DIGITAL DISTANCE EDUCATION
- A Longitudinal Exploration of Video Technology

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DIGITAL DISTANCE EDUCATION
- A Longitudinal Exploration of Video Technology

LENA DAFGÅRD

Doctoral Dissertation

Department of Applied Information Technology
University of Gothenburg
SE-412 96 Gothenburg
Sweden

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In 2004 the University of Gothenburg established the Centre for Educational Science and Teacher Research (CUL). CUL aims to promote and support research and third-cycle studies linked to the teaching profession and the teacher training programme. The graduate school is in an interfaculty initiative carried out jointly by the Faculties involved in the teacher training programme at the University of Gothenburg and in cooperation with municipalities, school governing bodies and university colleges.

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ABSTRACT

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The context of this thesis is digital distance education. Distance education has developed from correspondence courses, based on letters sent by mail between student and teacher, to digital distance education with interactive video classes from anywhere, as long as a computer/tablet/smartphone and an Internet connection are available. The development of technology, particularly with the introduction of the Internet, has completely changed the possibilities for teaching, learning, interaction, and communication at a distance. Many technologies can be used in distance education, but this thesis aims to: *Better understand the possibilities and limitations of video in digital distance higher education.* The research has three elements of analysis: *1) video technology*, *2) distance courses,* and *3) distance teachers*. Each allows a focus on how distance courses with video are designed and on teachers' perspectives on the use of video in distance education. The first focus on course design is examined through two research questions. RQ1 asks, *How is digital video used in distance higher education? When teachers design distance courses with digital video; a) which categories of video are used or not used? b) how much are these categories used? c) why are they used or not used? And d) how are they used?* Complementing RQ1, RQ2 asks, *How do course designers respond to the possibilities and limitations of video for distance higher education?* Addressing the second focus of the thesis on teacher perspectives, RQ3 asks, *What are the teacher's attitudes and perceptions about the use of digital video in distance higher education?*

With a comprehensive literature review as a foundation, the results of this thesis include a classification system with two main categories; *recorded* and *live video* that is developed and used to orient an empirical investigation. The data for this investigation was collected through a national web-based questionnaire. Then, based on the survey, a specific higher education

institution was selected for an interview study with teachers using video conferencing in distance courses in Teacher education. Interaction and communication are central concepts in this thesis, and the analytical lens combines the socio-cultural perspective and the theory of affordances.

The results indicate that across types, video is mostly used as a supplement to other resourses. Further, a correspondence is found concerning, on the one hand, teachers' experience of distance education and participation in in-service training, and on the other hand, their use of video in teaching. In general, the most reported reasons why teachers do *not* use video are that it does not bring anything and takes too much time. Many of the constraints that teachers perceive are related to time; e.g. competition between an ambition to teach according to a student-centred approach but also a strong feeling of responsibility of delivering content to students. The technology of video has the affordances of mediating a teaching and learning environment similar to the one in the classroom, but conditions such as large groups or many students and the difficulty of perceiving non-verbal signals through video, affect the communication situation negatively and reduce possibilities of interaction.

As a systematic study investigating the mainstream use of technology and media, this thesis contrasts with many other studies, which are often relatively small and local in nature, conducted by enthusiastic teachers investigating the use of one specific technology. The results show how the mainstream use of technologies such as video change conditions for distance teaching and influence how we think and interact with others and our environment.

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1 CUL stands for Centre for Educational Science and Teacher Research.

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2 PIL, the Unit for Pedagogical Development and Interactive Learning at University of Gothenburg.

3 NGL Centre, Next Generation Learning Centre.

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Sorunda December 2019
Lena Dafgård

FIGURES

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- A LONGITUDINAL EXPLORATION OF VIDEO TECHNOLOGY

LENA DAFGÅRD

DOCTORAL DISSERTATION

CHAPTER 1

INTRODUCTION

1.1 PREFACE

My interest in distance education was aroused in 1994 when I taught my first distance course, a contract education for the teleoperator company Telia. I soon discovered that the frames and conditions of distance education have a significant influence on the teachers' and the students' situations, and particularly on the students' learning environment. The design and planning for the few occasions when the teachers met students in the class, if ever, was reduced to a minor part of the teacher's preparatory work. The major work was instead to design and plan for what the students should work with at a distance.

Some years later, video conferencing was implemented in my courses as a way of bridging the geographical distance to my 500 students who were in 31 locations all over Sweden. I learnt a lot about the unique frames and conditions that emerged with the use of video conferencing and how to design a course with the use of video. These challenges raised my inter-

est in finding better solutions to these issues and how teaching in the video conferencing environment could be designed and further developed.

From 2004 to 2007, I worked with distance tutoring courses for staff at Specialpedagogiska institutet.[1] The online discussions with these engaged and skilled teachers opened my eyes to the fact that in most distance courses, *written communication* was dominating the interaction among teachers and students. These discussions inspired me to reflect on why this difference exists between distance and campus courses and how distance courses could be developed to offer a more varied learning environment for students, e.g. by using video.

My experience as a distance student (about 250 credits) also taught me a lot regarding the distance student's perspective. Especially important for my work as a distance teacher was student experience of lousy planning, unsuitable choice of technology, lack of contact with teachers and fellow students, poor adaptation to the special conditions for distance education etc. These experiences made me realise how important the teacher's design of the students' learning environment is for successful studies.

During these nearly twenty-five years, I have taught in many different types of courses, e.g. courses with or without physical meetings and with different kinds of technologies. These experiences have profoundly contributed to my interest in investigating *the digital distance higher education with a particular focus on video.*

1.2 DEVELOPMENT OF RESEARCH INTEREST

In this section, the main research interests in distance higher education, both in the international and in the Swedish contexts, will be identified. The arguments for selecting *the use of video in digital distance higher education* as the research interest will be presented. This thesis will contribute to richer knowledge within this field, which will influence in-service training for distance teachers. The results will also explain some of the difficulties with using video in distance education, inform practice, and give suggestions regarding how the use of video can be facilitated and improved.

1 "Specialpedagogiska institutet" was closed down in 2008 and their assignments were taken over by "The National Agency for Special Needs Education and Schools", (SPSM), in Swedish: "Specialpedagogiska skolmyndigheten".

RESEARCH IN THE INTERNATIONAL CONTEXT

Most international research on digital distance education has focused on asynchronous, text-based communication, e.g. discussion boards (see e.g. Akarasriworn & Heng-Yu, 2013; Akin & Neal, 2007). Hansch, Hillers, McConache, Newman, Schildhauer, and Schmidt (2015) argue that research on the use of video as a tool for online learning is lacking. Meskill and Anthony (2014) claim that few studies are investigating synchronous online interactions. Levine & Sun (2002) consider research on the use of synchronous communication to be very important as it can contribute to increasing interaction among distance students. Lack of student-student interaction is a common problem within distance education (Levine & Sun, 2002). It also increases distance teachers' workload as decreased interaction among students often results in more interaction with teachers (Söderström & Westerberg, 2005). Therefore, it is crucial to find ways of how to encourage interaction among students, and the use of synchronous communication could be one solution.

Synchronous communication can be beneficial, particularly as a complement to asynchronous communication. Further research is therefore needed regarding alternative ways of communication as synchronous communication and less frequently used technologies, such as video conferencing and desktop conferencing (Hrastinski, Keller, & Carlsson, 2010). Bates (1987, 2005) claims that knowledge of how to best make use of video in distance education is not always applied. Laaser and Toloza (2017) even claim that due to increased inappropriate use of video, educational quality has started to decline. They argue that video offers more possibilities than have yet been developed and used. For example, student-generated video content is only at the very beginning, and the potential of video for collaborative learning is still to be discovered (Laaser & Toloza, 2017). More research is, therefore needed.

Another identified gap in research is that few studies focus on *the teachers' perspective,* as most investigations are directed towards the students' view of distance education (Meskill & Anthony, 2014). That research is mostly focusing on the students' perspective also applies to video research (Zao, 2011). Therefore, more research from the teacher's perspective is needed regarding how to design courses with video. Other important issues to

investigate are teachers' experience of the video conferencing situation, and how this environment influences teachers' design, planning and realisation of distance courses.

RESEARCH IN THE SWEDISH CONTEXT

Before starting my research in 2009, it was essential to identify gaps in the empirical research in distance higher education in Sweden and a review was therefore conducted. The results showed that there were 16 Swedish doctoral theses about distance higher education in Sweden between 1981 and 2009. Amongst these theses, there was only one thesis in the year 1981, two in 1999, and none between the year 2000 and 2002, while there were 12 theses (covering 28 articles and ten papers) from the year 2002 and onward to 2009. The review of the main topics covered in previous theses is therefore based on the 12 theses published between 2002 and 2009.

Asynchronous communication[2] and *text-based communication* are the most frequently used types of communication in distance education (Akin & Neal, 2007; Laaser & Toloza, 2017). In order to identify a gap in research, it was relevant to find out if this also was the most researched areas. It turned out that in all but one, of the investigated theses, text-based asynchronous communication was dominating research (Björck, 2004; Hrastinski, 2007a; Keller, 2007; Lindberg & Olofsson, 2005; Malmberg, 2006; Mattsson, 2009; Olsson, 2007; Rydberg Fåhraeus, 2003; Svensson, 2002; Wännman Toresson, 2002; Östlund, 2008). In most of the investigated courses and programmes, a kind of asynchronous forum had been used, such as First Class[3], Fronter[4], WebCT[5], WebBoard, KOM2000[6] and DisCo. Hrastinski,

2 Asynchronous communication – not in real time communication, anytime.

3 http://www.firstclass.com/.

4 http://com.fronter.info/.

5 WebCT (Course Tools) or Blackboard Learning System, now owned by Blackboard; http://www.blackboard.com/. WebCT is significant in that it was the world's first widely successful course management system for higher education. At its height, it was in use by over 10 million students in 80 countries. Retrieved from http://en.wikipedia.org/wiki/WebCT, on 29 April 2011.

6 http://cmc.dsv.su.se/KOM2000/

Keller and Carlsson (2010) claimed that there is a need for more research in synchronous learning environments. Both designers and teachers need guidance on how synchronous communication could be used and how its use could be enhanced (Hrastinski et al., 2010).

In eight of the following theses, synchronous communication[7] was used in the researched courses. Text-based chat was dominating, as it was used in six of these eight theses (Björck, 2004; Hrastinski, 2007a; Keller, 2007; Lindberg & Olofsson, 2005; Malmberg, 2006; Rydberg Fåhræus, 2003). In the other two theses, video conferencing was used as synchronous communication (Jonsson, 2004; Svensson, 2002). In some of the eight theses, synchronous communication served as the only medium of communication and in others it was combined with asynchronous communication (Björck, 2004; Hrastinski, 2007a; Jonsson, 2004; Keller, 2007; Lindberg & Olofsson, 2005; Malmberg, 2006; Rydberg Fåhræus, 2003; Svensson, 2002). However, the use of desktop conferencing/web conferencing,[8] such as Skype, Marratech, Adobe Connect, was not investigated at all in any of the theses. (For more information on desktop conferencing, see section 3.2).

1.3 AIM AND RESEARCH QUESTIONS

In conclusion, several factors influenced the decision to choose *the use of video in digital distance higher education* as the research interest for this thesis. *First*, it was my own experience of using video, particularly video conferencing and desktop conferencing, which made me interested in how teaching with video could be developed to facilitate student learning and create more varied learning environments for distance students. *Second,* my work with in-service training in Sweden and Finland, regarding how to use, e.g. video conferencing has made me interested in finding ways of helping teachers to feel more comfortable in that environment and to use video in an excellent way to facilitate student learning. *Third*, the results of the investigation of research within distance education in Swe-

7 Synchronous communication – communication in real time.

8 Henceforth, I will only use d*esktop conferencing* instead of d*esktop conferencing/web conferen*cing.

den, (see section 1.2), indicated essential gaps in the empirical research on the use of video in digital distance higher education. *Fourth*, with the increased development of MOOCs,[9] the possibilities of video for presenting instructional content have been rediscovered. Some writers claim that video will be dominant as a teaching medium on the Internet (Hansch et al., 2015; *The State of Video in Education 2017. A Kaltura Report*, 2017). *Fifth*, due to the special conditions, which the dual-mode model creates,[10] it is especially interesting to study distance higher education in a country with dual-mode, for example, Sweden. The empirical studies of this thesis have been conducted in Sweden. Therefore, the fact that distance education is well integrated into higher education has influenced how distance education in Sweden is carried out.

Today, most of the Swedish higher education institutions, (HEIs) have requirements of education in Teaching and Learning in Higher education for all teaching staff or at least recommendations (SUHF, 2010, 2016). However, specialised in-service training in distance education is not required. Also, there is an underlying assumption that with the requirements for teaching on campus, the necessary qualifications for teaching in distance education are also fulfilled. However, research shows that it is imperative with specialised training for teaching in distance education (Compton, 2009; Sun, 2011; Wännman Toresson & Östlund, 2002).

Wännman Toresson and Östlund (2002) claim that the rapid increase in distance education has led to many university teachers teaching at a distance without being prepared or educated for it. However, if teachers are going to be able to cope with the new demands that come with distance education and distance courses are to be designed and carried out with good quality, as Wännman Toresson and Östlund (2002) identify, there is a need for in-service training of distance teachers. Added to this, teaching at a distance involves a new role for teachers and new demands for teachers' competencies (Compton, 2009; Sun, 2011; Wännman Toresson & Östlund, 2002). Distance education puts higher demands on the teacher's ability to plan and organise courses, to present course content,

9 MOOC is an acronym for Massive Open Online Courses (Laaser & Toloza, 2017).

10 Dual mode means that both campus and distance education are offered by the higher education institution.

to give response to students, to create interactivity in the group of students, the teacher's knowledge of technology and how to use technology for purposes, etc. (Wännman Toresson & Östlund, 2002). The use of the Internet offers new opportunities for presentation of course content, interaction and individualisation but it also involves more extensive preparations in order to make use of the possibilities the Internet entails (Levine & Sun, 2002).

The relation between teachers' background, training and previous experience, plays an important role regarding *how, for what purposes*, and *to what extent teachers use video in teaching,* and *to what extent it is used*. It is therefore essential to investigate whether the distance teachers in Sweden have experience and training within the field of distance education.

AIM AND RESEARCH QUESTIONS

The aim of this thesis is: *To better understand the possibilities and limitations of video in digital distance higher education.* This aim is understood through three elements of analysis; *1) video*, *2) distance courses,* and *3) distance teachers.* These elements of analysis are, in turn, examined through two foci; *1) how distances courses with video are designed* and *2) the teacher's perspective on the use of video*. In the following section, arguments for the research questions that address these two foci and how their answers contribute to filling gaps in existing knowledge will be described. With the didactic questions *what, how,* and *why* (Säljö, 2000) as a point of departure, the following questions have been specified.

The questions related to the first focus are:

RQ1: How is video used in digital distance higher education?

When teachers design distance courses with video;

a. which categories of video are used?
b. how much are they used?
c. why are they used or not used?
d. how are they used?

The use of video is closely related to teachers' design of courses, which influences the organisation, planning and realisation, e.g. how video can be used and which categories of video can support teachers' pedagogical

ideas in digital distance higher education. How much video is used will indicate the role of different categories of video when designing distance courses.

Also, the reasons why teachers select *not* to use video are of interest. More knowledge of the reasons why teachers decide *not* to use video can contribute to finding methods to increase teachers' use. Research demonstrates the potential of video as a critical element of distance education. For example, the use of video has been found to increase student motivation and to have positive effects on student learning (Ljubojevic, Vaskovic, Stankovic, & Vaskovic, 2014). Another example is a study by Donkor, which showed that video-based instructional materials are useful for learning practical skills at a distance (2011).

It is therefore essential to get a review of the use of video in Swedish digital distance higher education. Such a study has not been conducted before, and the result of this investigation will provide a deeper understanding of the possibilities and limitations of video.

> *RQ2: How do course designers respond to the possibilities and limitations of video for digital distance higher education?*

Video provides both possibilities and limitations for the realisation of teachers' pedagogical ideas regarding the three types of interaction that Moore has defined (Moore, 1993b). 1) student-interaction with course content, 2) teacher-student interaction and 3) interaction among students, (for more information, see section 2.5). Within the frame of this thesis, it will be too much to study several categories of video in the second study. Therefore, one category will be selected, especially important in distance education.

The second focus; the teacher's perspective of the use of video aims to obtain knowledge about how teachers, being key agents in education, use and value video and how this influences their teaching situation and their pedagogical work in distance courses.

> *RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance higher education?*

The results from several studies indicate that teachers' attitudes to technology could play an essential role in their use of technology (see e.g. Judson, 2006; Tabata & Johnsrud, 2008). Therefore, it is motivated to investigate teachers' attitudes and experience; i.e. the teachers' personal view on video and their use, and how they perceive teaching through video.

TWO STUDIES

In order to give a *general* and a *detailed and contextualised picture* of the use of video in Swedish digital distance education, two studies have been conducted within the frame of this thesis. An explorative questionnaire provided a general review on the use of different categories of video in Swedish distance higher education on a national level. An interview study of the use of video conferencing in teacher education programme at a university in Sweden gave a detailed and contextualised picture. Video conferencing is particularly interesting as it is used to bridge the geographical distance between the teacher and one or several groups of students (Smyth & Zanetis, 2007). More information about the two studies will be given in chapter 5.

1.4 OUTLINE OF THE THESIS

This dissertation is structured with eight chapters. The second chapter situates the setting and introduces the field of *digital distance education*. Chapter 2 also discusses similarities and difference between distance and campus education, how distance education can be defined and its development. To understand digital distance education, concepts as interaction, communication, technology, and media are essential, and they finish chapter 2. The third chapter begins with a discussion about video and continues with a review of research on video technologies in higher education. The fourth chapter gives the theoretical framing of the thesis; the socio-cultural perspective and the theory of affordances. In the fifth chapter, research design and methodology are presented. The sixth chapter consists of result and analysis of the national study of six categories of video. In the seventh chapter, the results and analysis of the interview study of the use of video

conferencing in teacher education at Karlstad University are presented. In the eighth chapter, the results of the two studies are discussed. In the last part of chapter eight, methodological reflections, implications and future research are included.

CHAPTER 2

DIGITAL DISTANCE EDUCATION

2.1 DEFINITION

For framing the concept of distance education, I draw on Moore and Kearsley's (2005) definition that covers the essential aspects of *distance education* for contextualising this thesis project:

> "Distance education is planned learning that normally occurs in a different place from teaching, requiring special course design and instructional techniques, communication through various technologies, and special organizational and administrative arrangements" (Moore & Kearsley, 2005, p. 2).

There are many terms used for distance education; e.g. Internet-based learning, web-based learning, flexible learning, open learning, telelearning, distributed learning, open learning and distance learning, online learning, distance learning, and e-learning (Dafgård, 2002). *Distance education* will be

used as a catchall term in this thesis, as is common in Europe, referring to correspondence courses as well as online learning and e-learning. *Digital distance education* will be discussed later in this chapter.

2.2 THE DEVELOPMENT OF DISTANCE EDUCATION

To understand distance education today and the conditions of learning within the field, it is essential to have knowledge about the development of distance education from a Swedish and international perspective. The history of distance education here below, therefore functions as a context and framework for this thesis. The use of technology is one dimension of how distance education has changed throughout the years and technology has often been a driving force during that development. However, even more important is how the pedagogical models have developed from self-studies, without any support from the tutor, to collaborative work among students at a distance.

The development of distance education has been a process of several stages, often called generations (Garrison & Anderson, 2003). It is important to emphasise that even if it is possible to distinguish between different generations in the development of distance education, this development has not been a linear process, and several of the generations have co-existed (Garrison & Anderson, 2003).[11]

THE FIRST GENERATION: CORRESPONDENCE COURSES

The first generation of distance education consisted of print-based correspondence courses, which started as early as the beginning of the 18th century (Bates, 2005; Holmberg, 1998). One example of these first traces of distance education was an offer of lessons in shorthand by mail from Boston (Holmberg, 1998). This form of distance education was far from

11 Several systems for dividing the stages of progress into generations of distance education exist.

what we mean by distance education today. It can be characterised more as self-studies than distance education since there was no communication between the teacher and the student. The course consisted of written lessons that the students worked with by themselves (Holmberg, 1998). However, already from 1840, there were also distance courses that included some kind of tutoring in contrast to this pedagogical model of self-studies (Holmberg, 1998). One of the first distance educations in higher education was a programme for degrees from undergraduate programmes to doctoral programmes that were started in Illinois Wesleyan University as early as in 1874. Many other institutes for correspondence studies were founded in Sweden and other parts of the western world (Holmberg, 1998).

Distance education was looked upon with certain scepticism by many people for several reasons (Bååth, 1994). It was looked upon as a new-fangled thing. Also, it could hardly be considered to be an education of high quality if the students were not at the same place as the teacher listening to the teacher. Despite these prejudices, correspondence courses offered new possibilities to those who wanted to combine work with studies and therefore, distance education became very popular (Bååth, 1994).

The rise of this type of distance education was later halted by the extension of public education systems where adult education was offered at a low cost or even for free in certain countries, e.g. in Sweden (Holmberg, 1998). This created economic problems for the correspondence institutes in certain countries since these institutes charged fees for studying (Holmberg, 1998).

THE SECOND GENERATION: THE MULTI-MEDIA MODEL

The development of ICT (Information and Communication Technology) has been of significant importance for distance education (Holmberg, 2006). With the possibilities that new technologies offered, the second generation of distance education, "the broadcast and television model" emerged (Moore & Kearsley, 2005). It is also called "the multi-media model" (Fozdar & Kumar, 2007) and it is based on media such as radio, television, video and computers (Christoffersson & Arwidsson, 1990; Tay-

lor & Swannell, 2001). With the use of technology followed opportunities for students to study where they lived and had their families. They were no longer forced to move to the cities where the HEIs were situated. Offering a more flexible study environment made it possible to realise more extensive recruitment so that new groups of students would get access to higher education. As before, print played an important role (Christoffersson & Arwidsson, 1990), but additionally, there were oral and visual dimensions to *the presentation* of information to distance students (Moore & Kearsley, 2005). Audio and videotapes were used more frequently than radio and television since they could be used for recording lectures and commenting assignments (Christoffersson & Arwidsson, 1990). In addition, the use of tapes had the advantage that it was possible to produce and distribute them at reasonably low costs (Christoffersson & Arwidsson, 1990). Computers were used to a certain extent, but the transmission of information was still mostly characterised by one-way communication (Holmberg, 1998). Distance teachers and organisers of distance education expressed that they would like to have improved possibilities of communication and co-operative work between students (Scigliano, 2000).

THE THIRD GENERATION: THE TELELEARNING MODEL

With the third generation, the Telelearning Model, possibilities of *synchronous* communication were finally introduced (Taylor & Swannell, 2001). At a rather large scale, audio-conferencing started in the 1970s, which made it possible for students to interact directly from their homes with their teacher (Moore & Kearsley, 2005). Later, the possibilities of one-way video/two-way audio communication came, which meant that picture and sound were transmitted from the original site. However, the participants could only communicate with audio, and they could not see each other in different locations. From the 1990s, two-way video conferencing was more frequently in use (Moore & Kearsley, 2005). This generation is sometimes called the generation of the open universities as the term

"open universities" refers to the institutions of single-mode[12] that were established. When considering the open universities generation as a separate generation, the Telelearning Model becomes the fourth generation, and so forth (Moore & Kearsley, 2005). However, as the use of radio and television in distance education was an essential foundation of the open universities and the generation of the open universities only occurred in the countries that chose the single-mode model, we have decided not to separate these two generations here.

THE FOURTH-GENERATION: THE FLEXIBLE LEARNING MODEL

Even more critical for the development of distance education is the implementation of the Internet (Holmberg, 2006), which in the history of distance education is called the Flexible Learning Model, which offered online delivery via the Internet (Taylor & Swannell, 2001). The use of the Internet made it possible to not only present content in different ways but also to support *communication and interaction* among students and teacher and students, which is a central prerequisite for quality education (Holmberg, 2006). Other advantages with the introduction of the World Wide Web for education were that the Internet made it possible to communicate even though different software, operational systems, screen resolutions etc. were used (Moore & Kearsley, 2005. In the 1990s, universities in the USA started Web-based educations (Moore & Kearsley, 2005). The development went very fast, and about ten years later, as many as 84 % of the public universities offered Web-based education (Moore & Kearsley, 2005).

Characteristic of online learning from about 1995 to 2005 was that the use of technology and learning management systems, which were the most current technology, were controlled by the teachers (Bates & Sangrà, 2011). However, regardless of this development of distance education and implementation of new technology, it is essential to remember that even if new technology emerged, it was not always used (Garrison & Anderson, 2003).

12 Single mode means that the institution only offers distance education and dual mode is when both campus and distance education are offered.

SINGLE-MODE MODEL

Distance education was considered a way of providing an answer to the changing political and individual demands for education, entailing, effective systems for learning created by the implementation of new technology, such as radio and television *(Flexibel utbildning på distans: slutbetänkande,* 1998). This originated from a very simplified view of education based on the ideas that education is primarily a problem of distribution, and that teaching is mostly about spreading information to the students. Nevertheless, these expectations were an essential basis for a determining decision, which was made on a national level; to either select *the single-mode model* or *the dual-mode model (Flexibel utbildning på distans: slutbetänkande*, 1998). During the late 1960s and early 70s, institutes were founded that specialised solely on distance education and adapted working methods and organisation to that type of education *(Flexibel utbildning på distans: slutbetänkande*, 1998; Moore & Kearsley, 2005). Both the experiences from the correspondence courses and the introduction of new technology, e.g. radio and television, contributed to the foundation of institutes developed according to *the single-mode model* in, e.g. the United Kingdom, France, and the USA *(Flexibel utbildning på distans: slutbetänkande,* 1998; Laaser & Toloza, 2017).

One of the strengths of the single-mode system was that the HEIs could carry out large scale education that was more cost-effective as there was a large number of students and a comprehensive selection of courses and programmes *(Flexibel utbildning på distans: slutbetänkande*, 1998). Other strengths were; 1) with the large scale it was possible to develop teams of experts within different fields, 2) better possibilities for careful planning and organisation of education, and 3) that there was administrative staff that solely worked with distance education. Initially, research was not included in the large institutions of single-mode, which was one reason why certain countries selected the model of dual-mode institutions *(Flexibel utbildning på distans: slutbetänkande,* 1998).

This can be compared to *the dual-mode model*, which entailed that the institute offered both distance education and campus courses (*Flexibel utbildning på distans: slutbetänkande*, 1998; Moore & Kearsley, 2005).

DUAL-MODE MODEL

Advantages with institutions of the dual-mode were that they often could utilise the same resources for both campus-based and distance education courses and programmes, which was an effective way of using resources (Kappel, Lehmann, & Loeper, 2002). However, from the beginning, the dual-mode institutions sometimes gave higher priority to campus education and research than to implement distance education in the organisation. This affected the development of distance education negatively *(Flexibel utbildning på distans: slutbetänkande,* 1998). Lack of necessary competencies, financial resources for developing distance education, and more advanced technology were other problems for the institutions of dual-mode *(Flexibel utbildning på distans: slutbetänkande*, 1998).

Another potential disadvantage was that the culture of traditional HEIs could remain strong and it might sometimes be difficult both for the organisation and individuals to adapt to the new conditions and circumstances that came with distance education *(Flexibel utbildning på distans: slutbetänkande,* 1998). When the "distance teaching universities" implemented different kinds of media in their courses, the traditional universities still used chalk and blackboard in the classroom (Laaser & Toloza, 2017). This meant that the conditions for distance education were profoundly affected by choice of the dual-mode model *(Flexibel utbildning på distans: slutbetänkande,* 1998).

However, a positive aspect of the dual-mode structure was that since teachers often taught in both forms of education and teaching methods and ideas from one form of distribution often inspired the other form *(Flexibel utbildning på distans: slutbetänkande,* 1998). It was therefore also difficult to draw sharp borders between distance and campus education and many methods and ideas that were applicable to distance higher education also functioned very well in campus education *(Flexibel utbildning på distans: slutbetänkande*, 1998). Experienced distance teachers had developed new strategies, adapted to the frames of distance education, to present content, create interactivity, take a more tutoring function, and implement collaborative work among students (Mason, 2001). According to Mason (2001), distance courses are the driving force of pedagogical development in higher education.

One effect of the dual-mode model is that the borders between distance education and campus education became blurred for several reasons *(Flexibel utbildning på distans: slutbetänkande*, 1998). For countries with dual-mode, it is not possible to separate campus and distance education in higher education as both forms of distribution are carried out at the same HEIs and often even by the same teachers *(Flexibel utbildning på distans: slutbetänkande*, 1998). Another reason why it is not possible to make this distinction is that the number of lectures, seminars etc. in campus courses is reduced for economic reasons, which results in campus students being more and more left to carry out self-studies. *(Eurostudent - om svenska studenter i en europeisk undersökning, hösten 2009*, 2010). A third reason is that technology, previously only used in distance education, is nowadays implemented in campus education as well. For example, many HEIs today have an LMS, Learning Management System, which from the beginning was intended for distance courses (Bates & Sangrà, 2011). In an LMS, the students have access to the curriculum, schedule, reading lists, assignments, links to supplementary material, communication facilities with fellow students and teachers, and sometimes even lectures in the form of the streamed video etc. However, teachers are not prepared or educated for this new situation (Levine & Sun, 2002). Pedagogy for using the Internet in higher education is non-existent, according to Levine and Sun (2002). Many teachers are also uncertain about how to handle technology (Levine & Sun, 2002).

It is particularly important to emphasise that the conditions for distance education are profoundly affected by the choice of the dual-mode model. Therefore, it is of special interest to study digital distance higher education in a country with dual-mode, for example, Sweden. The circumstance that digital distance education is well integrated with higher education has influenced how distance education in Sweden is carried out.

2.3 AN EXTENSIVE PART OF HIGHER EDUCATION

Today, digital distance education is a considerable part of higher education and affects many parts of the higher education sector. Therefore, it is essential to develop an understanding of the possibilities and limitations of this type of education to improve pedagogy and the use of technology from a pedagogical perspective (Natriello, 2005). For instance, when searching on the Swedish web site www.studera.nu,[13] for courses and programmes that were marked as distance education, there were as many as 4,630 distance courses and programmes offered during autumn 2010 out of totally 20,989 courses and programmes. The academic year 2016/17, there were 6,833 freestanding courses, and 499 were programmes (Gröjer, Berlin Kolm, & Lundh, 2017). For example, in Sweden, the number of distance students has increased dramatically from 13,000 in 1992/93 academic year (Gisselberg, Forsberg, & Riabacke, 2004), to 53,200 enrolled in 2006 (Högskoleverket, 2008) and to more than 126,500 in 2010 (*Theme: Education; Distance learning in higher education*, 2012). This means that in 2010, more than every fifth student in Sweden was studying at a distance[14] and in autumn 2015, more than every fourth student was a distance student *(Universitet och högskolor. Årsrapport 2016*, 2016).

Looking beyond the Swedish borders, other examples of the rapid growth of distance education emerge. For instance, at the Open Universities Australia, the number of enrolled distance students increased as much as 32 % to 49,000 students from the year 2008 to 2009 (*Open Universities Australia. 2009 Annual Report,* 2009). Other examples are the Open University in the United Kingdom, which had around 180,000 distance stu-

13 The site www.studera.nu was the official website for applying to higher education in Sweden and was managed by the The Swedish National Agency for Higher Education in cooperation with the National Admissions Office to Higher Education. (https://www.studera.nu/studera/1393.html) Retrieved 3 June 2010. As from 12 September 2011, it is not possible for students to apply for courses and programmes on http://www.studera.nu and HSV alone was responsible for the site. Students' applications are instead moved to http://www.antagning.se, for which VHS was responsible. Retrieved 27 February 2018.

14 https://www.studera.nu/studera/1738.html. Retrieved 3 June 2010.

dents in 2010, a growth from 70,000 in 1980[15], the University of South Africa (UNISA) with approximately 200,000 enrolled distance students[16], and Indira Gandhi National Open University, which had around 3 million distance students[17]. During the 2006-07 academic year, 66 % of 2-year and 4-year degree-granting postsecondary institutions in the U.S. offered distance courses in different forms (Parsad & Lewis, 2008). This means that the number of distance students in the U.S. during this period was approximately 12.2 million (Parsad & Lewis, 2008).

These large providers of distance education worldwide are often said to belong to a particular group of universities, so-called MEGA universities, which means that each of these universities has more than 100,000 students (Holmberg, 1998; Natriello, 2005). Centre National d'Enseignement à Distance – (CNED) – was the first of the MEGA universities, and it was founded in France as early as 1939. Already in 1995, the number of MEGA universities had increased to 10, and all provided distance education (Holmberg, 1998). In 2010, fifteen years later, there were as many as 57 MEGA universities[18]. If also those with 95,000 students are included, there were 62 MEGA universities on 1st June 2010[19]. All MEGA universities offer television and video resources to their students (Koumi, 2006).

As the statistics above show, the increase in distance education is a phenomenon on a global scale (Natriello, 2005). Furthermore, distance education is not solely growing in higher education but also in training in corporate environments as well as in secondary school and compulsory school. This means that research and experiences of distance education within higher education may also be necessary for other educational forms (Natriello, 2005). For example, Archambault and Crippen (2009) have pre-

15 http://www.open.ac.uk/about/ou/ and http://www.open.ac.uk/about/ou/p3.shtml. Retrieved 3 June 2010.

16 http://en.wikipedia.org/wiki/University_of_South_Africa. Retrieved 3 June 2010.

17 http://en.wikipedia.org/wiki/Indira_Gandhi_National_Open_University Retrieved 4 June 2010.

18 http://en.wikipedia.org/wiki/Mega_university. (Updated 1 June 2010). Retrieved 3 June 2010.

19 http://en.wikipedia.org/wiki/Mega_university. (Updated 1 June 2010). Retrieved 3 June 2010.

dicted that in the USA, 10% of all high school classes will be online classes in 2015 and in 2019 the figure will increase to 50%.

Another example of how distance education increases are MOOCs, (Massive Open Online Courses), which is a relatively new model of distance education (*7 Things You Should Know About ... MOOCs,* 2011). It started in 2008 when George Siemens and Stephen Downes opened up a course that they initially were teaching to a group of tuition-paying students. More than 2.300 students took the web-based course for free. "Massive" refers more to the opportunity of having thousands of students in one course than to the number of students studying in a course. Some of the well-known organisers of MOOCs are Stanford University, MIT, edX, Udacity, and Coursera (*7 Things You Should Know About ... MOOCs*, 2011; Mallon, 2013). The idea with MOOCs is that content is delivered to anybody who wants to take the course and have Internet access. "Open" participants get little or no feedback from the teacher, but the course is instead built on 1) a high degree of student-to-student interaction, often in self-selected review groups to provide feedback among students and 2) self-directed learning. The course may offer different ways of accessing the course content and discussing it with others; e.g. resources as videos, discussion boards, blogs, wikis, Google Sites, and opportunities of commenting via social media platforms, although the LMS used in the course for paying students is not accessible. The flexibility varies as some activities might be scheduled and others might be synchronous (in real-time). As anyone can attend, the variation of students' background is considerable, which the course can benefit from (*7 Things You Should Know About ... MOOCs,* 2011).

2.4 SIMILARITIES AND DIFFERENCES BETWEEN DISTANCE AND CAMPUS EDUCATION

Although the borders between distance and campus education are more blurred today than previously, distance education still entails special conditions, for example, concerning students' learning environment and teachers' teaching environment. In order to understand these particular conditions, some significant differences and similarities between distance and campus education are described here.

Distance education is founded on the same pillars as other higher education, e.g. assessment of students' previous knowledge and expected needs, the establishment of the content of the course, planning and organisation of learning activities, and assessment of the students' learning (Anderson, 2008). However, there are also important differences between distance and campus education (Levine & Sun, 2002). For example, campus education is built on students' physical attendance at lectures, seminars, and labs (Bates & Sangrà, 2011). Distance education can sometimes be perceived as less personal as teacher and students do not meet physically at all or at least not as often as on-campus (Conrad, 2015). Therefore, it happens that distance students feel isolated (Conrad, 2015). There are different forms of distance education. Some courses have physical course meetings, a model of distance education that is often called *blended learning*. Other courses can be studied completely at a distance. Literature often emphasises that course meetings are very valuable (Bonk & Graham, 2006a; Dafgård, 2002; Dziuban, Moskal, & Hartman, 2005; Garrison & Vaughan, 2008; Graham, 2006; Grepperud, 2008; Masie, 2002; Nilson & Lindgren, 2006; Sloman, 2007; Woolls, Dowlin, & Loertscher, 2002).

