Designing with Teachers

A case study exploring design guidelines for distance-learning environments

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Abstract

The research question for this study is “What different design guidelines can be distilled from teachers in a distance education organization when they are tasked to imagine the interface for synchronous video communication with students”. Previous research has shown that live streaming technologies are a viable option for students but more research is needed with the teacher perspective. By employing qualitative methods such as semi-structured interviews and holding a participatory design workshop with teachers at distance learning facilitator in Sweden this study argues that an online learning platform should be designed with social media aspects in mind, the ability to hold teacher-held lectures on a regular basis, present different modes of participation in order to improve online distance learning. The author suggests that more studies with the teacher perspective in mind should be conducted to further improve the understanding of teachers’ needs in an online distance-learning environment.

Keywords: e-learning, distance education, participatory design, human-computer interaction

1. Introduction

Online live streaming of different types of content is a common occurrence on the web today. With higher bandwidth and more accessible live streaming services, streaming audio and video to an online audience is a low-effort task. Services such as twitch.tv moves the traditional TV-studio into the home and allows everyday users to stream content of their own desire from their computer screen (e.g. gameplay). Applications for smart devices (smartphones, tablets) have also made it possible to stream video to a global audience independent of where the person who is streaming is currently located, provided that they have some sort of mobile Internet connection. Streaming video also has other uses apart from streaming games. To increase inclusion and accessibility in higher education, live streaming lectures help students who for different reasons cannot be physically presented and attend lectures at a specific location. This type of distance education is a viable alternative to study courses in classrooms.

Distance education isn’t a new phenomenon and with current technologies the boundaries of where the physical classroom ends and the digital counterpart begin are getting more blurred. The need for a student to be present in person isn’t required anymore to achieve good results in their studies. IT in education have been discussed and researched a lot and the field is ever evolving, employing novel uses of new technology in the everyday students’ curriculum to enhance the knowledge transfer between teacher and learner. In terms of distance education, the use of technology and digital media is more of a need than a complementing feature to meet the standards of today’s education.

Distance education is usually divided into synchronous and asynchronous courses. The latter makes it possible for the student to partake in a course in their own study pace,
whereas synchronous distance education is conducted in real time between teacher and students making use of web conferencing technologies. There are also combinations of these two types of distance education called blended learning (Osguthorpe & Graham, 2003) where both synchronous and asynchronous aspects are prominent in the course structure. Students prefer synchronous web conferencing to asynchronous text-based lecture courses according to Skylar (2009) and the use of video in the course material is beneficial for a student partaking in a distance course (Hartsell & Yuen, 2006; Ullrich, Shen, Tong & Tan 2010; Yunus, Kasa, Asmuni, Samah, Napis, Yusoff, Khanafie & Wahab, 2006).

Interactivity is also an important factor for student satisfaction (Skylar, 2009). Friends and strangers interacting through a text-chat whilst watching the same video have a positive influence on social relationships (Weisz, Kiesler, Zhang, Ren, Kraut, & Konstan, 2007). Collaboration in virtual learning teams has not been shown to be a particular hindrance when trying to accomplish tasks over distance (Johnson, Suriya, Yoon, Berrett, & La Fleur, 2002) and learners enjoy using tools that provide collaborative aspects (Yang & Liu, 2007).

In this study, the aim is shifted from being more centered on students and their experience of web conferencing systems to investigating what needs teachers of distance education find more important. By holding a design workshop at a facilitator of distance education in northern Sweden, this study’s goal is to gather useful design guidelines from teachers for an interactive web conferencing system. A more teacher-centered view on distance education is important in order to further develop distance education by ensuring that the tools used by the teacher are providing necessary and meaningful features for teacher-learner interaction.

1.1 Research question

The research question for this study is “What different design guidelines can be distilled from teachers in a distance education organization when they are tasked to imagine the interface for synchronous video communication with students?”

The hypothesis that underlines this research question is that teachers have different conditions and prerequisites for integrating live streaming video in their day-to-day work depending on what subject they teach. Previous technology experience is a factor that needs to be taken into consideration when designing live streaming technologies intended for distance education.

2. Related research

Live streaming video has been a well-researched topic and the use of video in a distance education environment has been shown to have positive results on students’ satisfaction. Primarily the body of research in this area is focused on the results and applicability of this technology for students (Abdous & Yoshimura, 2010; Johnson et al., 2002; Skylar, 2009; Ullrich et al., 2010; Yunus et al., 2006). However, there’s room to fill with studies investigating the effects on the teachers who makes use of this technology in this particular context.
The lesser body of research that exists suggests that web conferencing is a demanding task for teachers and issues of interaction and obtaining feedback from students is an apparent obstacle to overcome (Cornelius, 2013). Cornelius (2003) did an inspiring study with four experienced teachers making use of web conferencing technologies and documented their experiences with web conferencing as a tool to facilitate learners in a virtual classroom. In terms of interaction, the teachers felt that the technology in itself was hindering discussion with and among students. A lot of the moderation, rightly so, is put upon the teacher that in turn requires more concentration and focus whilst holding lectures in a virtual classroom. In this study teachers also felt as if they were talking to a “wall” because of the lack of learner presence. To receive feedback from students, the teachers had to develop strategies to make mutual understanding clearer. The web conferencing tool that was used in this study had a text-message chat where the use of emoticons from learners was sufficient to convey feedback to teachers.

Video conferencing sessions also require a lot more planning in comparison to traditional classroom teaching (Hedestig & Kaptelinin, 2002; Latchman, Salzmann, Gillet & Bouzekri, 1999). Apart from careful planning issues or breakdowns of the activity can also occur in different situations. Hedestig & Kaptelinin (2002) divide breakdowns originating from within the setting and breakdowns occurring outside of the setting. Breakdowns within the setting are issues with the activity of video conferencing occurring at the student site or at the teachers’ site. Video conferencing classes typically require more planning and preparation than in a traditional setting. So teachers have to prepare specialized course material to present during these video sessions prior to them taking place. There’s also a need for teachers to divert focus to what is actually being shown to the students. Since video conferencing typically is a two-way video communication teachers also have to coordinate the incoming video feed to be able to see if students want to ask questions or needs the teacher's attention. Technological breakdowns in terms of latency issues can disrupt the immersion of the students and make the overall experience negative if video stuttering occurs for example. Therefore, a high bandwidth that ensures reliable content delivery is a key issue for web conferencing systems. All in all traditionally developed methods for teaching isn’t applicable for a videoconference setting. Communication with students, cues for attention, materials being broadcast and time management are important for a teacher to coordination during a video setting.

Early studies on virtual classrooms show that these online alternatives to education are equal or superior to traditional classroom education in terms of mastery of course material among students (Hiltz & Wellman, 1997). Access to professors is perceived to be better by students in virtual classrooms in comparison to traditional classrooms. The collaborative aspects of virtual classrooms have been highlighted as a positive side effect of gathering students in these online environments because the notion of other students reading each others work will motivate them to perform better (Hiltz & Wellman, 1997).

In asynchronous virtual classrooms, the need for students to be present at specific times isn’t a requirement, which makes the classes more available for students with specific needs and for those who have other obligations to attend to. One disadvantage of the more leisureed attendance in an asynchronous learning environment is that this can lead to procrastination.
among students if they have other things to do (Hiltz & Wellman, 1997). In contradiction to distance education being less time dependent for students, Teng & Taveras (2004) have identified certain needs for asynchronous and synchronous education. In their study, they attempted to combine streaming video, audio, synchronous chat and asynchronous open forum discussions for a master’s program course and identified several instructional design issues. They found difficulties with increasing participation in asynchronous discussion boards among students who had to balance their commitment to the course with their personal life and other obligations. So the more asynchronous nature of distance education is a double-edged sword.

