid et al 2006). Within this setting, we have investigated how does space and layout of digital space, constitute and influence the learning experience?

In the following, we present the MIL-case and the applied educational design, then we give a brief summary of the students designs for learning and move on to the analysis of the digital spaces and the learning experiences.

## **2. The MIL case and the educational design**

MIL students are mature adults. The majority have years of experience from practice, and although they all have an interest in learning and technology, they come from very different backgrounds and from both the private and the public sector. It is a part-time study over 2 years, and the pedagogy is a blended mode where the students meet face-to-face 3 times a year for 2½ days seminars, and the remaining teaching and collaboration between students take place through online activities.

This video conference module is a 5-ECTS-module developed and taught by Rikke Ørngreen and Marianne Georgsen (in 2010 and 2011) and named: the didactic of video conferencing. It was slightly redesigned by Rikke Ørngreen (in 2012) and re-named: *video conferencing for learning and collaboration* with teacher assistance from Per Mouritzen.

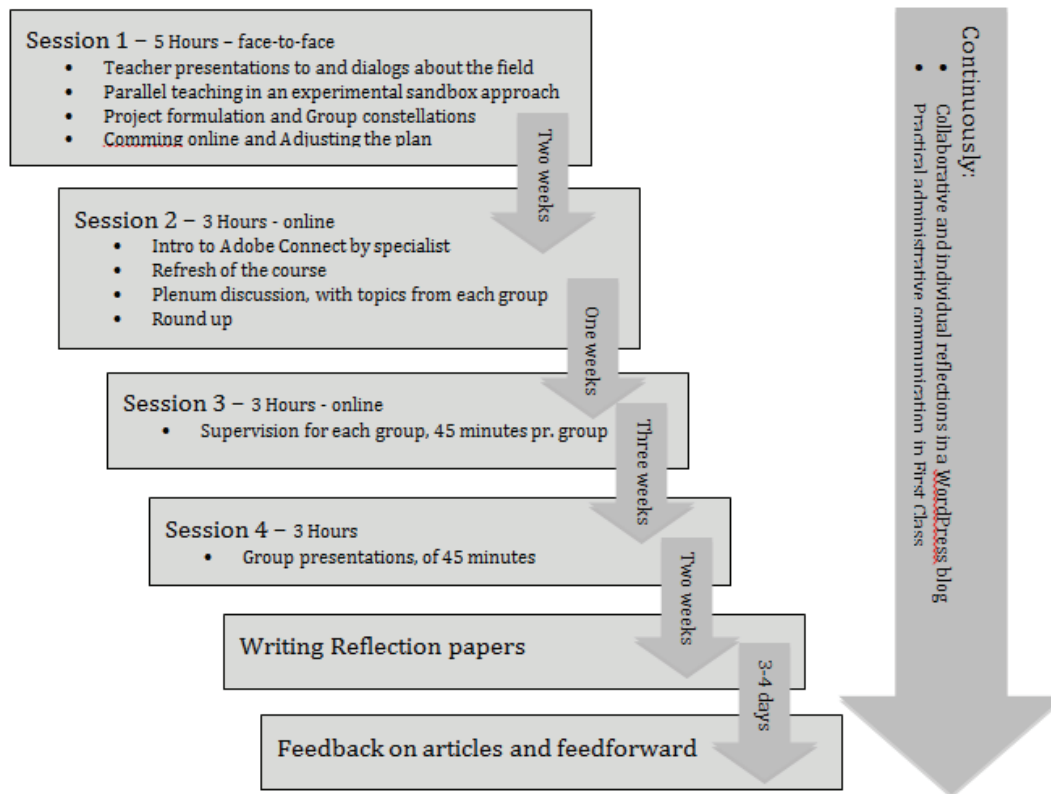
The students' works in groups and their assignment is to design, run, and evaluate an approximate 1 hour educational design either with their fellow students (role-playing the target group of the educational design) or with the actual target group. In case of the latter, they present the design and their experiences with the real target group to their fellow students. The domain area of the design, the learning objective and even the video conference system used is left open for the students to decide.