Since distance students are seldom or never at campus, it is not possible to have the same teaching strategy in distance education (Levine & Sun, 2002). It is becoming increasingly more accepted that the teaching methods used in the classroom cannot be transferred successfully to the online learning environment (Compton, 2009; Sun, 2011).

How to span the gap and carry out activities of teaching and learning despite the geographical distance between and among students and teachers is one of the main issues in distance education (Bernard et al., 2009). In distance courses, a feeling of isolation can emerge due to a lack of personal student interaction and lack of sense of community. Video can be used to reduce this feeling of isolation (Conrad, 2015; Rovai & Jordan, 2004).

In distance courses, the most common mean of communication is still writing. Distance education started with correspondence courses, and written communication is more comfortable to carry out compared to other types of communication (Levine & Sun, 2002). Distance students are also often left to interact with the course materials without teachers' explanations and clarifications during lectures and seminars. One way of

supplementing written communication is to offer alternative ways of communication and different modes of presenting the course content. For example, to create a more varied learning situation for distance students *video* can be used in different ways. It can be recorded lectures, documentaries, video conferencing, desktop conferencing, video production made by students, recordings of student behaviour for analysing etc. (Levine & Sun, 2002).

The Internet is a factor that has had a significant influence on the possibilities of creating entirely new learning environments compared to what most teachers in higher education have experiences of (Levine & Sun, 2002). The Internet offers increased possibilities of presentation, interaction and individualisation, but in order to make use of these opportunities, extensive preparations for teaching distance courses are required. Since there is seldom time for these preparations in higher education, a transition of traditional pedagogy of campus courses, based on transmission through lectures, to distance education is often chosen (Bates, 1997; Levine & Sun, 2002). Technology provides possibilities of this transmission; e.g. using video conferencing for lectures (information transmission mode) (Bates, 1997). The result is that the Internet is not used to its full potential, e.g. regarding possibilities of individualisation, content presentation, and interactive communication (Levine & Sun, 2002).

> "Today's new technologies, particularly the Internet, present higher education with the largest megaphone in its history − the capacity to disseminate knowledge to an exponentially larger number of people than ever before. To do this, educators use a vehicle now commonly known as distance education."[20] (Levine & Sun, 2002, p. 1).

However, research indicates that despite the opportunities that technology provides, it is mainly used as a way of transferring design and delivery of teaching from campus to distance instead of making use of its potential

20 "*Distributed education* refers to a mix of instructional practices—blending new technologies with traditional classroom practices. This paper focuses on obstacles to programs that rely primarily on new technological delivery systems. Therefore, we use the term *distance education*, rather than distributed education." (Levine & Sun, 2002, p. 1). (The number of the note is 1 in the original text).

and design courses in new, creative ways (Bates & Sangrà, 2011). Therefore, it is essential to identify the four main differences between campus and distance education that can be defined as circumstances which create special conditions for the distance education learning environment. These conditions require special competences of the distance teacher. The four competencies are; 1) the skill for shifting the time and place of the educational interaction is a prerequisite for distance education, 2) the expertness of supporting course content in a variety formats; e.g. text, multimedia, different types of video, 3) the ability to use the resources on the Internet, created by the teacher, fellow students, other educational organisers etc. and research libraries, and 4) the skill to support interaction in many formats; e.g. text, speech, video (Anderson, 2008).

2.5 INTERACTION

This chapter begins with two key concepts; *interaction* and *communication*, which are essential for understanding the theoretical approach. Interaction can be both individual and social, and both are important for learning (Bates, 1997). Individual interaction occurs with the learning materials, i.e. the student interacts with, e.g. text, video, audio, or computer program. The social interactivity focuses on the learning materials and takes place among students and the teacher and students. In order to obtain interaction; technology and media play important roles, especially in distance education.

Moore (1993b) classifies interaction into three categories:[21]

- Student – Content interaction;
- Student-Teacher interaction; and
- Student – Student interaction.

Student-content interaction is a prerequisite of education (Moore, 1993b). It can be described as: "… the process of intellectually interacting with the content that results in changes in the student's understanding, the student's

21 Moore uses 'Learner' and 'Instructor', but for the purposes of this thesis, 'student' instead of 'learner' and 'teacher' instead of 'instructor' is used to adapt to the environment of higher education.

perspective, or the cognitive structures of the student's mind." (Moore, 1993b, p. 20). Student-content interaction can take place in many different ways; from using didactic text in the oldest form of distance education to content broadcast on television programs and instructional videos in the form of digital video (Moore, 1993b).

Student-teacher interaction is not as essential for learning to take place as student-content interaction but is still an essential element of education (Moore, 1993b). Student-teacher interaction can be asynchronous as in recorded lectures (Moore, 1993b). One of the core problems in distance education is to provide synchronous oral communication among students despite the geographical distance, but this can be obtained by the use of *video conferencing* or *desktop conferencing* (Moore & Kearsley, 2005). In student-teacher interaction many elements are included; e.g. getting the student interested in the subject of study, motivating the student to learn, making presentations to facilitate students' learning, organising the students' application of course content, providing evaluation, counselling, support, and encouragement (Moore, 1993b).

Student-student interaction is the third type of interaction and can be characterised as: "… inter-learner interaction, between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor." (Moore, 1993b, p. 22). This type of interaction mostly lacked in the first generations of distance education, e.g. in correspondence courses (Moore, 1989), (see section 2.3). However, due to technological development which provides the required tools; two-way video conferencing or desktop conferencing, student-student interaction could be realised (Moore & Kearsley, 2005) Student-student interaction is often an element that can offer motivation to students and be a resource for learning (Moore, 1993b).

Student-teacher interaction can reduce "transactional distance" (Payne, 1999). The concept of "transaction" originates from John Dewey and is further developed into the theory of Transactional Distance by Moore (Moore & Kearsley, 2005). A certain degree of "transactional distance" occurs in all types of education, also in campus courses where students and teachers meet face-to-face (Moore, 1993b). It is, therefore, a question of degree of "transactional distance" and not whether it exists or not (Moore, 1997; Moore & Kearsley, 2005). However, "transactional dis-

tance" does not refer to the geographic distance *per se* between teacher and students, but to the psychological distance, the changed behaviour of students and teachers, and the *pedagogical effects which emerge as a result* of the geographical distance, e.g. problems in understanding and communication (Moore, 1997; Moore & Kearsley, 2005; Shearer, 2007). Therefore, "Transactional distance" has been especially critical in distance education, both for research and instructional design (Gibson, 2007; Shearer, 2007). Factors as teaching, learning, communication and interaction, curriculum, course design, organisation, and management of educational programmes are all influenced by the fact that distance students and teachers are spatially or temporally separated (Moore & Kearsley, 2005).

The course structure is dependent on, e.g. the teaching organisation, the teachers, the content, and the media of communication (Moore & Kearsley, 2005). How well the course structure is adapted to students' needs is determined by the degree of flexibility. A highly structured course has a higher degree of Transactional Distance (Moore & Kearsley, 2005). In order to create an excellent learning environment for students, the effects of the Transactional Distance have to be overcome or at least reduced (Moore, 1997; Moore & Kearsley, 2005).

2.6 COMMUNICATION IN AN EDUCATIONAL SETTING

Communication is essential for learning, knowing, and constructing information to knowledge (Kress, 2010) and therefore, communication between the provider of education and the students is an essential part of all education (Moore & Kearsley, 2005). Historically, interaction among teacher and students has been based upon oral communication (Garrison, Anderson, & Archer, 2000).

There are several models of communication, and since the aspects of *mode* is essential for video, the semiotic model has been selected, which focuses on three factors (Kress, 2010); 1) social interaction, 2) interchange in the process of meaning-making, and 3) modes and their affordances (Selander & Kress, 2010). Modes and their affordances (possibilities and constraints) are the resources for making meaning in the communication

process (Kress, 2010). Examples of modes are image (still and moving image, i.e. video), text, colour, sound, 3D models, action, and gesture. Since modes have a variety of possibilities, these modes are especially suited for different representational/communication purposes; several modes are combined into ensembles, which creates multimodality. Image, colour, and text are also often combined in signs (Kress, 2010).

Communication changes dependent on development in, e.g. social, economic, cultural, and technological fields (Kress, 2010). Within the academy, there are strong traditions of the dominance of writing, and the interest in implementing multimodality has, therefore been slower (Kress, 2010). The easiest way to communicate at a distance is through text-based communication but to mitigate problems of communication at a distance, video conferencing or desktop conferencing, which includes oral and visual communication, are more suitable (Caladine, Andrews, Tynan, Smyth, & Vale, 2010). When comparing oral and written communication, oral communication is less structured, faster, spontaneous, and fleeting (Garrison et al., 2000). Written communication is considered as a lean medium as much information in the communication is lost. If oral communication is taking place in a face-to-face situation, the speech is often completed with non-verbal cues as gestures, facial expressions, and tone of voice. Therefore, face-to-face oral communication is defined as a rich medium, both socially and emotionally (Garrison et al., 2000).

Verbal communication and non-verbal communication occur simultaneously (Lögdlund, 2011). Non-verbal communication, e.g. signs, sounds, gestures, and the position of the body aim at strengthening or modulating the message communicated verbally (Lögdlund, 2011). They are created and used in the social environment, but they do not carry meaning by themselves (Selander & Kress, 2010). In distance education, communication is supported by some technology, which is the reason why the development of technology has such an essential influence on distance education (Moore & Kearsley, 2005). However, technology does not only offer possibilities but also limitations, i.e. it changes the teaching and learning situation (Koehler & Mishra, 2009). For example, in a video conference setting, the teacher cannot always choose how to act in the teaching situation as the teacher continuously has to make sure to be captured by the camera and within reach of the microphone, which limit

the teacher's possibilities to use her body for non-verbal communication as desired (Lögdlund, 2011).

SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION

Included in the field of ICT (Information and Communication Technology), is Computer-mediated communication, (CMC), which can be characterised by a division into *synchronous* and *asynchronous communication* (Hrastinski, 2007a). Commonly, synchronous communication denotes simultaneous (in real-time) participation by teachers and students or among students as opposed to asynchronous communication, which is more flexible (Keller, 2007). That synchronous communication resembles classroom teaching, can be perceived as an advantage by some teachers, but it can also bring about a risk to think that the same methods can be used at a distance as on-campus (Bates & Sangrà, 2011). Examples of tools that provide synchronous communication are *chat, audio conferencing, video conferencing* (Keller, 2007), and *desktop conferencing* (Moore & Kearsley, 2005; Ng, 2007). In asynchronous communication, students have a higher degree of control over their learning situation, since they decide *when* and *where* to study (Keller, 2007). However, the lack of visual cues in asynchronous communication may also obstruct communication (Rydberg Fåhræus, 2003). Examples of tools for asynchronous communication are e-mail, discussion groups, computer-based tests (Keller, 2007), pod radio (Caudill, 2007), YouTube (Clifton & Mann, 2011), and streamed video (Daugherty & Russo, 2007; Kubota & Fujikawa, 2007).

However, even though certain media can be said to support either asynchronous or synchronous communication better, it is difficult to make clear distinctions between these two (Hrastinski, 2007a). Whether the communication is perceived as synchronous or asynchronous is not solely dependent on the medium that is used, but also how the user chooses to utilise the medium. "The difference between asynchronous and synchronous communication is often a matter of degree." (Hrastinski, 2007a, p. 34). If the user, e.g. decides to read and reply to the e-mail directly when it arrives, it can be characterised as synchronous communication although

e-mail often is considered as an example of asynchronous communication. Synchronous and asynchronous communication complete each other and the best choice may be to use a combination of the two.

2.7 TECHNOLOGY OR MEDIA?

Should television and the Internet be defined as technologies or are they media? Is it essential to make a distinction between *technology* and *media?* This has been an ongoing discussion for a long time, and these concepts are frequently used interchangeably (Bates, 2015; Moore & Kearsley, 2005). Bates (2015) claims that it is essential to distinguish between them as the concept we use also shapes how we think about selection and use. When talking about 'technology', there is a risk that we emphasise the features and buttons, but in teaching and learning, it is more important to focus on 'media' in a specific situation and how they can be used in the best way (Bates, 2015). The difference between technology and media can, e.g. be defined as; "It is the technology that is the vehicle for communicating messages, and the messages are represented in a medium." (Moore & Kearsley, 2005, p. 6). The relation between technology and media may also be described as: "… each technology supports at least one medium – and some can support more than one." (Moore & Kearsley, 2005, p. 6).

TECHNOLOGY

Technology can be analogue, as, e.g. a pen or a whiteboard, but analogue technologies seldom cause any problems regarding their use (Koehler & Mishra, 2009). When discussing technology in this thesis, we refer to digital technology and particularly digital technology in an educational setting, which often is regarded as tools or a combination of several tools used with the purpose to support teaching and learning (Bates, 2015). Garrison and Anderson suggest that educational technologies are defined as: "those tools used in formal educational practice to disseminate, illustrate, communicate, or immerse learner and teacher in activities purposively designed to induce learning" (Garrison & Anderson, 2003, p. 34). A noteworthy circumstance, which complicates the use of technology in teaching

is that; "most technologies are not designed for educational purposes." (Koehler, Mishra, Bouck, & Graves Wolf, 2011, p. 147). This means that teachers have to be quite creative and also often re-design the technology to be able to use it in their teaching (Koehler et al., 2011). Another issue which Kohler and Mishra bring up is that; "Technologies are neither neutral not unbiased" (2009, p. 61), which entails that the use of technology changes the whole teaching and learning situation. Not only positive effects emerge, but also negative effects might occur. The technology integration[22] challenges how teaching and learning traditionally have been carried out: "… the technologies do not merely support learning; they transform how we learn and how we come to interpret learning" (Säljö, 2010, p. 53). The quality of technology-based teaching depends on how a course is designed, developed, and delivered (Bates & Sangrà, 2011). Initially, when technology was going to be implemented, it was more a question of "What can we use technology for?" (Laurillard, 2008, p. 8). Now, the integration of pedagogy and technology has matured and developed to a more relevant question: "So what can the technology do for us?" (Laurillard, 2008, p. 8).

Technology has *features,* which can be described as; "whether multiple modes are supported; whether design is for single or group use; whether interaction is affected through the keyboard, mouse, joystick, or glove, whether data storage and retrieval occur to and from the Internet or on the local desktop" (Andrews & Haythornthwaite, 2007, p. 11). Technologies can be categorised into *recorded* and *live (interactive)* technologies (Moore & Kearsley, 2005). A Skype-meeting is an example of interactive technology and a video clip on YouTube is an example of a recorded technology. Often a mixture of interactive and recording technologies can be the right choice as Moore and Kearsley recommend: "… it is always desirable to have at least one recording technology primarily suited to the delivery of content and another that is suitable for interaction between the learner(s) and instructor(s)." (2005, p. 15).

Online technology is one of the most potent technologies as it can be used for communicating all types of media (Moore & Kearsley, 2005).

22 Koehler and Mishra, (2008), call the act of including technology in teaching integration instead of implementation, which often is used.

However, when considering the implementation of advanced technology in a distance course, it is essential to remember that maybe not all students have access to video, due to limitations in bandwidth etc. It is likewise essential to consider the issue of the quality of the media. Certain technologies for distribution results in poor media quality, e.g. comparing a movie on DVD with an online film transferred by too low bandwidth (Moore & Kearsley, 2005).

A critical principle for using technologies in distance education is that *no* technology can be the most suitable and sufficient for all sorts of messages to all students everywhere (Laurillard, 2002; Moore & Kearsley, 2005). It is, therefore, often necessary to use several different technologies. In order to use technology effectively in a teaching and learning situation, it is not enough to know *how* to use the technology (Bates & Sangrà, 2011). The utilisation also needs to be integrated into the knowledge of "understanding students' learning processes, development of students' skills and competencies, how knowledge is represented through different media and then processed, and how learners use different senses for learning" (Bates & Sangrà, 2011, p. 195). The purpose of using technology in education should be an added value to the students' learning situation (Garrison & Anderson, 2003; Laurillard, 2008; Moore & Kearsley, 2005). These values can be access to learning materials, multiple perspectives of learning materials, different modes of presentation, temporal and spatial flexibility, personalisation, and possibilities of communication among teacher and other students, (synchronously and asynchronously) (Garrison & Anderson, 2003; Laurillard, 2008; Moore & Kearsley, 2005).

The selection of technology influences the entire educational environment (Garrison & Anderson, 2003; Laurillard, 2008; Moore & Kearsley, 2005). First, the requirements of education must be stated, and then we can challenge the technology to meet these requirements (Laurillard, 2008). For example, factors as user-friendliness and possibilities of interaction are essential to consider when selecting technology for distance education (Guri-Rosenblit, 1999). Other important factors are; the content, who the students are, and where learning is to take place etc. (Moore & Kearsley, 2005). The more technology used, the more critical it is to use the selected technology in the best way (Bates & Sangrà, 2011).

The question of whether or not technology influences learning positively has been investigated and debated for a long time and measurable performance outcomes have been ambiguous, (see e.g., Bates & Sangrà, 2011; Coates, James, & Baldwin, 2005; Cuban, 2003; Johnson, Adams Becker, Estrada, & Freeman, 2015; Kozma & Isaacs, 2011).

The use of technology has both possibilities and limitations, and both these aspects have to be considered when selecting what kind to use and not the least, how to use it (Belanger & Jordan, 2000; Koehler & Mishra, 2008). The main question is not which technology is the most effective for learning or whether technology facilitates and enhances learning. The factors, which influence learning outcomes the most, are instead *how to select* the technology, (the most suitable for a specific learning situation), and *how to use* it in the best way in that situation (Laurillard, 2002). Technology, in itself, cannot support teaching and learning (Bates, 2015). It is only when they are put into action or when teachers and students start using them, they can support teaching and learning. Then the perspective often changes from technology to media (Bates, 2015).

MEDIA

Media, which is plural of medium, originates from Latin and means *"in the middle (a median) that which intermediates or interprets"*[23] (Bates, 2015, 6.3.1.2 Media). Media can be defined in different ways, but we will here focus on two definitions that are especially important for teaching and learning; *senses* and *meaning* (Bates, 2015). In order to interpret media; e.g. channels like text, audio, and video, *senses* like sight and sound are used. These channels *intermediate* the information that conveys *meaning*. The information has been created by the 'creator', and the 'receiver' interprets the information. For teaching and learning, it is essential to consider that media is not neutral or 'objective'. The interpretation of the meaning can be influenced by how media is designed or used. (Bates, 2015). Each *medium* has its characteristics; e.g. text is intended to be read, images are designed to be watched, and sounds are expected to be heard (Moore & Kearsley, 2005). The presentational attributes of a medium make it more suitable

23 Author's italics.

for some topics and learning tasks than for others (Koumi, 2006). There are variations for each medium, often determined by the technology used for distribution[24] (Moore & Kearsley, 2005). Examples of variations are; form, structure, suitability for different styles and types of interaction, and degree of abstractness and concreteness (Moore & Kearsley, 2005).

Media is used for communication and when comparing, e.g. text and pictures, there are varieties of communication, such as different insignificance and shades of meaning (*Läromedel - specifikt: betänkande om läromedel för funktionshindrade,* 2003). For example, the language of pictures offers other possibilities than verbal and written messages. Pictures can, e.g. provide examples, a feeling of distance, presence, and completeness. *Media* of today is multimodal, which means that media interacts simultaneously with different types of "languages", such as text, picture, sound, and moving picture. Electronic media provide possibilities to combine different types of media which complement each other and strengthen the message, e.g. may text and picture be combined with sound and music (*Läromedel - specifikt : betänkande om läromedel för funktionshindrade*, 2003). When media is discussed in this thesis, I refer to digital media.

When selecting media, it is not only essential to consider what a medium does, but also 'what a medium does in a particular communication situation' (Jung & Lyytinen, 2014). An analysis of the media and technology alternatives from teaching, learning and management perspectives is also necessary (Moore & Kearsley, 2005). Rice (1992) stipulates that how well the communication functions is to a certain extent dependent on whether characteristics of the medium work well with the characteristics of the task. The selection of the most suitable medium is even more critical than which technologies are selected (Moore & Kearsley, 2005). "Design of the instructional media depends upon the content, the delivery technology, the kind of interaction desired, and the learning environment." (Moore & Kearsley, 2005, p. 19). Naturally, this choice has a significant influence on the students' learning environment (Collins, Neville, & Bielaczyc, 2000).

Similar to the attempts of establishing the most effective technology for teaching and learning, there have been attempts to find out which *the most effective medium form* is. However, these studies have not obtained

24 Collin et. al., 2000 call it 'transmission'.

reliable results, due to the fact that there are too many factors that may influence the results, e.g. students' knowledge and previous experiences, and the quality of the developed materials (Laurillard, 2002). Another difficulty is due to that: "Form cannot exist without content and content not without form" (Laaser & Toloza, 2017, p. 5). This means that if the same content is presented through different media, as, e.g. text, audio, and video, it is difficult to establish which medium is the most effective as a particular content can be more effectively presented by a specific medium and the medium is under-utilised as it is not used to its potential (Koumi, 2006; Laaser & Toloza, 2017). Instead of trying to find the most effective medium for teaching and learning, it is often preferable to combine several media as they then can complete each other. According to Laurillard, "… improvements in university teaching are more likely to be achieved through 'multiple media', appropriately balanced for their pedagogic value, than through reliance on anyone learning technology." (2002, p. 174).

Media characteristics can also be divided into *social presence* and *media richness* (Rice, 1992). *Social presence* is related to how much of the actual physical presence is transferred by the medium (Rice, 1992). Creating and developing social presence in an online environment is essential for a thriving learning environment (Elwood, McCaleb, Fernandez, & Keengwe, 2014). Social presence can be defined as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Short, Williams, & Christie, 1976, p. 65). The degree of social presence differs depending on the media used (Schutt, Allen, & Laumakis, 2009). In the concept of social presence, not only words and other verbal cues are included as, e.g. pauses, accentuations, and tonal inflexions, but also nonverbal cues as, e.g. facial expressions, posture, clothes, direction of gaze (Rice, 1992).

Regarding *media richness*, Daft and Lengel (1986) suggest a list, which has face-to-face communication on the top, the telephone on the second place, and written documents in different forms are on third and the following places (Daft & Lengel, 1986; Trevino, Lengel, & Daft, 1987). Face-to-face communication has the following qualities: immediate feedback, which is essential for control that the message has been correctly interpreted, multiple cues provided via body language and tone of voice, and that message content is transferred in natural language (Daft & Lengel,

1986; Rice, 1992; Trevino et al., 1987). Media of lean richness has such disadvantages as fewer cues, restricted feedback, and less capacity of solving ambiguous issues. However, this type of media has proved to be more effective than rich media for certain types of communication, e.g. processing well-understood messages and standard data (Daft & Lengel, 1986). According to the media richness theory, communication works best when the possibilities of the medium are matched to the assignment (Owston, Lupshenyuk, & Wideman, 2011).

When comparing the richness of e.g. Computer-mediated communication (CMC), which is used in many online courses, and video conferencing, CMC is considered lean and video conferencing rather rich (Russell, 2004). There is a big difference in media richness between face-to-face communication, which has the highest richness, and CMC. It is due to that many of the nonverbal cues in face-to-face interaction disappear in online learning environments. The effect is that e.g. social and relational cues are missing and the communication becomes more impersonal as contextual, visual, and aural cues are omitted. This is particularly problematic when the learning environment only provides web page text or text-only e-mail. E-mail and web page text have the advantage of being asynchronous, which is essential for flexibility and the opportunity of reflecting on the content as long as students wish. Video conferencing has the drawback of not offering temporal flexibility and not always spatial flexibility either; if students need to travel to a studio to attend. The meetings have to be scheduled, and in large groups of students, meetings might need to be copied, if the group of students will be too big otherwise. However, advantages as broader bandwidth, key features as synchronous/live with possibilities of immediate feedback, which is the closest possible to face-to-face meetings, are essential aspects to consider when selecting media for online courses (Russell, 2004).

2.8 DIGITALISATION

Digitalisation has dramatically changed possibilities for distance education over time, such as creating possibilities with *student-student interaction* (Moore, 1993b), both asynchronously with, e.g. discussion forums and synchronously with desktop conferences, and the development of *MOOCs*, as has been described here above. Many technologies and media can be used in *digital distance education*, and it is essential to explore and investigate how they can be used in the best way to support student learning in different teaching situations.

This thesis focuses on one instance of the superior phenomenon of *digital distance education* - one part of this field, namely *video technology*. When studying digital distance education, it is necessary to take both technology and media into consideration. The purpose here is not to focus on concepts as technology and media, but to discuss their qualities, i.e. what they can offer and what is required of *video technology* in order to support teaching and learning in digital distance education. Video offers both live communication and interaction (synchronous) and recorded (asynchronous) communication. *Live video* is often more directed towards *technologies* as it makes a live situation possible. *Recorded video* can often be referred to as *media,* except during the production of recorded video, when technologies often are involved.

In the next chapter, *video technology* will be discussed further.

CHAPTER 3
VIDEO RESEARCH

This chapter consists of six parts. *The first part* discusses the definition of video, and in *the second part*, a brief description of the history of video use for distance education is presented. The third part introduces key features of video and suggests a classification system with two main categories; recorded and live video. Key themes in the literature are discussed in *the fourth part* through a suggested typology of pedagogical uses of video. In *the fifth part,* a review of relevant research for this thesis drawing on the classification and typology is presented. The *sixth part* concludes the chapter by highlighting some general conclusions on empirical studies of video in digital distance higher education.

There are many empirical studies on video, but the literature review here is directed towards video for distance higher education and the aim of this thesis; to better understand the possibilities and limitations of video in digital distance higher education. The studies presented here focus on the following research questions;

RQ1) How is video used in digital distance education?[25]

RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education? and

RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance education?

In order to find answers to these questions, it is essential, to understand the concepts *interaction* and *communication,* the terms *technology* and *media*, the concept of *video* and how they relate to *teaching and learning. Technology* and *media* are closely related to video as several technologies are included in video and it is also a kind of media. In distance education, technology generally plays an essential role in the design of a course; it is essential for the delivery of course materials, teaching, learning, and communication (Moore & Kearsley, 2005). Of course, media and interactivity are a core part of all education (Moore & Kearsley, 2005). However, the focus here is not on technology in general, but how technology can be used when designing a learning environment for students in a distance course in higher education.

Bates (2005) claims that "Of all the media available to educators, television and video come in the most diverse forms, have arguably the greatest potential for teaching and learning, and are probably the least well used" (p. 90). One reason why video has not been appreciated or used so much in distance education is that it is considered to be expensive (Bates, 1987), but that situation has changed since costs have been reduced over the years (Bates, 2005). Due to dramatic changes, video is a complex medium and unfortunately, sometimes used in a wrong way (Bates, 1987, 2005).

First, comes the *definition* of video in general. Then there will be a discussion of the development from analogue to digital video, which has been particularly important to distance education as it facilitates and reduces costs for production, storing, and distribution of video materials. Video is also essential for facilitating communication in distance education as the geographical distance between teacher and students often make communication more difficult. Since this thesis is focused on video for teaching and learning, some of the *key features* of video will be presented.

25 All the different aspects mentioned in section 1.3 are included in this RQ1.

Finally, video can be divided into *recorded* and *live video,* and their different characteristics and history will be described.

3.1 DEFINITION OF VIDEO

The concept of 'video' is problematic, as it is used in daily speech and refers to *entertainment, educational and other purposes*, which might be a reason why 'video' is seldom defined in research (see, e.g. Mitra, Lewin-Jones, Barrett, & Williamson, (2010). Initially, the term 'video' comes from a combination of two Latin words: 'videre', which means 'I see' and 'audire', which is 'to hear' (Wilcox, 2000). There are several definitions of video; e.g. "the generic features of the medium, such as moving pictures combined with audio" (Bates, 2005, p. 90), "Visual multimedia source that combines a sequence of images to form a moving picture. Video involves the transmission of a signal to a screen and the processing of the order in which pictures should be shown. Videos usually have audio components that correspond with the pictures being shown on the screen."[26] Wilcox (2000) defines video as: "a system that records and transmits visual information by conveying that information using electrical signals. Although the term video, in its strictest sense, refers only to images, common vernacular reflects the assumption that audio is synchronised with these images." (p. 1). Mitra, Lewin-Jones, Barret, and Williamson's (2010) use the term video: "as an umbrella term to include all media with moving pictures and sound" (p. 405).

In this thesis, I *define video as digital moving pictures and sound, including both video and television, which are used in higher education*. That does not mean that video has to be produced for pedagogical purposes, but that it is used in teaching and or learning in higher education. It has also been necessary to restrict the scope to certain types of video in this thesis and, e.g. video games, holograph computing and the combination of PowerPoint slides, the teacher's voice and or a still images of the teacher are *not* included in the definition of video in this thesis.

26 BusinessDictionary.com. Retrieved February 22, 2018, from BusinessDictionary.com website: http://www.businessdictionary.com/definition/video.html.

3.2 THE HISTORY OF EDUCATIONAL VIDEO

Video was initially a medium for presentation of information and could solely provide one-way communication. Later, two-way communication with technologies as *video conferencing* and *desktop conferencing* was developed, and new opportunities of meeting at a distance were created (Shephard, 2002).

The main steps in the development of the use of video in education can be summarised as:

- 1960 – 1970 – Television and film
- The 1980s – Videotapes, satellite, laserdiscs
- The 1990s – Two-way Video conferencing, camcorders, and video CDs
- The 2000s – DVDs, podcasts, streaming video, YouTube/Teacher Tube, Webcams, camera-enabled smartphones
- 2010 – Lecture capture, iPads & tablets computing, user-generated video, videogames, real-time 3D immersive worlds (inspired by Greenberg & Zanetis, 2012, p. 11).

In 1934, the development of educational television started (Moore & Kearsley, 2005). Video and video productions were first introduced into the classrooms in the 1960s (Kucan, Palincsar, Khasnabis, & Chang, 2009; Seels, Fullerton, Berry, & Horn, 2004) and has been used quite a lot for teachers' professional development and teacher education since the late 1960s (Santagata, 2009), especially since technological developments have created new opportunities regarding, e.g. software development, capturing, manipulation, storage and online tools (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011).

Twenty years later, in the 80s, educational television was considered so crucial that all American cable operators had to provide an educational channel (Moore & Kearsley, 2005). A critical factor for increased use of moving image in education was the widespread distribution of video-tape player-recorders in the 1980s (Burn, 2007). "In classrooms, films and television became carriers of curriculum content across all subject areas in the latter half of the twentieth century, in the form of documentary television in the humanities and sciences, filmic adaptations of literature and drama

in English, and specialist educational programming as part of public service broadcasting." (Burn, 2007, p. 504).

Also, in 1980, computer science courses were delivered through educational televisions from California State University to employees of Hewlett-Packard in five states (Moore & Kearsley, 2005). The development went quickly, and a need for a new term emerged; "telecourses", which means educational programs distributed by either broadcast or cable television. From 1981, the Corporation for Public Broadcasting (CPB) received 2-3 million dollars for university-level telecourses from the Annenberg Foundation. These courses, which were offered to and used by colleges and universities all over the country, consisted of complete packages with television programs, textbooks, study guides, and faculty and administrator guides (Moore & Kearsley, 2005).

FROM ANALOGUE TO DIGITAL VIDEO

Previously, the camera was analogue and to produce video; expensive special equipment was required (Shephard, 2002). One of the most important developments of video was the change from analogue to *digital video.* Digital video is easier to produce, and equipment nowadays is rather cheap to buy, portable, user-friendly. Editing software is also cheaper or can be used for free (Brunvand, 2010; Collins et al., 2000; Martin & Siry, 2012; Masats & Dooly, 2011). Today, anyone with a web camera, computer, tablet or smartphone, and an Internet connection can easily create and publish video, e.g. on YouTube (Brunvand, 2010; Shephard, 2002). On the one hand, professional video requires highly specialised competences. However, on the other hand, it is also becoming more and more frequent that children produce their videos (Collins et al., 2000). Naturally, there are differences in quality if expensive equipment and professional staff are used compared to a recording by, e.g. a web camera. However, technology development has had a significant influence on how easily accessible video is today. Therefore, digital video offers new opportunities in teaching and learning (Jonassen, Peck, & Wilson, 1999).

One such example is a survey ability, e.g. with page layouts and links, better possibilities for navigability and reproduction, as with all digitalised information (Collins et al., 2000). Video as a medium has a linear structure,

but the digitalisation of video makes it possible to create an interface, layered on top of a set of linear videos to *support students' interaction*, i.e. in an interactive video[27] (Martin & Siry, 2012; Wieling & Hofman, 2010). Video can be watched as many times as the student wants, which of course is an essential factor for better learning (Shephard, 2002). Certain parts of the video can also be viewed repeatedly, or specific parts from a video can be selected etc. (Bates, 1987; Bell & Bull, 2010). With computer control, an active learning situation can be created, all integrated into one learning environment; e.g. instructions of how to work with the material, different kinds of learning activities or tests (Bates, 2005; Bell & Bull, 2010). This offers better opportunities for students' engagement, and it might also improve learning effectiveness (Conrad, 2015; Wieling & Hofman, 2010). However, to achieve active learning, it is essential to provide instructions regarding how students should use video; e.g. writing questions and taking notes. Without instructions, there is a risk that the student becomes more or less passive (Shephard, 2002).

The increased possibilities with *digital video* have not only changed the learning environment for students but have also influenced how teachers can teach through video (Martin & Siry, 2012). More knowledge of using digital video to its potential is needed, and the knowledge also has to be applied, if video is going to be used in the best ways (Bates, 1987, 2005). To conclude, during these 50 years a significant shift has emerged as the *student's role* has been changed from a passive role as a viewer to become an active producer (Greenberg & Zanetis, 2012).

In the concept of *digital video;* educational television, educational video, video conferencing, desktop conferencing, recorded lectures as streaming video, television, pod castings etc. are included (Bates, 2005; Moore & Kearsley, 2005). *Television* can be characterised as "a particular form and organisation of communication that is dependent on the medium of video" (Bates, 2005, p. 90). Video and television can be viewed as differ-

27 The term *interactive video* can in the literature refer both to video conferencing and to that the user can control the video by viewing the video relatedly, stopping, starting and rewinding the video and selecting specific parts of the video i.e. that video can be non-linear. In order to avoid confusion, we only use the term *interactive video* when referring to the user's possibility to control his watching and we use the term *video conferencing* for e-meeting at a distance with video conferencing hardware.

ent media as the technologies are different, but they are often integrated in the concept of video, as in this thesis, because the instructional purpose of using them, how they function, their general appearance, and cognitive effects are the same (Seels et al., 2004).

There are many types of *educational television* and *video*; educational broadcasting, instructional television, (ITV), interactive television (ITV), recorded teaching situations, as e.g. recorded lectures, video clips, video streaming via the Internet, video conferencing, and desktop conferencing, pod castings etc. (Bates, 2005; Moore & Kearsley, 2005; Seels et al., 2004). *Educational television*, (ETV) aims at viewers' achievement of educational objectives (Seels et al., 2004). Bates (1987, 2005) claims that there are essential differences between two types of *educational television*; educational broadcasting and instructional television. *Educational broadcasting* is produced by organisations focusing on the unique presentational features of video. Their productions are directed towards a general audience, and they produce a special kind of programs, which provides materials that cannot be accessible otherwise, and both standard and production costs are high (Bates, 1987, 2005). *Instructional television*, on the contrary, is produced by educational institutions and mostly focused on distributing lectures. The target audience is confined to certain classes or groups, and typically, both the standard and the production costs are lower (Bates, 1987, 2005). In addition to the types of television and video mentioned above, also *video not produced for educational purposes* can be used, such as e.g. news programs for students studying foreign languages.