This means that in this context there have to be conscious decisions how much synchronous content a course should include in order to make distance education a viable option for students who generally have other important commitments in their daily life. The authors also identified interactivity as a key element of the online experience for the learners. The students have to have an active role in synchronous sessions and one way to create a more inclusive experience is to incorporate interactive features for the students. This gives the student and teacher greater opportunities to discuss and explore the course material. If the teacher is the only one providing information or is in charge of the content creation the experience for the students becomes more negative. Drange, Sutherland and Irons (2015) highlight the importance of interaction in online learning environments. The immediate access to course material and access to teachers or instructors creates an expectation of getting an immediate response from tutors by students. Furthermore, what the student is asking and how different questions are answered has a more direct impact on their overall education experience. Since tutor-student interaction mainly revolves around text-messages, a student cannot rely on contextual factors such as facial expression and body language to provide more depth to the interaction between them. Teng and Tevares (2004) also raise the point that it takes time for new users (teachers in this case) to grow accustomed to the use of synchronous video tools. One issue is that the presences of the students are not that apparent for teachers who might feel that they’re talking to a “wall” without any clear feedback on the content being presented to them. This also points towards the need for interactive features from the students’ side where their own presence in the synchronous lecture has to be apparent for the mutual benefit of the tool. In comparison with traditional classrooms, there’s a lack of face-to-face meetings in online education. Video conferencing systems are used in an attempt to bridge the digital with the physical classroom, Teng and Tavares (2004) pointed out that students find it important to see facial expressions and have eye-to-eye contact with the teachers, something that can be achieved through the use of a webcam albeit not as efficient as in a physical classroom.

He (2013) got indicative results that students from different disciplinary fields all make use of text message chat. They make a distinction between “hard” and “soft” disciplines where in the former the teacher takes a more central role during live streaming sessions because concepts and course content requires more focus and attention in order for students to fully grasp the content. For example, engineering and science students asked much fewer questions in comparison to education and health science students. One explanation could be that the former students have more reflective, constructive and reiterative courses rather
than more focused and instructive. These results points to the need for the teacher to invite for discussion in relation to Teng and Tevares (2004) findings where interactivity for students was a clear and sought after need. He (2013) recommends that teacher should encourage and present modes of participation for students in order to make the interaction more effective as well as provide students with collaborative learning activities and learning tasks to motivate online interactive, build familiarity, trust and relationships among students.

As we can see the teacher needs to take an active role in encouragement of participation whilst conducting live streaming sessions. Latchman et al. (1999) present seven different activities that can be realized through a combination of synchronous and asynchronous learning. The main challenge they found was to unify their respective pedagogical learning modes to an integrated educational approach. These seven different activities can help the teacher to organize and plan for synchronous educational events and better prepare content in an educational perspective.

- First and second, the typical lecture and demonstrations can be held where the teachers’ involvement is more apparent and gives the opportunity to underline important topics.
- Individual readings require more student involvement and provide access to more deepened knowledge in an area.
- Written exercises are not as applicable in a live video streaming session, but rather highlight the asynchronous nature of distance education where student involvement in the course is higher and useful in order to demonstrate mastery of different topics.
- Virtual experimentation can highlight and reinforce the understanding of the subject matter in a versatile manner.
- Real experimentation is another activity and has even higher student involvement and involves students in a more practical way and presents opportunities for students to grasp concepts in a concrete manner.
- Finally, practical projects combine theoretical knowledge with real cases and let a student showcase how course content is converted into practical cases. From the first activity, the typical lecture to the last, the practical project, the teacher involvement readily declines and gives the student greater opportunities to show course content acquisition.

Depending on what course is being taught, the applicability of these activities will differ and the teachers’ role in implementing them in a hybrid teaching environment will require more attention and finesse from the teacher.

E-learning consists of three main parts revolving around the student, the learning platform which provides the students the necessary tools to partake in a course, the content of the course and finally the interaction between tutor and student (Drange et al., 2015). The interaction takes the form of question and answers in relation to the course material and is, therefore, an important element in e-learning. Drange et al. (2015) identify five educational challenges students face that persists in an e-learning environment, namely over-reliance on the educator, lack of interaction between students, how tutors respond to students’ questions can negatively affect the learning process due to over-reliance on the educator which in turn
leads to many questions which reduce the educational quality of responses, and finally reflection of course content and positive interaction between teacher and student. Since the student can figuratively throw questions to the teacher through the use of the Internet, the teacher in turn will have difficulties responding to students in a way that conveys a sense of care.

Apart from these challenges, educators have certain expectations of how students should be more reflective and spend more time assessing their own abilities in order to create a more meaningful interaction between educator and student. Educators also expect the proper use of the platform, meaning that the students are expected to take part of the material being presented in learning platform such as schedule, references in course literature and be wary of specific deadlines for assignments. In contrast to educator expectations, the student expects educators to be available at all times in order to instill a sense of care, that the students can feel that the teacher listens and want the student to develop their skills. Furthermore, students also expect teachers to answer all kinds of questions, be it technical as well as course-related. Drange et al. (2015) therefore draw the conclusion that careful planning has to go into the development of a learning platform and to focus on the interaction between educator and student. This interaction can be realized via chat messages, message boards or through video. The interaction is a major factor in overall student satisfaction in online learning so live streaming video technology can make the interaction more pleasant and satisfactory.

The importance of social presence in distance education is highlighted by Wheeler (2005) who bases his study on Short, William & Christie (1976) Social Presence Theory which claims that people prefer to interact with other people rather than inanimate objects like computers despite being located in different places and interaction being digitally mediated. Collaborative work shows better results when group members experience high social presence and in turn makes them more engaged and involved in group processes. The use of technology would support to instill the feeling of absent presence (Wheeler, 2005) meaning that individuals can feel socially present despite being geographically distant to each other. Video conferencing tools are a form of digitally mediated communication that provides opportunities to simulate face-to-face interaction where important visual and auditory cues can be derived to enhance the interaction and social presence among group members. Wheeler conducted a study with over 300 students in a distance-learning environment and from the results presented recommendations to create a higher social presence among students. Tutors must respond to questions in an immediate manner, students also need a place to mix socially, and this should be incorporated into the learning environment, meaning that some sort of feature for interaction between students should be included. Students have different technology competence and tutors must, therefore, cater to each of them and plan course material accordingly. Students should also be actively encouraged to engage in discussions with peers.

Brown & Voltz (2005) discuss effective learning in e-learning environments and presents six design considerations that need to be accounted for when constructing material for e-learning. The first one is concerned with the activity the student is supposed to be engaged in. If the motive and goal of an activity aren’t clear or well elaborated the point of an activity will
hinder the learning process. Activities in this case would be tasks, such as an assignment a student has to partake in, in order to progress in the course material. If these tasks aren’t well elaborated and there isn’t a clear connection to how the activity fosters learning, the activity itself becomes moot. Brown & Voltz (2005) say that when new technologies are introduced in e-learning environments, teachers might get carried away with implementing them and therefore obscures the purpose of the use of the technology.