The educational design is illustrated in figure1 and can be outlined as follows: Each year, the module has a start-up activity at a face-to-face seminar (approximate 5 hours), and then it continues online for 6½ week. The online activities varies from asynchrone discussion boards, blogs, and project activities in shared documents, to synchrone presentations, discussions, and supervision using video conference tools as Adobe Connect (hereafter called Connect), Skype and Google+/Hangout. In between the teacher involved activities, the student's work on their PBL activities in collaboration. There is a mix of video conference use, with and without teachers, in small groups and in plenary sessions.

At the face-to-face seminar (session 1) the students are introduced to the video conference field (concepts and themes) and discussions on challenges and opportunities commence. Then follows a discussion of the possible problem-areas and projects the participants would like to explore and design during the module. This dialog has as the point of departure the students' work practice and their aspirations. Practical issues are coordinated, such as establishing the work plan, establishing themes and groups, and making sure everyone has access to Connect and the blog.

The evaluation of 2011 showed that the primary focus on desktop video conferencing left some participants with the unmet need to experience and talk about campus-to-campus conferencing. This was included in the

first session at the face-to-face seminar in 2012. At the seminar, we reserved two classrooms, in close vicinity to each other and experimented with the system in a sandbox-approach by simulating distance.



**Figure 1:** The structure of the module on video conferencing

In the PBL group process, the students meet with the teachers in a video conference: First in a plenary session to acquiring experience with video conferences for collaboration ranging from different design of virtual rooms to social fun with a distance-sing-along (session 2); Then in a supervision session to get fed forward to their design and progress (session 3); Finally, at the day of trying out or demonstrating experiences from their learning design (session 4). At all times, the students have the opportunity to raise issues, share information or ask questions in the First Class forum (the LMS of the MIL education). The teachers are online once a day and students can therefore expect an answer to a question within 24hours during workdays. Due to the students work-hours, all video conference sessions takes place in the evening.

The assessment criteria of the module are through satisfactory and active participation. During the process of making their learning design, students acquire experiences with and the students reflect on their experiences and designs in a blog. The individual blog posts should relate to the modules literature and in 2012 each student should write a minimum of 3 blog-posts, within 42 hours of the session 2-4. The teacher participated with mediating blog-posts that highlighted issues put forward by the students, and generalized or discussed them further by relating to previous experiences and existing literature. The module is completed with each group writing a reflection paper, which they receive written feedback and feed forward to. These papers relate to the practical experiences from the module and should once more apply the literature from the module.

### 3. The students educational designs

The students came up with a broad spectrum of educational designs from paper-folding challenges with the learning goal to engage the body in video conferences for children, over discussion of marketing strategies, to role-playing in the military. Each group was allowed to choose an online system of their choice that worked for their design, but all groups ended up using Connect. The main reason was properly due to easy access, as the program was provided free by the university in a no-limited addition (google hangout only allows for 7 multiple videostreams), and it was also introduced during session 2 (figure 1). Other reasons seemed to be due to the many functions Connect provide. For example, they can design different templates before a session, enabling the designed space to change while the session runs; they can assign different roles; and they can apply break-

out rooms, which are virtual meeting rooms, where participants can be sent to by the “owners” of the session (in this case the group of students). To give a better understanding of our analysis and of how the hands-on-experiences relates to the theories-in-use, we present a few exemplary designs from the most recent module (2012/2013).

One group explored how to design an online meeting room to give the participants a sense of presence, being mentally in the same place, even though they physically are situated in different spaces (Dourish 2006). They wanted to examine what happens when using different modalities in an online meeting. To examine this, they tried three different settings with the participants, and documented the process by participating as observants in each setting.