SOCIAL NETWORKING

Another step in the development of video is social networking, e.g. YouTube with user-generated and professionally generated content and user-edited and professionally edited videos (Clifton & Mann, 2011). YouTube was launched in June 2005 and offers personal video clips, such as TV clips, music videos, instructions (Clifton & Mann, 2011; Little, 2011). It is impressive that already in the first year after YouTube was launched, the number of produced videos made by individual users exceeded the total production of video made by the first American television networks (ABC, NBC, and CBS) during half a century (Bell & Bull, 2010).

YouTube was sold to Google in 2006 (Little, 2011). Improved bandwidth and the launch of YouTube have contributed to an increase in the use of video for educational purposes (Purcell, 2013). The use of video-sharing sites has, e.g. grown from 33% in 2006 to 72% in 2013 and the same year, 50% of online adults stated that they used educational videos (Purcell, 2013). Even if most of the content on YouTube is not related to learning, the possibilities of making comments, creating and uploading own videos, subscribing and joining groups promote students' active participation instead of just passively watching (*7 things you should know about ... YouTube*, 2006).

Today many television broadcasters, universities, and non-governmental organisers etc. have their own YouTube channels (Clifton & Mann, 2011; Little, 2011). Already in 2009, when YouTube EDU was launched with the purpose to host videos from HEIs, more than 300 universities and colleges worldwide contributed to content from 10 countries and in seven languages (Kincaid, 2010; Little, 2011). YouTube is also one of the largest online video repositories of higher education and library content (Little, 2011). It is also used for sharing collections from university archives of digitised audio-visual material, e.g. 10,000 motion pictures. Even though much of the content from higher education on YouTube is related to courses and lectures, the most common use of YouTube is for promotion or marketing (Little, 2011). YouTube has millions of users and is regarded as a source of information for both informal and formal learning (Clifton & Mann, 2011; Little, 2011).

There are several advantages of using YouTube in education. It is free and provides high flexibility; it is easy to use, accessible at any time, and from anywhere with an Internet connection (Chan, 2010; Chen & Burns Gilchrist, 2013; Clifton & Mann, 2011). YouTube can be played as many times as the student wants on computers and mobile devices as tablets and smartphones. (Chan, 2010; Clifton & Mann, 2011). YouTube is searchable both through its Google-powered search engine and through Google (Little, 2011). Since it is an alternative delivery method, there is a possibility that students get more attentive and there are many different ways of representing information with YouTube (Chan, 2010; Clifton & Mann, 2011). To remember something you have seen is often easier than something heard. There is much material to select from, both regarding depth

and breadth and different viewpoints of the same topic or problem can often be found which can increase engagement, motivation, and interest in discussing. For students, the most important factors are high-quality visual content and that the video clips load quickly (Chan, 2010). Furthermore, it is social software and a familiar environment for the netgen (net generation) (Clifton & Mann, 2011). YouTube has greatly contributed to increased interest in viewing and production of online video within higher education (Snelson, 2011).

However, there are also issues to consider when using YouTube (Clifton & Mann, 2011). There is a risk that students fail to analyse the data given. Since a lot of the materials are user-generated; there is no control of quality, and there might be misinformation. The information that students search for can be biased and even worse, there is a risk that students do not discover that it is biased. Therefore, the Internet and information literacy are required. Information needs to be evaluated, and critical engagement is necessary if students are to develop critical thinking skills when using YouTube for learning (Clifton & Mann, 2011).

Another example of a similar website as YouTube is TED-Ed, which was launched by the non-profit group TED (Technology, Entertainment, Design).[28] TED-Ed offers mainly two options; a library of lessons, which are created by expert educators in collaboration of screenwriters and animators. The second option is a possibility for any visitor to create a new lesson using a video on YouTube supplemented by questions, discussion topics and other material. As an example, 102,245 lessons were created, and 3,745,140 questions were answered on 2 January 2015.[29]

3.3 KEY FEATURES OF VIDEO

All technologies have features that offer possibilities but also limitations. In education, the use of technology can facilitate and or inhibit student learning depending on the particular *features* of the technology (Andrews & Haythornthwaite, 2007b). Examples of *features* are; "whether multiple

28 http://ed.ted.com/about.

29 http://ed.ted.com/.

modes are supported; whether the design is for individual or group use; whether interaction is affected through the keyboard, mouse, joystick, or a glove, whether data storage and retrieval occur to and from the Internet or on the local desktop" (Andrews & Haythornthwaite, 2007, p. 11). According to the literature, video has the following joint four *key features;* 1) moving pictures and sound, 2) rich medium, 3) live video, and 4) recorded video. These key features will be further explained here below.

Video:

- can offer both *visual and audio sensory systems* (Bates, 2015; Smyth, 2011) and it can provide moving or dynamic pictures (Bates, 2015), e.g. visual information about remote sites (Gaver, 1992), combined with words and sound (Bates, 2005). Therefore, video can be superior to, e.g. text in certain learning situations (Bates, 2005).
- is a *rich medium*, which means that it is possible to *combine media* such as words, picture, movement, sound, and representation of events as they occur over time (Bates, 2005). For example, video is a medium with high bandwidth which provides the possibility of combining representations simultaneously with captions, voice-over, and split screens (Collins et al., 2000). These possibilities have increased with the use of computers since they allow the use of multiple windows. Networks have made it possible for people to collaborate at a distance. They can view each other in one window and work with objects and representations simultaneously in another window during, e.g. video conferences (Collins et al., 2000).
- can be divided into two main groups; 1) *Recorded video and 2) Live video* (Bates, 2005).
    1. *Recorded video* has four key features; a) *asynchronicity, b) spatial and temporal flexibility, c) interactive video*, and d) *design for single and or group use*. a) Asynchronicity means that video can be transmitted asynchronously. b) Spatial and temporal flexibility refers to that both location and synchronicity of video are flexible (Andrews & Haythornthwaite, 2007a; Collins et al., 2000; Hakala, Laine, Myllymaki, & Penttila, 2009).

c) Interactive video means that there are different options regarding *watching video*. It can be watched once or repeatedly, straight through, or the viewing can be stopped for a discussion of the content or questions can be asked about the content (Bates, 1987; Bell & Bull, 2010; Hakala et al., 2009). Recorded video provides only one-way communication and examples of recorded video are recorded lectures, films, video clips on YouTube, and streamed video (Bates, 2005). Recorded video can be used for d) *individual* watching and analysing (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008) or *collaborative* viewing and discussion, with or without the teacher present (Bates, 1987; Borko, Jacobs, Eiteljorg, & Pittman, 2008). When video is watched during lessons on campus, it is mostly used for a group of students, but one single student can also watch from home or from another location. The text has been used to provide documentation of what has previously happened, and a similar development can also be noticed regarding video, e.g. in teaching (Collins et al., 2000).

2. *Live video* (also called interactive video), is, e.g. video conferencing, desktop conferencing and broadcasting television (Bates, 2005). Live video has two key features; a) *synchronicity* (Andrews & Haythornthwaite, 2007a) and that it can be b) recorded for later watching (Odhabi & Nicks-McCaleb, 2011). Synchronicity means that video can be transmitted live (Collins et al., 2000) which makes it possible to see, hear, and talk with participants. This is a feature, especially for distance education, as it creates a communication situation which is as similar as possible to a physical face-to-face meeting (Gaver, 1992, 1996). This means that video provides the possibility of *interactive teaching and learning* (Smyth & Zanetis, 2007). Interactivity promotes students' engagement, and it might also improve learning effectiveness (Wieling & Hofman, 2010). For example, students' engagement is positively influenced by the possibility of being able to ask a question at the very moment when there is something s/he does not

understand and get an answer directly or contribute to the discussion in real-time. Live video can provide both one-way and two-way communication (Bates, 2005).

RECORDED VIDEO

Collins, Neville, Bielaczyc (2000) suggest a framework with four dimensions to understand media; *"1) transmission characteristics, 2) recording characteristics, 3) production characteristics, and 4) social characteristics"* (2000, p. 146). Inspired by this framework, the description here bellow has been adapted to recorded video and the following dimension has been brought up; *production, editing,* and *distribution*. The description of the dimensions follows the chronological order. First come production aspects, which means recording for recorded video. Second, the video is sometimes, but not always edited. Third, the video is distributed to students.

PRODUCTION

Video materials can be purchased, or they can be produced by a Higher Education Institution (HEI), either in-house or externally. The most suitable alternative depends on which materials can be bought, whether there is production equipment and staff available, and the possibilities and costs for external production. When making professional productions, it is essential to have necessary expertise in several areas. For example, a skilled television producer with knowledge of how to use the medium of video in the best way, a person with good knowledge of the subject matter and pedagogical skill to teach a particular subject, and a person who has knowledge in instructional design so that a video is integrated with other teaching materials (Bates, 1987). Since these different types of skills rarely overlap in individuals, a team is often needed for successful production (Bates, 1987).

Video can also be "created or used in a wide variety of production formats. This includes lectures, studio discussions, drama, documentaries, case studies, video clips, or as an audio-visual database"(Bates, 2005, p. 90). The time for recording and editing video instruction can be many times longer than the time for a "live" lecture (Liu, Liao, & Pratt, 2009).

Recordings of lectures can be made in different ways; in the classroom or a studio (Myllymäki, Penttilä, & Hakala, 2014; Odhabi & Nicks-McCaleb, 2011). It can be recorded by the teacher at home, from the office with a webcam, and special software, or it can be a live recording of a video conference or a desktop conference (Odhabi & Nicks-McCaleb, 2011). However, with simpler technology and adjustment to the technical possibilities of the producer/consumer, e.g. YouTube, the quality of the production can be negatively affected. Also, there is a risk that previous knowledge and experience of video production will be ignored or forgotten (Laaser & Toloza, 2017).

By using a specially designed pair of eyeglasses, a lesson can be recorded from the points of view of both the teacher and the student, which both the teacher and at least one student carry (Odhabi & Nicks-McCaleb, 2011). The eyeglasses have a video camera and microphone, and everything the teacher and the student look at is recorded, e.g. if the teacher/student looks at the whiteboard, PowerPoint slides, demonstration of tools, laboratory work, or discussion among students, it is recorded. Also, body language and facial expressions are recorded, which facilitate the interpretation of communication. This means that the teacher can focus on teaching without having to bother about whether the text and illustrations are visible for students. The recordings from the teacher and the student can also be edited and combined to one recording, or the recording can be viewed either from the teacher's or the student's view. Issues to consider are ethical dilemmas and that it can be difficult to wear these eyeglasses on top of ordinary glasses (Odhabi & Nicks-McCaleb, 2011).

EDITING

Not only better picture quality was obtained by the introduction of digital video (Burn, 2007); digital editing software also emerged. It was first used primarily by media educators because it was rather expensive and required high-specification computers, which were not available for everybody. The first free digital editing software, was Apple's iMovie and later Microsoft's Moviemaker 2, changed the conditions for digital video editing dramatically. Editing software is now cheap, comparatively easy, and can even be used for free (Collins et al., 2000; Masats & Dooly, 2011). However, this

entails a more critical attitude to the credibility of video and it is becoming more and more critical to gain the audience's trust if the credit is not to be lost. The possibility of easily copy and paste has advantages but also drawbacks, as, e.g. that it facilitates for students to modify material and present it as produced by themselves (Collins et al., 2000). This resulted in a significant change in students' roles. Previously, students had mostly been consumers of film, television, and video but now they could also be producers, which completely changed their influence on the learning situation and their role as learners. However, this change was not appreciated by everybody. Voices were raised to warn against the risk that the video as a medium would become invisible or transparent and would, therefore not be scrutinised critically enough (Burn, 2007).

The producer of a video is mostly invisible, but occasionally, authors are portrayed in videos similar to how music videos are produced (Collins et al., 2000). It is possible that the requirements for documentation in future activities, which today are mostly text-based, will include video and software as well (Collins et al., 2000).

DISTRIBUTION

Video was originally *distributed* by terrestrial broadcasting, cable or satellite transmission, or by cassette and disc (Bates, 1987; Shephard, 2002). The development of technology and new ways of distribution of video are two factors that have increased the use of video for education and made it possible to use it in many more ways (Bates, 2005; Jonassen et al., 1999; Shephard, 2002). For example, one of the key protocols supporting the Internet, Hypertext Transfer Protocol (HTTP), was originally developed for asynchronous communication, but with so-called 'push' technology or HTTP streaming, it has become possible to transfer continuous media streams to a webbrowser (Johanson, 2003).

Digital video is nowadays easily distributed by cable, television networks (Brunvand, 2010; Masats & Dooly, 2011; Shephard, 2002) and especially the Internet (Collins et al., 2000). Such networks have increased accessibility further since they have made it possible to connect many people to different resources at the same time. Also, with the introduction of, e.g. YouTube, video materials have become more easily accessible as

more freely available as a seemingly endless resource (Mitra et al., 2010). Furthermore, video can easily be transferred through other storage and networking technologies such as USB and Wi-Fi, or sent by e-mail (Godwin-Jones, 2012).

Since video can be played on mobile devices like computers, tablets and mobile phones, it also makes it easy accessible (Godwin-Jones, 2012). Video is very suitable for large audiences, and the numbers of viewers can be enormous (Collins et al., 2000; Shephard, 2002). With large audiences, video is considered to be very cost-effective. Since it is more popular to watch television or film than to read books, video is even more accessible to people than text is (Collins et al., 2000). There is also a tradition of people watching movies and television together, which makes video less isolating than text. Increased access to the Internet, as well as environmental, technological, and economic reasons, have developed an increased interest for using video communication of different types (Caladine et al., 2010).

Streaming video

Streaming video, also called *webcasting*, (Jones, Skirton, & McMullan, 2006) can be delivered both live and archived (asynchronous) (Shephard, 2002). Webcasting often refers to streaming or broadcasting audio or video synchronously over the Internet (Walls et al., 2010). Streaming video is "a continuous video stream over the Internet as digital codes which are reinterpreted as moving images to a compatible web browsers for instant playback" (Bridge, Jackson, & Robinson, 2009, p. 2). The user can start playing a video file by, e.g. clicking on a hyperlink on a web page (Shephard, 2003). With today's technical solutions, which make it possible to start playing a streaming media file more or less directly, without having to download the entire file as was required before, streaming media has quickly grown in popularity (Shephard, 2002). Streaming media is created in four phases: First, the content is captured, which means that audio or video content is converted into digital format (Shephard, 2002). The second phase is to edit the content. After that, the content has to be encoded in order to be transferred and delivered across the network. The bandwidth that is required for playing the streaming media file is determined by the processes of encoding and transferring and it is an essential factor for how

the user will experience the quality. In order to reduce the effects of insufficient bandwidth, the media player buffers the file, which means that the media player collects and stores some of the incoming data before the file is executed. Putting it very simply, the process of buffering ensures that there is enough data available for the continuous playing of the media file. If the buffer runs out of data, there may be interruptions in the video or audio. Streamed video can be distributed in smaller 'clips' and students can select which clip they want to watch by using the controls in the software (Shephard, 2003).

Podcasting

A newer kind of technology is *podcasting*, which is an alternative method of webcasting (Walls et al., 2010). The main difference is that podcasting downloads the media file while webcasting broadcasts the file, making it easier for copyright holders to keep control of a file (Shephard, 2003; Traphagan, Kucsera, & Kishi, 2010). Podcasting is a catchall term for distribution of both audio and video files. It offers even more flexibility than many other types of distribution as it can be downloaded to computers or mobile devices as tablets and smartphones and therefore provides effective use of time (Brown & Green, 2007; Copley, 2007; Harris & Park, 2008; McKinney & Page, 2009).[30]

The term 'podcasting' originates from the portable music player iPod by Apple (Copley, 2007). The first podcast was produced in 2005 (Milman & Walker, 2010). Podcasting was originally used as a medium for music or video entertainment, or news, but is becoming increasingly common for distribution of educational material (Copley, 2007; Harris & Park, 2008).

To separate video recordings from audio recordings, the term 'vodcasting' (Billings & Kowalski, 2007; Brown & Green, 2007; Liu & McCombs, 2008) or 'video podcast' are used (Brown & Green, 2007; Kay, 2012; Liu & McCombs, 2008). There are also other definitions of vodcasting, which, e.g. include all kinds of visual information (see e.g. Brown & Green, 2007; Fernandez, Simo, & Sallan, 2009; Liu & McCombs, 2008), but since this

30 Many of the ways of using podcasting described here do also apply for webcasting as the difference between them is primarily a question of distribution.

is excluded in the definition of video for this theses, we will not bring it up here. This inconsistency in defining different types of podcasting creates problems as it is not clearly defined what is meant and therefore it is essential to clarify which type of podcasting that is referred to both in educational settings and research.

From the student's perspective, vodcasting offers anytime-anywhere-learning opportunities (Brown & Green, 2007; Liu & McCombs, 2008), i.e. media-on-demand (Brown & Green, 2007). Students can choose how many times they want to use the podcasting material (Harris & Park, 2008). This means that podcasting gives students control over their learning (Kay, 2012). Another vital feature of podcasting is that it can both communicate content (Descy, 2005) and be used for the production of content by, e.g. students (McGarr, 2009; Supanakorn-Davila & Bolliger, 2014). The use of podcasting provides opportunities for multiple methods of communication (Brown et al., 2009) and it increases social presence in distance education (Brown & Green, 2007).

Seeing it from the teacher's perspective, podcasting can add value to a course by, e.g. contributing to building a connection between students and teacher and having a positive influence on student motivation. The learning environment can be perceived as more personal, and it can also provide an alternative teaching and learning approach (Supanakorn-Davila & Bolliger, 2014).

From the beginning, many vodcasts were produced for television. Therefore, they were not really adapted for the new media of vodcasting, where the video is most likely to be watched by one or at the most, a few persons and on a smaller screen than on television (Brown & Green, 2007). It is essential to develop the production of vodcasts so that the possibilities of the medium can be better utilised, e.g. to use shorter clips and maybe subtitles. It can be challenging for teachers, who are used to one or two hours lectures, to break down the content into smaller pieces of 5-10 minutes vodcasts of their lectures (Brown & Green, 2007). Vodcast production can be technologically challenging (Brown et al., 2009; Kay, 2012) and time-consuming, especially as knowledge about both production and editing is required (Brown & Green, 2007; Supanakorn-Davila & Bolliger, 2014). There are several steps in the production process that demand special knowledge and take extra time. For example, learning how

to make the production, to be updated regarding software updates and new tools, and to update the recordings by editing or making new productions when the course materials or content of the course change (Supanakorn-Davila & Bolliger, 2014). Both training and support in the production process are strongly recommended. Some teachers also perceive it as challenging to make recordings without students' presence as they do not get a response from students which the teachers are accustomed to having (Supanakorn-Davila & Bolliger, 2014).

According to a study of how much teachers in higher education in the USA used podcasting; 9% posted content for class and 23% used it in class (Moran, Seaman, & Tinti-Kane, 2011).

LIVE VIDEO

In combination with telecommunication technology, two-way communication, like *video conferencing* and *desktop conferencing* were developed, and new opportunities for meeting at a distance were created (Shephard, 2002).

VIDEO CONFERENCING

The history and development

"The implementation of both the telephone and the radio constitutes an important background for understanding wireless communication" (Shephard, 2002, p. 238). The invention of the telephone by Alexander Graham Bell in 1876 was the first step towards video conferencing. Around 1920, educational radio was introduced as a delivery technology for education (Moore & Kearsley, 2005). The first video telephone call was made in 1934, a year after a prototype of a video conferencing system was demonstrated at the World's Fair in Chicago (Kraut & Fish, 1995; Noll, 1992; Webster, 1998).

Later, the development of video conferencing continued in the U.S. with Bell Labs[31] demonstrating a video conferencing system in 1956 (Shephard, 2002; Wilcox, 2000). Video conferencing systems were initially developed from the same analogue technology as television. To obtain digital transmission was difficult as the required bandwidth was unavailable (Wilcox, 2000) and the quality of the picture was inferior as it only transmitted "… one frame (image) every two seconds (compared to modern video systems that transmit 30 frames per second, or 60 times the rate of the first PicturePhone)." (Shephard, 2002, p. 238). Many attempts followed before the first commercial system was launched in 1964.

At the end of 1960, a new technology for transferring video conferences was developed, Integrated Services Digital Network (ISDN) lines. This was a significant breakthrough (Läärä, 1995; Shephard, 2002) though slow to be adopted and later described as "the technology that took 15 years to become an overnight success" (Shephard, 2002, p. 91). Two, four or six lines were used (Läärä, 1995), and each line cost approximately the same as a telephone call. The costs were dependent on the number of lines used and the distance per kilometre or mile[32] (Caladine et al., 2010).; i.e. with six lines, the costs were tripled compared to two lines. Therefore, two lines were often chosen with the transfer rate of 2 x 64 Kbps or 128 Kbps, which unfortunately led to poor picture and sound quality (Läärä, 1995). Before 1990, video conferencing was only affordable for very big companies (Wilcox, 2000). When more than two sites were connected, a bridge was required and the quality was always restricted by the site with the lowest capacity (Wilcox, 2000).

The development of visual communication has four stages of development (Wilcox, 2000). *The first* is dial-up room conferencing, *the second* is ISDN-based desktop conferencing, and *the third* is video conferencing over LANs (including LAN-multicast in which multiple users receive a

31 Also known as Bell Laboratories and formerly known as AT&T Bell Laboratories and Bell Telephone Laboratories (http://en.wikipedia.org/wiki/Bell_Labs). Retrieved on 2nd June 2010.

32 As a comparison, a videoconference from Australia to the UK cost about $1,200 AUD per hour for three ISDN lines and only $1,50 AUD per hour when IP was used (Caladine et al., 2010).

broadcast signal over a single channel). Digital media is very demanding on bandwidth, and the signals had to be compressed to be transmitted over a network (Johanson, 2003). *The fourth* and last is video conferencing over the Internet, i.e. that the video conference was conducted over a network that uses IP (Internet Protocol) (Wilcox, 2000), which sometimes is called *internet-based video conferencing* (Smyth & Zanetis, 2007). The introduction of IP was essential for video conferencing as the costs for transferring data were reduced considerably, which were especially important for education providers (Caladine et al., 2010; Wilcox, 2000). Compatibility standards had made it possible to connect via ISDN and IP in the same video conference. Other technologies for accessing the network are cable, DSL, wireless or a dedicated private line (Shephard, 2002).

In the beginning, the experiences of using video conferencing were not solely positive (Weinman, 2007; Wilson, 2008). There were problems with bad picture quality, particularly when only two ISDN lines were used. The picture resolution was low, the connection was unreliable, the technology was not user-friendly, and a technician was therefore often required (Weinman, 2007). Other drawbacks were expensive investments in equipment, and it also cost a lot to use it. It required organising and planning, and it was necessary to move to a special room to use it etc. (Weinman, 2007). These factors resulted in limited acceptance by users and limited use in the past (Kraut & Fish, 1995). Even if video conferencing has not been so frequently used from the beginning, as from the late 1980s to 1993, it became very popular (Caladine et al., 2010; Läärä, 1995).

Since 2006, the term *telepresence* is used in order to emphasise today's changed conditions for video conferencing (Lazar, 2007). "Tele" is Greek and means at a distance (Shephard, 2002). "Telepresence" signifies presence at a distance (Shephard, 2002). Telepresence is defined:

> "… as videoconferencing that incorporates furniture, lighting, camera and acoustic elements that give meeting participants the feeling that a telepresence system goes beyond just high definition on large plasma screens but defines the entire conferencing experience. Telepresence is meant to deliver a natural meeting experience, with multiple cameras to eliminate scanning and permit individuals to look directly at the other participants rather than in the camera." (Lazar, 2007, p. 14).

Telepresence is mostly used for twelve or fewer participants as one of the ideas with telepresence is that it should be as close as possible to a face to face meeting (Caladine et al., 2010). If more people are involved, the benefit of visual interaction will be lost, even when the telepresence pictures are of high quality (Caladine et al., 2010).

Prerequisites for these ameliorated experiences are flat-screen displays (often two screens – one for the sending and one for the receiving picture), high-definition (HD) cameras, processing components in the form of codecs[33] and bridges[34], and converged network services[35] (Weinman, 2007). However, the difference in cost was initially substantial with high-definition telepresence solutions costing between 10 and 20 times as much as basic high-definition video conferencing systems (Lazar, 2007).

Definition and characteristics

According to Wilcox (2000), video conferencing is not a technology but "… a collection of technologies that form the foundation for a wide variety of applications"(Wilcox, p. 1). More often, it is these applications that are referred to when the term video conferencing is used (Wilcox, 2000). Wilcox (2000) suggests a definition of video conferencing"…an exchange of *digitized* video images and sounds between conference participants at two or more separate sites" (p. 1). Sometimes the terms "(live) interactive television" (ITV) (Annetta & Minogue, 2004; Annetta & Shymansky, 2006; Zao, 2011) or "interactive video" (Dobbs, 2004a; Hansford & Baker, 1990; Zao, 2011) are used as a synonyms to video conferencing. The word *video conferencing* originates from three words in Latin (Wilcox,

33 Codec is compression and decompression algorithm, an algorithm that is used for compressing and decompressing data.

34 A bridge is used to connect more than two sites in a video conferencing.

35 Converged network services: "Network Convergence is a broad term used to describe emerging technologies, and network architecture designs used to migrate voice and data networks into a single network. Specifically, Network Convergence describes the transition from separate circuit-switched voice network and packet-switched data networks, to a single packet-switched network supporting both voice and data protocols." (http://en.wikipedia.org/wiki/Network_convergence). Retrieved 27th May 2010.

2000, p. 1). The combination of the two words *videre,* which means *"I see"* and *audio,* which originates from *audire,* which means "to hear" are united in the word *video* (Wilcox, 2000). The Latin word *conferre* which means "to bring together" is the origin of the word conferencing (Wilcox, 2000).

In video conferencing, a *hardware system* is used, and it is most often used in education for groups of students and not for individuals (Caladine et al., 2010). Typically, the following devices are included in video conferencing equipment (Caladine et al., 2010):

- cameras to capture images of local participants,
- screens to display images of remote participants,
- microphones to capture local audio, and
- speakers to replay remote audio (Caladine et al., 2010, p. 258).

Three types of media can be used; video, audio, and data (Belanger & Jordan, 2000). The transferred images can be moving pictures of the participants themselves, but they can also include video clips or other material such as still pictures of objects or information stored on a computer (e.g., graphics, data files, applications)." (Wilcox, 2000, p. 1). The use of data consists of shared documents, shared applications, shared whiteboards, and automated file transfers (Johanson, 2003). Shared documents mean that the documents can be seen and edited synchronously by participants (Johanson, 2003). Video conferencing can be described as a "virtual classroom" since students and teacher and or groups of students can meet "face to face" despite the geographical distance (Guri-Rosenblit, 1999)." As video conferencing provides excellent possibilities for co-operative work, which often is difficult at a distance, it constitutes an essential part of distributed Computer-Supported Cooperative Work (CSCW) (Johanson, 2003).

However, video conferencing has the drawbacks of not providing temporal flexibility and not always spatial flexibility either: if students need to travel to a studio or a local study centre in order to attend (Collins et al., 2000; Russell, 2004). It is technically possible to connect many sites with many students in each location. However, larger groups and a higher number of sites make it more challenging to have eye-contact and see facial expression, cues etc. clearly. The benefit of visual interaction, which video conferencing can offer, is then reduced (Caladine et al., 2010). In

order to use video conferencing effectively, it is crucial to understand its' limitations, e.g. that it is not suitable for delivering lectures to 50 locations (Greenberg, 2009).

According to Caladine et al. (2010), there are *three factors* that mainly influence the *increased use of video conferencing*. One factor is the reduced costs when the Internet could replace the much more expensive ISDN connections. Another factor is the climate and economic change as video conferencing is a more environmentally friendly alternative than travelling and that it is essential to limit travel in order to reduce costs. The third and last factor is that the standard of interpersonal communication is changing from audio to video (Caladine et al., 2010). As Weinman (2007, p. 62) states: "Driven by fundamental enterprise imperatives, such as cost reduction, virtual networked enterprises and globalization, video is now ready for prime time." Other factors are related to global warming and climate change and time-saving aspects (Caladine et al., 2010). They are similar factors that have made the use of desktop conferencing a more interesting alternative for communicating in educational settings at a distance.

However, even if technical development has made it much easier to use the equipment today, research regarding sound pedagogical practices is still rare (Caladine et al., 2010). Instead of developing new methods for teaching directed towards interactive approaches and knowledge construction, the format of lecture-hall didactic information delivery has in many cases been copied and transferred into the video conferencing situation (Caladine et al., 2010). From the beginning, the main focus was on using video conferencing for delivering of lectures and not on developing the possibilities of new forms of teaching and learning that video conferencing could offer (Lawson, Comber, Gage, & Cullum-Hanshaw, 2010). It is, e.g. rare to use video conferencing for collaborative work, although it is possible (Mason, 1994). This means that video conferencing has a history of being regarded as a tool for one-way communication according to the model of communication; one to many; i.e. a lecturer transfer information to students (Laurillard, 2002). According to Laurillard, (p. 157), "Video-conferencing invites the delivery of lectures." as it is a presentational medium which includes both visual information and audio. Therefore, interaction with and among students in the video conferencing situation is unfortunately rare (Laurillard, 2002).

However, there is a need for a changed approach from stand-alone rich media technology to using the capacity of video conferencing in two-way, synchronous video communication, which makes it possible to reduce students' isolation and enhance personalisation of learning experiences for students (Caladine et al., 2010; Smyth, 2005). With these technical improvements, it is possible to replace or complete the traditional lectures and tutorials with other teaching activities as small group activities, student-initiated interaction, role plays, simulation games, problem-based learning, team-based learning etc. (Smyth & Zanetis, 2007). In order to support the opportunities that video conferencing provides, teachers must become aware of the possibilities of using video conferencing as a pedagogical tool (Caladine et al., 2010). Teachers need to adapt both content and technique in order to create interactive pedagogical situations (Greenberg, 2009). For example, a project with staff from several Australian Universities showed that video conferencing could be used successfully for immediate questioning and feedback (Andrews & Klease, 2002). The use of video conferencing also facilitates the opportunity to involve a variety of experts and peers in courses due to lower costs as lecturers do not have to travel. To lecture through video conferencing is also less time consuming than travelling to the course meeting with the students (Andrews & Klease, 2002). Technical development with improved bandwidth, mobile and wireless connectivity was identified early on as increasing opportunities for a social constructivist approach to using video conferencing in teaching and learning (Caladine et al., 2010). Better possibilities for connectivity also increase the demand for video and audio communication in education and mobile technologies for teaching and learning are a part of this development (Caladine et al., 2010).

The use of video conferencing involves possibilities for communication for universities that have multi-campus locations and collaboration of programmes and courses, both nationally and internationally, with other HEIs (Caladine et al., 2010). Also, from the students' perspective of accessibility to university education, video conferencing can make it possible to participate in higher education from local study centres and to other HEIs than where they live (Caladine et al., 2010).

However, it is essential to emphasise that teaching with video conferencing requires more time for teacher preparation than an equivalent face-

to-face teaching (Mason, 1994). Three elements make the preparations for video conferencing more time consuming; 1) planning for and producing visual material, 2) planning the format and adapting to the format of the session, and 3) the higher ambition of more interaction with students, the more planning is necessary. Furthermore, video conferencing requires a high degree of teachers' simultaneous concentration on several issues; the content, the visual material, students at remote sites, to remember to look into the camera, to control which picture is sent to the sites, and to manage the technology in general. Also, the fact that it is often necessary to move as little as possible (in order to stay in the picture), contributes to a higher level of concentration compared to a face-to-face situation (Mason, 1994).

DESKTOP CONFERENCING

History and development

In 1994, the first combination of desktop video conferencing and computer application sharing at a reasonable price was developed by Intel for Windows PCs (Halhed, 1996). The system was called ProShare 200 and the software also included a feature for note-taking (Halhed, 1996). In 1995, Microsoft Netmeeting, one of the first examples of desktop conferencing, was released (Panton, 2005; Simonson, Smaldino, Albright, & Zvacek, 2009). Other, more modern examples of desktop conferencing are Skype, which was released in 2003 and only had audio from the beginning (Caladine et al., 2010),[36,37]Adobe Connect,[38] and Google Hangouts, (text, voice or video chat in Gmail)[39] which includes a video function

36 https://www.skype.com/en/ Retrieved 26 February 2018.

37 Skype was bought by Microsoft in 2011. http://sv.wikipedia.org/wiki/Skype (Retrieved 9 June 2015).

38 http://www.adobe.com/products/adobeconnect.html (Retrieved 19 May 2011).

39 http://www.google.com/+/learnmore/hangouts/?hl=en (Retrieved 3 January 2015).

similar to what can be found in Microsoft Live Messenger.[40] Adobe Connect [41] provides more advanced features than the alternatives that are free; such as shared document, shared application, whiteboard tools that can be used interactively, polling, web tour, animated presentation, DVD quality video, connection through mobile devices (Panton, 2005).[42] Already in 2005, there were approximately 100 synchronous collaboration products and web sites (Panton, 2005).

As of version 9 of one of these products, Adobe Connect, it is possible to integrate desktop conferencing with video conferencing systems,[43] which, e.g. means that one or several groups could be connected through video conferencing and other groups could join through Adobe Connect. The recorded session of a desktop conference can be accessed on another occasion for those who were unable to attend the synchronous session (Bates, 2005).

Accessibility to a system for desktop conferencing increased in Sweden when SUNET[44] offered a deal to all HEIs for access to Adobe Connect Pro through SUNET[45]. As a result of this deal, accessibility was increased and communication between HEIs was facilitated since nearly all used the same tool. The use of Adobe Connect also increased accessibility as the application is run through a web browser and no special software needs to be installed. Also, other tools such as Skype have improved their quality,

40 http://explore.live.com/home (Retrieved 19 May 2011).

41 Adobe Connect was previously called Adobe Connect Pro.

42 http://www.adobe.com/products/adobeconnect/features.html (Retrieved 5 August 2012).

43 http://www.adobe.com/products/adobeconnect/features.html (Retrieved 5 August 2012).

44 SUNET (Swedish University Computer Network) is a joint organisation that aims at the goal that University Sweden always should be provided with a computer network with very good quality. Administrative authority for SUNET is the Swedish Research Council and there are contact persons for SUNET at the HEIs (http://basun.sunet.se/engelska.html. Retrieved 6 January 2012).

45 SUNET started the e-meeting service with Adobe Connect Pro during the spring of 2009 and has had complete service since 7 September 2009. (http://basun.sunet.se/aktuellt/netmeeting_beskrivning.html. Retrieved 6 January 2012).

and remained accessibile to students as relatively easy to use free tools that can be downloaded from the Internet. The increased interest in creating new tools for desktop conferencing depends on the development of faster computers with more memory and the accessibility of more bandwidth to a lower cost (Panton, 2005). The development of 3G and 4G mobile phones, which can be used as Video over IP devices, Apple iPhones, tablet PCs, and PDAs also created an increasing demand for high-speed wireless/mobile networking (Caladine et al., 2010). As a result, new tools have emerged and Zoom[46] and Skype for Business[47] are two examples of tools for desktop conferencing that are increasingly used with Zoom replacing Adobe Connect as the the common tool for Swedish HEIs.

Definition and characteristics

Desktop conferencing can be used both synchronously and asynchronously, as it is easily recorded and saved on a server (Bates, 2005). To get a moving picture, a web camera is used (Johanson, 2003), which can be described as: "… a video camera attached to a computer that transmits a live video feed to a client web browser (Johanson, 2003). Today, desktop conferencing is not only used on computers, but also tablets, laptops, and smartphones as many of these devices have a built-in webcam (Bates, 2005; Godwin-Jones, 2012; Gronn, Romeo, McNamara, & Teo, 2013).

Desktop conferencing tools provide a selection of modalities for synchronous representation, interaction, and collaboration (Bower & Hellstén, 2010). Systems free of charge have fewer features, but commercial systems offer more possibilities (Gronn et al., 2013). Teachers and students can communicate with voice, video, and chat and they can make presentations, share their desktop to show web sites, pictures or documents etc. (Bower & Hellstén, 2010). Typical features are applications such as shared document, shared whiteboard, text-based chat, notes, desktop sharing, shared application, and manipulating the screens within the page (Bates, 2005; Godwin-Jones, 2012; Gronn et al., 2013). Shared

46 https://zoom.us/ Retrieved 23 February 2018.