Therefore, if live streaming media through the use of web conferencing system doesn’t have a clear connection to what the student needs to grasp in relation to the course material, the lack of clarity will reduce the learning experience for the students. The point of an activity is to create a sense of reflection in the student and make them ponder around the course material. Reflection, as pointed out earlier is a crucial aspect of the learning process among students. In turn, this leads to teachers that develop courses for e-learning themselves also have to adopt a reflective manner around the activities that are supposed to be conducted. According to Brown & Voltz (2005), there are four key aspects to consider in this context:

- To alleviate this crucial point the activities have to be framed in a meaningful scenario or context (Brown & Voltz, 2005). Scenarios can take the form of a role play, a story, or a simulation of a real world context. Framing the activities in a scenario supports the student for transferring the knowledge to real use cases and helps to ground the learning in a more meaningful manner. A math student's activity of solving complicated algebra problems could, therefore, become more meaningful and more motivating for the student if it was framed as a real world problem.

- Again the importance of proper and meaningful feedback is highlighted by Brown & Voltz (2005). The use of technology in an educational setting provides many means of supporting feedback from teachers, but as highlighted previously, the teacher has to take time and effort into the feedback. With the use of a live streaming conferencing system social presence can be instilled and the feedback given to the student would become more meaningful.

- The delivery of course material and interaction in an e-learning environment is another design decision that needs to be taken into consideration. How material is delivered is dependent on the technology in use, and technology in turn provides many ways of achieving delivery. Brown & Voltz (2005) don’t point to any particular means of delivery, but firmly points to the need to maximize engagement.

- The context is the fourth consideration to be accounted for when designing e-learning environments. Previous design implications that have been presented affect the context of use, but also the broader context, such as institutional approach and goals of the learning. Finally, how it’s supposed to influence individuals is the last and final consideration presented by Brown & Volts (2005).

Many studies focus on the effects on students subjected to live streaming technologies and web conferencing systems in distance education. The studies show that these technologies have their use in this context, but in this study, the focus is shifted towards the teachers’ perception of the use of live streaming technologies in their day-to-day work. By conducting a contextual study at a school that solely focuses on distance education and are in the process of implementing web conferencing technology in the work agenda, this study hopes to be able
to present useful design guidelines for future web conferencing systems by distilling different needs from teachers teaching different subjects. The hypotheses for this study is that there will be variations in needs for live streaming video depending on what subject is taught and therefore a contextual study is required to identify these variations.

3. The case

NTI-skolan in Umeå is one of many facilitators of distance education in Sweden and provides courses at an upper secondary level aimed for an adult audience. Students’ decide their own pace, which makes the studies highly individual. Teachers are responsible for instructing, grading and be of general support for the students. A student follows a study plan and completes modules in order to progress in the course. At the end of a course, the teacher and student have a conversation over the phone (or Skype) discussing the course and assignments. Apart from the phone call in the end a student can contact the teacher via their virtual learning environment through text-based messages. On this platform, all necessary information is presented in order to complete a course as well as a means to get in contact with a teacher.

The courses are provided as a mixture of synchronous and asynchronous material, meaning that the students can access the material at their own leisure. Assignments and tests do however have fixed deadlines in relation to an agreed upon study pace prior to the course start. The course material consists of reading instruction in accompanying course literature, useful digital documents and links to other online resources. Teachers are also encouraged to make use of video to further explain and present certain concepts relating to the course.

Teachers are available at office hours either on the phone or via the virtual learning environment if a student has a question or needs help with understanding a particular concept to progress in the studies. This particular instructional strategy is usually referred to as “flipped classroom”. The difference between a traditional classroom and a flipped classroom is that the learning model doesn’t center around the teacher but rather around the student. This means that with digital tools the students themselves have the responsibility of learning and progressing in their studies whilst the teacher provides course material and support for the students.

Depending on the course and the student enrollment on that particular course at the time the number of students a teacher is responsible for can be very high. And since most students also follow their own individual study pace, there’s a separation of progress between students taking the same course. In addition, the final phone call at the end of a course with each student could be time-consuming for the teacher depending on how well the teacher can assess the students’ progress and if they meet the requirements to pass the course. This in turn could reduce the ability for the teachers to be present and accessible to other students who need help or have questions making the workload higher.

A push has been made to implement live streaming technologies to their virtual learning environment, giving the opportunity for teachers in real time explain certain aspects of the course with the addition of digital tools to enhance the tutoring in comparison to regular text messages or phone calls. They would also have the ability to be of general assistance to the
student, but also to open up for group discussions. Since students have their own study pace they get a rather solitary experience where the only contact in relation to the course is with their assigned teacher. This is a problem that NTI-skolan has identified and has, therefore, in an attempt to bridge students together to nurture learning, tried to implement new features that will make the learning experience more dynamic and varied. One new feature that is currently under development is the introduction of the web conferencing system BigBlueButton (BBB) that they have successfully integrated into their platform. BBB is an open source web conferencing system that makes it possible for a teacher to broadcast lectures in real time, have a voice- and video-chat with students or initiate debates or seminars on specific topics with students. The features of BBB make it possible to create a virtual classroom for NTI-skolan’s online students and to gather them and have discussions about the course material. The education manager and principal at NTI-skolan have identified this need among students and teachers, an extension to the long-term plan is to also be able to provide recorded group discussions to other students as a sort of frequently asked questions-library in connection to the course material. BBB is currently under development and the group discussion feature isn’t yet available for the students at the time of writing, however, teachers can initiate phone calls to students and other teachers via BBB.

3.1 The virtual learning environment

NTI-skolan makes use of their own virtual learning environment called Omnius that their own in-house developers have created. Other facilitators of distance education rely on proprietary software to be able to provide course material and a virtual distance learning experience for students, NTI-skolan, on the other hand, have the interesting niche that they have in-house full-time developers that constantly develop, refine and maintain features of their virtual learning platform. Since in a sense the end-user sits literally side-by-side to the designers and developers of the technology that they are dependent upon the teachers have a unique opportunity to directly affect what shape and form their virtual learning environment take.

At the time of writing, Omnius is being developed in order to satisfy the need for a more mobile friendly version, a need expressed by their students. In this new version, more features and better overall stability will be included.

During a discussion with one of the developers at NTI-skolan revealed a typical issue of design work, namely communication problems. The developers make use of a message-board like system where users of Omnius can report bugs, suggest improvements or raise other points of concern. The developers in return can respond to these reports and take appropriate action to resolve or dismiss the issues depending on how critical they are for the overall day-to-day work.

In order to bridge the gap between end-user and developer to make the communication more fruitful for all stakeholders included in a design process, one method common in the field of HCI-research is the incorporation of participatory design.
3.2 Participatory Design

Teachers, who are daily users of Omnisus, sometimes come up with ideas of how to improve their platform and this is then directly relayed to a developer who can decide if this is a worthwhile feature to implement, or relay the decision higher up in command. Developers and users have a different understanding of how a system works and therefore there’s a need for clear communication between stakeholders when developing a new feature. As an example, a developer said that one teacher might want a feature that works as a notebook which in itself can seem like a trivial feature to implement, but when it comes to actually implementing a notebook feature into the system there need to be more specific details included in that request. The developer needs to know where it should be implemented on the platform, who would have the rights to make edits, how long to save the post, etcetera. Usually, these are details overlooked by the users that are necessary to know in order to make a meaningful feature.

This method is used early in the design process and includes the end-user in the idea generation phase. Typical of this more creative method is that participants through manipulation of visual artifacts get an opportunity to communicate their own ideas of sought after features and solutions to identified needs by creating a mock-up or a sketch of how they’d like the outcome of the design process to end up (Hanington, 2003). As these design workshops are made in groups this collective creativity is referred to as co-design and refers to “creativity of designers and people not trained in design working together in the design development process” (Sanders & Stappers, 2008, p. 6)

4. Methodology

The methods used to answer the research question were divided into three parts, an initial study, a design workshop and a follow-up study. These parts will be presented in greater detail in the following sections.