The students met in a plenary Connect room for introductions by the planning-group. This Connect room was owned and designed by the student-group and had break-out rooms. After the introduction the students were divided into groups of maximum 4, and sent to the break-out rooms. The groups did not know that they did not have the same communication-channels/tools available for their assignment. The assignment was to “design a meeting room”. In one break-out room they were only allowed to use audio, in another break-out room the where allowed to use audio and video, and the last break-out room the used audio, video and a program called floorplanner, which they used by the desktop sharing function in connect. After this exercise that was monitored by a group member in each break-out room, the session ended with a discussion in plenary (see figure 2), where the different starting points were revealed. The group in charge wrote about their immediate reflections and experiences in the blog, as well as on their different roles during the session, as observants, discussion facilitators and technical responsible persons. The final paper that was handed in also included a very thorough analysis of the empirical data collected during the process.

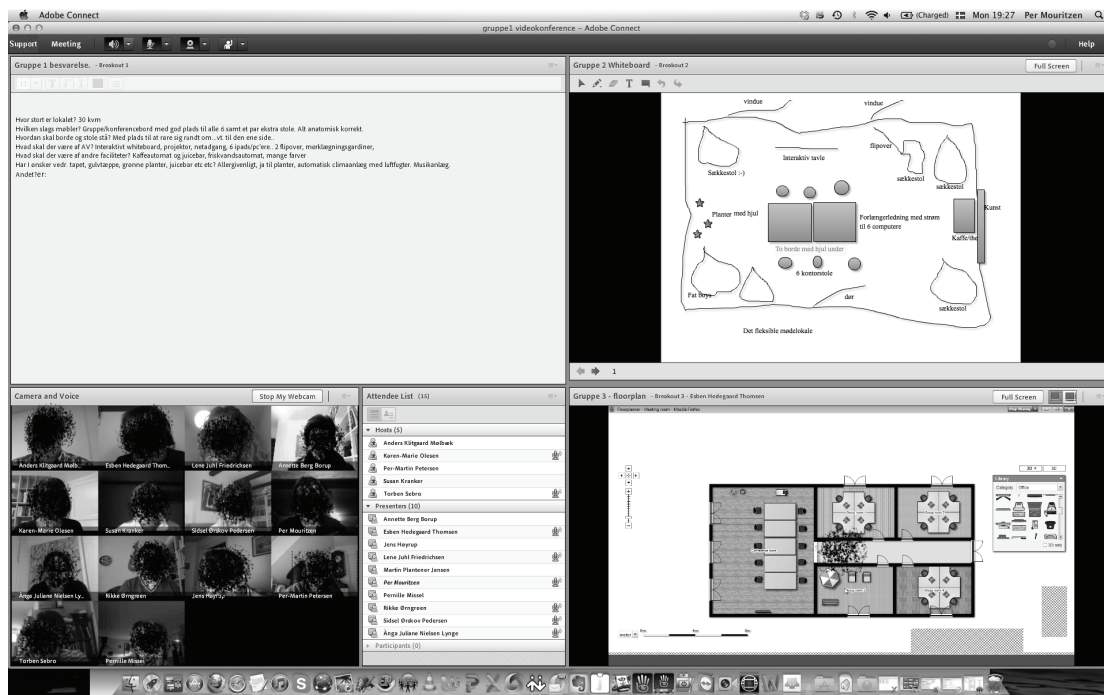


Figure 2: Plenary discussion in the “design a meeting room”-assignment

Another group used a similar setup, but with a difference in objective and in technological setup. The focus was communication and negotiation, specifically to agree on important events from 2012 in a short time-slot. They wanted to examine the difference in communication when people have different modalities available: one group with access to video and sound, the other only with access to sound. As the above described group, this group had a plenary Connect room for introduction and discussion. However, for the group work, the participants were asked to log-in to another meeting-room in Connect. This is the only technical way to record the session, for example when you want the video available for later reviewing and analysis. Break-out room activities cannot be recorded as everyone is still technically in the same Connect session. As the previous group, the student-group could have chosen to attend the break-out-rooms as observants. However, they had made a design where they did not want to interrupt or take over control of the activity. Having people to move

from one Connect session to another turned out to be a little challenging, in such a short timeframe, but nevertheless it worked in the end. As mentioned by many in the reflection blog-post afterwards, this challenge was probably intensified by the fact that unlike all the other groups, this group did not have a technical facilitator appointed. Although, all the participants found their way, either by helping each other or themselves, this difference was felt.