47 https://www.microsoft.com/en-us/p/skype-for-business/9wzdncrfjbb2?activetab=pivot:overviewtab Retrieved 17 February 2019.

application refers to a feature that makes it possible to see an application from another computer on your screen, although the application is not installed on your device (Bates, 2005). Certain tools have features which make it possible to set different roles to participants in the conference, e.g. host, presenter, and participant, in order to control which authority the participants should have. For example, hosts have access to all the tools and control the conference, but can share control and take it back at any time. Group size can also be flexible, as a large group can be divided into smaller groups by using a feature of breakout rooms, which facilitate group activities in smaller groups (Akarasriworn & Heng-Yu, 2013; Bower & Hellstén, 2010). Each breakout room has its own video, audio, whiteboard, and application features and the teacher can visit the break out rooms to answer questions and help students (Akarasriworn & Heng-Yu, 2013). The use of desktop conferencing is somewhat complicated as there are multiple channels for communication, several tools to cope with simultaneously, and the possibilities and limitations of tools need consideration (Bower, 2011; Bower & Hellstén, 2010). If the teacher does not understand how the tools function and should be used, the effectiveness of delivery and learning can be negatively influenced (Bower, 2011).

The use of desktop conferencing is often similar to the use of video conferencing. However, desktop conferencing is typically used for individuals or small groups in different locations. Video conferencing, on the contrary, is mostly used for groups or a teacher or an external expert communicating with one or several groups of students (Bates, 2005; Furr & Ragsdale, 2002; Godwin-Jones, 2012). One of the advantages with desktop conferencing compared to video conferencing is full spatial flexibility as teacher and students can participate from where they are as long as there is an Internet connection (Bates, 2005; Godwin-Jones, 2012; Panton, 2005).

The use of video applications is increasing more than the use of audio applications among university students (Caladine et al., 2010). This is due to the development of popular tools for communication such as Microsoft Skype, Adobe Connect, and Google Hangout, and not least applications that can be embedded in social software, e.g. Facebook (Caladine et al., 2010).

3.4 CONCLUSIONS FROM RESEARCH

A research synthesis of studies on the use of video in distance higher education, published between 1990 and 2015, showed a total number of 253 studies consistent of 103 journal articles and 146 conference papers (Kilinç, Firat, & Yüzer, 2017). The highest number of publications was found within the Computer Science, Engineering, and Social Science fields. The lowest number of studies was found within the Veterinary, Chemistry, Multidisciplinary, and Materials sciences fields. The authors claim that there is a need for research from the perspective of the social sciences that considers pedagogical, cognitive and psychological aspects (Kilinç et al., 2017). This thesis addresses the gap in empirical studies regarding the pedagogical aspects of the use video in digital distance courses with a design focus from a teacher perspective which entails considering the possibilities and limitations of the use of video in digital distance education.

Interestingly, despite the development of technology that has made it easier to use video, the number of citations on the use of video in distance higher education declined between 2010 and 2015 (Kilinç et al., 2017) The highest number of citations was found 1997-2010. When looking at the distribution of publications on video by country, the USA lead, followed by China, Australia, India, Spain, Italy, England, Germany, Turkey, and Iran (Kilinç et al., 2017).

Yengin, Karahoca, Karahoca, and Uzunboylu (2011) elucidate on problems and flaws occurring in media comparison studies, which are also applicable to video research more generally such as the video category not being defined or several video categories being investigated in the same study without considering their differences. Koumi (2006) claims that low production quality is a flaw in most media comparison studies, especially for video, but teacher's pedagogical perspectives also influence the results of the use of video in teaching and are also under examined (Kilinç et al., 2017). The importance of a focus on teacher perspectives such as that taken in this thesis is further supported by a study in teacher education suggesting that learning outcomes were strongly influenced by which instructional approach the teacher used (Blomberg, Sherin, Renkl, Glogger, & Seidel, 2014).

DEFINING VIDEO CATEGORIES

An analyse of several hundred articles on video, showed that the concept of *video* is problematic and it is seldom defined in educational research (Mitra et al., 2010). This entails obscurities regarding which category of video[48] has been investigated, and it also occurs that several categories of video are studied at the same time without making distinctions between them. One example of this indistinctness is that the term *podcast* is a catch-all term which covers both *audio* and *video*. When scrutinising research, it becomes clear that very few of the articles about podcasts include video. Furthermore, it is often unclear that not video but only audio has been investigated when podcasts have been studied (Lazzari, 2009).

Another example of indistinctness is that podcasts with only audio and vodcasts (i.e. video) have been mixed in the same study without a critical discussion that the results can be influenced by using different media in the same study (see e.g. Bolliger, Supanakorn, Boggs, (2010), Copley (2007), and Holbrook & Dupont, (2011)).

The same kind of problem as with *podcasts* can be found for *lecture capture*. In some studies, all media in the lecture are recorded, i.e. video and sound of the lecturer synchronised PowerPoint slides or other illustrations (Osborn, 2010). In other studies, lecture capture means that only the teacher's speech is recorded or that the speech and the PowerPoint slides are recorded (Chen & Wu, 2015). Studies investigating lecture capture as in the latter example have been excluded from the review of research here as they are not included in the definition of video used for this thesis. That different definitions are used can be illustrated by the following examples. Laazar and Toloza define lecture capture as; "the teacher's lecture is recorded by a fixed camera, showing either his "talking head" or his writing on a tablet or whiteboard; sometimes shots of the audience are added" (Laaser & Toloza, 2017, p. 3). Lecture capture can also refer to "… classroom capture featuring both the computer presentation and speaker on separate video feeds, narrated computer screen capture, dramatized tutoring situations, and live footage of presenters shot indoors and out-

48 Recorded video could be divided into different *types*, depending on content, but live video; video conferencing and desktop conferencing cannot as they are technologies. Therefore, video categories are used instead.

doors" (Harrison, 2015, p. 173). Since there can be differences in what is included in the lecture capture, it is essential *not* to mix several types of lecture capture in the same study as it can influence the results. For example, research indicates that there is a difference in learning between different lecture capture formats; that learning performance is better with lecture capture or picture-in-picture[49] compared to the voice-over type[50] (Chen & Wu, 2015).

Another example is student engagement, which can affect learning and is mediated by artefacts, (e.g., tools as video) (Cole & Engeström, 2008). It is therefore of interest to consider how the different types of lecture capture may influence student engagement. Research by Guo, Kim and Ruby (2014) demonstrate that students engage easier in shorter than long videos, that teacher's talking head mixed with slides is more engaging than only slides, that videos with a personal style can be more engaging than recordings with expensive, high-quality equipment, and that Khan (Academy) style with drawing tutorials can engage students more than PowerPoint slides or code screencasts (Guo et al., 2014). Therefore, it is essential *not* to mix several types in the same study and to clearly define which type of lecture capture has been investigated.

It also occurs in research that the term *video conferencing* is used (even in the title of the article), although it is actually *desktop conferencing,* (e.g. Elluminate Live! and Skype) that have been investigated (Akarasriworn & Heng-Yu, 2013; Bower, Kennedy, Dalgarno, & de Barba, 2012; Candarli & Yuksel, 2012).

Another aim with this thesis is, therefore, to bring order in the literature by showing that how we understand the results can be affected if the investigated category of video is not clearly defined and or if several types of content and pedagogical purposes with using video are mixed in the same results.

49 Video with a picture of the teacher and lecture slides, combined with the voice of the teacher, subtitles or flash animation (Chen & Wu, 2015).

50 Voice-over type has the recorded audio from the teachers lecture combined with the teacher's image and PowerPoint slides (Chen & Wu, 2015).

CLASSIFICATION SYSTEMS OF VIDEO IN EDUCATION

There have been several attempts to classify different categories of video, especially in teacher education, e.g. Masats and Dooly (2011) with four categories identified; *video-viewing, video-modelling, video-coaching,* and *video-making*. Video-viewing was used for directing students' attention to specific topics and as a point of departure for class discussions and assignments. The purpose of using video-modelling was to direct students' attention to target skills or behaviour. Video-recording meant that students' acting in a classroom situation was recorded and used for group discussions. When individuals or groups of students made their video, it was called video-making (Masats & Dooly, 2011). Arya, Christ, and Chiu had tried two systems for categorisation (Arya, Christ, & Chiu, 2016; Christ, Arya, & Chiu, 2017)[51]. The former had five categories, which had emerged through the analysis of the video; *1) video to focus on children, 2) video to show subject area content, 3) video to show how to teach, 4) video on the Internet,* and *5) video for remote teaching*. The problem with this system is that the categories are not on the same level and therefore not comparable (Ejvegård, 2009). For example, video focusing on children mirrors one part of the teaching situation, but it also includes the teacher's actions. Video for subject area content can be used to replace text, but video to show how to teach has a similar instructional purpose with the video. By contrast, the category video on the Internet does not relate to any specific content or purpose, but to a form of distribution and video for remote teaching is used to bridge geographical distance between teacher and students.

Similarly, attempting to classify educational video, Lee and Wu (2006) classified the use of video into two categories; *learning from exemplars* (see also, e.g. Borko, Jacobs, Eiteljorg, and Pittman (2008) and Stockero (2008)) and *self-evaluation* (see, e.g. Kong (2010)). During the investigation of research for this thesis, an additional third category emerged; *video for assessment*. The assessment could be carried out either by teachers, (see, e.g. Admiraal, Hoeksma, van de Kamp and van Duin (2011) and Bakker, Roelofs, Beijaard, Sanders, Tigelaar, and Verloop (2011)), or by fellow

51 The study by Christ, Arya & Chiu (2017) will be further explained later in this section.

students (see e.g. Wu and Kao (2008)). Another system of classification by Christ et al. (2017) is related to specific learning outcomes, e.g. teacher learning and that the teacher students applied in their teaching what they had learnt. The categorisation distinguished between what is called "video methods" with four categories; 1) multimedia, 2) case studies, 3) discussion with peers or professors, and 4) self-reflection (Christ et al., 2017). An example from teacher education is provided by Siry and Martin (2014) who propose dividing research on video in science teacher education into the following categories; video as a tool for noticing, video as a tool for facilitating reflection, and video as tool for changing practices (Siry & Martin, 2014). However, there are also other kinds of pedagogical purposes with using video in courses outside teacher education. In a review of more than 100 publications on video, Martin and Siry (2012) developed another system "… six categories of implementation, including (1) video cases, (2) hypermedia/multimedia presentations of video, (3) video for self/individual analysis, (4) tools/programs for analysing video, (5) video utilized in electronic portfolios, and (6) conferencing facilitated by virtual/video interaction." (Martin & Siry, 2012, p. 420)[52]. Similarly, Koumi (2006) has suggested that educational video can be divided into three domains;

1. Assisting LEARNING and SKILLS development
2. Providing (vicarious) EXPERIENCES (the role most often assigned to TV in many institutions)
3. NURTURING (motivations, feelings) (Koumi, 2006, p. 3).

These domains are then further divided into added value video techniques and teaching functions.[53] However, this division is more directed towards *techniques within video production* than *the uses of video* (Koumi, 2006), the interest in this thesis. It can be problematic to classify a video with only one of these domains as they are not exclusive categories, e.g. video can support both learning and nurturing. Also, Juhlin, Zoric, Engström, and Reponen, (2014) argue that a re-conceptualisation of the video field is required and

52 The author's italic.

53 For more information, see Koumi, 2006, p. 4.

suggest a changed direction to focus on "how video is consumed, produced, shared, and interacted with" (Juhlin et al., 2014, p. 685).[54]

Koumi (2006) argues that *the teacher's intentions* with the use of video are essential to consider in a system of classification as the choices teachers make are based on teachers' aim at facilitating student learning. Bates (1987) has a similar line of thought and emphasises that how video is *utilised* should be included in a classification system for video in distance education. His system consists of three categories; *1) the type of production, 2) the method of distribution, and 3) the method of utilisation.*[55]

However, since video has changed considerably since 1987 when Bates introduced his suggested categories, it is crucial to adapt the classification system to the factors that have become important today. For example, the type of production has become less relevant since the introduction of digital video and the issue of distribution has nearly disappeared as the Internet is the dominant method of distribution today. Another argument is that the forms of production and distribution change quickly with technology development.

A TYPOLOGY BASED ON PEDAGOGICAL USE

Given the issues with existing typologies discussed above, I propose another way to organise knowledge in the domain. I suggest a typology that is a more sustainable system directed more towards Bate's third category; *the method of utilisation* which also supports Koumi's view that a teacher's intention is vital as it is a part of the pedagogical approach. This classification system is built on *the pedagogical use of video*; i.e. *how video is used* and *for which purpose,* as learning outcomes are dependent on the method of utilisation (Kleinknecht & Schneider, 2013). Based on the results of the literature review, I propose that video for digital higher education can be productively divided into two main categories; *recorded* and *live video. Recorded video* can be characterised as *media;* it is video with asynchronous,

54 Video interaction refers to the closing gap between video consumption and video production (Juhlin et al., 2014).

55 The other two categories are included in the dimensions of media (Collins et al., 2000) that has been described in section 3.4.

one-way communication, which offers full flexibility. It consists of four subcategories, which will be described in more detail later. *Live video* is consistent with two specific *technologies* that will be described later, rather than with *media*. (For more information about the difference between technology and media, see section 2.7).

KEY THEMES IN THE LITERATURE

When analysing existing literature on video in digital distance higher education, I found that the results can be divided into seven themes. Four of these themes are relevant for this thesis;

1. instructional effectiveness and perceptions of video,
2. different ways of using video and its features in teaching,
3. benefits and challenges of using video in teaching, and
4. psychological distance, immediacy behaviour, and social presence.

Three other themes were also identified in the review of research, but as they are not relevant to the research interest of this thesis, they have been omitted from the review and are only mentioned here. The first omitted theme is *comparisons of face-to-face and video-based teaching*, see e.g. Abdous and Yoshimura (2010), Jones, Dean, and Hui-Chan (2010), Myllymäki (2018), O'Malley, Langton, Anderson, Doherty-Sneddon, and Bruce, (1996), Olson, Bruxvoort, Vande Haar (2016), Poland, Frey, Khobrani, Ondrejka, Ruhlin, George, Gothard, and Ahmed (2018), Rennar-Potacco, Orellana, Chen, and Salazar (2019), Sever, Yurumezoglu, and Oguz-Unver, (2010), Weiser, Blau, and Eshet-Alkalai (2018). The second omitted theme is *comparisons of video and other media*, see e.g. Beard, Wilson, and MacCarter, (2007), Borup, West and Thomas, (2015), Choi and Johnson (2005), Donkor, (2010), Kearney (2013), Lloyd and Robertson, (2011), Olson et. al. (2016), and Wiens, Hessberg, LoCasale-Crouch, and DeCoster, (2013). *Investigation/evaluation of technological tools for video* is the third and last omitted theme and for examples of research, see Abbasian and Sieben, (2016), Bandung, Tanjung, and Subekti (2018), Cornelius and Gordon (2013), Gleason and Greenhow (2017), Kometani, Tomoto, Furuta, and Akakura (2013), Marsh, Mitchell, and Adamczyk, (2010), Macdonald & Campbell (2012), Mu (2010), Rich and Hannafin (2009b), and Vural (2013).

The research review here focuses on studies which are relevant for this thesis, i.e. studies on the use of video in digital distance education for pedagogical purposes. However, some studies included in the review, have not been conducted within distance education, but they have been found relevant also for distance education. Studies with a mixture of categories of video and studies which lack a description of which category of video that has been investigated have been omitted. (For more information regarding these flaws in video research, see section 3.4).

Following the proposed typology based on pedagogical use, the review presented here is structured in the following way: *First*; research theme, *second*; main category of video – recorded or live*, third*; subcategory, and fourth; method of utilisation. Some research articles presented here could be classified with more than one theme as several aspects of video have been investigated in the same study. In those cases, the focus of the research interest has determined which theme the research has been classified with. Much research has been conducted within teacher education, and this research has been presented within the general themes as it common aim to develop teacher students' or teachers' professional development. In the conclusions after each theme, insights related to recorded video are presented followed by those related to live video. It is important to note that these subcategories of video are analytical constructions employed to understand the results and therefore, the subcategories are separated in the conclusions. Additionally, even though the research questions for this thesis do not directly consider student perspectives, it is still essential to include studies of students' perceptions of the use of video in the research review as the learning environments teachers design are designed for students. The first theme to be examined is instructional effectiveness and perception of video.

3.5 THEME 1: INSTRUCTIONAL EFFECTIVENESS AND PERCEPTIONS

The studies included in this first theme focus on instructional effectiveness and both teachers' and students' perceptions of video in digital distance education. These studies are mainly of interest for *RQ2: How do*

course designers respond to the possibilities and limitations of video for digital distance education and *RQ3: What are the teachers' attitudes and perceptions about the use of video in digital distance education?* Regarding instructional effectiveness, it is very difficult to measure if and/or how the use of video has contributed to learning. Therefore, the studies in this part are more directed towards students' perception of effectiveness than the effectiveness of the use of video *per se*. First comes the main category *recorded video.*

RECORDED VIDEO

In the main category of recorded video, studies on three out of four subcategories will be brought up; *video-based materials*, *video-recorded teaching situations*, and *video as a tool for learning*. Most research within this theme is conducted on video-recorded teaching situations, and here 18 examples from this category will be brought up.

VIDEO-BASED MATERIALS

Definition: ***Video-based materials*** *can be compared to course books but in video format. This category of video is used for presenting the content of the course, and it is characterised by learning from video and student-content interaction (Moore, 1993b). (For more information about interaction, see section 2.5).*

The impact of video-based course materials on test scores has been investigated by Dupagne, Millette, and Grindfeder (2009) and Dupuis, Coutu, and Laneuville (2013). The first study used vodcasts for revision (Dupagne et al., 2009). The difference in students' attitudes seemed to be the reason for the variations regarding the number of watched vodcasts. Reasons for not watching vodcasts were class viewing, time constraints, that the students thought that they already have learnt most of the content. Some students also reported technological problems. Watching vodcasts was not related to higher test scores (Dupagne et al., 2009). In the other study (Dupuis et al., 2013) a supplement with online videos were made available, *demonstrating the application of concepts to solve problems* as an additional resource in a molecular biology course. The videos were associated with higher scores on exams, and that video was especially beneficial to students with lower academic performance (Dupuis et al., 2013).

A study by Bravo, Amante, Simo, Enache, and Fernandez (2011) showed that *video-based materials could increase students' motivation.* The result also demonstrated that it is crucial to define the investigated type of content, the amount of information transmitted, and the duration of the video (Bravo et al., 2011).

VIDEO-RECORDED TEACHING SITUATIONS

***Video-recorded teaching situations**, which can consist of recorded lectures, either especially recorded without students present or recordings of live lectures. It can also be recordings of seminars, lab work, or teacher's/student's feedback to students. This category of video is used for instruction and is characterised by learning from video and teacher-student, student-content and/or student-student interaction (Moore, 1993b). (For more information about interaction, see section 2.5).*

Danielson, Preast, Bender, and Hasall (2014) have conducted two related studies on *video-recorded lectures*, which included video capture of the teacher and all the information that the teacher used, e.g. slide presentation and video. Students preferred videos with teachers lecturing instead of videos with interaction between students and teachers. Reasons for watching were; to study for exams, to try to keep up with fast-moving lectures, to review content that they have missed (but not recorded lectures which they deliberately had decided to be absent from) and particularly, if the mate*rial was not provided in any other way, and the content was considered relevant. The quality of the lecture had little influence on whether the students watched the videos or not. Students were convinced that the recorded lectures helped them to learn better, but teachers were less sure of the pedagogical value* (Danielson et al., 2014).

A study by Mendoza, Caranto, and David (2015) demonstrated that *students' academic level influenced students' perception of the effectiveness of video lectures.* Students with lower academic level perceived video lectures as more effective than students with higher academic level (Mendoza et al., 2015).

Toppin (2011) has compared *students' and teachers' perceived performance when using lecture captures.* Nearly no negative influence on attendance was found, and some students even increased their attendance. The lecture captures provided possibilities of improving students' performance. Students appreciated it as a supplement to their live lectures, and students

claimed that it contributed to their understanding of concepts. Students were more positive than teachers (Toppin, 2011).

Giannakos, Jaccheri, and Krostie (2016) have investigated *the usage patterns for video lectures and students' attitudes towards using video lectures.* Students with more experience of video lectures found them more useful than students with less experience, but the degree of experience did not influence students' behavioural intention of watching video lectures in the future. It is therefore important to introduce video lectures already at the beginning (Giannakos et al., 2016).

Le, Joordens, Chrysostomou, and Grinnell (2010) have investigated *the use of recorded lectures and their features,* e.g. how the pause function influenced student's approaches to learning and their performance. Both a high degree of online viewing and extensive use of the features influenced students' results negatively since they were used for memorising the content instead of achieving a more in-depth understanding. This could be avoided by giving the students instructions on how to use video in the best way (Le et al., 2010).

How *class lecture webcasts impacted on students' attendance and learning* has been investigated by Traphagan, Kucsera, and Kishi (2010). Webcasts could impact students' learning positively, even though the access of webcasts had a negative influence on class attendance. However, e.g. PowerPoint slides and lecture notes influenced class presence even more negatively than access to webcasts (Traphagan et al., 2010).

How student engagement in online educational video is affected by production decisions has been investigated by Guo, Kim, and Rubin (2014) in a MOOC[56] environment. The study is probably the largest-scale investigating as it consisted of 6.9 million video watching sessions. Shorter videos, (less than 6 minutes), were more engaging than longer videos. Informal talking-head videos, where the teacher had good eye contact, were more engaging than recordings from lectures. Teachers' enthusiasm and showing energy influenced students' engagement positively. Students watched lectures and tutorials differently. Length of video is more important for lectures than tutorials. To re-watch and skim were more critical for tutorials than for lectures (Guo et al., 2014).

56 MOOC stands for Massive Open Online Courses.

Kim, Guo, Seaton, Mitros, Gajos, and Miller (2014) have studied *in-video dropout and peaks in viewership and student activity*. Dropout rate increased with video length and re-watchers had a higher dropout rate and more numerous peaks than first-time watchers. Tutorial videos had a higher dropout rate than lecture videos and had stronger and more numerous peaks than lecture videos. Peaks occurred more frequently during transitions (a change between presentation styles). In conclusion, students interaction with videos were influenced by the visual, pedagogical, and stylistic properties of the video (Kim et al., 2014).

Effectiveness and student attitudes to instructional videos for learning practical skills have been investigated by Kelly, Lyng, McGrath, and Cannon (2009) and by Donkor (2011). Students were positive to recorded skills demonstrations as a supplement, but not as a replacement for lecture demonstrations (Kelly et al., 2009). The most important advantage was flexibility and that students could watch the videos an infinite number of times. Recordings were useful for preparation for class and revision. Negative was that questions could not be asked (Kelly et al., 2009). In the study by Donkor (2011), results indicated that *video-based instructional materials had possibilities of supporting and enhancing student learning of practical skills* at a distance. Student regarded the materials as relevant, effective, and enjoyable, and interesting (Donkor, 2011).

Sowan and Idhail (2014) have investigated *nursing student satisfaction and the results of using recorded ideal lab demonstrations* of medication administration fundamental skills. Nearly half of the students thought that the videos could replace the face-to-face lab demonstration, and they were satisfied with the videos. A significant correlation was found between student satisfaction, self-efficacy, and achievement. The main disadvantage was difficulties accessing the videos from home (Sowan & Idhail, 2014).

Brar and van der Meij (2017) have studied *the effect of using video for learning statistics and statistics software.* Video was found to be engaging as it gained and maintained students' motivation and attention. However, moderate results were found regarding what extent video supported knowledge development. Video could be beneficial for student learning as it could serve as a bridge between theory and practice in statistics courses (Brar & van der Meij, 2017).

Hill and Nelson, (2011) and Hill, Nelson, France and Woodland (2012) had investigated *the use of vodcasting teaching situations as fieldwork*. The following advantages for students were found; e.g. the convenience, spatially and temporal flexibility, the ability to self-pace their learning, opportunities of 'accessing' and seeing remote environments, opportunity to visualise abstract concepts which contributed to understanding, variety, extending resources and that vodcasts contributed to students' active engagement and increased motivation. Vodcasts were an excellent tool for revision, not the least as it provided different means of revision, but students did not want them to replace lectures or fieldwork but rather to be used as a supplementary resource. However, no significant differences could be found regarding examination results, between students who watched the vodcasts and those who had not (Hill & Nelson, 2011; Hill et al., 2012).

Video-recording of lectures, both from the teachers' and the students' perspectives, with the use of special eyeglasses with a built-in video camera and microphone had been investigated by Odhabi and Nicks-McCaleb (2011). The two recordings could be merged into one video which combined both perspectives or students could select which point of view they would like to watch. The combination of the videos into one video was much more useful than the recordings from only one perspective. The most critical disadvantages were if other glasses also were needed and ethical issues (Odhabi & Nicks-McCaleb, 2011).

McGarr (2009) has investigated *how podcasts are used in education and identified three main purposes with podcasts;* 1) recorded lectures so students could take part when missing class, 2) a supplement for instruction, and 3) students' recordings of podcasting to show learning. Furthermore, other content could be transferred through podcasting as timely academic material, which provided continuous communication and interaction among teachers and students (McGarr, 2009).

A survey by Myllymäki and Hakala (2013) on *students' experience of video lectures* demonstrated that video could facilitate study participation, revision, completion of tasks, understanding of content, and increase time effectiveness. Few students thought that video lectures complicated learning.

Mathisen (2012) has investigated *how video feedback in the form of screen capture*[57] *can contribute to the quality of teachers' feedback* on written assignments. Screen capture made it more explicit what was commented and assessed as the text, and the comments were simultaneous, which provided a high degree of interaction between the student's text and the picture on the screen. This resulted in a high degree of learning and excellent educational practice. Quality and precision of feedback increased with video feedback, and it was perceived as meaningful and promoted improvement. It was also more time-cost effective, and students got better and more varied feedback. Students also perceived video feedback as more personal; that they were "seen" by the teacher, and that the video feedback contributed to students' feeling that they got to know the teacher better (Mathisen, 2012).

VIDEO AS A TOOL FOR LEARNING

Definition: ***Video as a tool for learning*** *has the characteristic of learning with video. It can be specified into two subcategories.*

a. *Video-making: students make their productions*. Often the purpose is that students create their learning materials or for students to learn how to make a video production, which means that it commonly entails student-content interaction. Flexibility can be reduced as it might be important that the students work together, both spatially and temporally, when filming. It is characterised by student-student, student-content and/or student-teacher interaction (Moore, 1993b).

Students' perceptions of the use of video-supported forum theatre have been investigated by Hakkarainen and Vapalahti (2011). Students perceived a highly positive emotional involvement in the learning and perceived the video cases as authentic and illustrative. The video-supported forum theatre

57 Screen capture is a software which makes it possible to make a recording capturing everything that happens on the screen, e.g. the student's written work displayed on the screen combined with the recording of synchronous audio, e.g. the teacher's voice commenting on his/her feedback using the cursor.

offered possibilities of meaningful learning processes, especially collaborative, co-operational, and conversational. All students were unanimous regarding that making the video production added value to the project (Hakkarainen & Vapalahti, 2011).

b. *Video-recording: video-recordings of students' acting are analysed and discussed.* This category of video is often used in professional education programmes as, e.g. within Medical education (see e.g. Strand, Fox-Young, Long, & Bogossian, 2013) or within teacher education (see e.g. Blomberg et al., 2014; Seidel et al., 2011). The purpose is that students' by the help of the video-recordings learn how to act in a professional situation; e.g. a teaching situation for teacher students or when a nurse or doctor meets a patient. If a video-system with possibilities of annotation is used, it could provide full temporal and spatial flexibility and asynchronous mode of communication. However, if students or teacher and students are going to discuss the recordings together, the flexibility can be reduced, and it might be a synchronous mode of communication. It is characterised by student-student, student-content and/or student-teacher interaction (Moore, 1993b). (For more information about interaction, see section 2.5).

Students' perceptions of video-recorded project group presentations and evaluating student performance have been studied by Tugrul (2012). Five learning outcomes, deriving from necessary skills in the business world were investigated; 1) oral presentation skill, 2) communication skill, 3) career-related skill, 4) learning motivation, and 5) overall course evaluation. Students perceived that their ability to make a presentation and their communication skills were positively influenced by both the recordings and the discussions of project presentations. The video-recorded presentation impacted highly on their development of career-related skills and their motivation to learn was increased (Tugrul, 2012).

LIVE VIDEO

In this section, the studies in the subcategories of live video will be presented; one study on *video conferencing* and three studies on *desktop conferencing*.

VIDEO CONFERENCING

Definition: ***Video conferencing*** *is characterised by a hardware system and is often used for groups of students. Several sites with groups of students (sites) can be connected simultaneously when a so called bridge is used (Shephard, 2002). Three types of media can be used; audio, video, and data (Belanger & Jordan, 2000). The spatial flexibility is reduced as students need to go to either the HEI or a local learning centre in order to get access to the video conferencing equipment. When this video category is recorded, it is instead categorised as video-recorded teaching situations.*

Teacher-student interaction during video conferences was more appreciated by students than student-student interaction (Gillies, 2008). Group presentations were not considered as valuable spent time and students did not want to work with tasks during on-air-time out of teacher contact. The contact with teachers, social presence, was more important to students than pedagogical approaches (Gillies, 2008).

DESKTOP CONFERENCING

Desktop conferencing*, which often is based on software, e.g. an add-in to the browser and typically includes features as shared document, shared whiteboard, text-based chat, notes, desktop sharing, and shared application (Bates, 2005; Godwin-Jones, 2012). Shared application refers to a feature that makes it possible to see an application from another computer on the screen, although the application is not installed on the computer in question. Desktop conferencing is typically used for individuals in different locations, and as long as there is an internet connection, there is full spatial flexibility, and a computer, tablet, or smartphone can be used for participation (Bates, 2005; Godwin-Jones, 2012). When this video category is recorded, it is instead categorised under video-recorded teaching situations.*

The findings in a study of the tool Elluminate Live! indicated that the *discussions during desktop conferences were beneficial to students' knowledge construc-*

tion and that they perceived that the small group discussion facilitated their learning (Akarasriworn & Heng-Yu, 2013). The use of desktop conferencing provided possibilities of sharing ideas, students' understanding of concepts, and facilitating their group. Students perceived a sense of community, but they also experienced limitations with the technology (Akarasriworn & Heng-Yu, 2013).

The findings from another study, where the tool Skype was used, indicated that *students had positive attitudes towards Skype* (Candarli & Yuksel, 2012). Most of them thought that they will use desktop conferencing in their teaching. Online interaction was considered as one of the advantages of desktop conferencing (Candarli & Yuksel, 2012).

The results, from studying formal online tutor training, suggested that *teachers' attitudes towards distance education were positively influenced by the use of desktop conferencing* (Dvorak & Roessger, 2012). With increased effectiveness when using technologies, teachers' ability to use technologies enhanced and they felt more comfortable and showed higher commitment to online synchronous tutoring programmes (Dvorak & Roessger, 2012).

A study by Dyment and Downing (2018) has investigated the use of *desktop conferencing to support 'professional conversations'*[58] in teacher education. Findings indicated that the use of desktop conferencing offered powerful possibilities for students to participate in meaningful professional conversations, which were effective for student engagement and facilitated deep learning. Even learning outcomes necessary for classroom teaching were achieved in this online environment (Dyment & Downing, 2018).

CONCLUSION

Here, a conclusion of the studies in *theme 1: Instructional effectiveness and perceptions of video* will be presented. First, *recorded video* and then *live video.* Each subcategory within *recorded video* will be summarised separately as to how the results are understood can be affected by the category of video, since they are analytical constructions. First, comes video-based materials.

58 The term 'professional conversations' is defined as: "… formal and informal dialogue that occurs between education professionals including teachers, mentors, coaches and school leaders and is focused on educational matters". (p. 6 Timperley, 2015).

RECORDED VIDEO

Students' motivation could be influenced positively by *video-based materials* (Bravo et al., 2011) and students' attitudes to video influenced how much video-based materials they watched (Dupagne et al., 2009). The results of one study indicated no relation between watching vodcasts and higher test scores (Dupagne et al., 2009). However, another study demonstrated the opposite; that watching video-based materials was related to higher test scores, especially for students with lower academic performance (Dupuis et al., 2013).

Several studies on *video-recorded teaching situations* showed that students perceived video as more effective than teachers did (Danielson et al., 2014; Toppin, 2011) and students with lower academic level perceived video lectures as more effective than students with higher academic level (Mendoza et al., 2015). Students with more experience of video lectures found them more useful than those who were less experienced (Giannakos et al., 2016). A significant correlation was found between student satisfaction, self-efficacy, and achievement (Sowan & Idhail, 2014). There were conflicting results regarding the relationship between test results and student watching video-recorded teaching situations. Two studies demonstrated no differences between students who watched the video-recorded teaching situations and those who did not (Hill & Nelson, 2011; Hill et al., 2012). Another investigation found moderate results regarding how much video-recorded teaching situations supported student knowledge development (Brar & van der Meij, 2017). Results from yet another study demonstrated positive effects of video lectures as facilitating, e.g.; participation, revision, completing of task and understanding, and more effective use of time (Myllymäki & Hakala, 2013). However, yet another study indicated that students' results could be influenced negatively by watching many video lectures as there was risk that their approach to learning was more directed towards memorising content than developing deeper understanding (Le et al., 2010).

These contradictory results concerning the effectiveness of video-recorded teaching situations for student learning indicate some of the complexity in measuring the effects of student watching video and other factors that could influence the results of effectiveness, as e.g. students'

previous experience of using video, how they use video to support their learning, and their academic level. Several studies demonstrated that students found video-recorded teaching situations engaging, interesting, and motivating (Brar & van der Meij, 2017; Donkor, 2011; Hill & Nelson, 2011; Hill et al., 2012). Convenience, spatial and temporal flexibility were significant advantages with video-recorded teaching situations according to students (Hill & Nelson, 2011; Hill et al., 2012; Kelly et al., 2009). Students were positive to video as a supplement (Kelly et al., 2009; Toppin, 2011), but according to several studies, students did not want video to replace lectures and fieldwork (Hill & Nelson, 2011; Hill et al., 2012). Video-recorded teaching situations were often used as preparation for class (Kelly et al., 2009), for revision (Hill & Nelson, 2011; Hill et al., 2012; Kelly et al., 2009) and for catching up when missing class (McGarr, 2009). Length of video was significant; shorter videos were more engaging than long ones (Guo et al., 2014) and longer videos had higher dropout rate than shorter videos (Kim et al., 2014). Contradictory results were found regarding whether video-recorded teaching situations influenced student attendance or not. According to a study by Toppin (2011), no negative influence on student attendance was reported, but another study showed that webcasts influenced class attendance negatively (Traphagan et al., 2010).

Students were very positive to the use of *video as a tool for learning* according to the two studies brought up here. Advantages were increased motivation to learn and possibilities of meaningful learning (Hakkarainen & Vapalahti, 2011; Tugrul, 2012).

LIVE VIDEO

Within the main category *live video* a summary of research in the two subcategories, *video conferencing* and *desktop conferencing*, will be given. Gillies (2008) shows that when *video conferencing* is used, students value teacher-student interaction and the teacher's social presence more than student-student interaction. This is complemented by (Dyment & Downing, 2018) finding that *video conferencing* was very suitable for teacher students' development and provided possibilities of meaningful learning in 'professional conversations'. *Desktop conferencing*, by contrast, is more often used in smaller

groups than video conferencing. An investigation by Akarasriworn and Heng-Yu (2013) emphasised that students perceived a sense of community with small group discussions, sharing ideas, and development of an understanding of concepts in the desktop conferencing learning environment. Also, a study by Candarli & and Yuksel (2012) brought up online interaction as one of the advantages with desktop conferencing according to students. The use of desktop conferencing could also influence teachers' attitudes positively towards distance education, but teachers' ability to use technologies was critical for how teachers perceived the desktop conferencing environment and their commitment in their teaching (Dvorak & Roessger, 2012).

3.6 THEME 2: DIFFERENT WAYS OF USING VIDEO

The studies in theme two are mainly focused on different ways of using video and its features in teaching, i.e. *RQ1: How is video used in digital distance higher education?* First, the main category of *recorded video*.