This study is framed as an exploratory case study. The purpose of a case study is to “investigate a phenomenon in a realistic environment or context where certain boundaries between phenomena and context aren’t given” (Backman, 2008, p.55). Case studies are most advantageous when the research question(s) are poised as a “how” or “why” question and includes a contemporary set of events whilst the researcher has little to no control over the intended case to study (Yin, 2014).

In comparison with for example, a history study, one of the strengths of a case study is that this approach presents a wide variety of evidence to investigate by direct observation and interviews with individuals involved in the events that constitute the phenomena, whereas a historian has to rely on documents and artifacts as the main source of evidence (Yin, 2014). This means that by having the possibility to directly observe and conduct interviews with people involved, a more nuanced pool of sources is readily available for a researcher.

Most of the previous research presented in this paper has been conducted with the focus on virtual classrooms where collaboration among students is apparent. What sets this study
apart from previous studies is the current relationship between students at this particular school, meaning that they don’t actively collaborate in any assignments.

The reason for this is that there isn’t any clear area for collaboration presented for students since they individually decide their own study pace. The main form of contact conducted is between student and teacher and since the teachers have many students partaking in the same course, there’s a gap between possible interaction among students that otherwise might alleviate workload for teachers. Web conferencing systems help gather students in a virtual classroom to present their projects or hold a seminar-like discussion to nurture interaction and collaboration among students. However at NTI-skolan, each student is graded and receives feedback individually. This is the contextual difference between previous research and this study that sets them apart and is, therefore, an interesting case to study. Another clear advantage is to be familiar with the setting before conducting interviews in order to avoid asking questions that have obvious answers (Benyon, 2010). The author of this study has previously been employed at NTI-skolan as a part-time substitute teacher. One important factor when conducting observations is that the researchers presence shouldn’t affect users behavior during the observation (Hanington, 2003). At the very least the researcher should strive to have minimal impact on the observed individuals when they carry out their activities. If the researchers sole presence negatively affects user behavior, results from the observation will not accurately reflect actual user behavior. Plowman argues that by being part of the organization where an observational study is conducted and doing the same work as the participants, a researcher gets a greater contextual understanding and hopefully more socially connected to the group who are of interest of the study and less seen as a detached researcher (as cited in Laurel, 2003). This means that the results from an observation can lead to a more accurate reflection of real user behavior. The authors’ previous employment can, therefore, be seen as an advantage since individuals have gotten to know the author.

4.1 Initial study

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*Table 1. Participants in the initial study*

The initial study was used to get initial reactions from stakeholders and gather data to be used as a comparison with the follow-up study, e.g. a way to get a feeling for teachers perception of live streaming and later to be able to evaluate their thoughts and what effect live streaming has on their work. To gather participants to the initial study, stakeholders were asked in person if they were willing to participate in a short interview about their work. Participants that were willing to be included got a more formal and detailed presentation of the area of focus was before the interview started.

Questions of interest in the initial study were what subject they’re teaching, their prior technology experience, the current use of video and live streamed video in their day-to-day
work, their preferred method of teaching, stance on current systems in use at the moment for teaching (see appendix 1).

For the initial study, semi-structured interviews were held with three participants (table 1) that were recorded with a voice recorder and later transcribed for data analysis. The interviews took approximately 20 minutes each. Notes were also taken with pen and paper during the interview to help identify key points to iterate and further develop with the participant during the interview. The initial study questions worked as a prompt for discussion and to keep the interview on track and were of general-purpose exploratory nature (Benyon, 2010). The questions were constructed in three sections where each section was aimed at different individuals and contained 10-12 prompts each. The first section concerned the teachers at the school where questions related to their day-to-day work and current view of live streaming was distilled. The second set of questions was directed towards the administration at the school, individuals who are in charge of organizational work and decision-making. These questions were similar to the teachers’ questions but also had questions about their push towards implementing their web conferencing system. Finally, the last set of questions was directed to the in-house developers at the school who are in charge of implementing the software in their current virtual learning environment. Again, questions were similar in the beginning but also constructed to gather information about difficulties with the technological aspects of implementation. So, the questions were separated into three different categories, user, organization and technology.

4.2 The workshop

The main part of the study consisted of a two-hour workshop session held with teachers. The purpose in relation to the research question was to gather insights to what features teachers would expect to be present in a web conferencing system. The hypothesis was as stated in the beginning section, that there will be differences between perceived feature needs in relation to what subject teachers are responsible for. The use of a workshop session is based on the theories behind participatory design where end-users are included in the design process in order to achieve a more user-centered design of an interactive system. Visser, Stappers, Van der Lugt and Sanders (2005) point out that users of a system can become part of the design team as so-called experts of experiences provided that they have the right tools to express themselves. In order to make the teacher more included in the design process of new features, they were asked to participate in a workshop session where they were tasked with imagining a future classroom. The goal was to divide the participants (table 2) into even groups with other group members who tutored in the same subject. In total, there were seven teachers present, all of them teaching different subjects except for two of them (D & E).

Sketching is a useful tool to convey visions and ideas and serves as a basis for discussion around important design decisions. Therefore, the participants were provided with paper, pen, scissors, glue, post-it notes etc. so they could create a lo-fi prototype or a sketch of how they imagined an ideal system interface for tutoring online would look like.

After a brief introduction to the workshop, the participants were divided into groups and asked to discuss how they would design this kind of system. It was pointed out that they should try to disregard limitations with the current system and see beyond current restraints
in order to keep the session as open as possible without limiting their imagination. They were asked to create the prototype from a tutoring perspective, as in how a system could help them hold lectures or seminars in direct contact with students.

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</tr>
<tr>
<td>F</td>
<td>Female</td>
<td>Hotel and Tourism, Business and Administration</td>
</tr>
<tr>
<td>G</td>
<td>Male</td>
<td>Business Economics</td>
</tr>
</tbody>
</table>

*Table 2. The table shows the participants of the workshop.*

Participants were given approximately an hour to create their designs and then asked to present them for the each other and discuss the features they’d included. Specific points of interest were variations between the groups in terms of features created. The sketches were collected and later used for analysis to find common or varying themes of features. The presentations were video recorded for data analysis.

This method draws inspiration from the PICTIVE-approach presented by Muller (1991). The idea behind this method is to enhance user participation in the design process by incorporating low-tech objects as material for constructing an imagined design. The advantage of using low-tech objects is that stakeholders in the design process all have different knowledge of a system’s technical details and possibilities and with the help of less technical objects it ensures that all participants have equal opportunities to contribute with their ideas. Whilst using the PICTIVE-approach, video recording is also included in the sessions. As described by Muller (1991) it is used as a low-effort design document, meaning that the documentation of the design processes would be less demanding in comparison with note taking. The difference between the approach used for this thesis and how Muller (1991) presents it is that the video recording focuses solely on the presentations rather than the actual design work while it was being conducted. The focus of this thesis was the actual features that participants included in their design rather than the modes of getting to a general consensus of what to include, therefore the video recording focused on the presentations. The video in itself is supposed to be used as a design document and when recording the presentations the general idea of each approach would be summarized and serve as a more concrete template for a design document. The video recordings were later analyzed together with the results from the follow-up study (section 4.3) and comprised to a set of features that a web conferencing system needs according to the participants.