A third and final example is a group that wanted to explore what could be identified as engaging factors when using video conferencing with school children at app. 10-12 years old, when learning Danish grammar. They tried to carry out their learning design with the actual target-group. However, they ran into technical difficulties as this was done in a private-household, using several computers on one Wi-Fi connection. They experienced so much delay that the learning process could not be executed. The group documented this and in their 45min presentation and then they asked us as participants to try out the planned design, both using break-out-rooms and gamification elements. The gamification elements used the facilities of the Connect room (the whiteboard etc.), but also engaged in low-key technologies, as when the participants were asked to write on paper and just hold the result up to the webcam. This idea of using fast methods for distributing results by holding objects to the webcam is something we in our research has used several times and had discussed in our teaching. Often we find teachers use a lot of time on distributing pictures from the mobiles to the class folders and then to the shared desktop or smart board. Holding objects, the mobile screen etc. up to the webcam is a low-fidelity solution, but works well and focusses more on the learning objectives.

#### **4. The teachers condensed analysis**

As researchers and teachers we have during and after each year of the module evaluated on the learning process and the students experiences as a whole. The MIL program performs standard evaluations which has been very positive indeed, and confirms our educational design (in particular this last year – 2012/2013), with the exception of two qualitative remarks about how the module, though engaging, required a big effort to carry out. Our analysis hereunder investigates the actual situations as they unfolded, a much richer empirical outset than the formal evaluations. We focus on the use and layout of digital space, and how PBL applied in video conference settings constitute and influence the learning experience.

##### **Tele-experience**

It is notable how everyone feels that one hour of teaching using videoconference demands more energy than normal classroom teaching. This was also found in the (Kear et al. 2012) study, where tutors found themselves “fatigued” and “wiped out”. They argue that the reason is the complexity of the interface (many types of media and streams of communication in play). In our situation, we found teachers and students alike experienced this, perhaps due to the PBL-setting, where students have active roles. Also, in desktop video conferences, everyone perform a focusing / a zooming of the senses. This hyper-zoom is necessary, as some of the senses that are normally helps us in judging a situation via the body and the peripheral sense of the room, cannot be used to the same degree via video. Another perspective is that we tend to use more “effective” time together. For example, there is less chit-chat, less moving about in groups etc.

There is also an extra cognitive load caused by awareness of oneself based on the image shown in the video conference. It is not that we as participants want to “look good from the right angles”, on the contrary there seems to be a relatively relaxed atmosphere, with people participating in the most fascinating angles: from the “cam” on an iPad lying flat on the desk and students leaning over the desk, to strange back-lit settings. We found it is often just a “being made aware of own presence” that we are not accustomed to, and even if this is just for a brief second or less at a time, it makes a difference. This corresponds with findings of people performing worse in job-situations of video conferencing, where they can see themselves (Wegge 2006). Although we found participants did not perform worse, just differently and more self-aware, it may add to the cognitive strain and energy use in a video conference session (when the video stream / webcam is turned on and not hidden by documents).

As mentioned the students could choose platform and often chose Skype/Google+ hangout for supervision, and Connect for teaching their educational design. It could be that they are familiar with theses first two platforms, and feel comfortable with them. Trying other platforms means leaving their comfort zones (Penteado 2001), and they want to play-it-safe when having supervision. Perhaps the students experience as



we do that for a small number of participants, these freeware often works better, and a more intuitive. The sound is better, and Connect does not mirror the image, and for many it seems unnatural to look at themselves in a non-mirrored image. As such, the design of the different platforms, the designed space, constitutes frames for the design of communication.