RECORDED VIDEO

In the main category *recorded video*, studies from two subcategories are included; two investigations of *video-recorded teaching situations* and eight studies on *video as a tool for learning*. Most of the research in this section is about feedback and assessment.

VIDEO-RECORDED TEACHING SITUATIONS

The use of video for *general and individual feedback to students* has been investigated by Crook et al. (2012). Video provided opportunities for overcoming the problem with time efficiency for staff, the delivery of a good, quality, timely feedback to a large number of students, illegible handwriting, and lack of students' engagement. Video was found especially helpful for distance students as it was easily accessible and provided timely and spatially flexibility. Additional effects were, e.g. staff reconsidering and

developing their feedback and that students became more engaged in the feedback they received (Crook et al., 2012).

Video for student feedback with screen capture had been investigated by Jones, Georghiades, and Gunson (2012). Video with screen capture means that the teacher's marking process on the computer was recorded together with the teacher's verbal comments during the marking. When the student played the video file, it was like the student was sitting beside the teacher during the marking process. Students appreciated video feedback; it was perceived as personal by students, it was close to and fitted other forms of communication that students used (mobile phones, texting, YouTube etc.) (Jones et al., 2012).

VIDEO AS A TOOL FOR LEARNING

Research has shown that specifically in teacher education, video is used for a variety of different purposes (see e.g. Blomberg et al., 2014; Calandra, Sun, & Puvirajah, 2014; Christ et al., 2017; Fadde & Sullivan, 2013; Martin & Siry, 2012; Shanahan & Tochelli, 2014). For example, results from a study by Kong (2010) indicates that *watching videos had an impact on both the quantity and quality of student-teachers' reflections* in all areas of their teaching competence. However, even though videos could contribute to a growing competence, professional mentoring by teaching supervision was needed as a complement (Kong, 2010).

The use of *video for assessment* is emplified by two studies of *the use of portfolios,* which provided evidence of teacher competencies from a broader perspective than written portfolios (Admiraal et al., 2011; Bakker et al., 2011). Also, it could give specific information about the contexts in which the teacher was recorded. Admiraal and his colleagues (2011). found problems with reliability, construct validity, and consequential validity when video portfolios were used for assessing teaching competences. Bakker et al. (2011) had instead used videos and supporting materials produced by the researchers and focused on whether the assessors' judgements were reliable. Although the assessors in both studies had been specially trained for the assignment, results showed that they had difficulties in making judgements with only a few video clips. A context was needed. The difference in students' attitudes seemed to be the reason for the vari-

ations regarding the number of watched vodcasts (Admiraal et al., 2011; Bakker et al., 2011).

Seidel, Stürmer, Blomberg, Kobarg, and Schwindt (2011) had compared *the effects of analysing teachers' teaching and the teaching of others'*. They found that analysing teachers' teaching was more activating. Experience in video-based research facilitated analyses of their teaching, but inexperienced teachers found analysing others' teaching as more meaningful. However, the results also showed that teachers tended to be less critical and identify fewer consequences and alternatives when analysing their teaching than analysing the teaching of others (Seidel et al., 2011).

Zhang, Lundeberg, Koehler, and Eberhardt (2011) have *combined three types of videos; 1) published video, 2) teachers' video, and 3) their colleagues' video in their study in a Problem-Based Learning professional development program for teachers.* Each of the video types was valuable, and reflection could be improved by integrating all three types as they had different possibilities and challenges. The context of the published video was necessary. To watch the videos several times was perceived as especially effective by many of the teachers (Zhang et al., 2011).

One of few more extensive studies, an international survey of the use of video in teacher education, have investigated *the use of five "video methods";* 1) self-reflection, 2) peer discussion, 3) professor-led discussion, 4) case studies, and 5) multimedia (Christ et al., 2017). The result indicated that video was used in average three times per course, typically only one 'video method' was used per course. High teaching load decreased the use of video in general and the use of several 'video methods' in particular. Factors as specific disciplines areas and colleagues' support increased the use of video. Older teachers (60-69 years old) used multimedia video more than younger teachers (Christ et al., 2017).

Video can also be used for language learning, e.g. that *language students produce their video* (Nikitina, 2011). Video production for language learning contributed to an authentic learning experience as a number of both linguistic and non-linguistic learning outcomes emerged. Students enjoyed working with the video project, although it was more time consuming than, e.g. written assignments. (Nikitina, 2011).

LIVE VIDEO

In this section, studies in the main category *live video* will be presented. There are two studies on *video conferencing* and two studies on *desktop conferencing*.

VIDEO CONFERENCING

Wang and Wiesemes (2012) have investigated *the use of live video conferencing in initial teacher education as a means to enable and support remote classroom teaching observation*. Video conferencing provided support for teacher trainees' professional development through the process of four steps; 1) observation, 2) contextualisation, 3) reflection, and 4) development of practices. However, it is crucial to integrate video conferencing into other teaching activities continuously in order to take full advantage of the possibilities that video conferencing can provide (Wang & Wiesemes, 2012).

In a study by Sundh (2018), video conferencing has been used for *sustainable communication in an international context* in teacher education. International and Swedish students exchanged ideas and experiences about didactic and pedagogical issues. The results indicated that the students were very positive to the student-interactive video conferences discussing both professional and personal issues, as they learnt from each other instead of studying theoretical perspectives (Sundh, 2018).

DESKTOP CONFERENCING

Another of few studies on video from a Swedish context is *an investigation of tutoring through web camera* by Linda Borglund (2011). Desktop conferencing (Adobe Connect Pro) functioned well for tutoring at a distance. It entailed advantages for both students and teachers, e.g. that the tutoring became more efficient and that the use of desktop conferencing saved time. However, the use of web camera created a different tutoring situation as the dialogue between tutor and student changed. The synchronous mode was perceived as superior compared to asynchronous, written communication. Borglund suggested further research in the form of a survey in order to get a picture of to which extent the HEIs in Sweden work with

tutoring through desktop conferencing tools (Borglund, 2011), which is included in the research for this thesis.

Four required types of *student and teacher synchronous collaboration competencies* had been identified in a study by Bower (2011). These competencies were *1) operational (to operate the tools and functions), 2) interactional (to interact in order to perform a task or solve a problem using the technology, 3) managerial*, i.e. to manage a group or class (support included on how to use the technology and interact effectively), and *4) design the ability to select and organise tools to optimise interaction. 1) operational competencies* were easiest to achieve, but practice was a prerequisite. *2) Interactional competences* consisted of knowledge of using the tools for collaboration and co-creating. The selected pedagogy influenced which type of synchronous collaboration was needed. *3) Managerial competencies* were especially important on the teacher's and group work level; description of the task and its objective, roles, troubleshooting technological problems, and how to interact effectively were included. *4) Design competencies* entailed understanding representational and interactional possibilities and constraints of different tools and selecting and using appropriate tools according to their possibilities. The teachers' ability to handle the desktop conferencing technology influenced both the effectiveness of delivery and student learning. The teacher's collaboration competencies were even more important than students' ability of synchronous collaboration, as it was the teachers who had to provide support regarding students' technical problems. Therefore, substantial professional development for teachers was required (Bower, 2011).

CONCLUSION

In the text here, a conclusion of the studies in *theme 2: Different ways of using video and its features in teaching* will be presented.

RECORDED VIDEO

In the subcategory *video-recorded teaching situations*, two studies have investigated video for student feedback (Crook et al., 2012. Students were positive as it was easily accessible with timely and spatial flexibility. It was perceived as personal; students became more engaged, and it was similar

to other forms of communication that students used, e.g. mobile phones, YouTube etc. (Crook et al., 2012; Jones et al., 2012). Also, teachers were positive as it saved time, it was possible to deliver good feedback to a large number of students, and the feedback was more developed due to teachers' reconsideration (Crook et al., 2012; Jones et al., 2012).

The studies in the subcategory *video as a tool for learning* demonstrated that video has been used for many different purposes, and it has been used in particular in teacher education. Students' reflection was positively influenced both regarding quality and quantity by watching videos (Kong, 2010). It was essential to give the context and not only have the video clip (Admiraal et al., 2011; Bakker et al., 2011; Zhang et al., 2011). The analysis of teachers' teaching was more activating, but students were more critical of others' teaching than of their teaching (Seidel et al., 2011). Students with less experience appreciated the analysis of others' teaching more than analysing of their teaching. Many of the teachers perceived repeated watching as more effective (Zhang et al., 2011). Older teachers (60-69 years old) used more video than younger teachers. Specific discipline areas and colleagues' support increased the use of video, but high teaching load decreased the use of video (Christ et al., 2017). When video production was used in a language course, it contributed to an authentic learning experience (Nikitina, 2011).

LIVE VIDEO

Within the main category; *live video* a conclusion of research in the two subcategories; *video conferencing* and *desktop conferencing* will be presented.

The results from a study on video conferencing indicated that it could be used in teacher education for enabling and supporting remote classroom teaching observation in four steps; 1) observation, 2) contextualisation, 3) reflection, and 4) development of practices (Wang & Wiesemes, 2012). Video conferencing was also useful for bridging the geographical distance and creating sustainable communication among students in an international context (Sundh, 2018).

Tutoring through *desktop conferencing* functioned well, was more efficient than written communication, and saved time, but the web camera created a different situation than in a face-to-face situation and dialogue between

tutor and student became different (Borglund, 2011). The findings from a study by Bower (2011) showed that teachers' ability to handle the technology influenced both the effectiveness of teaching and student learning. Teachers' professional development was critical since it was the teachers who provided support for students' technical problems (Bower, 2011).

3.7 THEME 3: BENEFITS AND CHALLENGES

In theme three; benefits and challenges of using video in teaching, the studies are mainly directed towards *RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?*

RECORDED VIDEO

First, the main category recorded video. Here one study on *video-recorded teaching situations* and one on *video as a tool for learning* will be discussed.

VIDEO-RECORDED TEACHING SITUATIONS

Al Nashash and Gunn (2013) have investigated how students in Electrical Engineering classes *perceived possibilities and limitations with the use of recorded lectures* (lecture capture). Examples of possibilities; that students perceived that the recorded lectures contributed to their understanding of the course materials and that they had a positive impact on students' results. Access to the recorded videos whenever the students wanted and as many times as they wanted, increased students' autonomy and made it possible to concentrate on the lectures instead of taking many notes. The recorded lectures were considered as another possibility for learning the course content, not as a replacement. Therefore, in contrast to what many teachers thought, the recorded lectures did not influence students' attendance in class negatively. Even though most students did not have technical problems, some students reported having troubles accessing the recordings, which resulted in wasted time. Another drawback was that the teachers' microphone was sometimes not turned on or running out of batteries, which made it difficult for students to hear what the teacher said in the recordings. The statistics in the LMS (Learning Management

System) showed that most of the students watched the recorded lectures (Al Nashash & Gunn, 2013).

VIDEO AS A TOOL FOR LEARNING

In a pilot study in nurse education at a distance, *students were recorded in a clinical setting while performing clinical examinations* (Strand et al., 2013). Students' actions were assessed by clinical mentors, and the result indicated that video assessment could be carried out and was valuable. However, technological and ethical barriers occurred and made it quite difficult to realise the study as intended (Strand et al., 2013).

LIVE VIDEO

Seven studies from the main category of live video will be presented here; three investigations on *video conferencing* and four on *desktop conferencing*.

VIDEO CONFERENCING

Benefits and challenges of teaching mathematics and science via video conferencing classes have been investigated by Plonczak (2010). The video conferencing environment contributed to pre-service teachers' understanding of what is required for a successful lesson, e.g. to have a high ability of asking questions and being clear and well-articulated in the communication with the pupils. However, video-conferencing posed higher demands on teacher's knowledge of the subject matter as the content was emphasised more compared to in a face-to-face teaching situation, where the teacher can build a relationship with his students. This resulted in more lecturing than in face-to-face teaching, and if teachers had insufficient knowledge of the subject matter, the tendency of more lecturing was even stronger, which made it more challenging to adapt a student-centred style during video conferences. The use of video conferencing made the teachers realise the importance of thorough planning of the lessons. Even with careful planning, the teacher had to be prepared for dealing with the unexpected, which was more difficult in a video conference environment. Other challenges were that video conferencing limited the pre-service teachers' opportuni-

ties for exploring and being aware of students' conceptual understanding. Most appreciated were hands-on activities and inquiry-based components (Plonczak, 2010).

Findings from a study on *in-service training for different professions through video conferencing* (Johannesen & Eide, 2000), indicated that it was essential to adapt technology to content and objectives, to have sufficient time for planning, and try out different ways of working. Students had to be activated directly from the beginning to prevent them from adopting their usual behaviour of being passive receivers in an entertainment situation when watching television or video. In order to avoid too much attention to technology, the equipment had to be user-friendly and straightforward. Teachers and students needed knowledge of both advantages and disadvantages with video conferencing, and also training in how to make the best use of the environment and to reduce or even eliminate drawbacks (Johannesen & Eide, 2000).

A study by Burns (2002) has investigated *the role of technology in video conferencing*. The results demonstrated that students' perceptions of video conferencing could be negatively affected by deficiencies in the technological capabilities, characteristics of the technology, and the environment where the video conferencing was used. Main technical problems identified by teachers and students were; inferior quality of sound, insufficient number and inappropriate type of microphones, only one screen available, and the lack of tiered seating. The interaction was limited by a lack of microphones and poor audio quality. That only one screen was used,[59] reduced the sense of presence, (one of the purposes of using video conferencing) as the students could only see either the teacher or the notes. The teachers' lack of confidence resulted in that the teachers mostly used video conferencing for introductions and revisions instead of teaching content. Despite the problems, students appreciated the contact with their teachers through video conferences (Burns, 2002).

59 To use only one screen is probably rather unusual nowadays, which makes this problem less important nowadays.

DESKTOP CONFERENCING

Cunningham, Fägersten and Holmsten (2010) have investigated *the benefits and issues of using desktop conferencing, Marratech.*[60] Perceived problems were poor connections, sound quality, and low refreshment rate for synchronising the video image with speech. This meant that lip-reading did not work, and gesture and body language could not be transferred and therefore, these cues were missing in the communication situation. However, as participants used compensating strategies; e.g. text chat, nodding or shaking the head to give a response, the communication functioned most of the time. The whiteboard could be used to support oral communication. Since the participants often were asked to turn their microphones off when not speaking to avoid disturbing noise, teachers felt that they were utterly alone and lost contact with the students, particularly, if participants did not have their webcams on. In conclusion, the multimodal environment of Marratech made it possible for students and teachers to compensate for the disadvantages and thereby, more than made up for the drawbacks (Cunningham et al., 2010).

Kear, Chetwynd, Williams, and Donelan (2012), have investigated the teacher's perspective on the use of *the desk conferencing tool Elluminate Live!*[61] Three themes emerged, (although partly overlapping); *1) preparation and improvisation, 2) interaction and participation*, and *3) usability and practical issues*. Regarding *1) preparation*, it was more time-consuming than the teachers had expected. For example, they wanted to practise before the lesson, and they discovered that the resources used for face-to-face teaching did not work in the desktop conferencing environment without adjustments. Teachers perceived it more challenging to discover students' different levels of understanding of the content due to the lack of facial expressions

60 Marratech was a desktop conferencing software, which originally was developed by Marratech AB in Sweden. Included in the Marratech solution were meetings between several parts through video or only audio, chat, shared whiteboard which could be used for showing presentations at a distance to several participants, shared desktop or shared applications, and recording of desktop conferences. Marratech has been used by many HEIs in Sweden. The software Marratech was bought by Google in April 2007 and in June 2009, Marratech AB decided to no longer provide the client and server software and cease supporting the system (http://sv.wikipedia.org/wiki/Marratech, retrieved 25 March 2011).

61 *Elluminate Live!* is now subsumed in *Blackboard Collaborator* (Kear et al., 2012).

and body language. It was also more challenging to adjust the material according to the students' needs during the conferencing than in a face-to-face situation. Theme *2) interaction and participation*, showed that it was challenging to motivate students to attend the desktop conferences due to time being unsuitable, technical difficulties, and lack of hardware. Teachers were often more active than students, and the interaction among students was particularly low. An advantage with desktop conferencing was the social benefits, and a disadvantage that it was difficult to get response from the students as facial expressions and body language were not visible. The main challenge was to develop social presence (Rice, 1992, 1993) in the desktop conferencing situation (see section 2.7).

Regarding *3) usability and practical issues,* teachers found the training they had received was crucial as it contributed to their confidence with the technology and teaching technique in the unique desktop conferencing environment. The complexity of the interface and the multimodality, with audio, video, white board, chat, voting tools, turn taking etc. made it difficult for teachers due to a cognitive load, which required special competencies in handling this learning environment. It was also tiring for the teachers. With more training, most of the issues brought up in the investigation should be overcome and the benefits of using desktop conferencing should be more evident (Kear et al., 2012).

Interaction has also been in focus of another study by Bower and Hedberg (2010), who have investigated how "the interface design, task type, and activity design influenced the amount and type of collaboration" (p. 462). Bower and Hedberg found that a *student-centred design* in desktop conferencing increased student discourse more than six times compared to a teacher-centred approach. A student-centred design also resulted in students working more autonomously and contributed more to the content-based discussion (Bower & Hedberg, 2010).

A study by Lieser, Taff, and Murphy-Hagan (2018) on webinars in medical education indicated a similar result; in order to engage students in webinars, it was *important to have a more student-centred approach* to learning. Both teachers and students were positive to the use of webinars, but it could be negatively affected by the lack of technology and training resources (Lieser et al., 2018).

CONCLUSION

RECORDED VIDEO

Students perceived that *video-recorded teaching situations* facilitated their understanding and had a positive effect on their results (Al Nashash & Gunn, 2013). The videos increased students' autonomy and made it easier to concentrate on the lecture instead of focusing on note-taking. Students' attendance was not negatively affected by the recorded lectures as students saw the recordings as another possibility for learning the content. However, students also perceived some technical problems with the teacher's microphone and when accessing the recordings (Al Nashash & Gunn, 2013).

A study in the category of *video as a tool for learning*, which investigated how recordings of nurse students' action were assessed, showed that it worked well and was valuable, but technological and ethical limitations made it difficult (Strand et al., 2013).

LIVE VIDEO

In her study of live video use in science teacher training, Plonczak (2010) found that the *video conferencing* environment facilitated pre-service teachers' understanding of what is required for a successful lesson; thorough planning and dealing with the unexpected. Also, the video conferencing teaching environment put higher demands on teachers' knowledge of subject matter (Plonczak, 2010). Teaching and tutoring through video conferencing offered good possibilities for in-service training for professions, but it was necessary to consider certain aspects, e.g. to activate students from the start, user-friendly equipment was essential, and training in using video conferencing (Johannesen & Eide, 2000). Technical problems, lack of technology, and teachers' lack of confidence could influence students' perception of video conferencing negatively, but students appreciated the contact with their teachers through video conferencing (Burns, 2002).

A study on *desktop conferencing* demonstrated technical problems, but compensating strategies still made the communication function (Cunningham et al., 2010). Another investigation found that preparation for lessons was more time-consuming than expected and resources had to be adapted for the desktop conferencing environment (Kear et al., 2012). Teachers perceived it more challenging to discover students' different levels of understanding and to motivate students to attend the desktop conferences. The main challenge was to develop social presence in the desktop conferencing environment as it was difficult to perceive non-verbal signals. The complexity of the interface and the multimodality resulted in a cognitive load that required more training of teachers (Kear et al., 2012). A student-centred design in the desktop conferencing environment contributed to more content-based discussions, made students work more autonomously, and increased student discourse more than six times compared to a teacher-centred approach (Kear et al., 2012; Lieser et al., 2018).

3.8 THEME 4: PSYCHOLOGICAL DISTANCE, IMMEDIACY BEHAVIOUR AND SOCIAL PRESENCE

The studies presented within theme four, *psychological distance, immediacy behaviour, and social presence* are mainly relevant for understanding *RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?* and *RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance education?* Few studies could be identified in relation to this theme so only two examples of recorded video belonging to the sub-category of video-recorded teaching situations are discussed.

RECORDED VIDEO

VIDEO-RECORDED TEACHING SITUATIONS

Schutt et al. (2009) have made a *comparison of how the delivery modes audio and video influenced students' perceptions of teacher immediacy and social presence* and the relationship between these two phenomena in an online environment. Teacher immediacy behaviours can be defined as: "voice, gestures, and facial expressions as well as verbal expressions of inquiry, concern, inclusiveness, encouragement, and recognition" (Schutt et al., 2009, p. 136). Research indicated that teachers' high *immediacy behaviours* influenced students' motivation and satisfaction positively, and students achieved better results (Schutt et al., 2009). Students' perception of immediacy was not only dependent on the type of media used and their possibilities and limitations, but also on whether teacher employed immediacy behaviours or not, as the concept of immediacy and social presence were closely related. In order to develop skills in employing immediacy behaviours, a prerequisite was that teachers received training. With high immediacy, students perceived increased social presence (Schutt et al., 2009).[62]

Borup, West, and Graham (2012) have investigated how different video-based instructional strategies influenced *social presence* and whether students' perceptions of their teachers seeming more real, present, and familiar. The video-based technologies used were VoiceThread[63] and YouTube[64]. Two strategies were used with VoiceThread; student-teacher interaction (conveying content and moderating discussion) and teacher-small group interaction (to introduce assignments, to facilitate small group interaction among students, and to give individual feedback on assignments). The findings demonstrated that video communication could have an essential influence on creating the teachers' social presence. Students

62 It is not quite clear what type of video that is used here. There is talk about asynchronous video and comments from the teachers, so it is probably some kind of video-recorded teaching situations, but this serves as an example of that video is not always defined in research.

63 http://ww.voicethread.com.

64 http://www.youtube.com.

claimed that video contributed to seeing the teacher as a real person and they got to know the teacher. The interaction with the teacher was perceived as similar to face-to-face interaction, and contributed to the developing an emotional connection with the teacher (Borup et al., 2012).

LIVE VIDEO

VIDEO CONFERENCING

As discussed earlier in section 2.5, studies have shown that distance students can perceive *psychological distance* if teacher's and other students' faces become invisible as no physical meetings or video conferences and/or desktop conferences are offered (Moore, 1997; Moore & Kearsley, 2005; Shearer, 2007). Findings from a study by Dupin-Bryant (2004) demonstrated that *a more student-centred teaching style could reduce the psychological distance.* The most effective ways of adapting a student-centred style in the video conferencing environment were consulting and discussing with colleagues. Training in the use of technology was less efficient (Dupin-Bryant, 2004).

Mottet (2000) has investigated *how teachers perceived students' nonverbal responsiveness in the video conferencing environment.* The findings suggested that teachers' perceptions of students' nonverbal responsiveness were positively related to teachers' impression of students, how they perceived their teaching effectiveness and satisfaction, teacher-student interpersonal relationships, and their preference for teaching in the video conferencing environment. However, teachers' perceptions of students' nonverbal responsiveness were significantly lower in the video conferencing situation compared to the face-to-face classroom. Both visual and audible nonverbal cues with two-way audio/video compared to two-way audio/one-way video enhanced positive perceptions of both student and the distance teaching process (Mottet, 2000).

CONCLUSION

RECORDED VIDEO

In relation to recorded video, a general theme in the findings of earlier studies is that teachers' high immediacy behaviours, which could be obtained with training, had a positive influence on student motivation, satisfaction, and results (Schutt et al., 2009). Students' perception of immediacy behaviours were affected by the type of media and its possibilities and limitations, but also whether teachers employed immediacy behaviours and had received training (Schutt et al., 2009). Video-recorded teaching situations could create the teachers' social presence, and the interaction could be perceived as similar to face-to-face interaction (Borup et al., 2012).

LIVE VIDEO

In relation to live video, studies have shown that a more student-centred teaching style could reduce the psychological distance that sometimes emerges in distance education when teacher's and students' faces are invisible (Dupin-Bryant, 2004). Teachers' perception of students' nonverbal responsiveness was significantly lower in video conferencing compared to the face-to-face classroom, which could influence teachers' impression of students (Mottet, 2000).

3.9 FINAL REMARKS

This review demonstrates that research on video in digital distance higher education is diverse, but that often only one aspect has been investigated and studied for one of the six proposed categories of video. This makes it difficult to get a full picture of how video is used/or not used in education. Despite an extensive investigation of more than 500 articles, reports and conference papers, a Swedish study investigating the use of several categories of video could not be found with only one survey of video in distance higher education found that treated video as **one** technology (Axlid, 2005). The review presented here shows that video can be used

for many purposes and that it is crucial to make distinctions between the categories of video as they provide different possibilities and limitations of learning.

Previous research has focused on students' perspectives, e.g. students' perceptions and attitudes, and learning outcomes from using video. Few studies have brought up teachers' perspectives, i.e. teachers' experiences, training, pedagogical perspectives, attitudes. Teachers' reasons for *using* or *not using* video, how their teaching was designed when video was used, how the use of video influenced teaching situations, teaching methods and activities etc. are also under-examined areas. A review of what teaching activities video is used for could, to a certain degree, be found in the American context but is not well covered in the European context. From a general point of view, there is much international research on video, but surprisingly little research has been conducted in Sweden. Therefore, the results of this thesis can contribute to filling in the gaps and providing valuable knowledge within these fields of research which have not yet been thoroughly investigated.

One subcategory of recorded video, *video materials – not produced for pedagogical purposes*, is missing in this review as it could not been found amongst the chosen studies, although it is mentioned in the literature more generally (Bates, 2005). It can be defined as:

> Video materials – not produced for pedagogical purposes can be consistent of, e.g. recordings of news programs which are used in language courses, films produced for entertainment which can be used for explaining how a story board in films is built up, documentaries etc. It is characterised by learning from video and student-content interaction (Moore, 1993b). (For more information about interaction, see section 2.5).

The reasons for why this type of video has not been extensively researched might be that it is not often used as an essential part of the content in a course but instead used as something extra, a supplement. Expectations for learning regarding this category of video may be low, which might explain why the research interest for this category is also low. This assumption is supported by the fact that the research found was to a high extent

focused on measuring the effectiveness of or finding the best technology or teaching method and comparing several technologies in order to find the most effective one (see e.g. Abdous & Yoshimura, 2010; Annetta & Shymansky, 2008; Holland et al., 2013; Tugrul, 2012). As it is used in practice, but is under-researched, it is essential to investigate this category of video to contribute to new knowledge and is considered in this thesis.

Finally, from this review of research on video in distance higher education, an important conclusion can be drawn; it is *essential to define which category/categories of video that are investigated* as how we understand the results of a study will be affected by how these analytical constructions are defined. Following the review presented here, a typology for the classification of video used in digital distance education is proposed as a way to synthesise the literature and suggest a way to better understand the use of video for digital distance higher education (see Figure 1).

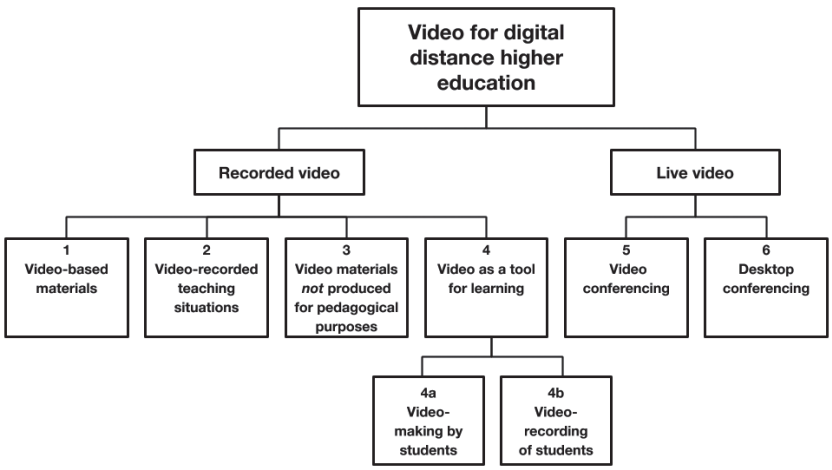

Figure 1. Proposed typology for video for digital distance higher education.

CHAPTER 4
THEORETICAL FRAMING

The purpose of this chapter is to give the theoretical framing of the object of study in this thesis; the use of video in digital distance education. This thesis aims *to better understand the possibilities and limitations of video in digital distance higher education.* The aim and the following research questions have directed the selected reading of literature, which is central to the analysis of the two studies in this thesis:

- *RQ1: How is video used in digital distance education?*
- *RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?* and
- *RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance education?*

Selected reading from the theoretical approach of the socio-cultural perspective and the theory of affordances will be presented. They are central to the analysis of the studies in this thesis. Finally, the relation between the theoretical approach and the use of video in distance higher education will be explained.

As this thesis focuses on the teacher's perspective of designing, planning, and carrying out distance education, it is essential to start with making a distinction between *teaching and learning* (Säljö, 2005). Teaching aims to facilitate learning, but learning does not always take place even if teaching is provided. We learn all the time and learning can emerge without teaching, but since learning is invisible, it is not possible to observe precisely *when* and *how* learning occurs (Säljö, 2005). This makes it difficult, not to say, impossible, to measure the most effective technology or media and the best way of using them. It is also very complicated to isolate only the role of technology or media for learning since also many other factors influence student learning, e.g. students' previous knowledge, motivation, reasons for studying, time for studies, previous experience of studying in higher education, personal circumstances etc. Furthermore, *why, what*, and *how* we learn depend on our cultural environment (Säljö, 2000).

In order to analyse and understand teachers' use of video and the reasons for this use, a lens that combines *the socio-cultural perspective and the theory of affordances* is suitable.

4.1 SOCIO-CULTURAL PERSPECTIVE

The socio-cultural perspective is not one theory, but rather a catchall term for several theories for understanding learning, development, and reproduction of knowledge and skills in social practices (Säljö, 2000). Initially, it was the Russian psychologist Vygotskij, who reacted to Pavlov's behaviouristic view on learning; i.e. that learning evolves solely through processes of stimuli and response (Säljö, 2000; Vygotskij, 1978). According to the behaviouristic perspective of learning; knowledge is outside the student, which, e.g. means that the teacher has the knowledge and by transferring his knowledge in small chunks to the student (e.g. by lecturing), the student can build a bigger piece of knowledge by adding chunk by chunk of knowledge (Säljö, 2000). As a reaction to this view of learning and knowledge, Vygotskij introduced the social dimension as an essential factor for understanding learning and development (Vygotskij, 1978). The social-cultural perspective contributes to the understanding of the relationship between, on the one hand, *human-mediated action* and on the other hand, *the cultural, institutional, and historical contexts* in which actions

take place (Wertsch, 1998). When acting and perceiving the world around us, we *mediate,* i.e. we interact with *mediational tools,* e.g. technology (Säljö, 2000, 2005; Wertsch, 1998). Mediational tools can be both *physical tools,* e.g. technology and *language* (intellectual, communicative, mental, and discursive tools) (Säljö, 2000, 2005).

Tools afford using (Gibson, 2015), and we use tools for all we do as it has become a natural part of the action (Säljö, 2000, 2005). We perceive the world through the tools and how the mediated action is carried out is based on our interpretations of the world (Säljö, 2000, 2005; Wertsch, 1998), which is culturally, historically, and institutionally situated (Wertsch, 1998; Wertsch & Rupert, 1993). In order to understand how we use cognitive resources and how we learn, it is essential to reflect on how we interact with tools, use them to solve problems, and cope in social situations (Säljö, 2000). The use of mediating tools does not change the problem of learning, but they change *the conditions* for learning as these tools are essential for how we think and how we interact with others and with our environment (Säljö, 2000). Communicative processes are central to a socio-cultural perspective of learning (Säljö, 2000) and therefore, it can be used for understanding "technology affordances as possibilities for human actions mediated by cultural means" (Kaptelinin & Nardi, 2012, p. 967).

LANGUAGE AND COMMUNICATION

The central role not only verbal *language*, but also non-verbal signals such as gestures, facial expressions, and postures, which we use in communication with others, is especially emphasised by Vygotskilj (1978). These non-verbal signals are typical of a face-to-face meeting and constitute an essential part of communication as they support what is expressed orally and provide shades of meaning (Lögdlund, 2011; Selander & Kress, 2010). Due to the non-verbal signals, it is often perceived that a face-to-face meeting facilitates communication compared to, e.g. a telephone call, where non-verbal signals are lacking. Video can provide the possibilities of *language*, both verbal (sound) and non-verbal signals (picture).

It is worth noticing that in a physical meeting, air affords reciprocal communication, which means that persons involved can predict what the others will see and hear as that is the same as they see and hear (Gaver,

1992). Since this *isotropism* is a prerequisite for many of the social conventions related to interaction, problems are likely to emerge when this isotropism is lacking, which is common when communicating through video (Gaver, 1992). With video, the picture is transferred by cameras to monitors, and the sound from microphones to speakers are independent and separated. Light and sound are therefore transmitted differently between different points, which makes video *anisotropic*. This means that it is more difficult for teachers and students communicating through video to predict what others will see and hear compared to communicating during a physical meeting. This situation interferes with the design of communicative gesture and with gaze awareness as possibilities of predictability of both gesture and gaze are weaker. To be able to see and interpret gaze are essential to facilitate turn-taking, indicate interest, and reflect social relations. With an anisotropic environment, which video is, real eye contact and the perception of gaze direction are difficult, which restrain interaction (Cunningham et al., 2010; Gaver, 1992; Kear et al., 2012). Possibilities to move may compensate for anisotropies (Gaver, 1996).

4.2 AFFORDANCES OF TECHNOLOGY

In the context of educational technology, the use of the concept of *affordances* refers in a broad perspective to the properties of a specific system, which enables and encourage certain actions and behaviour of the student (Koehler & Mishra, 2008). The use of technology can facilitate or inhibit student learning dependent on *the affordances* (possibilities and constraints) of technology (Andrews & Haythornthwaite, 2007b). *Affordances* are related to the possibilities for students and teachers, e.g. "ways of communicating and connecting with others, being visible in the online context, viewing and using data and information, creating and displaying content, linking with others and with resources" (Andrews & Haythornthwaite, 2007, p. 11). However, in order to realise affordances, technology needs to be used in such a way that makes it possible to take advantage of the affordances, i.e. users, (teachers and students) must have knowledge of how new features can be used and not refuse to use them for different reasons (Andrews & Haythornthwaite, 2007).

The theory of affordances originates from ecological psychology, where it was coined by James J. Gibson (1977, 1986, 2015). It has been used and discussed within several disciplines, e.g. design, HCI (Human-Computer Interaction), cognitive science and IS (Information System) (Gaver, 1991; Kaptelinin & Nardi, 2012; Leonardi, 2011; Norman, 2013; Oliver, 2013; Osborne, 2014; Salomon, 1993). According to Gibson;

> "The *affordances* of t*he environment are what it offers the animal, what it provides or furnishes,* either for good or ill. The verb to *afford* is found in the dictionary, but the noun *affordance* is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment" (Gibson, 1986, p. 127).

According to Gibson (2015), the animal and the environment are inseparable and dependent on each other. A prerequisite for the animal's existence is the environment, which surrounds it and equally important is the animal to the environment, as, without the animal, the environment has nothing to surround. The animal's relation to the environment can be defined as the animal is both a perceiver *of* the environment and a behaver *in* the environment (although the degrees might differ) (Gibson, 2015).

Affordances can be described as "the possibilities for users" (Andrews & Haythornthwaite, 2007a, p. 11). An affordance relates both to the environment and to the observer with one crucial difference (Gibson, 1986). The environment is not dependent on the organism for its existence, but the organism cannot live without the environment (Gibson, 1986). An essential basis for the theory of affordances is not whether affordances "exist and are real, but whether the information is available in ambient light for perceiving them" (Gibson, 1986, p. 140). Gibson makes a difference between *features of an object,* which he thinks is less critical, compared to the more critical *perceived affordances* of an object (Gibson, 1986, 2015). He focuses mainly on affordances that can be visually perceived as it is when seeing things the observer can perceive which affordances the object has. Based on that, a decision can be made whether to use the affordances or not (Gibson, 2015). This means that the observer's behaviour is highly influenced by visual perception. Gibson distinguishes between two kinds

of pictures; still pictures and motion pictures. He claims that the still picture is a frozen image as it captures a special moment in time from a specific immobile point of observation. The motion picture, on the contrary, changes and transforms. Gibson argues that the motion picture camera has similar qualities as a person's head as it can move in a similar way. It can look up or down and turn, but the visual solid angle captured by the camera is more limited compared to what a person's eyes can capture. The optical information provided to the viewer, is transferred by the same device, which consists of the camera, film, projector, and screen (Gibson, 2015).