4.3 Follow-up study

After the workshop session, semi-structured interviews were held with participants (table 2) where they get a chance to elaborate on their thoughts and experiences. Six out of the seven participants in the workshop study could attend. The interviews spanned over approximately
20 to 30 minutes and were held in a conference room at the school. In the room, both groups' prototypes were laid out on a table in front of them. Their answers were recorded with a voice recorder and the author took notes. Questions of interest were about their day-to-day work, common challenges, preferred way of contact with students, what activities they spend most of their workday on, imagined use of a web conferencing system, their current stance on their learning platform (Omnibus) as well as how they perceived the participatory workshop and what feature they included on the prototype that they liked the most (see appendix 2). The interviews were semi-structured and were done with the participants one by one. This way the participants had the freedom to elaborate on their answers and the author could ask follow-up questions in order to clarify their responses or go into more detail on certain concepts.

4.4 Data analysis
The video recordings of the presentations were analyzed for deviancy between features included in the two groups different paper prototypes. The main goal was to find a coloration between subject taught and features included in their prototypes. The data consisted of recorded presentations of the participants prototypes where they in their own words described the features they included, why they were included and how it was intended to be used.

The interviews were analyzed by transcribing them into separate documents and then highlighting certain passages of interest each participant said. After that was done the participants' answers were categorized (fig. 1) into each question they answered with a summarized version of what their response was.

![Fig 1. Categorizing participants answers](image)

This was done in order to identify themes, similarities or deviancy between the participants. When the categorization and themes had been identified the responses were analyzed based on the related research presented in section 2. Implications of this study are presented in section 6 (discussion) and section 7 (conclusion).
4.5 Ethical considerations

Participants were informed of their rights prior to them partaking in the study. Before interviews were held they were informed that they had the right to stop the interview whenever they wanted. Before any form of recording took place, participants were informed that data collection would occur. To increase anonymity all participants have been given a fictitious name in the results section however since it’s in the interest of the study the specific subject the participants teach has to be published.

5. Results

5.1 Initial study results

Teachers come with suggestions for improvement of their own platform. Current development areas revolve around to update their platform and revise the design of the assignment module. To ensure that the new design would meet the needs of teachers, a work group was created where teachers from different teams, developers and management were included.

“We created a group where we worked together during a three-month period. We made different revisions, gathered ideas, analyzed them, came up with suggestions, got the response, went back to the drawing board, revised... I think we had three different revision before we decided on the final design [...] In that group, we were 8 different teachers, in principal one from each work team in order to cover all forms of issues, because each team has different challenges”

(Participant X)

The push for a more video complemented learning environment is a stepping stone for making the student feel more involved in the studies and instill the feeling of them being present in a traditional classroom.

“My goal is direct interaction with the teacher and to simulate classroom situations even better [...] that the student can sit and read at home and them come and ask questions and have discussions with their teachers. But the video is a good stepping stone because all students cannot be present at all times when the teacher is present”

(Participant X)

The management recognizes that video-based education cannot replace teachers and with the push for more video material a change of thought have been done in regards how education at the school will be handled. Much of the time spent by the teachers is by grading and giving feedback on assignments that students hand in. The assignments in turn require certain course literature to be read by the students in order to complete them. Instead of teacher handing out reading instructions as feedback, the management wants to shift focus to a more tutoring based education.
“We’ve previously called it reading instruction, the things we have in the database. The students in turn go through this and think ‘this is what I must read’. I’m now trying to implement the word tutoring, that what you have here is actually tutoring, just to instill the sense of grading of assignments isn’t tutoring but rather the receipt that the students have understood the tutoring”
(Participant X)

So the tutoring portion would be enhanced with the use of video if the teachers would implement more self-made videos to the course material. With the introduction of the intended web conferencing system, the interaction would move from an on-demand basis to a more direct interaction and also provide the opportunity for students to gather in a virtual classroom.

Participant Y said that the most common challenge was that some students don’t always have the required prerequisite knowledge in the courses they’re taking and that the study pace is rather short. For these students, more workload is added on the teacher to identify what knowledge the student is lacking and provide appropriate extra material that the students can work with. In addition to this, it’s not always clear if the students make use of the extra course material that the teacher provides in order to gain the required knowledge for the course. Text message correspondence in turn does therefore become rather lengthy if the student through this medium cannot understand concepts and ideas. “Then it’s better to call the student,” said participant Y.

“But through Omnibus, us teacher have been able to raise our ideas and design the platform according to how we want to work [...] and that it never is finished, you can always change things... that’s really good. You can say ‘now we need to change this’.”
(Participant Y)

On the question what exceptions participant Y had on the launch of their web conferencing system it was stated that it would be positive to contact more students at the same time but the concern of the students varying study pace was also raised which in turn would require more coordination from the teacher. One issue that was expected to be alleviated with the web conferencing system was that students would have the ability to discuss course related material with each other. Participant Y said that one possible use of this subject was to hold debates among students in order to start a discussion and the teacher acting as a moderator, presenting a topic to be discussed. Since Participant Y was a teacher in different language-related courses, grammar questions would be a good topic to discuss in a group.

Furthermore, issues with implementation of new features were raised. Some points with implementing the new web conferencing system BBB was raised in relation to testing.
“It should be tested before it’s implemented because it has caused our system to crash a couple of times. It’s good that new features arrive but maybe you should test it before it’s implemented so it doesn’t disrupt the ongoing work”
(Participant Y)

Implementation of features in general could be handled differently according to participant Y. The teacher gets updated features and report bugs that they come across after they’ve been implemented.

“Maybe you have devoted some time to implement a new feature in the course material and add assignments that correlate to these functions but this takes longer than expected because the feature isn’t tested properly”
(Participant Y)

Developers at the school maintain and develop new and old features on the learning management system as well as fix bugs that have been reported by users. The most common challenges this developer faces is concertizing what users (teachers) wants and need in the system. Sometimes it can be very obvious things for them but difficult for the developer to make the contextual connections to features and specifics of where it should be implemented.

“To them it can be a very obvious thing because they use the system daily and see the faults and potential development areas but for me as a developer I just write the code and then let it go and think ‘now I don’t have to touch this until something needs to be changed or to correct a bug’, then it’s not as obvious”
(Participant Z)

If there are issues in communication between developer and teacher sketching or similar software as an example serves as a good basis to go further with ideas. The good parts of the system can be copied and improved from other software and if it is some completely new feature a mock-up of how the intended feature is supposed to work is also appreciated. The mock-ups serve as a good tool for discussion between developers and users.

“The absolute best thing is if they have sketched something themselves so you can take that mock-up and develop it further [...] you don’t have to think as much, you have a clear goal and what it should look like and you can quickly copy the good parts and implement the functionality”
(Participant Z)

The status of the open source web conferencing tool BBB is currently integrated into the platform with an in-house developed solution. BBB is a third party open source web conferencing tool that hasn’t been designed and developed by the IT-staff at NTI-skolan. Teachers can set up a connection to other teachers and students and an interface to search for users in a database to call. Currently, no group conversations can be held and the lecture
functionality is not yet present. The lecture functionality has a whiteboard, chat and it is intended to save these lectures to an archive that students can access later.

5.2 Workshop results

Fig 2. The result from the workshop presented by group 1.

The first group (group 1) consisted of participants C, D, E, G and together they created a paper prototype, which acted as a separate module to their current learning management system. Their focus on the paper prototype was to make it possible to hold lectures with one or more students (fig. 2). Information could be shared between these modules such as relevant information about the students such as course progress and grades on assignments. So the module was connected but separate. The participants agreed upon having a shared interactive area in their interface where the teacher could draw, upload files, post useful links or display power point files. There was also a webcam feature (fig. 3) included where the teachers could see other students or show themselves. Participant D said; “It’s good to have if you’re showing things, it’s good to see that you’re in picture”.