Another point of “un-natural” vs. natural frame of communication is the concept of gaze. A lot of papers deal with the direction of the eyes; that one cannot look directly into the eyes of the participants (by looking into the webcam) and at the same time watch the participants look back at you (by looking at the computer screen). In the simulation of a two-campus solution at the seminar day, we discussed gaze direction: How the teacher may direct his/her eyes towards the camera to establish a more engaging tele-experience. It may seem “un-natural” to look in the direction of the ceiling (because the camera was mounted higher than the participants), but it supports in establishing a common tele-experience and an element of trust. For PBL-pedagogies the element of trust is vital and looking into a webcam in desktop video conferences may interrupt visual cues of trust. This was discussed in the blog and also got some attention in our synchronous dialogs. The student mentioned that *when the teacher sometimes in the dialogue looks smiling at me, into the camera, it seems like cheating*. We argue that people today are accustomed to the skype/hangout way of communication that a culture of how this is done has been established. Either people look at the one they talk to (i.e. the computer screen) or at everything and nothing. People do not look directly at the camera and smile. When doing so, it could feel as a try to establish a connection that is not there, i.e. cheating. The unnatural way of speaking indirectly to people’s faces in video conferences, may have become the natural tele-experience way, where we use our bodily senses of the emotions displayed by the other to connect with each other. This is a new way of using our bodily senses in digital spaces, and because of its newness, it may add to the cognitive load discussed above.

#### **Collaboration on technological pedagogical features and technical problems**

Common questions the first time the module ran were “can you hear me?” and “do I have sound?” Even though there were sound problems during the last module virtually no one asked this question. We believe one reason was the technical walk-through at the first online session (session 2). The introduction had moved the students from their comfort zone into a risk zone (Pentado 2001), meaning the students felt safe enough in the Connect space to take some risks. We also saw that the students supported each other in their groups. Some groups used dedicated roles, where many applied a technical facilitator during their 45min session. Hedestig and Kaptelinin talks about the technical facilitator as a role that do more than technical support. The technician acts as an assistant teacher, meeting the students before and after the session and therefore knows them at a semi-personal level, and assists the teacher by directing his attention to students with questions. The technician can also predict if the equipment has or is going to have a breakdown, e.g. if the picture begins to drop-out. (Hedestig & Kaptelinin 2005).

Technological problems are of course present, and audio/visual delays and need for explicit turn-taking increase as the number of participant increase (see also (Ruhleder & Jordan 2001)), in particular when the number of participant rise from around 10 to 15-20. In a state-of-the-art and literature review of desktop video conferencing, (Smith 2004) concludes that this is “*most suitable for collaborations with single individuals or small groups of up to three four people*” (p. 23). We agree that this lowers the complexity, and that true collaboration in a PBL-setting is difficult with many people online, but we also find that the number of people participating can be bigger depending on the learning design. Although this does require a set of “knowing what to do” and “plan B’s”, when things do not go as planned.

Several groups used the break-out-room feature. This is an excellent tool for process management of group-sessions, however, as some discovered it sometimes management as in the sense of control. The planning-group had a control button to send people to their groups, rearrange them, send messages to, etc. This led to people felt they lost control. Some got frustrated: “*I was in the middle of a sentence and then wupti...*” was an experience we heard often, when the participating students were called back to the plenary session. In a traditional group work, students will often rise from the chairs, move in and out of the classroom, and they will themselves decide whether to end in a sentence or carry-on. As such the video conference features influence the pedagogical-space.

### **Recordings as reflection tools**

Some groups used the recording tool in Connect, to be able to analyse the learning design afterwards. This method is supported by Thuraijah et al (2011), whose findings points to the benefits of using synchronous conferencing in distance learning, but also finds that the recordings and asynchronous use are of great value for the students. Desktop video conferences are easy to record and share. Rattleff and Holm (2009) describes that teachers' worry about their organizations re-use of recordings and the students worry about who can see them in the future. However, their studies also show that students use recordings in support of their learning (stopping, pausing and reflecting).