However, there are also affordances, which can be perceived through other senses than sight, e.g. sound, smell, and tactile information (Gibson, 1986). If the affordances can be perceived, it is easier for the agent (the user) to find out the possibilities of interaction with the object. However, even if the affordances are not perceived, they still exist, and they do not change even if the observer's need changes (Gibson, 1986, 2015). These modalities can be characterised by the affordances they provide (Gaver, 1991). Gibson (2015) talks about a special kind of artificial objects, *devices,* which can display visual information. They can be images, pictures, and surfaces which you can write on. These devices can afford a specialised knowledge, which he calls *mediated* or *indirect*, as this is knowledge at second hand. The knowledge is permanent and can be stored (Gibson, 2015).

Central to the theory of affordances is *intention* (Gibson, 1986). Each technology can support multiple affordances, dependent on the user's intentions or purposes with using the technology (Markus & Silver, 2008). However, if the actor/user does not need a specific affordance, e.g. video for teaching, the intention to make use of it is lacking, and thus, the affordance has no meaning for the actor and video will not be used (Gibson, 1986). In order to realise affordances, technology must also be used in such a way that it is possible to take advantage of the affordances, i.e. users must have knowledge of how new features can be used and not refuse to use them for different reasons (Andrews & Haythornthwaite, 2007a). For example, if teaching with video shall be effective, it requires that the video content is closely related to the teacher's instructional aim (Bell & Bull, 2010).

However, it cannot be taken for granted that mediating tools solely facilitates communication and understanding (Säljö, 2000). The socio-cultural perspective discusses *both possibilities and constraints* (Wertsch, 1998), not concerning affordances, but how mediation empowers or enables action and how artefacts constrain or limit action, due to their properties (Wertsch, 1998).

Technology can also inhibit student learning dependent on *the affordances* (possibilities and constraints) of technology (Andrews & Haythornthwaite, 2007a). William Gaver has contributed to the knowledge of constraints within video and claims that constraints can limit possibilities of learning and decrease expected affordances if situated conditions, circumstances, or limitations of technology emerge (Gaver, 1992, 1996).

The theory of affordance is useful for analysing the results in this study as each medium[65] and technology have different affordances and constraints (Gibson, 1977; Koehler & Mishra, 2008). By identifying constraints, it is possible to understand *how* and *why* they emerge and *what* effects they have. With this understanding, it is possible to improve technology and inform design to reduce or even eliminate constraints. With knowledge of constraints; the effects that video has on interaction, communication, and collaboration can be understood, which have implications for design and help us improve interaction, communication, and collaboration in video environments. Even if constraints from a general perspective can be identified, social activities are situated, and therefore, constraints are also situated and dependent on the technology used (Gaver, 1992).

It is not unusual that our own biases and preconceived ideas of how a specific technology could be used inhibit a creative application of the technology, called "functional fixedness" (German & Barrett, 2005). However, "there is no one way to adopt the affordance lens" (Stendal, Thapa, & Lanamäki, 2016, p. 5271). Hansch et al. (2015) even use the concept of "pedagogical affordances of video" (2015, p. 2). Different aspects are included, such as the relation between the type of information and how well a specific medium can convey this information, how the content is presented and perceived by the audience, and to what degree there are constraints in adapting the influence of a message (Collins et

65 For more information about media, see section 2.7.

al., 2000). Some researchers claim that it is crucial to make a distinction between affordances and constraints which "are *inherent* to the technology and those that are *imposed from outside by the user"* (Koehler & Mishra, 2008, pp. 5-6), while others consider this issue as a topic for discussion (Gaver, 1991; Norman, 1999).

Video has *the affordance of social characteristics* as attitudinal or emotional aspects of a subject, or an issue can be conveyed (Collins et al., 2000; Moore & Kearsley, 2005). This entails that there is a high degree of involvement in video, which offers excellent opportunities for student engagement of the content as more than one sensory system is used (visual and audio) (Collins et al., 2000; Mitra et al., 2010). A lecture in the form of talking heads makes it possible to see the authors of ideas. Also, it provides the essential cues which are characteristic of face-to-face communication and which are excluded in, e.g. text (Collins et al., 2000). However, if these cues for some reason cannot be perceived in the video situation, then the affordance of social characteristics is constrained. Affordances are *situated,* i.e. they exist in a specific context, which corresponds very well with the socio-cultural perspective (Heft, 1989; Säljö, 2005). They are related to the possibilities for students and teachers, e.g. "ways of communicating and connecting with others, being visible in the online context, viewing and using data and information, creating and displaying content, linking with others and with resources" (Andrews & Haythornthwaite, 2007a, p. 11). For example, recorded video has the capability of *showing concrete examples of abstract concepts* (Bates, 1987, 2005) and "video is most effective when the message to be conveyed is conceptual or is of a nature that enables it to take advantage of the multiple sensory inputs that video provides" (Shephard, 2002, p. 323). This can, e.g. be used to analyse the event from an abstract view, which is useful as a tool for teaching procedures (Bates, 2005). To explain this content with text can be challenging (Bates, 2005) and therefore, video can be superior, e.g. to text in certain learning situations (Bates, 1987). The fact that video has the key feature of richness means that video has the affordance of *offering information in an attractive way* (Wieling & Hofman, 2010). Video also has *the affordances of capturing and keeping attention* (Moore & Kearsley, 2005) and of *demonstrating people's interaction*, which offers good possibilities of *learning interpersonal skills* (Moore & Kearsley, 2005).

Furthermore, video has *the affordance of transferring impressions* (Moore & Kearsley, 2005), e.g. viewing objects and realistic scenes, bringing events, environments, and situations directly to students, which might not be accessible for students otherwise (Bates, 2005). In addition, video has the affordances of *showing spatial relations* (Collins et al., 2000) and *the look and feel of processes*, e.g. to see sequences in motion, show events and processes unfold in the way they happen. This makes it possible for viewers to see and recognise objects, people, and places which take part in the act (Collins et al., 2000). For example, when a lesson is captured in a video case, a great deal of the lesson context is included in the recorded video. Teacher students can see the students and how they are acting, the physical setting of the learning environment in the room, how time is allocated, materials and how accessible they are, classroom interruptions, and other factors that might have influenced the teacher's acting and decision-making (Olson et al., 2016). Video also has the affordances of *showing several different perspectives;* e.g. close-ups, motion in varying speeds, demonstrating several perspectives of an issue or a subject; (Moore & Kearsley, 2005), and showing complex or ambiguous situations (Bates, 1987, 2005). The use of voice in video, e.g. as *an affordance of narration*, provides an extra dimension, which is particularly important in education, when a voice can be used to explain what is happening and why it happens, even at the same time as it happens (Collins et al., 2000; Zhang, Zhou, Briggs, & Nunamaker Jr, 2006).

When we are physically present in a location, we have a spherical field of visual information, which means that we can see almost everything around us (that is not hidden by something) without moving our head or eyes (Gaver, 1996). Video constrains *perception* (Gaver, 1992), which means that what we see through video is a *restricted field of view of remote sites.* It can, therefore, be difficult to perceive peripheral activities, if the camera does not capture remote information and if the focus is on other activities. Remote events can also be unnoticed if the monitor is on the periphery of the optical information (Gaver, 1992). How much we see of the environment when video is employed depends on two factors; 1) how much the wide-angle lens of the camera can capture and 2) the size of the screen where the video is displayed (Gaver, 1996).

This means that there is a selection of what is shown to the audience and that, e.g. the producer can influence what the audience sees,

which influences credibility (Collins et al., 2000). The peripheral vision is limited and perceptual exploration as possibilities to look around and expand our field of view is constrained (Gaver, 1996). For example, we are unable to see whether there are other persons present in the room of the remote site if the camera does not capture them (Gaver, 1992). Also, the wide-angle lenses determine how much visual information we can get from the remote site. A wider angle increases possibilities to see more of the remote site but often results in a loss of quality, which reduces the possibilities to see details (Gaver, 1992). For example, it is easier to communicate with a group of students in a video conferencing studio (up to the number of persons that can be visible simultaneously on the screen) than it is to have many individuals connected in a desktop conference, when the video of every participant is shown (up to a certain number of participants, dependent on the technology used). If too many sites are connected simultaneously in a video conferencing (more than five), the interactivity in the conference is constrained and it becomes difficult to see all sites in picture, to have eye-contact, and to clearly see facial expressions, cues etc. (Caladine et al., 2010).

Participants, who are not visible in the video conference, tend to lose interest in the video conference as they do not feel involved. In order to overcome this problem, it is either necessary to have a better resolution than our eyes can register or that multiple video images can be integrated. However, how detailed a video is depending on the resolution of the video, i.e. it is constrained by the technology (Gaver, 1992). The other constraints mentioned here above are related to the static perception of remote locations through video, which happens if cameras and microphones are stationary or only moved remotely (Gaver, 1992). However, during the physical presence in a location, it is rather unusual with static perception as we explore our environment in order to discover new perceptual information by moving around in the environment.

When video is used, *the exploratory movement is not supported*. To move is a prerequisite to be able to see an environment from different angles and from long or short distances, to see more or fewer details, to select whom we want to talk to, to avoid noisy environments etc. Those possibilities are constrained when our perception of remote sites is transmitted through video (Gaver, 1992, 1996). It is therefore essential that video sys-

tems afford movement and not only makes movement possible but also invites to and facilitates movement (Gaver, 1992, 1996).

Much of the three-dimensions are lost with video and movements in remote sites are mostly perceived as two-dimensional, which makes it difficult to discriminate and attend to persons and things based on their distance (Gaver, 1992). This also results in that exploration, inspection, and peripheral awareness are limited (Gaver, 1992). In order to increase the three-dimensional structure, users can wear special glasses (Gaver, 1992; Odhabi & Nicks-McCaleb, 2011) or several displays can be used, one for each eye (Gaver, 1992). Since *the digital medium alters sounds*, the auditory information made available by video will be biased (Gaver, 1992). For example, microphones, which capture the sounds, and speakers, which represent the sounds, also shape the auditory signals. Unwanted sounds can disturb the perception of sounds that we want to hear. Furthermore, microphones to a higher degree capture sound from locations near, which means that there is a disproportionate emphasis on peripheral noise, like footsteps, machines, and traffic. When being physically present in a location, we can ignore the disturbing sound and focus on the sounds we are interested in hearing (Gaver, 1992).

Another reason why we experience that an artefact/technology has constraints can depend on that most of the cultural tools we use are designed for another purpose than we use them for (Wertsch, 1998). For example, video conferencing equipment and desktop conferencing software, which initially were developed for business meetings, but are also used for educational purposes now (Carter, 1997; Lazar, 2007; Mason, 1994; Weinman, 2007). Digital video is an *unstable artefact* as the development of technology goes very quickly, which influences the possibilities of video (Gaver, 1992). How we interact, communicate, and collaborate when video is used, is shaped by the properties of video and they change as a result of the development of technology (Gaver, 1992). This perspective on video in digital distance education is crucial for the analyses that unpack the research questions in this thesis.

CHAPTER 5
DESIGN AND METHODS

In the work of conducting the studies for this thesis, I have drawn on a reflexive personal engagement with digital tools in my teaching that has influenced my understanding of their development and use. My experience of distance education dates back to 1994 (which has been described in section 1.1). Parallel to my work with this thesis, I have had the possibility to keep myself updated with what is happening concerning the use of video and other digital tools within digital distance higher education. As a PhD student, I have maintained my engagement being involved in teacher education through teaching courses on ICT and through projects where I helped teachers to develop their digital competence in using ICT in their teaching. I also taught a part of a distance course, "Distance Education and Learning", (15 ECTS) during four semesters, in which I used several tools for desktop conferencing such as Interwise[66] and Adobe Connect. In addition, since 2011, I have worked as an Educational Developer at several universities. First at Mälardalen University, then at the University of

66 Interwise was bought by AT&T in 2007 and became AT&T Connect. https://www.crunchbase.com/organization/interwise. (Retrieved 6 June 2019).

Skövde, and for the past five and half years, at the PIL Unit[67] at the University of Gothenburg. As an Educational Developer, I have been responsible for several courses in distance pedagogy for teachers, where the use of video and video conferencing have been included. In my work as a pedagogical consultant, I have helped teachers design and organise distance courses. Providing me further opportunities to reflexively draw on the professional experience of my study object, I have taught a distance course in Andragogy, in which I used video-recorded lectures recorded in a video conference studio. I have also taught and been course coordinator for more than 20 blended and distance courses in Teaching and Learning in Higher Education. Due to my interest in using modes of communication other than text in my distance teaching, I have long used video and other digital tools such as a document camera for showing small objects.[68] In distance courses, I have used video conferencing or desktop conferencing, and in blended courses, the "flipped classroom"[69] method of using recorded videos has been an essential part of my practice during the past five years. This extensive professional engagement with the study object of this thesis has made it possible for me to try out and reflect over the affordances and constraints (Gibson, 1986, 2015) when using different methods for video-recorded lectures such as making a recording without students or during a lecture with students present. I have been able to compare and contrast techniques such as recording with a prompter, as a "talking head", with or without a PowerPoint presentation, or with the use of "green screen" where a background is added afterwards.

The practical experience described above has had an essential influence on the work of this thesis as I have been able to continuously interact with the phenomenon I have been researching and consider how video can be best used in teaching. This has made it possible for me to reflect on different theoretical perspectives over long periods and evaluate the

67 PIL stands for Pedagogical Development and Interactive Learning (in Swedish).

68 The document camera can enlarge small objects to make them visible in class.

69 "Flipped or invented classroom" is a teaching method, which means that students prepare *before* the course meeting, often through watching video-recorded lectures. During the course meeting, the teacher is available to help and support students when they do assignments, labs, and tests (Sams & Bergmann, 2012, 2013).

results in the literature and my empirical studies. Similarly, I have also had the opportunity to reflect on technological development and how possible affordances have not been realised due to different conditions in specific teaching situations. One example is from the time when it was common to use two ISDN-lines for video conferencing when only two or three sites could be in the picture at a time. Picture quality was generally poor and missing non-verbal cues affected the communication situation between teacher and students. I have been able to contrast this situation with the development of telepresence with good quality of picture and sound, which has improved the possibilities to perceive non-verbal cues and has therefore contributed to better communication and understanding between teacher and students. Such long-term personal engagement means that there is a process aspect in my method, combining empirical research with practical experience resulting in a reflexive professional engagement that is a contribution in itself.

5.1 DESIGN OF THESIS STUDIES

In this chapter, the design and methods of the studies in this thesis will be described. This thesis aims *to better understand the possibilities and limitations of video in digital distance education*. The research questions are;

a. RQ1: How is video used in digital distance education?
b. RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?
c. RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance education?

Based on this aim and these research questions, I will here argue for how the research design has been developed and for the decisions made.

In order to obtain a review of *which categories* of video that were used, *how* they were used, and *why* they were used or *not* used, a survey of descriptive and explorative character was conducted (Cohen, Manion, & Morrison, 2007). The primary purpose for chosing a descriptive research approach was to acquire as much knowledge as possible within a specific field, and descriptive research is especially suitable for the questions "why", "what", "how" (Yin, 1994), which are central in this thesis. Another argu-

ment for descriptive research is that the results can be used when selecting a subject for further investigation (Yin, 1994). A category of video for an interview study was going to be selected to focus on the RQ2 and RQ3 (see here above). Characteristics of descriptive research (also known as statistical research) are that it describes and presents data (Cohen et al., 2007) and that there are gaps of knowledge within the selected field (Patel & Davidson, 1994). The review of research in chapter 3 showed that there are such gaps. Since it is challenging to provide in-depth and detailed information from a survey, another complementary study was also needed. It was decided to do an interview study, as this is a suitable method to find a more situated description. Also, an interview study can provide a deeper understanding of how course designers' respond to the possibilities and limitations of video for distance higher education and teachers' attitudes and perceptions with regard to the use of video in distance higher education.

The category of *video conferencing* was selected for the interview study. Video conferencing is of particular interest in distance education due to its possibilities of providing live, two-way communication and meetings despite the geographical distance, which often is used in order to replace physical meetings (Smyth & Zanetis, 2007). This means that the interview study became a follow-up of the questionnaire (Holme, Solvang, & Nilsson, 1997). Another alternative could have been *desktop conferencing* as it has similar key features, but it was not as well established as video conferencing during the time of the investigation.

In this thesis, both the top-down and bottom-up approaches have been used. On the one hand, a top-down approach has been used in the first study, as an analysis of which questions that should be included were based on my research questions (Cohen et al., 2007). On the other hand, a bottom-up approach has been used for the second study as the answers to the interview questions have been analysed without having a predetermined categorisation. The categories of the answers were instead created from the data (Cohen et al., 2007).

After this general perspective of methodological and design issues, the more specific descriptions related to the two studies will follow, starting with the study 1.

5.2 STUDY 1 - QUESTIONNAIRE

METHODS AND INSTRUMENTS

A questionnaire as a web form was selected as that is less time consuming and more convenient for both respondents and researcher compared to sending a postal questionnaire (Cohen et al., 2007). It is also easier to ask and control complex question branching/skip patterns, i.e. contingency questions with a web form. Contingency questions mean that the respondent's answer directs the next question to the previous question. In that way, respondent's time is used respectfully as he only needs to answer relevant questions (Cohen et al., 2007). For instance, if the course coordinator answered that he did not use that type of video, there was only one more question regarding that field, which concerned the reasons for *not* using that particular category of video. If the course coordinator instead answered that he used video conference, he would get another four questions within that section. More about contingency questions will be explained later in this chapter.

Due to the large number of respondents, the questionnaire was highly structured and only dichotomous, and multiple-choice questions were used, which has the advantage that response frequencies can be measured and the results are suitable for statistical treatment and analysis (Cohen et al., 2007). The coding and analysing process is also quicker, and the questions are more directed towards the information that the researcher is searching. However, the drawback with highly structured closed questions is that it is very time-consuming to develop such a questionnaire as the researcher has to take full responsibility for providing all possible alternative answers the respondents may need when answering the questions (Cohen et al., 2007).

CONSTRUCTION OF THE QUESTIONNAIRE

In general, video may serve more functions in distance courses compared to campus courses. The questionnaire was divided into ten sections. The first section regarded teacher's background information, which was one

object of analysis. The other object of analysis was the course or programme[70] , and therefore, specific questions had to be answered for each course. The third object of analysis was *video.* As have been described in section 2.7, the use of technology is always situated, i.e. no technology is the best for all teaching and learning situations and to all students (Laurillard, 2002; Moore & Kearsley, 2005).

Furthermore, technology can both support learning and create obstacles in the learning situation and technology changes the learning situation (Koehler & Mishra, 2009; Säljö, 2010)(see section 2.7). The most important factors for learning with the support of technology is how to select the technology for a specific situation and how to use it in the most suitable way (Laurillard, 2002). In sections 3.1 and 3.4, several examples are brought up regarding that *video* is a problematic concept and that video is often not defined in research. Different types of recordings of video are often mixed in the results without considering how that can affect the result of the study. From a pedagogical perspective, it is essential to distinguish between different categories of video as they are intended for different purposes. For example, the teacher's pedagogical purpose is different, if, e.g. video-based materials are used instead of text-based literature compared to when a recorded lecture is used in order to replace the lecture in the classroom. Therefore, it has been necessary to clearly define the different categories of video and formulate questions about them separately in the questionnaire according to the typology presented in section 3.4 and 3.9. The questions concerning *how* video was used, *why it was used or not used* were based on the theoretical approach of affordances, i.e. how the course designers perceived the possibilities and constraints of the six categories of video (Gibson, 1986, 2015).

The questionnaire was divided into six sections, and most of the questions regarding these six categories of video were the same or similar for all categories of video. The questions needed to be as similar as possible for the six categories as the intention was to compare the results between the different categories. Each section began with a question regarding whether the specific category of video was used or *not* in the course. If

70 Henceforth only "course(s)" will be used instead of course(s)/programme(s) except when it is important to point out that there is a distinction between the two terms.

the answer was *yes*, the following questions were asked (with some adaptation to the category of video):

- how the categories of video were used (only for the categories *video as a tool for learning, video conferencing*, and *desktop conferencing* as they are the most interesting to investigate for distance education and it was necessary to limit the number of questions in the questionnaire),
- which the three most important purposes of using the video category were,
- to what extent the category of video was used,
- whether the video category was compulsory or optional for students, and
- how the video was distributed (not applicable for video conferencing and desktop conferencing).

If the course coordinators answered that they did *not* use a special kind of video, they got the question of *why* they did not use that video category. Both these two questions could be answered by marking a maximum of three alternative answers, or they could choose to mark the alternative answer; *Other, namely …* and write an open answer. These open answers have been analysed and categorised into five to ten categories. The same categories have been used as consistently as possible throughout the different categories of video, even though some adaptations have been necessary.

The alternative answers, regarding *the three most important reasons for using* a category of video, were developed to cover different perspectives; pedagogical perspective, subject matter, the content of the course, students' motivation, mode, and variation in teaching methods. Depending on the category of video, there might be minor adaptations in the formulation of the answers.

For the alternative answers regarding *the three most important reasons for not using* a category of video, reasons were related to institutional factors, the students' perspective, infrastructural factors, pedagogy, didactics, educational planning, subject matter, the individual teacher and his knowledge and experience, i.e. the teacher's background factors.

For three types of video; *video conferencing, desktop conferencing,* and *video as a tool for learning*, there has been a particular set of questions directed towards the pedagogical use. The reason for only selecting the first two categories for this particular set of questions is that they are not likely to be used so much in campus education as they often are used to replace physical meetings. Therefore it was especially interesting to find out how these categories of video were used, as this thesis is directed towards distance education. The third type, *video as a tool for learning*, could be used in different ways and therefore, it was interesting to find out how it was used. Most teachers in the investigation had only one course, and in total there were 20-49 questions for course 1, depending on how many categories of video were used etc.

The table below shows how many questions the respondents received. The difference in numbers between the minimum and maximum of questions depends on that the number of questions the respondents received was directed by their answers (contingency question). If a teacher, e.g. answered that they did not use a category of video, they only received one question concerning the most important reasons for not using the category of video. If they instead answered that they used that category of video, they received questions such as how they used it and why they used.

Table 1 Outline of the different sections in the questionnaire.

	The different sections in the questionnaire	**Minimum of questions**	**Maximum of questions**
1.	The course coordinator's gender and age, experience of distance education, in-service training within the distance learning field (if any), experiences of video conferencing, and desktop conferencing	7	13
2.	Background questions related to a specific course	7	7
3.	Video-based materials	2	8
4.	Video materials not produced for pedagogical purposes	2	6
5.	Video-recorded teaching situations	2	9
6.	Video conferencing	2	5
7.	Desktop conferencing	2	5
8.	Video as a tool for learning	2	5
9.	The course coordinator's planned use of video during the autumn of 2009	1	2
10.	Use of video in the course coordinator's other distance courses/programmes during the spring of 2009	1	4

The priority was made to use mandatory questions except for specific questions regarding background information of the course, which were set as optional due to ethical reasons, (which will be further explained later in this section). With mandatory questions, the respondent cannot proceed to the next question without having responded to the previous question, and the risk of item nonresponse is eliminated (Cohen et al., 2007). However, some respondents react negatively to mandatory questions and leave the questionnaire without completing it. This means that the data of the questionnaire will never be sent in, which will have a negative effect on the response rate. However, with optional questions, the collected data is less valuable if many answers are missing (Cohen et al., 2007).

There is always a risk when a highly structured questionnaire is used, that alternative answers that respondents wanted to mark are missing, as it is difficult to cover every possible option for all individuals (Wärneryd, 1990). As recommended by Wärneryd (1990) a last open-ended question, "Other comments" was provided for the three most important purposes of using a particular type of video and the reasons for *not* using different categories of video.

CHOOSING AND PILOTING THE QUESTIONNAIRE

After investigating several tools, EsMaker[71] was found, which could fulfil all the prerequisites of the questionnaire without making any adaptations of the questionnaire to the tool. Two reminders were sent out, solely to the respondents who had not answered the questionnaire. The first was sent after five days and the last one after ten days. The answering time was limited to 17 days.

The questionnaire was tested on a pilot group of seven people consisting of teachers, PhD students and other colleagues. The purpose of this test was mainly to check that the questions were comprehensible, that the instructions worked, that the alternative answers covered possible answers etc. (Ejvegård, 2009). Some questions were reconstructed in the final version of the questionnaire after feedback from the pilot group.

RESPONDENTS/INFORMANTS

The decision was made to do *a whole population study*, a national study, as there was not enough information about the population to make a sample and because many variables were required, e.g. when questions were asked about subject matters or subject (Cohen et al., 2007).

There are reasons to assume that several factors are influencing the choice of and use of technology in a distance course, e.g. institutional conditions, teachers' pedagogical approach, teachers' knowledge of technology for educational purposes, frame factors such as financial resources, teachers' time, equipment, technical support etc. The person who has the

71 http://www.entergate.se/.

knowledge of and makes the decisions of most of these conditions and circumstances on course level is in most cases the course coordinator. Even though it is common that several teachers are involved in a course, it would be too complicated to collect information from all teachers involved. Also, the circumstance that several teachers may be asked questions about the same course would produce misleading results. The course coordinator has the necessary picture of the course as well as knowledge of other important factors for making choices of the technology to use in a course; based on, i.e. subject matter, the extent of the course, and whether it is a course or programme. Due to these reasons, the course coordinator was selected as a respondent in the national study.

I have chosen to use the term "informants" for these course coordinators. The reason for this is that they were not solely respondents and answered questions about themselves as persons. They have also been my informants regarding background information, designing, planning, organising, and accomplishment of the courses.

Initially, the questionnaire was sent to all 1,553 course coordinators, who were considered to be responsible for distance courses in Sweden during the spring of 2009. However, 48 of them were no longer working as course coordinators since they were on sick leave, had ended their employments etc. Sixty-seven were not the course coordinator of the course, 35 of them were not responsible for a distance course, and five of them had their courses cancelled. That means that 155 informants had to be removed from the study and 1,398 course coordinators remained.

ATTRITION

Of the 1,398 course coordinators who received the questionnaire, 534 did not answer it, and 62 informants had only opened it without answering any questions. To determine whether there was a particular reason for not answering, which may have influenced the results, a follow up was done (Ejvegård, 2009). Every 10th course coordinator was contacted by phone and asked why he had not answered the questionnaire. The reasons were very varying (did not have time, problems with connections abroad, had been away, etc.). Even though the follow up did not show any biases, there could still be a risk for bias as the course coordinators, who did not use

video at all, could be less motivated and therefore could be overrepresented among those who did not respond to this survey on the use of video. One-hundred-five course coordinators only answered parts of the questionnaire. Sixty-two course coordinators who answered the questionnaire as far as to question 5 a, received a special reminder saying that it would be valuable to have their answers and informing them about how much was left of the questionnaire.

For six informants, there was no answer to the first question within the six areas of video in the questionnaire: "Do you use this particular kind of video in this course/programme?"[72] This probably occurred because the informants had first answered the question, then proceeded to the next question and after that moved back to the first question again and unmarked their answer. The problem could have been avoided if the questionnaire had been constructed in such a way that is was impossible for the informants to move backwards. The answers to questions about the particular area of video from these course coordinators have been omitted from the results. Attrition of the remaining questions will be presented together with the results of the specific question.

PROCEDURES (DESIGN AND IMPLEMENTATION)

This study was conducted at the beginning of the autumn in 2009, and a historical selection was made (Cohen et al., 2007) because it was essential for the results that the respondents had designed, planned and carried out the distance course they were asked about. Therefore the previous semester, the spring of 2009 was selected. The information of the available distance courses was collected from the website www.studera.nu during the spring of 2009, which lists all courses and educational programmes that students can apply for in higher education in Sweden. The website was launched in 2001 and was managed by *The Swedish National Agency for Higher Education (HSV)*[73] in cooperation with *The National Admissions Office*

72 Dropped due to incomplete data sets for the questions 6a, 7a, 8a, 9a, 10a, and 11a.

73 Högskoleverket, HSV in Swedish, http://www.hsv.se/.

to Higher Education[74] since 2005[75]. HSV was shut down in 2012, and the Swedish Council for Higher Education, (UHR)[76] was established in 2013 and took over the website www.studera.nu. Swedish Higher Education Institutions, (HEIs) contribute to the site with information of their educations in order to make their courses and programmes searchable. Distance courses and programmes for the study were filtered from all the courses/programmes by searching for *distance courses, all levels of education, all subject matters, all institutions of higher education, and spring 2009*. During the spring of 2009, approximately 3.500 distance courses/programmes were marked as distance courses on the website. However, there were only 2.650 distance courses, when all cancelled courses were excluded. When analysing the courses of each HEIs, it was revealed that about 500 courses for the spring of 2009 were marked as cancelled.

In order to send the questionnaire to the course coordinators, their e-mail addresses were required. The primary source for finding these e-mail addresses was the links from www.studera.nu to the course web sites. However, it was often necessary to mail study advisers and others in order to obtain the course coordinators' e-mail addresses. Most people were helpful and provided the addresses for me. Only one study advisor at one department refused to give me the course coordinators' e-mail addresses and suggested that I instead should use the course e-mail addresses for these 65 courses, which I had to do. This limited the possibilities of receiving answers from these course coordinators and unfortunately it resulted in that I only received answers regarding a couple of these courses.

When tracing the course coordinators' e-mail addresses, it was discovered that there were even fewer courses that had been carried through and for 30 of these courses I did not manage to obtain the course coordinators' or course e-mail addresses. At least 850 (24%) of the approximately

74 Verket för Högskoleservice, VHS in Swedish, http://www.vhs.se.

75 As from 12 September 2011, it is not possible for students to apply for courses and programmes on http://www.studera.nu and HSV alone is responsible for the site. Students' applications are instead moved to http://www.antagning.se, for which VHS was responsible.

76 https://www.uhr.se/en/start/

3,500 courses that were published on the website www.studera.nu for the spring of 2009 were not realised. This can be compared to 3,723 courses and programmes that were offered during the autumn of 2009 (Amnéus, 2011).

The reasons for this discrepancy in advertised courses compared to realised courses were several. Some courses were cancelled due to a lack of students, and some HEIs had a strategy to mark additional courses as distance courses although they were campus courses because they thought it was good publicity. Other courses only ran during the autumn but were advertised for the spring semester as well. It turned out that 16 courses, marked as distance courses at www.studera.nu, were campus courses and they were excluded from the study. This analysis showed that there is a risk of an overestimation of the number of distance courses and programmes if not every course is followed up.

In total, the answers of the questionnaire covered 1,246 courses/programmes and 852 of these were "unique". The remaining 394 courses were duplicates of the 852 courses; i.e. the course has the same name, video is used in the same way, but there might be differences in, e.g. teaching language, study pace and the same course could be offered twice during different periods[77] but during the same semester etc.[78]

Twenty-six out of 56 HEIs offered distance courses according to www.studera.nu. The number of distance courses of each of these 26 institutions varied from 2 to 422 distance courses, cancelled courses excluded.

The course coordinators, who had several distance courses, could answer the questionnaire for each course, but most course coordinators did not, and on average, they filled in the questionnaire for 48% of the realised courses.[79] It is worth noticing that some of the institutions with many courses had a rather low response rate while institutions with fewer

77 The semesters are divided into periods depending on whether the course begins at the beginning or middle of the semester. The spring semester has periods 1 and 2 and the autumn has periods 3 and 4.

78 A course with groups of students in several locations is regarded as one course, since the course code is the same.

79 Karolinska institutet had 93.3 % answers but in total there were only 15 courses, so that result is not comparable with the result from the HEIs with 50-421 courses.

courses had a higher response rate. This might indicate that the course coordinators from HEIs with a smaller number of distance courses were more inclined to answer the questionnaire.

Naturally, it is possible that more courses were cancelled, e.g. if the institutions did not update the information on their web sites. It is also possible that some of the courses that I have been unable to obtain the course coordinators' e-mail addresses have also been cancelled. I might have had some of these teachers' e-mail addresses already without knowing it, as some teachers were responsible for several courses. The web questionnaire was sent to the course coordinators of 2.650 distance courses. Even if there were some difficulties in finding e-mail addresses for all the courses, it is reasonable to assume that the collection of e-mail addresses was successful.

ETHICAL CONSIDERATIONS

The ethical principles (honesty, openness, orderliness, consideration, and impartiality) have been followed (Vetenskapsrådet, 2011). In order to protect participants in research studies, there are four main rules regarding ethical considerations that researchers must follow (Vetenskapsrådet, 2011). The first rule is about the demand for information, i.e. the researcher must inform the participants in a study about the purpose of the research, how the study will be conducted and the conditions for participation. The informants were informed correctly through a letter that was sent by e-mail together with the questionnaire. The second rule is about the participants' consent, i.e. that the participants should be informed about that they have the right to decide whether they want to participate in the study or not and that they can interrupt their participation at any time during the study (*Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning [Electronic resource]*, 2002). The letter consisted of information about the study, its purpose, and that participation was voluntary. The third demand is the rule of confidentiality, which means that individuals' privacy interests must be protected. To protect the course coordinators' identities, they were called by a number instead of their names in the SPSS file. Some of the questions in the questionnaire regarding background information of the course was not set as mandatory out of consideration as some of the course coordinators' might be easy to identify.

COURSE COORDINATORS' BACKGROUND

There were about as many men (52%) as women (48%), (N=740). This means that the percentage of women teaching at a distance was significantly higher in my study (χ=10.68, df=1<0.01) than in Swedish higher education in general, where the percentage of women was 42% and for 58% men (*Universitet och högskolor. Personal vid universitet och högskolor 2008*, 2009).

The average age of the course coordinators was high as 55% were between 49 and 68 years old. This is higher compared to teachers in Swedish higher education in general (*Sveriges Officiella statistik Statistiska meddelanden. Universitet och högskolor. Personal vid universitet och högskolor 2008*, 2009), where 34 per cent of the researching teaching staff were 55 years or older.

ANALYSIS

In the analysis of the results, Moore's three categories of interaction(see section 2.5), student – content interaction, student-teacher interaction, and student-student interaction were used (Moore, 1993b). Some types of interaction are especially applicable to specific categories of video. Student – content interaction has been used for analysing the results of *video-based materials* and *video-materials not produced for pedagogical purposes.* Student-teacher interaction has both been used for recorded video in the category *video-recorded teaching situations* and live video in *video conferencing,* and *desktop conferencing.* Student-student interaction is the type of interaction that could take place in most categories of video; *video-recorded teaching situations, video conferencing, desktop conferencing,* and *video as a tool for learning (both video-making by students and video recording of students).* The concept of communication, which included both different modes of communication and synchronous and asynchronous communication, has been used to analyse the use of the six categories of video. The socio-cultural perspective has been an analytical lens for analysing the human-mediated interaction with mediational tools, i.e. how teachers and students in digital distance education interacted with video (see section 4.1). Even if different categories of video has features, it is more interesting for the design of teaching in higher education to analyse how teachers in digital distance education have

perceived the affordances (see section 4.2) of the six different categories of video.

The results of the questionnaire have been analysed both with the 1,246 courses/programmes (duplicates included)[80] and the 852 unique courses/programmes as the basis. Since no significant differences between these options were found, the decision was made to present the results based on the answers of the total offer of distance courses and the basis for analysis was all the 1,246 courses/programmes that the questionnaire covered.

Before choosing tools for analysing the data, it was necessary to decide from which perspective the data was going to be analysed. There were three different approaches to this thesis. One approach was that of the respondents, i.e. the course coordinators who had given the teachers' opinion in the survey from their perspective. When designing the distance courses, it was the course coordinators who could see the possibilities with the use of video, but it was also the course coordinators who perceived the constraints that video entailed in the teaching situation. The other approach was the six categories of video that have been investigated. The third object of analysis was the courses/programmes. The character of the survey is descriptive, and therefore analyses in the form of tabulations and cross-tabulation have been made. Cross tabulations were made in order to explore correlational patterns in the data.