Fig 3. Close up on webcam feature group 1 included.

To the right of the shared interactive area, they included a list of all current participants in the live lecture. Apart from showing who’s currently partaking in the live lecture, the teacher
could also see if they’ve accessed the material that has been uploaded. Participant E said; “if a link has been posted you could see if the student has opened that link”.

If a teacher clicked on a student in the participant list, additional information would pop up under the interactive area showing the student’s course progress and grades and comments the teacher have left to that student. In the current learning management system, each student have a course matrix where the teacher fills in what level the student reaches in accordance with course goals. This information could also be shared with the individual student.

Communication between student and teacher would be conducted by microphone or text message in the form of a text chat. Depending on the amount of participants the teacher would have the option to choose if microphones would be enabled or make use of the chat. In the chat there’s an option for the students to ask questions who would be displayed in a separate box. Participant D said “If there are many people presented it could become messy to sort through the messages if there’s no moderation present”.

Fig 4. The image shows the questions box (left) and shortcut menu (right).

Fig 5. Close up on tab (right) to switch between modules and student information (right)
The “asked questions”-box (fig. 4) would help the teacher to organize and answer questions in turn and act as a confirmation for students that the teacher has acknowledged their questions. When a question has been answered the teacher can check it off the list.

In a menu (fig. 4) above the interactive area, the teacher would have easily accessible options for controlling the live lecture such as microphone-, web cam-, save-, edit-, upload-controls. In this menu, there would also be a calendar option where the teachers could schedule lecture and which the students would get a notification about sent as a message.

Fig 6. The result from the workshop presented by group 2.

The second group (group 2) consisting of participants A, B and F focused more on the final phone call (fig. 6) the teacher has with each individual students (described in section 3). This was due to their subjects varying to a high degree and their courses weren’t constructed in the same manner. What the participants had in common was however the final phone call. Their prototype was the interface of how this final phone call could be improved.

Fig 7. Here’s the interactive area (left) and grading matrix (right).

All teachers have a course matrix that they fill out as the student progress in the course to assess who well the reach course goals. This matrix serves as an overview of what skills the students has acquired over the course and how proficient they are in certain aspects of the course. The second group identified the issue of now having to open up each individual
assignment and look what comments and grades they’ve left to each student, making the whole ordeal rather tiresome. Their prototype consisted of a separate module that solely focused on the final phone call and showed the students course matrix (fig. 7) as well as an area for the teacher to drag and drop comments that the teacher has left on the students’ assignments.

This group also included an interactive area (fig. 7) where both student and teacher could draw or sketch if there would be issues with describing certain concepts verbally.

“Maybe you cannot describe what a cell looks like, it’s really hard, so then you just share the interactive area and the student can draw what the cell looks like, and I as a teacher can go in and correct if it’s needed”

(Participant F)

This interactive area could also work as a platform for file sharing. If the student had previously drawn a cell for instance, the student would be able to take a picture and upload that to the interactive area. In addition to these features, this module would be connected to a calendar and when an agreed upon time for the final phone call between teacher and students, the student could access this list in order to better prepare for the phone call. According to this group, this way of handling the final phone call would become more individual than it is now.

“Sometimes the student doesn’t always have a verbal complement on assignments... but there could be questions you would like to talk more about, like development areas for the students. Like ‘you’ve reached the required knowledge goals for the grade C, except for one so maybe we should try to raise it to a C’. It becomes more student-specific that way. I would like to have it more individual based than it is today.”

(Participant B)

Participant B mentioned that if a student reaches required goals for their sought after grade you more or less repeat the questions you ask each individual student and therefore the individuality disappears.

5.3 Follow-up study results

After the workshop study interviews were held with the six out of seven participants. The seventh participant (B) couldn’t attend. Common challenges teachers at NTI-skolan face consist of being able to explain and elaborate concepts for students.

“[The problem is] that you cannot be there, answers questions directly, observe the students in their work and kind of directly come with suggestions and proposals. That’s the biggest challenge.”

(Participant E)
All teachers that were interviewed said that they prefer if the students call them if there are any questions about the course material or assignments. Depending on what type of question the student has, messages were also acceptable. Certain concepts are hard to explain in a meaningful manner in a text, if that is the case, all teachers preferred to either talk with the student over the phone, or record a short video snippet where they answer the question. Teacher D & E who had IT-subjects usually record short video snippets aimed directly at that student. It was explained that it was much easier to actually show whilst they were talking since the text can become rather abstract. Participant C sometimes made use of the built-in text chat in Skype because it was more direct and interactive in the sense that a student directly could ask follow-up questions if needed.

It was also made clear that there was an issue with encouraging and motivating students to contact the teachers if they have questions. Some students are more talkative and contact seeking than others but other students try to keep it to a minimum. Participant D said that the reason for this was explained that in some courses students prefer to sit by themselves such as in introductory web development courses but in information and communication courses the students called and asked more questions.

Since the contact between teacher and students is on a one to one basis, teachers get to know the students if they have them in many consecutive courses. Often personal issues outside of school-related areas are relayed to the teacher from the student. The implication of this is that teachers sometimes have to act as a counselor, mediating between students personal struggles and planning for their studies, an example that participant A gave was to prolong deadlines of assignments if the student has complications outside of the school.

In terms of current educational strategies, participant G said that current state is much better than before because they've tried to become more personal and to meet the students by focusing on giving meaningful and personalized feedback on their assignments. Participant G did think that there need to be more tests in order to gauge students’ skills in a subject in order to provide more feedback and develop their skills. Participant C valued that the student has access to a personal teacher in the course and that the study pace is very flexible to fit the students needs, however, participant C recognized that it's not as much tutoring that is sometimes needed because of the construction of the courses.

Participant E thought that the tutoring part was lacking because limited allocated time for course development. In newly developed programming courses there has been a conscious decision to include more video material to give students a more similar experience to a classroom. In courses that participant E have developed and a lot of video material is included, the videos help to answer frequently asked questions and therefore gives more time to do other things. Working with video is something participant D also values. Participant D compares video with a traditional classroom in the sense that it provides an opportunity to explain and show certain aspects of the course material. According to participant D, some students learn better if other senses are included, like auditory and visual senses, and video is a good stepping-stone to cater to this facet.
"I think that the tutoring is to a great extent that you as a teacher provides the knowledge that the student can gather themselves, but you do it in a simpler manner"  
(Participant D)

Participant F said that a lot of relevant course material is accumulated over time to complement the course literature. Participant F saves a lot of material in different folders on her computer that can be useful for students’ progress.

A lot of time is spent on grading assignments and providing feedback. Participant E, G & F recognized that this is what they spend most of their workday on. It is important to formulate understandable and pedagogical feedback to students, something that has to be highly individualized and targeted to each specific student. Since there isn't any clear area of collaboration among students, many of them have similar questions. Participant F solves this by saving responses to common questions.

"There are some responses you always come back too, but then I have these post it notes on the computer, which is quite good when 80% of the students need to hear the same thing it's almost like sitting and copy-pasting"

(Participant F)

This is something participant A and D also does but pointed out that it is important that students feel that they've gone through their own assignment in order to instill a more personal feeling in the feedback and not just provide generic feedback. Participant D and A spend a lot of time on giving feedback and answering questions. Participant A said that some students are more communicative than others.