These types of studies all address recordings of teachers' lectures. In PBL/POPP it is a process-perspective and recordings work as reflection tools. This is confirmed by Tripp & Rich (2012) where video-based-analysis of own practice was catalysts for changing own practice. Also, the teacher role is dramatically different. In PBL it is a facilitating role, where the subjects and the actions taking place cannot be 100% a priori defined, this makes the teachers dilemmas with being made obsolete due to recordings of their lectures less problematic.

### **The learning and communication process**

We have observed many different utterings between students, and between students and teachers. When Majid et al (2006) studied the interaction patterns in a video conference learning situation, they identified dimensions of interactions and categories of exchange: teacher talk to students, student talk to teacher or students initiate and direct other students) (Majid et al 2006). A number of similar interaction and exchange forms took place in this module. We also found that a lot of the interaction is non-verbal, also in video conferences. We saw how the shared digital materials provide the possibility to collaboratively "build" something, and how the building of arguments, of keywords, of drawings are a vital part of supporting the communication and the PBL-process in non-verbal ways. This is an added-value experience, which our traditional face-to-face interaction-form does not cater for.

Our analysis shows that the PBL-setting allows for a very lively dialog, and the students use many of the functions while learning about video conferences. It was, however, more difficult for the student to explore the pedagogical spectra in their own design, in particular the first two times we ran the module. Our analysis shows that for some students it is difficult to move beyond the more traditional teaching formats: a lecture or instruction, then a group assignment, and a plenary session. As mentioned two alterations affected this: The brief technical introduction/walk-through to allow a sense of familiarity with the possibilities, and secondly, we tried to frame the PBL-module as a sandbox, as a chance to explore and play with technology. This playfulness was further established by having a sing-a-long. At first we introduced this as a heartwarming farewell at the end of the module. But for the last run of the module, we used it as an ice breaker. We played a traditional well known (to almost everyone) song in a karaoke form and tried to have people sing-a-long from their various distributed positions (figure 3). A completely impossible task, due to delay of sound, but also very funny and relaxing.

## **5. Discussion and interpretations**

The form of not only talking about but also doing video conferencing (in a learn-by-doing thinking) seems to work very well. Compared to other modules in other educations with which we have experience the literature comes well into play (it should be duly noted, that we as teachers had explicitly framed that theory and the literature of the module should be used in the blogs and in the final paper). Besides technical issues, such as technical interruptions we found that the students in the collaborative and group processes are able to carry out and learn from their sessions, while exploring many different PBL-settings and different pedagogics.

The analysis also shows that there are interesting aspects of how we experience each other via video conference. Some functions as break-out-rooms and the setup of various windows provide different spaces for us to interact with each other. As other researchers confirms, the element of self-awareness plays a significant role when carrying-out video conferences. We found desktop video conferences adds another dimension to self-awareness, and the concept of trust in eye contact / gaze seem to change, as our everyday familiarity with the skype/hangout facilities has shown a new way of communicating. In the beginning these new forms of teleexperience and telepresence might add to the cognitive strain on the participants.