The open answer: "Other, namely …", which was available for two of the questions; (the three most important purposes of using and the three most important reasons for *not* using) have been analysed and first categorised into one set of categories for each of the questions. Within these two sets, the categories have then been put together into five to ten broader categories. The same categories have been used as consistently as possible throughout the different categories of video, although this option has not been used for each of the six categories.

For the questions concerning the three most important purposes of using a particular kind of video, have the following categories been created: *1) flexibility – accessibility, 2) pedagogical reasons, 3) method, and 4) other.*

80 Duplicate courses/programmes mean that it is the same course with the same syllabus, but it could run in another pace, (maybe half-time or full time studies), it can be started several times during the semester, both period 1 and 2 etc.

Examples of answers that have been categorised in the category of *1) flexibility* – accessibility is that the respondents have wanted to offer increased flexibility in different ways, e.g. providing the knowledge of experts, offering material to the distance students that the campus students have access to, and making it possible that the students can watch lectures when, where and how many times as they want. These answers can be compared to some of the alternatives answers that were given in the questions: *"To replace physical meetings"*, *"Teacher and students can be in different locations"*, *"Teaching in several locations at the same time"*, and *"Possibility of revision"*. In the category of *2) pedagogical reasons*, there are examples as; to add a presentation mode, to complement teaching during physical meetings, to give lectures, to use course meetings to other things than lectures, to use video as tool for documentation, for examination, for motivating the students, and for creating a pleasant social climate. These answers can be compared to the alternative answers: *"As an alternative mode"*, *"To increase motivation"*, *"To give entertainment/change"*, *"To complete other material"*, and *"An alternative to written communication"*. The category of *3) method* includes only a few answers in the field of video as teaching materials, as, e.g. that the purpose is timesaving, which can be compared to the alternative answer *"A cost-effective way of offering teaching"*.

Regarding reasons for *not* using a particular type of video, the following categories have been created: *1) method – other choices, 2) method – negative choice, 3) problems related to technology, 4) due to legal reasons, 5) lack of resources, 6) lack of knowledge, 7) under development, 8) a good tip, 9) do not understand the question,* and *10) other*.

In the category of *1) method – other choice*, the answers indicated that the teachers have made a decision to use something else instead as the following examples showed: it is not part of the course, the course has worked well anyway, other methods are chosen, the students choose materials, the course is based on physical meetings, or seminars, discussions, external lectures, or text-based asynchronous material, the teacher prefers her materials, and other technologies are used. These examples can be compared to the alternative answers that were available: *"Desktop conferencing or similar is used instead"*, *"Video conferencing or similar is used instead"*, and *"Nobody has requested it"*.

The category *2) method – negative choice* covered answers that were characterised by a negative attitude to the use of video, e.g. that it demands too much work, the teachers do not want to use video or do not believe in video, fear that the teaching profession is going to be replaced by video, it is asocial, students are spread all over the world, lectures cannot be recorded without students, it is an old fashioned technology that is disappearing, and it is unsuitable from pedagogical perspectives. These answers can be compared to the following alternative answers in the questionnaire: *"No suitable material", "It requires thorough planning", "Difficult to find a time that suits all students",* and *"Difficult to make students travel to a studio", and "It does not add anything"*.

In the category *3) problems related to technology*, there are answers regarding that students are unfamiliar with technology, technical problems, problems with students' technology, problems with students' bandwidth, and that the platforms cannot handle video. These examples can be compared to the alternative answers: *"Too many problems with technology", "There is no technical support",* and *"Problems with students' infrastructure"*.

The category of *4) due to legal reasons* includes answers as, e.g. problems with copyright and uncertainty of the laws regarding copyright. In the category *"It feels uncomfortable"*, answers as that the teacher was uncomfortable with teaching in front of a camera, and that it felt strange to see and hear oneself on film can be found.

The category *5) lack of resources* covers answers as, e.g. that there is no material, lack of time, it is not cost-effective, and that there is no money, which can be compared to the alternative answers: *"Lack of time", "No money"*, and *"No necessary equipment"*.

Examples of answers in the category *6) lack of knowledge* is that the teacher has not thought about it, lack of knowledge whether suitable material can be found, need of further education, and that the teacher does not know how to use it, which can be compared to the alternative answer *"I have no experience of using it"*.

In the category *7) under development* the following types of answers can found: that it is going to be implemented in autumn 2009, that it is under development, and that they are working on developing the use of this kind of technology.

Category *8) a good tip* included answers that teachers have been inspired to start using video by the questionnaire. The answers, in category *10) other*, cannot be placed in either of the categories as they are very special.

As the table below shows, there was more variety in the arguments for *not* using a specific type of video than regarding the reasons for using a specific category of video. When comparing the alternative answers that were given in the question with the categories for the open answers, there are mainly four categories for *not* using a specific type of video that may not have correspondence with the alternative answers that were given in the question.

Table 2: The categorisation of the open answers regarding the reasons why a certain category of video was used and why it was not used. (Categories in italics do not have correspondence with the alternative answers given in the questions).

Categories for reasons for using a specific type of video	**Categories for reasons for not using a specific type of video**
Flexibility - accessibility	Method – another choice
Pedagogical reasons	Method - negative choice
Method	Problems related to technology
Other	Due to legal reasons
	Lack of resources
	Lack of knowledge
	Under development
	A good tip
	Do not understand the question
	Other

5.3 STUDY 2 - INTERVIEW

METHODS AND INSTRUMENTS

The results of the survey provided information relevant to the first research question: *RQ1: How is video used in digital higher education? More specifically: When teachers design distance courses with video;*

a. which categories are used?
b. how much are they used?
c. why are they used or not used?
d. how are they used?

However, the results also raised new questions, especially a need for further investigation to obtain more in-depth knowledge. In an interview study, it is possible to focus more on specific selected issues and have less breadth e.g. more detailed information on *how* and *why* video was used and also the two other research questions:

RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?

RQ3: What are the teachers' attitudes and perceptions about the use of video in digital distance education?

The only people who can provide answers to these questions are the teachers that design, plan, and carry out the courses. Due to time limitations, the second study had to be somewhat limited and it was decided to do an ethnographicaly informed investigation of the practices of a single Higher Education Institution (HEI).

SELECTION OF VIDEO CATEGORY AND HEI

Six categories of video were investigated in the survey. Since there is a specific interest in this thesis on the particular conditions that frame distance education, I decided to focus on live video (video conferencing and desktop conferencing) in the second study. Live video is of particular interest for distance education because it is often used to replace physical meetings (Smyth & Zanetis, 2007) and to bridge the geographical distance among teacher and students. Categories in recorded video can be used in both distance and campus education.

Due to time limitations, it was impossible to to investigate both *video conferencing* and *desktop conferencing* within the frame of the thesis and therefore only one of the categories in live video had to be selected. Desktop conferencing was a rather new technology, and therefore, teachers' experience of how to use it from a pedagogical perspective might not be so developed. Another reason for not selecting desktop conferencing was the technology, which has been used previously in Sweden, "Marratech". It had not been developed for several years since Google bought the system in 2007.

Furthermore, Swedish HEIs did not have a joint system for desktop conferencing until the autumn of 2009. It takes a couple of years before teachers are familiar with a new system and have developed suitable methods of integrating it in teaching. Therefore, the decision was made to focus on video conferencing instead. It had been in use since the 90s, and it was the category of video that was least used according to the results of the survey. It was interesting to find out why it was rather little used

and whether there were factors which might influence an increased use of video conferencing. Therefore, an HEI, which used video conferencing and had a long experience of using it, had to be found for the second study for this thesis.

When comparing the results of the use of video at Karlstad University and the other higher education institutions, specific differences were found. The course coordinators at Karlstad University used three out of six categories of video, which were more than course coordinators in other HEIs. The most significant difference was for video conferencing, which had more than twice the percentage at Karlstad University. It was used in totally 122 courses/programmes compared to other HEIs. Mainly three HEIs used video conferencing in their distance education. At Karlstad University, video conferencing was used in 14 courses and 8 programmes, (in 18% of the courses/programmes), at Umeå University it was used in 11 courses and 3 programmes, (12% of the courses/programmes), and at the University of Kalmar,[81] it was used in 5 courses and 6 programmes, (in 9% of the courses/programmes). The most crucial difference was that the percentage of course coordinators who had experiences of using video conferencing in teaching was much higher for course coordinators at Karlstad University, compared to course coordinators in other HEIs.

81 University of Kalmar is today Linneaus University, which was established in 2010 through a merge between Växjö University and University of Kalmar: https://lnu.se/en/meet-linnaeus-university/This-is-linnaeus-university/linnaeus-university-in-numbers/

Table 3. The different categories of video that were used. The course coordinators had answered the question: Do you use this category of video in the course? Comparison of the course coordinators at Karlstad University (KU) and the other higher education institutions, (OHEI). Frequency within brackets, ( ). Percentages without brackets.

	Q6a. Video-based materials		**Q7a. Video materials *not* specifically produced for pedagogical purposes**		**Q8a. Video-recorded teaching situations**		**Q9a. Video conferencing**		**Q10a. Desktop conferencing**		**Q11a. Video as a tool for learning**	
	KU	OHEI	KU	OHEI	KU	OHEI	KU	OHEI	KU	OHEI	KU	OHEI
Yes	(33) 50	(281) 38	(9) 14	(166) 22	(34) 52	(224) 30	(23) 35	(99) 13	(22) 34	(238) 32	(13) 20	(125) 17
No	(33) 50	(461) 62	(57) 86	(574) 78	(31) 48	(517) 70	(43) 65	(642) 87	(43) 66	(498) 68	(52) 80	(609) 83
Total	(66) 100	(742) 100	(66) 100	(740) 100	(65) 100	(741) 100	(66) 100	(741) 100	(65) 100	(736) 100	(65) 100	(734) 100

Furthermore, the course coordinators' good experiences of using video conferencing in teaching were 14% higher at Karlstad University compared to the other HEIs. In general, the results of this comparison showed that the course coordinators at Karlstad University were more familiar with and more positive to using video conferencing in teaching.

Table 4. Q3a Course coordinators' experiences of video conferencing in general. A comparison between Karlstad University (KU) and the other higher education institutions (OHEI).

		KU		**OHEI**	
Type of experience	N	n	%	n	%
Good	71	14	23	57	9
Bad	39	5	8	34	5
Both good and bad	194	21	35	173	27
Neither good nor bad	27	2	3	25	4
I have no experiences	369	18	30	351	55
Total	700	60	100	640	100

Another argument for selecting Karlstad University was the long tradition, and an established infrastructure for distance education with a well-established co-operation with a number of local study centres and that video conferencing has been a core technology for many years.

Concerning the choice between selecting a programme or free-standing courses, it was found to be more valuable to investigate a programme since a programme has a joint structure for all the courses within the programme and at the same time. Other arguments for selecting a programme instead of free-standing courses were:

- conditions differ between a course and a program. A course is shorter than a program, and a program has a joint curriculum that covers the whole program, although it is divided into courses
- in a program, several courses of different subject matters could be selected and aspects generated by the different characters of subjects matters could be covered in the study

- it may take some time for students to be familiar with the video conferencing situation and a teaching situation is always influenced by both the students and the teachers
- students will get to know each other better if they study a programme compared to a course.

When considering which programme would be most interesting, it was decided that teacher education would be the best choice because it offers a variation regarding different subject matters. This would provide a broader perspective of different conditions for the use of video conferencing related to subject matters. This was very well expressed by one of the teachers in teacher education during one of the interviews; "teacher education is special as it goes right through the university".[82]

According to the results of the survey, the only higher education institution that used video conferencing in teacher education was Karlstad University. Eight teachers answered the survey and taught in a programme at Karlstad University, and five of them taught in teacher education. When investigating the organisation, it turned out that Karlstad University has developed a unique model for teacher education at a distance, which therefore seemed especially interesting to investigate and which also contributed to the choice of Karlstad University.

THE DISTANCE MODEL OF TEACHER EDUCATION

In order to obtain information about the distance model of teacher education at Karlstad University, an interview was conducted with Lennart Jansson, who was the coordinator for education and research at Karlstad University. Lennart Jansson described how it all started:

Karlstad University once started with delocalised education, from which distance education was developed, and it has been an essential part of the university's education since then. Different methods of delivery have been used, but in 1994, a new model for distance education with local study centres and video conferencing was tried in a project of continu-

82 Author's translation.

ing professional development for pre-school teachers[83]. A few years later, several factors contributed to the idea to have the entire teacher education programme at a distance; a new curriculum for teacher education, the use of and possibilities with the Internet had been developed, and the number of applicants, e.g. natural science increased. By offering teacher education at a distance, recruitment could be widened, and it was possible to reach out to students who typically did not apply for higher education.[84]

It was decided that from a pedagogical perspective, it was desirable to divide the students into study groups according to their geographical location (Jansson, 2000). A programme of four years required higher demands on the planning and organisation than a course.[85] As the students needed a place to meet and it was also necessary to provide technical equipment to students, at least to a certain extent, municipalities that provided local study centres were engaged in the model. Through the network of Nitus, (Nätverket för kommunala lärcentra),[86] municipalities were contacted, and their interest for participating was considerable. The local study centres could offer video conferencing equipment, computers with Internet access, a "homeroom" where the students could meet and work together, technical support, and other kinds of support functions. However, involving video conferencing in the education also resulted in limitations regarding the number of centres that could be connected at the same time. The technical support at Karlstad University recommended a maximum of 10 local study centres. "Contact teachers" were appointed to create a link between Karlstad University and the local study centres (Jansson, 2000).

Practical experience is a considerable part of teacher education. The students were going to obtain their practical experience in a partner school during one day a week except for particular longer connected periods when the student spent more time at the partner school (Jansson, 2000).

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83 Interview with Lennart Jansson, 16 June 2011, coordinator for education and research, Karlstad University.

84 Interview with Lennart Jansson, 16 June 2011.

85 Interview with Lennart Jansson, 16 June 2011.

86 The network for municipal local study centres in English. Author's translation. Nitus has nearly 120 members from mostly Swedish municipalities but also a few Finnish municipalities are members. http://www.nitus.se/index.php?id=117 retrieved 17 August 2011.

The concept of teacher education at a distance at Karlstad University was a well-integrated system consisting of: course meetings at Karlstad University, study groups and video conferencing at local study centres, and practical experience at a partner school (Jansson, 2000). Local study centres had an important role both for the quality of education and students' results (Haglund & Johansson, 2011). The concept was completed with a computer conference system, which initially was 'First Class', which was gradually replaced by the Learning Management System (LMS) 'It's learning'.[87]

The first admission was in the autumn 2001, and 48 students were accepted, but already the next semester, there were 104 applicants to 30 seats (Jansson, 2000). Evaluations had shown that students were more satisfied with the distance form than the campus form of teacher education at Karlstad University.[88]

By offering teacher education at a distance, it was possible to obtain several advantages compared to the campus model (Jansson, 2000). From a student perspective, it would be a chance for students who did not want to or could not move, i.e. for family reasons and it would be financially advantageous. Students would also more or less be guaranteed a job when finishing their studies, as they have already had contact with the employers from their practical experience period and the employers knew the students and their professional competence. It turned out that distance students were much more coveted than campus students and they got work before they have finished their studies.[89] Students had good knowledge of local political goals and ambitions for schools as they lived where they achieved their practical experience. Being a programme in distance education, design and organisation of the education would promote especially good knowledge in computer communication, independence, ability of problem-solving and co-operation with others (Jansson, 2000).

From the perspective of the municipalities, teacher education at a distance would facilitate recruitment, develop co-operation with the univer-

87 Interview with Lennart Jansson, 16 June 2011.

88 Interview with Lennart Jansson, 16 June 2011.

89 Interview with Lennart Jansson, 16 June 2011.

sity with advantages of better opportunities for school development, and possibilities of influencing teacher education (Jansson, 2000).

From the perspective of the university, it would be possible to solve the problem with too few applicants in mathematics-natural science, develop distance pedagogy, widen recruitment, contribute to regional development, marketing and strengthen the position of Karlstad University, especially outside Karlstad (Jansson, 2000). It seems as if teacher education at a distance at Karlstad University has been more successful regarding widening recruitment than other educational institutions (Fjällsby, 2000). Results of a questionnaire among distance students in teacher education at Karlstad University in June 2000, showed that 24 of 35 students had never studied in higher education before. Twenty-one of the students stated that they would not have applied to teacher education if the distance form had not been available (Fjällsby, 2000).

Experiences showed that the main reason for students to apply to teacher education at Karlstad University was the flexibility of the design and organisation of the programme provided.[90] teacher education for younger ages at a distance at Karlstad University has been one of the most popular Teacher programmes in Sweden (*Utbildningens distributionsformer - frågor som bör utredas,* 2011). As an example of this, there were 80 applicants (first-hand applications) from Norrtälje municipality to the autumn of 2011[91] even though there were other teacher educations in that region. Karlstad University had co-operation with approximately 50 of 180 local study centres that work with higher education in Sweden (Haglund & Johansson, 2011).

CONSTRUCTION OF INTERVIEW

When planning the interview study, an aim was to use other types of questions than those in the survey. Since it is challenging to analyse many free text answers in a survey, it would be essential to let the participants speak rather freely in the interviews. In that way, information that I did not even think about could emerge. It is also good to compare and contrast

90 Interview with Lennart Jansson, 16 June 2011.

91 Interview with Lennart Jansson, 16 June 2011.

different methods in order to get deeper and broader knowledge. Therefore, in contrast to the questions in the questionnaire, which were highly structured, the questions for the interview were formulated open-ended. The purpose with the open-ended questions was to provide opportunities for the teachers to talk freely (Ejvegård, 2009) and to give their personal opinion of their experiences regarding how they used video conferencing, how they perceived teaching through video conferencing, and how video conferencing functioned in teacher education at Karlstad University. The interviewer's strategy was to let the teachers answer the questions freely. If it turned out that there was any part of the questions that they have not covered in their answers, further questions were asked until the topics that were interesting for the study were covered. The teachers were free to choose which issues they liked to emphasise or give more in-depth information about, and the purpose with carrying out the interviews in the way they were conducted was to get the teachers' stories - their voices.

By combining the questionnaire and the interview and using both highly structured and open questions, broader and more in-depth information could be obtained. The questions of the interview study were partly generated from the analysis of the results of the survey and more in-depth knowledge regarding the following issues was desirable: (For more information of the results of the questionnaire, see chapter 6).

- How teachers used video conferencing? (This question was also a part of the questionnaire, but more in-depth and more detailed knowledge could be obtained in the interview).
- Whether the use of video conferencing influenced teacher's design of courses and lessons. (The analysis of the results of the questionnaire showed that one of the most important advantages of using video conferencing was that it required high demands of planning and organisation. It was therefore of interest to find out more about this aspect of using video conferencing).
- What kind(s) of medium/media teachers used for the lectures. Lectures can be made in different ways, and different categories of media interact simultaneously with different categories of "languages"; such as text, picture, sound, and moving picture (*Läromedel - specifikt: betänkande om läromedel för funktionshindrade*, 2003). For

example, the language of pictures provides other possibilities than verbal and written messages. A combination of different types of media can complete each other and strengthen the message (*Läromedel - specifikt: betänkande om läromedel för funktionshindrade*, 2003). (For more about media, see section 2.7).

- Teachers' perceptions of using video conferencing. (This question was also included in the questionnaire, but more in-depth and more detailed knowledge could be obtained in the interview).
- Dilemmas and advantages with the use of video conferencing. (This question was also a part of the questionnaire, but more in-depth and more detailed knowledge could be obtained in the interview).
- How the use of video conferencing could be developed in order to inform the design of digital distance education with the use of video conferencing. (This would be a further development of the results of the analysis from the questionnaire).

Furthermore, teachers' knowledge of and attitude towards technology and distance education may influence how they used video, and these issues were also covered in the interview questions. Questions about the *teacher's background;* how and why the teacher has started with distance education, and video conferencing were also included. Also, questions about *the courses* were formulated, which was of particular interest as the length of the course and subject matter may influence the design and organisation of the course and video conferences. The use of video conferencing can be influenced by institutional aspects, as, i.e. technical support, co-operation with colleagues and video conferencing equipment, which also were covered in the interview guide. In order to inform design, the teachers were asked if there were any changes they would like to make and how they saw the future of distance education and the use of video conferencing. The respondents had a chance to add anything they wanted in the last question. In total, the interview guide consisted of 20 questions. Estimated time for the interview was 1-1,5 hours, which seemed reasonable both from the aspect that it takes some time to get more in-depth information, and it was impossible to take more of the teachers' time (Holme et al., 1997).

When interviewing the teachers, it was necessary to reflect over what information the teachers provided concerning the information I as a researcher wanted to achieve. Was it the teachers' view of how the teaching situation worked in the HEI or was it how it functioned? This study intended to cover both these perspectives with a particular focus on teachers' view.

PARTICIPANTS: TEACHERS

I have chosen to use the term 'teachers' as the interviewed teachers provided their opinions from a teacher's perspective, and they were all teachers. It was necessary to make a selection with 10-20 distance teachers, as the time for the study was limited and if the purpose of attaining more in-depth knowledge was to be achieved. It was decided to focus on the teacher programmes for pre-school and school. The program of recreation instructor was omitted, in line with the purposes of the doctoral school CUL within which this thesis is written[92]. When selecting teachers for the interviews, the intention was to cover as many subject matters as possible in order to get a wide variety as possible. Both courses from the general education area and specialised courses were covered. The ambition was also to select teachers, who had as many video conferences as possible, but as there were many teachers involved in some of the courses, there was also a variety concerning how many video conferences the teachers had.

The course coordinators for the seven selected courses were contacted. They helped me with names and contact information to the other teachers, who were involved in the courses, and provided information regarding the number of video conferences each teacher had. One teacher was teaching in two courses of the selected seven courses and in total 13 teachers were interviewed.

92 The laws concerning the requirements of education for recreational instructors have been changed. From the 1st July 2019, recreational instructor is a regulated profession. https://www.skolverket.se/regler-och-ansvar/aktuella-regelandringar/lagandring-2019-07-01-krav-pa-legitimation-i-fritidshemmet

TEACHERS' BACKGROUND

Nine women and four men were interviewed, and the teachers' backgrounds were varying. Most of them were educated teachers, and some of them had even two teacher exams or a combination of a teacher exam and another professional education. Most of them had worked as teachers for ten years or more in pre-school, leisure-time centre, compulsory school, upper secondary school, municipal adult education (Komvux), and higher education, but a few had less experience in teaching. Subject matters were also varying; natural science, languages, esthetical subjects, and social science. Some of the teachers were course coordinators, and some were teachers.

BACKGROUND INFORMATION ON COURSES

The teachers provided this background information about the courses in the interviews. The courses covered between 7.5 and 13.5 credits. All courses had "their" morning or afternoon once a week when the video conferences in the course were scheduled. Each course had the same schedule for the video conferences during the whole time of the educational programme. In some of the courses, there were only two teachers, and in other courses, there could be up to seven teachers involved, and some were internal or external guest lecturers. Depending on the number of locations where the courses were offered, 7-20 local study centres were connected simultaneously during the video conferences.

PROCEDURES (DESIGN AND IMPLEMENTATION)

PILOT INTERVIEW

A pilot interview was conducted with a teacher from the University of Skövde who had several years of experience of both distance education and teaching through video conferencing. This interview was recorded (with an H4next Handy Recorder Zoom) as is recommended by Ejvegård (2009). The duration of the interview was 1.5 hour. The recorded inter-

view was saved in MP3-format, and the file was then transferred to a computer. The teacher was asked about his opinion of the questions, the order of questions, and if something was missing. The teacher found the questions very interesting, and according to his opinion, the interview guide and the order of the questions worked very well. Therefore, the pilot interview did not result in any changes in the interview questions.

Even though the interview method has the advantage of providing more in-depth information, it is also important that an interviewer is aware of how the formulation of questions influences the respondents, the interviewers' body language, facial expressions, feedback on answers etc. (Ejvegård, 2009; Holme et al., 1997). There is always a risk that the respondent answers according to the answers that he thinks the interviewer wants to have. No matter how much effort the interviewer puts in, the respondent will always be influenced by what the interviewer says, does, and responds (Holme et al., 1997).

Therefore, another purpose with carrying out a pilot interview was to listen to the interview afterwards. The intention was to discover in what ways the interviewer could have influenced the teacher and what can be done to avoid this as much as possible in the remaining interviews. For example, the interviewer responded very frequently to what the teacher said which may have given the teacher a feeling of approval. This should be avoided as the interviewer should take as a neutral position as possible. A lesson learned from the interview was to make a short pause after the teacher's answer as it was rather common that the teacher made a pause to think and formulated an answer and then added information. If the next question was asked too quickly, then there might be information that the teacher never got a chance to express. A pause also signalled respect and a genuine interest in what the teacher said in the interview.

INTERVIEWS AND ETHICAL CONSIDERATIONS

This study followed Swedish regulations for ethical research conduct described in more detail in section 5.2 (*Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning [Elektronisk resurs]*, 2002; Vetenskapsrådet, 2011). In these regulations, it is the researcher's responsibility is to inform the participants about the purpose of the research, how the study

will be conducted. The conditions for participation was fulfilled as the teachers in the Karlstad study were first informed by e-mail of the survey and the purpose to investigate the use of video conferencing in teacher education at Karlstad University. The second rule about the participants' consent was fulfilled as the teachers were informed that participation was voluntary and that they could interrupt their participation whenever they wanted. They were then contacted by telephone and asked if it would be possible to interview them and they were all positive about participating. When dates and times for the interviews were booked, the teachers were also asked if they consented to the interviews being recorded, which is recommended by Ejvegård (2009) and they all agreed. The interviews were carried out during three weeks in June 2011, were recorded and transferred to a computer as the pilot interview. In all cases but one, the interviews took place either in the teacher's office or in a few cases in the coffee room. One interview was conducted through the desktop conferencing tool Acrobat Adobe Connect. The duration of the interviews varied between 45 minutes and 1.5 hours, except for one interview that was 2 hours long. The interview material was anonymised and safely stored. Each transcript from the interviews was sent to by e-mail individually to the teachers to give them the possibility of correcting the information, if something has been misunderstood och or misinterpreted. None of the teachers had any corrections to make. The third demand is the rule of confidentiality, which means that the participants' personal information must be protected. To protect the interviewees' identities, they were called by a number instead of their names in the recordings of the interviews and the transcripts. I was the only person with access to the files with recordings, which were protected with a password. The fourth and last rule is that the collected data must only be used for research and not in other ways, which has been followed.

ANALYSIS

The recorded interviews were imported into a tool for analysing qualitative data, NVivo 9.1. The interviews of approximately 18 hours in total were transcribed verbatim in NVivo. The advantage of using NVivo for

transcribing the interviews was that the pace of the sound file could be reduced to 50 % of authentic pace, which made the transcription easier.

All interviews were transcribed as thoroughly as possible, except for a few parts in one of the interviews which contained information that was sensitive and was not directly related to the study. The analysis of interviews could be executed in several ways. For example, the questions of the interviews could be the grounds of the analysis or they could be based on recurrent themes of content or topics that occurred in the interviews. The form of the interview was open, and the teachers came up with information regarding different topics in the same question. Therefore, the decision was made *to analysis the interviews from the different themes of content* as the questions became less important than the themes. The role of the questions was more a way to get the different themes covered by each interviewed teacher.

In the transcripts, patterns and themes have been searched for inductively (Silverman, 2010). By listening to the interviews several times and make notes of what has been assessed as interesting statements for answering the questions of the study, four themes were identified (Braun & Clarke, 2006). During the data analysis, categories have been developed, data have been compared, and categories have finally been determined (Silverman, 2010). The nodes (categories) were created by reading the transcripts several times, and new nodes were created until there was no need for new ones any longer. The nodes were also divided into sub-nodes based on their content. When going through the nodes repeatedly, it was found that some covered the same theme, but were expressed in different ways and these nodes were put together. Since the interview data from the 13 interviews were extensive, there had to be a selection and themes related to the research questions, and the survey had been prioritised. In the next step of the analysis, the relationships between the nodes have been analysed.

In the analysis of the results, two of Moore's categories of interaction; *student – teacher interaction* and *student – content interaction* have been used, (see section 2.5). As student-teacher interaction can reduce "Transactional distance", (see 2.5) the interviews have been analysed regarding how understanding and communication have worked. The concept of communication, (see section 2.6) has been used to analyse the teachers' perception of

and attitudes to using video conferencing in their teaching as it can provide synchronous, two-way communication with moving pictures and sound. Particular interest has been taken to analyse the non-verbal communication between teachers and students from a socio-cultural perspective in the video conferencing environment, (see section 4.1). Non-verbal communication is an integrated part of human communication and is included in mediational tools (language). Video, like other technologies, have features. However, even if, e.g. video conferencing has specific features as, e.g. to provide two-way communication, sound, and moving picture, it is crucial to analyse how the interaction between teacher and students in the video conferencing environment has functioned. The theory of affordances has been used as it is useful for analysing perceived affordances of an object (Gibson, 1986, 2015), both possibilities and constraints of technology, in this case, video conferencing.

Excerpts from the interviews had been selected to give authentic examples and to support the results of the analysis. For each excerpt, the teachers' code is indicated, how many references the teacher had made within the theme, and which number of reference the excerpt is among the teacher's references within the theme in question.

The results of the interviews are presented in chapter 7, but first, the results of the national study of video in digital distance education will be presented.

CHAPTER 6

SURVEY: THE USE OF VIDEO IN DIGITAL DISTANCE EDUCATION

6.1 COURSE COORDINATORS' CHARACTERISTICS

In this section, the course coordinators' characteristics are described based on the results of the national survey. Particular focus will be on their experience as distance teachers and the in-service training in distance education they have received. These variables are essential for cross-tabulation with the results regarding the categories of video. Furthermore, their experience of using video conferencing and desktop conferencing from a general perspective will be presented.

EXPERIENCE OF TEACHING

The course coordinators' experience in the *number of years* as a distance teacher and *the number of courses taught* were investigated. Both these factors were important when measuring teaching experience of distance higher education as research indicates that teachers seldom teach only distance courses (Åström & Högskoleverket, 2007) .

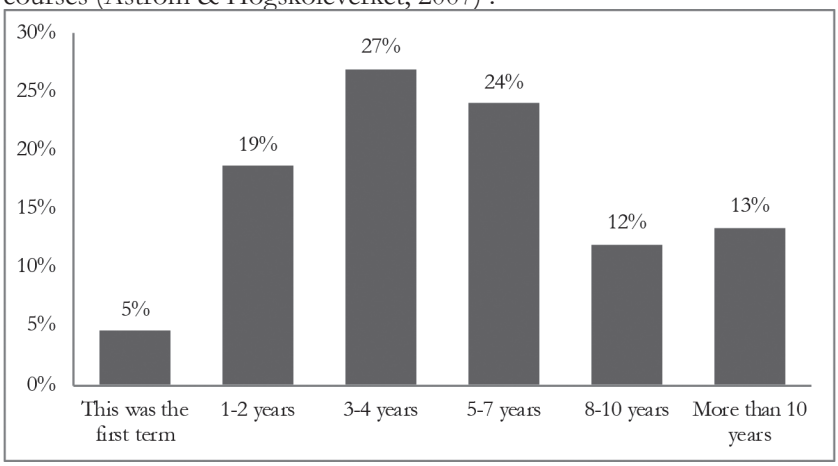

Figure 2. Q2a. The course coordinators' experience of distance education (in years), (N=740).

Half of the course coordinators had five years' experience or more (see Figure 2). Since few were new to distance education, it is reasonable to assume that teachers with experience of distance education who are more likely to be selected to be course coordinators.

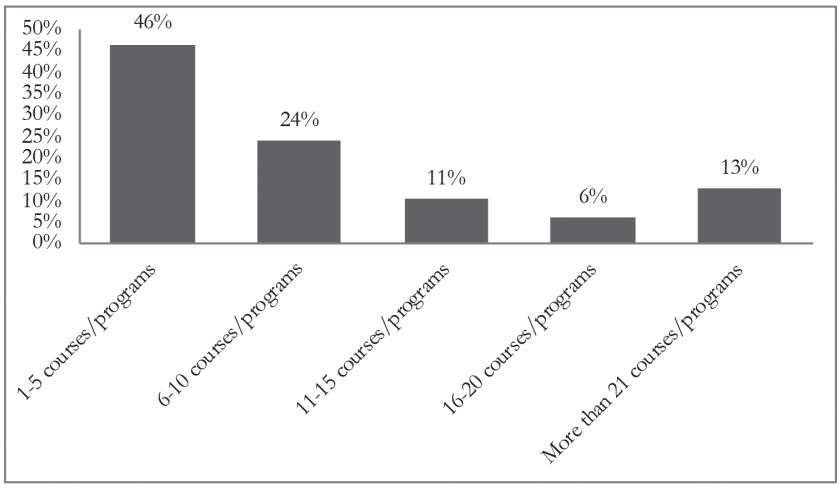

Figure 3: Q2b. The number of courses/programmes each teacher had taught (N=736).

It was most common to have somewhat limited experience of 1-4 courses, but the majority of the course coordinators (54%) had six or more courses[93] (see Figure 3). It is reasonable to argue that this group can be classified as 'experienced', even though some teachers in this group may have gained this experience over a short time period.

CLASSIFICATION BY EXPERIENCE

By cross-tabulating the results regarding experience measured in years and the number of courses taught, the new measure *teaching experience of distance education* was created with three categories and the following criteria:

- *Little experienced* = < than 3 years of experience AND < than 6 courses/programmes.

93 Four informants did not answer the question of how many distance courses they have been teaching.

- *Intermediate experienced* = (>5 years of experience AND < 11 courses/programmes) OR (< 5 years of experience AND > 6 courses/programmes)
- *Experienced* = 5 or more years of experience AND 11 or more courses/programmes.

However, it is essential to take into consideration that the concepts; *little experienced, intermediate experienced*, and *experienced* are relative, as experiences can be of varied types and qualities. Therefore, the analysis of the course coordinators' experience is not equivalent to their level of expertise (Berliner, 1986).

This classification is based on other examples of categorisations of teachers' experience, which often refer to classroom teaching. These classifications often have only two categories; for example, *novices* and *experts* (Meskill, Mossop, DiAngelo, & Pasquale, 2002; Wade, 1998; Westerman, 1991; Wetzel, Zambo, & Ryan, 2007). How long experience that should be required for being an expert differs. For example, Westerman (1991) categorised teachers as experts if they had more than five years of teaching experience, while Queensland Teacher' Union recommended at least four years of experience for full-time teachers and seven years of experience for part-time teachers for applying to be appointed *Experienced senior teachers (Union, 2012)*.

For this study, it was reasonable to have lower requirements regarding the number of years as it can be assumed that participants would not have been appointed course coordinators unless they were experienced teachers. As the results of this study indicated that few course coordinators taught only at a distance, it was probable that they had more teaching experience, although some of it was from campus education, as Sweden has the dual-mode system. (For more information, regarding dual-mode, see section 2.3).

However, distance education is more dependent on technology use than campus education. To be classified as an expert, there are higher demands on the course coordinators' Technological Pedagogical Content Knowledge. This means integration of the three perspectives of teacher's knowledge; technology knowledge, pedagogical knowledge, and content knowledge according to the TPACK framework (Koehler, Mishra, Kere-

luik, Shin, & Graham, 2014). It was, therefore, necessary that the classification of being an expert was also based on the number of distance courses.

The number of course coordinators fitting both criteria of experienced was about one-fourth of the teachers and those having little experience regarding both criteria were about one-fifth of the course coordinators, (N=736).[94] The remaining part, about 55% had either more than five years of experience AND less than eleven courses/programmes) OR Less than five years of experience AND more than six courses/programmes), i.e. they had a certain experience.

A further analysis indicated that more men than women were experienced, both regarding the number of years and number of courses/programmes taught and it was a significant difference. However, it was surprising to find that many were less experienced among older course coordinators. More than 40% of the course coordinators with less experience were older and half of them (50 years or older) had only had a few courses. The assumption that only younger course coordinators were less experienced was not correct. Even though 70% of the experienced course coordinators were older, as much as 40% of the less experienced were also older.

CLASSIFICATION BY TRAINING

Training within the field of distance education, in particular, is vital as there are differences between distance and campus education. One of the differences is that distance education is more dependent on the use of technology and media, e.g. video, (see section 2.7).