"Some students are extremely communicative, they call before they start on an assignment, the call when they've started on an assignment, they call before they send it in, they call when they've sent it in, they call when they've received feedback"

(Participant A)

When asked how the teacher themselves perceive how live streaming features would be used in their daily work their responses varied. One way was to use this tool to have a weekly Q&A session where students can send in their questions and the teacher could show and explain how certain concepts work. By doing this, common questions could be answered and the ability for students to discuss things together would also be presented.

"There's always someone who have the same question as you and then you'll get an answer, maybe you do not dare or do not want to ask a question for some reason. And in that situation I can invite everyone who wants to be there and they send in questions prior to this session and I prepare, and then we talk about the questions for an hour"

(Participant E)
Other use cases for live streaming features imagined by participant D would be to have sessions in the start of a course where the teacher could have a roll-call and hence be able to extract students who do not intend to continue the course. This would also give an opportunity to properly introduce everyone who will partake in the course as well as everyone to get to know the teacher. To keep the group mentality, courses could also include seminars held via a web conferencing system to invite for more discussion.

"Some areas fits really well with seminars instead of just doing an assignment on your own or only communicate with the teacher and discuss the assignment in group"
(Participant D)

Participant G imagined a scenario where a web conferencing system could be used as a regular check up on students in order to better assess their acquired knowledge during the course. By having a weekly session where students could join, participant G could explain and present certain aspects of the course material that would eventually come on the final test. Since a web conferencing system provides an interactive aspect, students have the opportunity to ask questions directly to what is being presented.

One of the participants couldn't see a clear need for a web conferencing system in their courses. Participant F had previously tested BBB by calling a colleague, but the quality of the call wasn't optimal, therefore the technical functionality was of importance.

"If it works as it should I don't really feel a need to use it either, if it works it has to be without all noise and sound and that you cannot hear others, otherwise it doesn't have any function"
(Participant F)

When asked what could be improved with the current platform the general consensus was that more interactive features need to be implemented in order to save time and improve the personal connection to students. Participant F suggested a chat feature where different course material also could be provided to the student such as complementary documents. Participant E uses third party screen capture software where his computer desktop and voice is recorded. The reason for this is that it's important to be able to show simultaneously as you explain concepts, in a text it gets too abstract. Participant G had a need for an area where teacher and student could meet on the platform. The only time where student and teacher have a required phone call is at the end of the course, and that is where a teacher has an opportunity to assess and develop a student's knowledge in a subject, the issue is that this phone call is held at the end of the course, so no real opportunity is given to discuss and provide feedback to a student, unless the student contacts the teacher themselves, according to participant G.

When asked what the participants view on the use of a webcam in a web conferencing system their responses varied. Participant A, D and F all said that they would have to tidy up their desks if a webcam would be used. Participant A said that she didn't see the need for a
student to be able to see them if they were having a conversation through a web conferencing system. Participant F said that this isn't something students have specifically requested and therefore didn't see the need to have that feature included in a web conferencing system however it was noted that it could be good for the students to see the person they're talking to so the experience is more personal. Participant D said it was a clear advantaged for students who like to see who they're talking to but it has to be an option they choose. A typical scenario participant D imagined was if the student has a presentation, then it could be better if it was conducted with a live streaming webcam instead of recording themselves, which according to D, could be an awkward experience. Whether or not participant E was being shown didn't matter, what was more important was what course related content the student could see. Participant E mentioned that seeing the speaker could have its perks but wasn't interested in seeing the students. Participant G didn't see any issues with using a webcam in live streamed lectures.

6. Discussion

From the results, it's apparent that teachers of distance education value features that allow other means of interaction than just through text or voice. Both groups who participated in the workshop included similar features that would help students express ideas and concepts in different ways other than the ones currently available. The interactive whiteboard seems to be a feature that could help both student and teacher in their communication between each other. In most traditional classroom the whiteboard serves as a fundamental tool for tutoring where teachers can draw and write down text to refine certain topics in the school curriculum.

The research question for this thesis was aimed at to find differences between teachers’ subjects and need for a web conferencing system making use of live streaming video. As He (2013) indicated, there are discrepancies between “hard” and “soft” disciplinary fields, something that also have been indicated in this study. Participant D and E who are tutoring in subjects in the IT-field both expressed a need to be able to show and tell in order to give meaningful feedback to their students. Participant A who was tutoring in biology and natural science also indicated this, and specifically when the final phone call is being conducted. A feature where students could express themselves in other ways than voice or text would help both student and teacher to convey information to each other. A synchronous area for, much like a whiteboard, would therefore be one design implication future web conferencing systems should include, where both students and teacher can draw, sketch and show in order to concretize abstract thought processes.

This synchronous, digital whiteboard could therefore be included in the learning platform as a separate module where student and teachers can gather and share information and ideas with each other. A more clear and obvious area for discussion among students who study the same course would also help alleviate issues with social presence, as discussed by Wheeler (2005), and increase collaboration.

Since the majority of participant thought the tutoring aspect was lacking in its current form, an interactive whiteboard area opens up for new modes of activities that can be
included in a course, specifically lectures and demonstrations as presented by Latchman et al. (1999).

Confirmed in this study and brought up in studies presented in the related research section (Drange et al., 2015), immediate response from teachers is an important factor. The participant preferred to talk to students over the phone if the question required a more elaborate response however it was also made clear that few students actually resort to calling or seeking out contact with the teacher. A more neutral middle ground where student and teacher could meet would be to include a text-based chat feature in conjunction with the interactive whiteboard.

Participant A & D both made use of prepared responses saved in third party note keeping software. This was done in order to save time and answer common general questions about the course material that the participants found to answer often. Drange et al. (2015), Brown & Voltz (2005) and Wheeler (2005) points to the need to instill a sense of care in responses and feedback given to students, something that also concerned participant A. Since most of the time is spent on grading and giving feedback to students this approach to responding to general question would be a time saver if it were integrated into the learning platform. Common responses pointing towards general issues with a certain concept would give teachers more time to spend on the developing course or more qualitative interaction with students for instance in terms of holding a live-streamed lecture. The issue with this type of feature is how students would respond to the more prepared answers, individual responses and instilling a sense of care as well as areas to meet students is important factors for the participants in this study.

Evident from the initial study, workshop and follow-up study was that there’s a clear need for creating more spaces to meet. Since the education is based online and social presence is of importance in distance education (Wheeler, 2005) an interesting approach to bridge educational and social aspect would be to include social media aspects in an online learning platform. This idea was something that participant G had imagined in order to improve the ability to interact and develop relationships. This could be realized by including features where students and teacher alike can create personalized pages to present themselves. The teacher and student relationship is important in these situations where the education is generally solitary. Participant F had identified problems with students not seeking out the teacher. A personalized page where teachers can present themselves could help in breaking down the “wall” that hinders students from contacting a teacher.

The use of a webcam in a web conferencing system didn’t seem to have a clear use among the participants other than that it would improve the experience for students. Participant A and F were most reluctant to use a webcam. Participant D, E and G mentioned that a webcam would be a positive feature to include. Teng and Tevares (2004) points to the importance among students to be able to have eye-to-eye contact with the teacher and in comparison with the data gathered in this study, there seems to be a discrepancy between students and teachers needs in this matter. Group 1 did include a webcam feature in their paper prototype whereas group 2 didn’t. Participant A, D and F mentioned concerns with personal appearance and the use of a webcam in this context, this could be explained with flexible work hours and that teachers sometimes work from their personal residence where there's no
need for professional attire. Since there's no need to meet students at a physical location, a more leisured appearance isn't a factor that would reduce the perceived quality of the education among the since the teachers are "hidden" behind their computers. To circumvent breakdowns within the setting (Hedestig & Kaptelinin, 2002), the use of a webcam should therefore be limited to scheduled web conference meetings with one student at the time and be optional for both parties in the conversation.