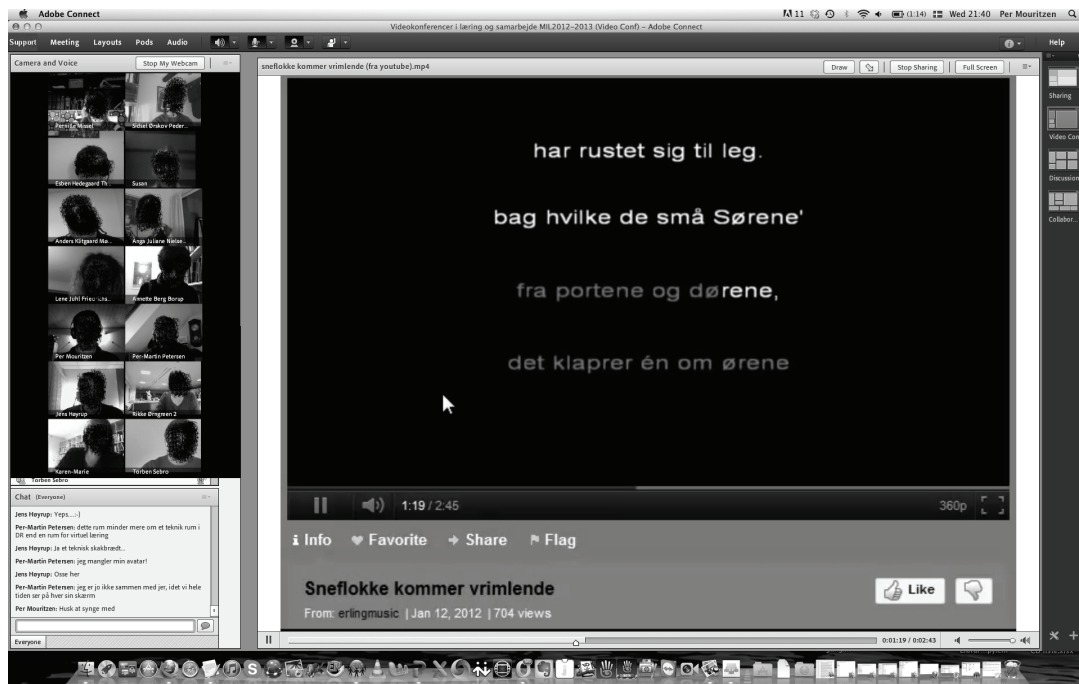


Figure 3: Screenshot from sing-a-long exercise

As teachers, one of the challenges has turned out to be how to support students in moving their focus beyond technical problems (like log-in, delay and using advanced features in connect), to enable students to discuss video-mediated communication and learning on a more academic level of a master module. On the other hand, technical issues do play a significant role; as such it cannot be ignored. This entails that the roles of teachers, facilitators *and* students should be discussed, when we know such issues will occur. We find that giving the students some basic technical skills in the beginning minimize problems underway, particularly if they know how to solve them themselves (adjusting the Connect microphone and camera settings). Similarly, the PBL/POPP setting was framed in an atmosphere that gave room for sandbox-thinking and playfulness.

The very different learning designs that the student groups worked with meant that everyone got experience with and reflected on areas that we as teachers would not have been able to include. As facilitators, we were able to recognize which aspects would be relevant to bring forward in the discussions, but in general the students themselves identified relevant aspects. Thus in cooperation we found and discussed subjects from the literature, but also subjects that are not visible in the literature, as the issue of gaze. As such, we find that the PBL format not only work as research-based-education but also as an education-generating-research in a mutual learning process.

## 6. Conclusion in relation to teaching this module

In this paper we have shown a possible scenario for teaching desktop videoconferencing through problem-based-learning approaches, and the roles and learning strategies applied. Through this work we identified aspects important for the learning experience, the design of the video conference space and tele-experience. We also found that to some extent the video conference learning and teaching mirrors students existing practices and thus provides an opportunity for the students to reflect on own practices, whether in video conference setting or not.

Our roles as teachers are to create a frame, where students get an array of practical experiences, to initiate reflection at several levels, and to expand collective knowledge and knowledge in the field collaboratively. We have created this frame by using a number of IT tools (Connect, blogs...), but find that the educational design (the schedule of events and facilitated activities) in particular contributes to the students learning. In this PBL/POPP setting the frame was given (to develop and try-out a learning design), but how to reach the learning design, what to put in it, which topic and empirical data to use for the paper were based on students' own choices. As teachers we try to further progression by participating in the ongoing discussion, in the plenary video conference events, through group supervision and onwards by commenting on the papers written.

## Acknowledgements

First and foremost we thank the students participating in this module for the three years described and of course also Marianne Georgsen, who were in the teacher-team for the first two years.

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