7. Conclusion

Based on the findings of this study, a conclusion that can be drawn from this specific case is that in a distance education where students have a primarily solitary experience throughout their education, different modes of participation needs to be designed for. A primarily text- and verbal-based communication isn't sufficient for teachers in order to satisfactorily meet their and their student's needs. Interactivity is the key aspect that is lacking in this case. To get a better mutual understanding of what course material has been understood, modes for capturing abstract thoughts would be a viable solution, according to participants in this study. The design implication for this means that resources must be allocated to investigate needs and demands for how teachers best can convey abstract course-related concepts digitally to students other than verbally or in a text. A suggestion would be the ability to in a synchronous environment be able to make use of a digital whiteboard where student and teacher can “meet”. This could alleviate time-consuming activities such as formulate feedback in written text, something that teachers face currently in distance education in this case.

Since students have varying study pace, assessment check-ups and group tasks under the supervision of a teacher should be conducted on a regular basis, for instance with the help of a digital whiteboard. It became apparent that teachers value video as a tool for tutoring but since this material is on-demand at the time of writing and not conducted synchronously the dynamic discussions that can appear in real time conversations have no chance of occurring at this institution. The design implication for this is that a virtual learning platform should include features that allow students to interact and discuss course-related material with peers and teacher. A lot of workload that is otherwise put upon the teacher, mainly in the form of answering questions individually to students who have the same or similar question could therefore be avoided and reduce time spent on these repetitive tasks.

The use of a webcam isn’t a requirement from the teacher’s perspective, however, its perks are recognized among them. A scenario where the use of a webcam would be useful is when communication is conducted between student and tutor to further enhance presence. These points of contact should be limited to scheduled meetings such as the final assessment phone call. The design implication for this means that focus should be diverted to enhancing the user (student) experience of conversations between student and teacher. Students value eye-to-eye contact (Teng & Tevares, 2004) and teachers at this school prefer if they have time to prepare before these conversations.

An extension of a more defined and clear area for interaction would be if students as well as teachers had the ability to introduce themselves to peers and have a place for
communication. A virtual learning platform should therefore draw inspiration from social media where the users of the platform have an opportunity to find and mix socially in order to create a more coherent social experience. An issue teacher face at this school is that some students are more communicative than others; some prefer to talk over the phone whilst others don't and some students do not actively seek out the teacher to get the support they need in order to progress in the course. It was explained that it's not obvious for them that this is in fact an option. The design implication for this would mean that if the virtual learning platform is designed with social media aspects in mind a clearer and well-defined area of communication is included and access to the teacher would become more evident, and in turn could help students to reach out to their tutor. If the communication between student and teacher has a more solid base, issues with providing feedback would be circumvented, and that aspects of social media can help to alleviate.

The audience for this paper is mainly aimed to practitioners in distance education and designers for tools developed to assist these practitioners. The research question was “what different design guidelines can be distilled from teachers in a distance education organization when they are tasked to imagine the interface for synchronous video communication with students?”. Following the data and previous research presented in this study the following guidelines can be concluded:

- The online learning platform should be designed with inspiration from social media
- Live streamed lectures and demonstrations with participants should be held on a regular basis in order to better be able to assess student progress
- Different modes of participation other than through text and verbal contact should be included, specifically a requirement for “hard” disciplinary fields
- Webcam conversations should be designed solely for two way communication

The hypothesis for this study was that needs and guidelines will differ depending what subjects are being taught. In this regard, no conclusive results have been able to be drawn however indicative results point towards that more interactive features are needed in order to foster tutoring irrespective of the subject. It’s therefore suggested that future studies look into this matter with a larger set of participants.

7.1 Limitations of the Study and Future work

One drawback of this study is that the intended web conferencing system (BBB) was not in use. If BBB had been available as it was intended, a more elaborate comparative study could’ve been made where the participants got to evaluate the usability and applicability of BBB in their daily work and then construct prototypes. There was a conscious decision not to include any other web conferencing systems other than the one who was intended to be used since BBB and the implementation of it to Omnius was already under development.

One hypothesis of this study is that the needs in a web conferencing system will differ between teachers in different subjects. Due to a massive amount of students graduating at the time of the workshop was held, many of the teachers at the school couldn’t attend the workshop session. The relatively low amount and heterogeneous group of teachers meant that only two groups of teachers could be formed and almost every one of them were teachers in different subjects. In an ideal situation, more groups would be formed with teachers
tutoring the same subjects and let them discuss their needs together. More groups also mean more variation in the data collection and therefore more conclusive data could be gathered.

The data gathered from the participants is confined to their own experiences and the tutoring model NTI-skolan has. This means that no generalizable results can be drawn but instead give fruitful insights to needs and design implications for this particular scenario. To further elaborate the data, more studies needs to be done at distance education facilitators with the teacher perspective.

To get more conclusive results and develop further on this study the author suggest that the workshop sessions is used to it full potential in further studies. In this study it was consciously confined to lo-fi prototypes in order to gather data of what features perceive necessary in a web conferencing system. Ideally all stakeholders would be included and if more participants who could form more homogeneous groups of teachers (teaching the same subjects) a more clear variation of different needs can be distilled.

References


Appendix 1: Initial study interview questions

Questions for teachers (User)
1. Name
2. Age
3. Prior education
4. What subjects they're teaching
5. No years as a teacher
6. Day to day work
7. Most common challenges
8. Previous experience of distance education
9. Previous work with video
   a. How often
10. Previous experience of live streaming video
11. If students have questions, preferred method of contact
12. What do you think about the current system (omnius)
13. Other questions?

Questions for administration (Organizational)
1. Name
2. Age
3. Occupation/Title
4. Day to day work
5. Most common challenges
6. View on the use of video material
7. Directives for digital media in course material
8. What do you think about the current system (omnius)
9. Intended use of BBB
10. Other questions
11. Talk about why BBB is being introduced
   a. Overcome challenges, which?
   b. Quality of education, how?
   c. Pros, which?
   d. Cons, which?

Questions for developers (Technological)
1. Name
2. Age
3. Occupation/Title
4. Day to day work
5. Most common challenges
6. Current status of BBB
7. Issues with implementation
8. Pros and cons with BBB
Follow-up study interview questions

1. What subjects are you teacher in?
2. How long have you been working as a teacher?
   a. How long at NTI-skolan/distance education
   b. (If applicable, How does a traditional classroom differ from distance education)
   c. What features should a teacher that works with distance education have?
3. What are your most common challenges you face in your work?
   a. What do you approximately spend most time on (grading, answer messages, final phone call, course development, other)
   b. What could be changed or improved with the learning platform in order to make your daily work more efficient?
4. Your view on tutoring here at NTI-skolan?
   a. How well does NTI-skolans tutoring model fit with the subjects you’re teaching?
5. If a student contacts you, what type of contact do you prefer (phone, messages, other)
   a. Your view on the use of a webcam?
   b. Examples on how you would use BBB/web conferencing system
6. How do you think Omnius currently work with all its functions for your subjects
   a. When a new feature is launched, how do you perceive the general implementation of it (e.g. matrix)?
   b. How do you perceive your power to affect the design of your learning platform?
      i. What did you think of the workshop?
      ii. What feature did you like the most, and why?
7. Other questions or anything else you think is important to discuss?