Slightly more than half of the course coordinators (54%) had participated in any in-service training within distance education, and 46% had not (N=740). Formal training is essential if the teachers shall be able to use technology according to teaching methods of the twenty-first century (Bates & Sangrà, 2011). Also, Yuen and Ma (2008) claim that both teachers' attitudes and acceptance of technology are important factors if

94 The four informants who did not answer the question of how many distance courses they had had as teachers have been omitted from the result.

their use of technology is going to be successful. Even if the question of whether or not the course coordinators were specifically trained in using video was not investigated, it is likely that training in distance education also includes the use of technology and media since they are often used to distribute information and course materials, and to bridge the physical distance between teacher and students and among students.

It is worth noting that there has been an increasing requirement that higher education teachers take courses in *Teaching and learning in higher education* in many countries including Sweden. However, many of the teachers in this study are likely to have taught in higher education for several years, as a majority of the course coordinators were 49 years of age or older. This means that they might not have participated in in-service training since the formal requirements regarding pedagogical education for university teachers were not introduced until 2003 (*Högskoleförordningen (1993:100)*, 2003).[95]

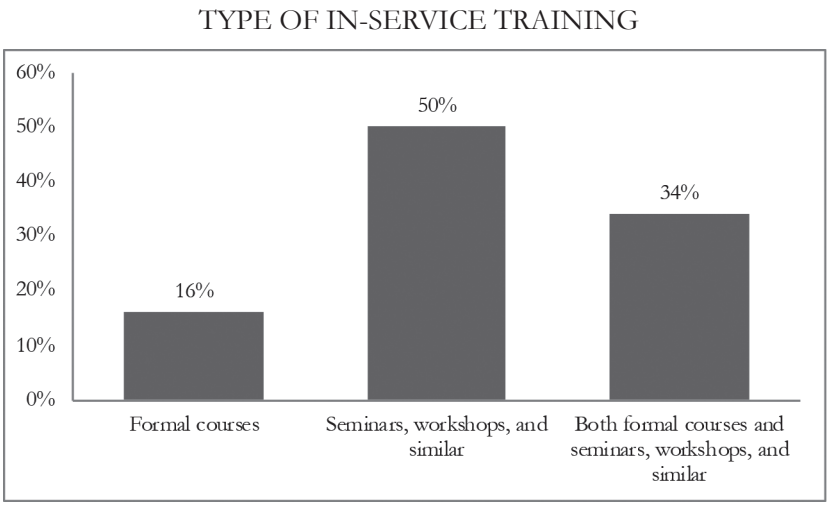

Figure 4: Q2d. The distribution (in percentages) regarding the type of in-service training the course coordinators had participated in, (N=338 course coordinators).

95 These requirements were omitted from the Higher Education Ordinance on 1 January 2010. Instead SUHF (Association of Swedish Higher Education) decided on new recommendations in 2011 which were revised in 2016.

As Figure 4 shows, less than one-fourth of the course coordinators had participated in formal training and half of them in informal training.[96, 97] Concerning *seminars, workshops, and similar;* either it had been only informal training, or it had been in combination with *formal courses*.

THE AMOUNT OF IN-SERVICE TRAINING

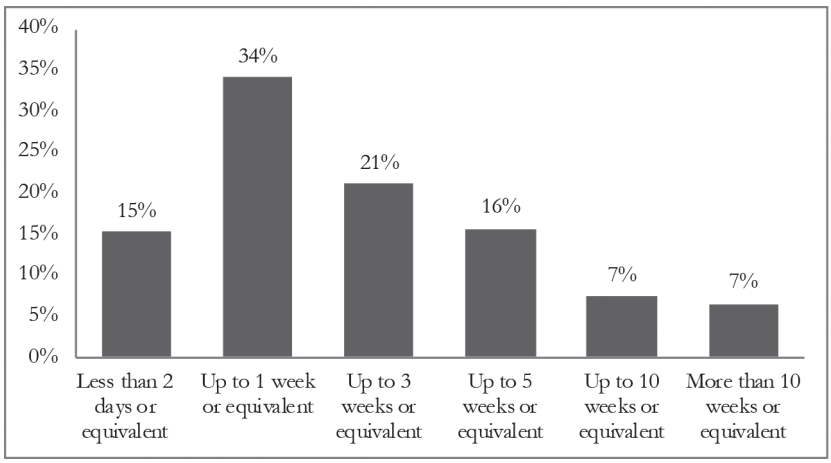

Figure 5. Q2e. The distribution regarding how much in-service training the course coordinators, who had training, had participated in, (N=337).[98]

About half of the course coordinators, who had participated in any training at all, had *only up to one week* or equivalent (see Figure 5). Only 170 out of 740 course coordinators (23%) had up to one week of training, and the same share had *more* than one week of training. More than half of the course coordinators had *no training* at all.

Looking at the amount of in-service training in relation to the whole group of course coordinators, only *one out of two* had *no in-service training at*

96 Both alternatives could be marked.

97 Only those who have answered that they had participated in in-service training, i.e. 341 informants have received this question.

98 Only those who have answered that they had participated in in-service training, i.e. 338 informants have received this question.

all, one out of four had a week or less, and *one out of four* course coordinators had *more than one week* of in-service training. As the context of this study is higher education, it is reasonable to 'translate' the received time of in-service training into the system of credits in higher education. Then it was only 14% who had received training equivalent in time of a course of 7.5 credits, which is half of the credits that most higher education institutions in Sweden have as a qualification in Teaching and Learning in Higher Education in order to get an employment as a teacher (SUHF, 2010, 2016).

When analysing more profoundly and cross *tabulating the degree of experience of distance education with in-service training*, a significant correlation was found; *the more experienced the course coordinators were, the more in-service training had they participated in*. The most significant differences were found between little experienced course coordinators and the others. Furthermore, amount of in-service training varied more for those with more experience. This means that course coordinators often *started working with distance courses without in-service training*, but participated in in-service training later when they had more experience. This might indicate that they realised that working with distance education required another type of competence, which they discovered that they did not have. A certain difference regarding gender was found as men, who were little experienced, to a higher degree lacked in-service training compared to women with little experience.

EXPERIENCE OF VIDEO CONFERENCING AND DESKTOP CONFERENCING

Video conferencing and desktop conferencing are the two categories of video that offer potential possibilities to bridge the geographical distance between teacher and students, replace physical meetings, and offer synchronous communication with picture and sound in distance education. Answers will be given to the research question regarding specifically video conferencing and desktop conferencing, from the course coordinators' perspective.

RQ3: What are course coordinators' attitudes and perceptions about the use of video conferencing and desktop conferencing in digital distance education? Even if it is not possible to say anything definitive about the possibilities and limita-

tions or affordances (Gibson, 1986, 2015) of video conferencing from a survey, the analysis of the results can still point to areas of possible affordances. This will be followed up later in the results of the interview study.

One of three course coordinators' did not have any experience of using either video conferencing or desktop conferencing and to have experience of both was even less common. This is especially noteworthy since this group of informants was considered to be responsible for distance courses in Sweden during the spring of 2009.

Cross-tabulations of the course coordinators' background factors have been executed for all factors, but the results are only presented when substantial differences were found. For example, as video conferencing and desktop conferencing provide similar features, it is of interest to examine whether or not there is a correlation between the experience of video conferencing and desktop conferencing (see Figure 6).

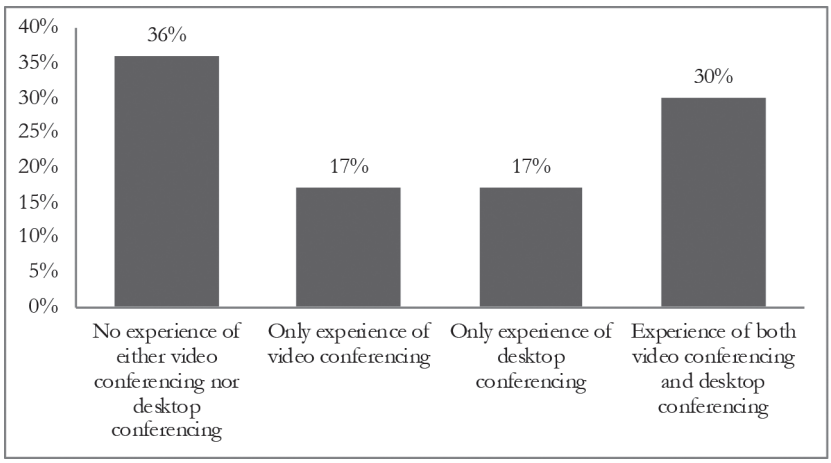

Figure 6. Q3a and Q4a. Whether course coordinators had experience of video conferencing and desktop conferencing, (in percentages), (N=740).

A correlation between experience of distance education and the use of video and desktop conferencing was found. The more experience of distance education the course coordinators had, the more experience they also had of using both video conferencing and desktop conferencing.

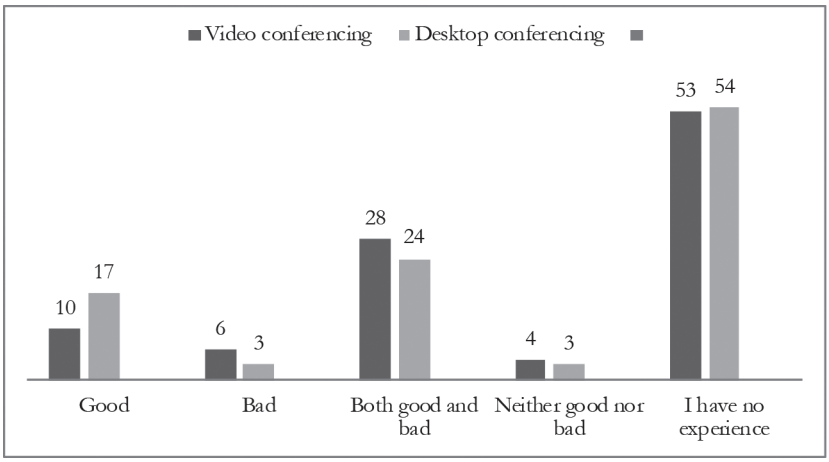

Figure 7. Q3a and Q4a. The course coordinators' experience (in percentages) of using video conferencing and desktop conferencing in teaching, (N=740).

RQ3: What are course coordinators' attitudes and perceptions about the use of video conferencing and desktop conferencing in digital distance education?

As shown in Figure 7, results were similar for both video conferencing and desktop conferencing, but more course coordinators had good experiences of desktop conferencing than of video conferencing. More than half of the course coordinators had *no experience* of using video conferencing or desktop conferencing in teaching, which probably meant that they would not even consider using these technologies. More than half of those with experience had both positive and negative experiences. A significant relation between experienced course coordinators and experience of using video conferencing was found.

VIDEO CONFERENCING

Answers to this research question from a general perspective will be given below:

RQ2: How do course designers respond to the possibilities of video conferencing?

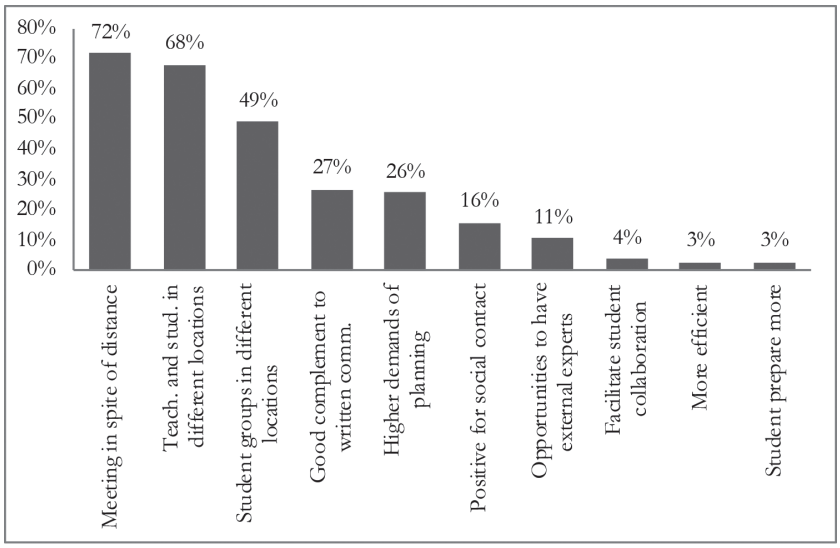

Figure 8. Q3b. The described most important advantages (in percentages) of using video conferencing in teaching, (maximum three alternatives could be ticked), (N=280).[99]

The most frequently selected advantage of using video conferencing was that it made it possible for teachers and students to meet despite the geographical distance (see Figure 8). This is consistent with a common argument of why video conferencing is used in distance education (Bernard et al., 2009). This is also a reason why the model with only online learning without meetings in many cases has been replaced by blended learning (Bonk & Graham, 2006b; Dafgård, 2002; Dziuban et al., 2005; Garrison & Vaughan, 2008; Graham, 2006; Masie, 2002; Sloman, 2007).

The alternatives ranked second and third, *"Teacher and teaching group(s) of students can be in different locations"* and *"You can have teaching groups of students in several locations at the same time"* are variations of a classical argument for distance education, that it provides spatial flexibility. This means that the course coordinators' appreciated what (Gibson, 1986, 2015) calls 'features

99 Only those who had answered that they had "good experiences" or "good and bad experiences" of using video conferencing in teaching received this question, i.e. 280 informants.

of an object' – the possibilities of video conferencing to offer meetings between teacher and students despite geographical distance and spatial flexibility. When cross tabulating the most important advantages with experienced course coordinators, no differences were found in relation to the course coordinators' experience of distance education.

Another feature of video conferencing - the possibility of oral and visual communication in the sense that, *"It is a good complement to written communication",* was considered as an essential advantage by the course coordinators.

It is somewhat surprising that the alternative *"The use of videoconferencing requires higher demands of planning and organisation"* was considered as an advantage because it was also viewed as a disadvantage, which will be shown in the next figure. Maybe the course coordinators thought that extensive preparations often resulted in higher quality in teaching and in that sense it could be an advantage. The alternatives with fewest markings in relation to the other answers were; *"Students prepare more compared to physical meetings."* And *"It is efficient. You accomplish more than during physical meetings"*.

As it is easier and less costly with experts lecturing through video conferencing instead of travelling to the course meetings. Therefore, one could assume that it was rather common to invite experts to the courses. However, the video conferencing environment made some experts uncomfortable, and some teachers even refused to lecture through video conferencing. This might be a reason why it was not so common to use external experts, and it was not considered as an essential possibility of video conferencing. Another reason might be that external experts might be expensive.

It is often claimed that it is difficult to work with group assignments at a distance; for example, negotiations take time with written asynchronous communication (Potter, 2004). Therefore it was a bit surprising that the course coordinators did not value this possibility with video conferencing as the alternative: *"It facilitates collaboration among students"* was among the least marked. However, it is important to bear in mind that there are several factors which influenced collaboration among students. Even if video conferencing offered excellent possibilities for collaboration as it provided synchronous communication, video and sound, special equip-

ment was required, and it could be difficult for students to get access to video conferencing. Furthermore, if video conferencing was mostly used for teachers' lectures, there were few possibilities for students to work together during video conferences, which could explain that it was one of the least reported alternatives. No differences were found in relation if the course coordinators were little experienced or experienced.

The course coordinators were also asked to mark the most important *disadvantages* (maximum three alternatives) from a general perspective with using video conferencing in teaching and below is the answers to;

RQ2: How do course designers respond to the limitations of video conferencing?

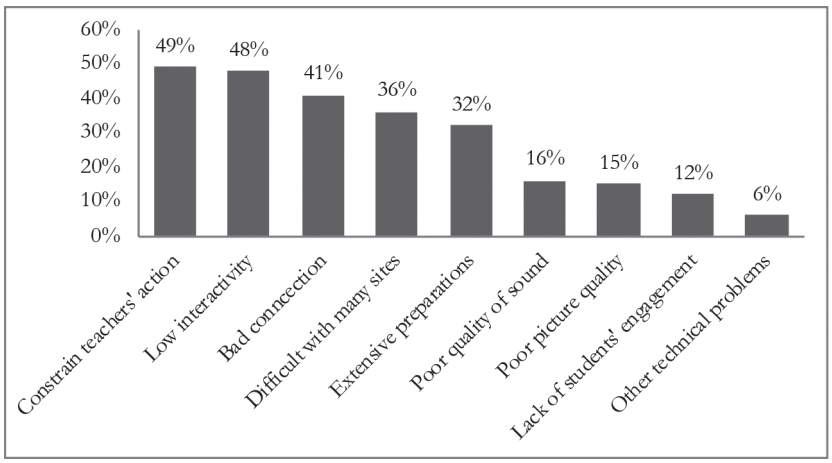

Figure 9. Q3c. The described most important disadvantages of using video conferencing in teaching, (maximum three alternatives could be ticked), (N=250).[100]

The most frequently selected disadvantage that almost half of the course coordinators marked was *"The use of video conferencing limits how I can act in the teaching situation"* (see Figure 9). This indicates that the use video conferencing constrained how the teachers could behave and act in the video conferencing environment. Even if video conferencing has the possible affordance of being able to mediate the teacher's teaching by interact-

100 Only those who had answered that they had "bad" or "good and bad" experiences of using video conferencing got this question, i.e. 250 persons. Maximum three alternatives could be marked.

ing with the video conferencing technology, many course coordinators claimed that it also had possible limitations which influenced how they could act in the teaching situation. The course coordinators' stated that their action was constrained in the video conferencing environment. The alternative *"Low degree of interactivity"* was considered as a nearly equally important limitation. This is interesting as even if video conferencing provides the possibility of interaction, the interaction was still constrained according to many of the course coordinators. Lack of interaction, often social interaction between teacher and students and among students, is a common problem in distance education as has been described in section 2.5. The use of video conferencing or desktop conferencing is often a suggested to increase the level of interaction. However, the result above indicated that it still was a problem. Interaction seldom emerges automatically. Teachers, with more experience, probably know more about how to promote interaction and that can be the reason why they do not perceive it as such a big problem. More course coordinators with little experience had marked this alternative compared to them with more experience, but there were no significant differences.

Figure 9 could be interpreted as showing that the technology was not a problem during the use of video conferencing. However, when looking more closely at different disadvantages that can be categorised as problems with technology, it is clear that four out of ten course coordinators had problems with the connection, 15% had problems with lousy quality regarding sound and picture, and 6% had other technical problems. The relatively low percentages concerning poor quality of sound and picture indicated that these issues were not regarded as an important disadvantage. Although deficiencies in sound and picture used to be the main reasons for why video conferencing did not become as popular as expected (Weinman, 2007; Wilson, 2008). However, the limitations that previously were caused by technology have decreased considerably (Weinman, 2007).

The result of the questions above regarding the reported most important advantages and disadvantages must be viewed in the light that the informants only could mark the three most important alternatives. It does not mean that they did not consider the other alternatives as advantages or disadvantages. The way the questionnaire was constructed results in that certain advantages/disadvantages were emphasised, and others were less

important in relation to all the alternatives that were provided. It can also be discussed how the fact that several alternative answers had a similar meaning may have influenced the results. However, the results showed that the teachers addressed different issues.

DESKTOP CONFERENCING

Answers to the question will be given here below from a general perspective; *RQ2: How do course designers respond to the possibilities of desktop conferencing?*

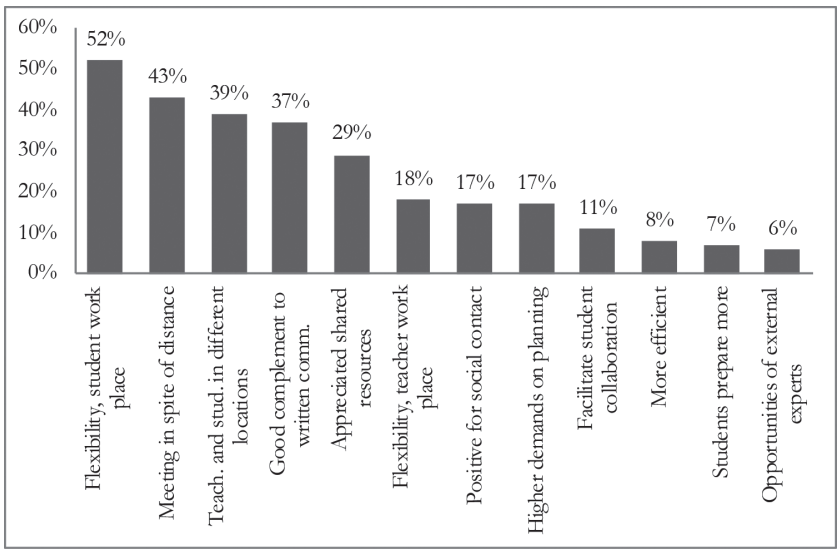

Figure 10. Q4b. The described most important advantages (in percentages) of using desktop conferencing in teaching, (N=280).[101]

The described three most important advantages were; *"Students can participate from anywhere, as long as they have access to a computer and the Internet", "Desktop conferencing/web conferencing makes meeting possible despite geographical distance",* and *"Teacher and students can be in different locations"*. These were

101 Only those who had answered that they had "good" or "good and bad" experiences received this question, 280 informants. Maximum three alternatives could be marked.

variations of the theme that desktop conferencing offered the possible affordances of spatial flexibility and made meetings without being in the same location possible (Gibson, 1986, 2015). The most important advantage emphasised the students' perspective, i.e. that *students* can participate from anywhere. Desktop conferencing also had the possible affordance of offering an alternative to written communication (Gibson, 1986, 2015). Other affordances that desktop conferencing offers are, e.g. shared document, shared whiteboard, and shared application were also appreciated by the course coordinators as that alternative was considered important by 29%. The alternative: *"The use of desktop conferencing/web conferencing requires higher demands of planning and organisation"* was a less important advantage in relation to other alternatives. The alternative: *"It is efficient. You obtain more than during physical meetings"* was one of the less marked alternatives, (8%). This result can be compared to another study by Borglund (2011), where all the interviewed teachers perceived that tutoring through desktop conferencing was more efficient and focused. A possible explanation for this discrepancy in results might be that there were fewer students involved in a tutoring situation than in other situations when desktop conferencing was used. The number of students might influence the perception of effectiveness.

The course coordinators were also asked about the limitations with desktop conferencing, the answers to *RQ2: How do course designers respond to the limitations of desktop conferencing?*

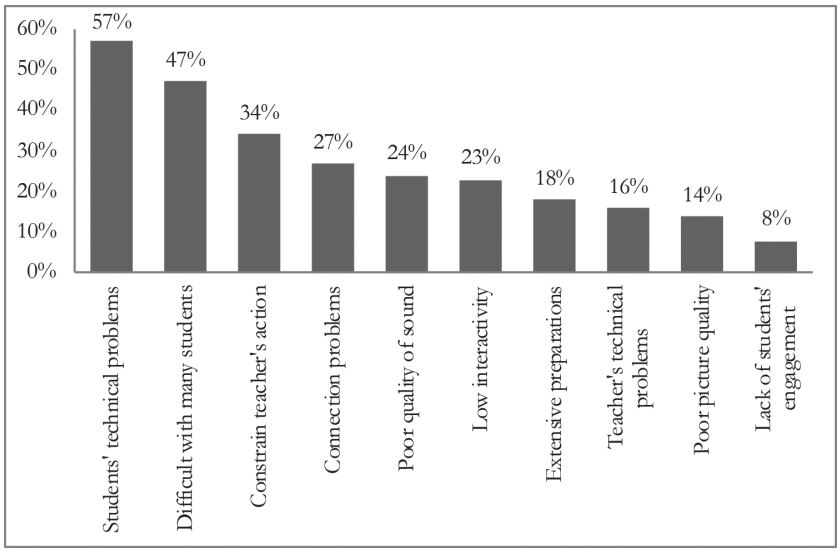

Figure 11. Q4c.The described most important disadvantages (in percentages) of using desktop conferencing in teaching according to the course coordinators, (N=250).[102]

Concerning the described most important disadvantages, the possible affordances of desktop conferencing also included limitations (Gibson, 1986, 2015). These limitations were in the form of frequent technical problems; such as students' having technical problems in general, connection problems, and poor quality of sound, although poor quality of picture seemed to be a less common problem. However, the results also indicated that the teachers' technical problems were less frequent than the students'. This difference could be since the teachers experienced the students' problem with technology more frequent as the students were more numerous, but there was only one teacher. The fact that one or several students had technical problems was somewhat likely and natural, it created problems in the teaching situation. Another difference was that the teachers had more access to technical support compared to students.

102 Only those course coordinators who had answered that they had "bad" or "good and bad" experiences of using video conferencing got this question, i.e. 250 persons. Maximum three alternatives could be marked.

On third place was the disadvantage that *"The use of desktop conferencing limits how I can act in the teaching situation"*. This means that even though desktop conferencing offered the possible affordances of teaching at a distance, i.e. mediating teaching by interacting with desktop conferencing (Säljö, 2000, 2005; Wertsch, 1998), many course coordinators claimed that it also had possible limitations which influenced how they could act in the teaching situation. Even though the alternative: *"The use of desktop conferencing requires extensive preparations"* had been marked by relatively few of the course coordinators in competition with the other alternative answers, it can still be interpreted as a possible limitation of desktop conferencing that it required more preparations than teaching at campus (Gibson, 1986, 2015).

CONCLUSION

More than half of the course coordinators could be classified as having intermediate experience of distance education.[103] However, the other half could be classified as either experienced or little experienced, which might be considered somewhat surprising.

More than half of the course coordinators had not received any in-service training within the field of distance education. Those who had the training, had participated in informal forms of training, such as seminars and workshops. The training had also been modest in time as less than half of them had participated in training equivalent to less than 7.5 credits.

Distance education partly involves different conditions and frames than campus education. In recent years, there have been increased demands of pedagogical education of teachers in higher education. Therefore, it lies close at hand that teachers in distance education also need in-service training within that particular field. This means that there are reasons for questioning why so relatively few course coordinators had participated in in-service training within the field of distance education and why the received training had been so modest in time.

103 Intermediate experienced is defined as: experience from more than five years and less than eleven courses/programmes or having less than five years of experience and more than six courses/programmes.

Here the answers to *RQ2* will be presented; *How do course designers respond to the possibilities and limitations of video conferencing and desktop conferencing?* The three most reported advantages for both *desktop* and *video conferencing* were related to the fact that these technologies have the possible affordances (Gibson, 1986, 2015) of oral and visual communication between groups and individuals in different locations. The possibility of spatial flexibility is also one of the main arguments for distance education. This means that the course coordinators appreciated that both technologies had the possibility of offering a complement to written communication, albeit more so for desktop conferencing than for video conferencing. An explanation for this difference is that verbal and visual information is more critical during individual communication, which is more common than group communication in desktop conferencing. Group communication is more frequent when video conferencing is used.

Many typical advantages and disadvantages were related to the specific features of the technologies, which are described in section 2.7 and their affordances in a given teaching situation. For example, the most reported important *advantage for video conferencing* was that it required higher demands of planning and organisation and for *desktop conferencing* that it had the possible affordance of offering a complement to written communication. Also, that features as shared documents, shared whiteboard, and shared application were more emphasised as possible affordances of desktop conferencing. This indicated that the course coordinators did acknowledge and use these specific possible affordances.

A comparison of the *disadvantages of video conferencing* and *desktop conferencing* revealed that affordances related to typical ways of use of the two technologies played a significant role. For example, students' technical problems were a significant limitation for *desktop conferencing,* but not for video conferencing. *Desktop conferencing* is typically used by individual students without technical support whereas support is often available during *video conferences*. There are also fewer types of equipment involved that may cause problems as it is mostly used for groups and not individuals as desktop conferencing.

The result that students had problems with the technology, is supported by a study by Furr and Ragsdale (2002), which showed that technical problems and delays in audio and video caused frustration for both stu-

dents and teachers. A study by Cunningham (2010) also found that poor connectivity and quality of sound during desktop conferencing caused problems in understanding among teachers and students. The quality of sound is regarded as much more critical than the quality of picture (Kraut & Fish, 1995). In addition, Burns (2002) has even found that poor quality of sound decreases the degree of interactivity when video conferencing is used, and there are reasons to assume that the effect can be the same for desktop conferencing. The fact that *desktop conferencing* is more individually used probably also explains why low interactivity was not a significant *disadvantage* in this study, while it was mentioned as the second most important disadvantage for *video conferencing*.

There were many similarities between course coordinators' experiences of *video conferencing* and *desktop conferencing* regarding the research question *RQ3: course coordinators' attitudes and perceptions about the use of video conferencing and desktop conferencing in distance education?* For example, it was as common for course coordinators not to have any experience of video conferencing as of desktop conferencing, although they worked with distance education, which is a striking result. More course coordinators had both good and bad experiences, and the difference between video conferencing and desktop conferencing was small. The positive experiences were more frequent than the negative, and this also applied to both video conferencing and desktop conferencing.

That almost half of the course coordinators marked; *"The use of video conferencing limits how I can act in the teaching situation"* as a *disadvantage,* was exciting since it shows that the technology of video conferencing can entail possible limitations (Gibson, 1986, 2015). By identifying, a constraint like this, it can be possible to understand *how* and *why* it emerges and its *effects* (Gibson, 1977). This can contribute to improve technology and inform the design to reduce or even eliminate constraints. The result that video conferencing limited how many of the course coordinators could act in teaching is comparable to Burns' finding (2002) that teachers did not consider themselves confident enough to use the *video conferencing* sessions for teaching content, which resulted in sessions being used for introductions and revision instead. Similarly, Jonsson (2004) found that the teacher claimed to feel constrained by the setting of projection screens, fixed rows, and the technical equipment on the desks. Also, the teacher

had to be concentrated on three different angles; the camera in front of him, the computer on the table, and the projected picture on the screen of the computer (Jonsson, 2004). This would be very interesting to investigate further.

These results also indicated that it is crucial to study the category of video conferencing separately from the category of desktop conferencing as this study showed that there were differences in affordances between the technologies. It also demonstrated that the category investigated must be defined. Previous research has not always considered these differences (Akarasriworn & Heng-Yu, 2013; Bower et al., 2012; Candarli & Yuksel, 2012).

One of the main questions of this study was *what* categories of video were used, *how* different categories of video were used, *how much* they were used, and *why they are used or not used*. This will be presented in the next section, starting with the categories of video that were used.

6.2 NON-PEDAGOGICAL ASPECTS OF THE USE OF VIDEO

The results of the analysis of the reported use of video in the courses in relation to non-pedagogical considerations will be presented here. Naturally, the reasons for course coordinators' decision to use or *not* use categories of video in a course and how much they were used was probably due to pedagogical arguments, but these will be set aside for now and discussed later on.

The answers to the following questions will be given in this part of the thesis:

RQ1: How is video used in digital distance education? When teachers design distance courses with video;

a. which categories of video are used?
b. how much are they used?
d. how are they used?

The answers give an essential review of the use of video in digital distance higher education in Sweden, and at least to my knowledge, this research has not been carried out before.

According to some of the course coordinators' comments, particularly regarding *video as a tool for learning,* one can suspect that some informants did not quite understand what was meant by the description of this category. It is always challenging to find the right balance between how much explanations and definitions are necessary, and when it is redundant information, which will take too much of the informants' time. That was, for example, the reason why pictures were used in the questionnaire for distinguishing between video conferencing and desktop conferencing. It is also difficult to explain what is meant when some of the informants had never experienced the use of that particular technology, and they, therefore, had nothing to relate to.

In order to give a complete view of similarities and differences, the results regarding the different categories of video will be presented side by side, when there are similar questions in the questionnaire. For specific questions concerning a particular category of video, the results will be presented separately.

USED CATEGORIES OF VIDEO

In general, course coordinators who had participated in in-service training and had more experience in distance education used video more than those without experience and in-service training.

Below, the answer will be presented to the following questions; *RQ1: How is video used in digital distance education? When teachers design distance courses with video;*

a. which categories of video are used?
b. how much are they used?

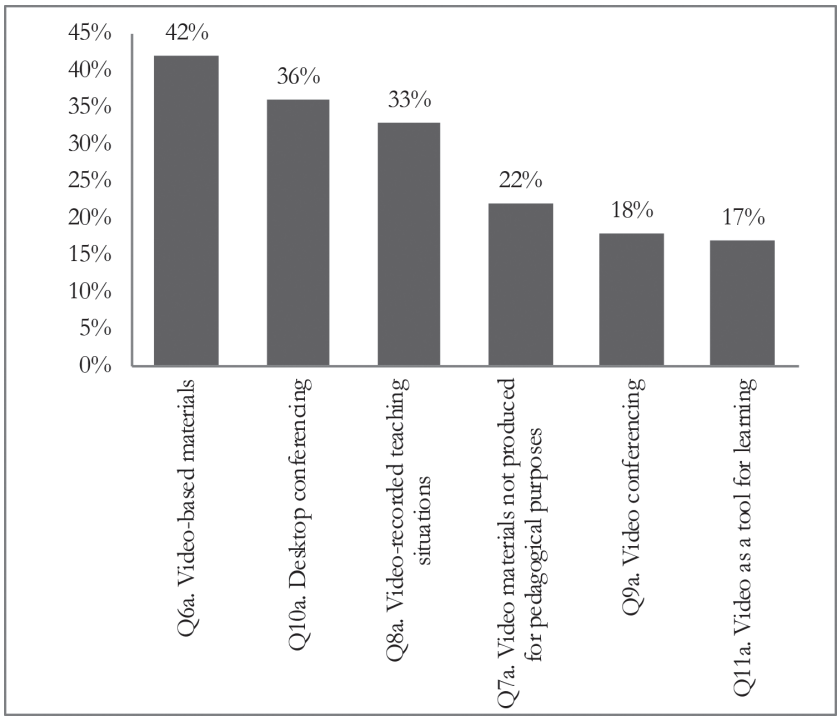

Figure 12. The distribution of different categories of video in courses/programmes. (In some courses/programmes several categories of video were used).

Three categories of video were used in most courses; *video-based materials,* 42%, *desktop conferencing,* 36%, and *video-recorded teaching situations,* 33%. As learning materials in the form of video was used in less than half of the courses, written course materials were not as dominant as previous research has indicated (Akarasriworn & Heng-Yu, 2013; Akin & Neal, 2007; Hrastinski, 2007a; Hrastinski et al., 2010; Levine & Sun, 2002; Söderström & Westerberg, 2005). *Video-based materials* can be viewed as having among the lowest demands on teachers' knowledge of technology, and it was mostly used by course coordinators with little experience in distance education. No relations were found regarding how much *video-recorded teaching situations* was used and experience of distance education or participation

in in-service training. When *video-recorded teaching situations* were used, they consisted of *video-recorded lectures* in three out of four courses.

Both *video-recorded teaching situations* and *desktop conferencing* play an especially important role in digital distance education since they can be used to mediate teaching and to create a similar situation as on campus with, e.g. lectures and seminars but at a distance (Säljö, 2000, 2005; Wertsch, 1998). However, among these two categories, it is only desktop conferencing, which has the possible affordance of providing the categories of interaction that Moore calls *student-teacher interaction,* and *student-student interaction* (Moore, 1993b). That *desktop conferencing* was used in so many courses is probably related to that it has the possible affordance of offering personal meetings with moving picture and sound. One of the challenges with distance education is the geographical distance between teachers and students (Bernard et al., 2009). Furthermore, *desktop conferencing* has the possible affordance of spatial flexibility and that students and teachers can be in remote locations. However, it is surprising that it was the second most used in courses as it is a newer technology than *video conferencing* and because it was as late as in the autumn of 2009 that SUNET signed an agreement offering Adobe Connect to Swedish HEIs. This means that Adobe Connect was probably not used so much during the spring of 2009, which is the period the questionnaire covered. It is therefore likely that other solutions such as Marratech and Skype were used and that courses which used Skype as a tool for desktop conferencing were included in the results for *desktop conferencing*. On the one hand, desktop conferencing is probably used even more today, but on the other hand, the implementation of technology in higher education goes rather slowly.

The group of least used categories of video consisted of *video materials not produced specifically for pedagogical purposes,* used in 22% of the courses, *video conferencing*, and *video as a tool for learning,* which were used in respectively 18 and 17% of the courses. It seems somewhat natural that *video materials not produced for pedagogical purposes* were not so commonly used as teachers probably prioritised materials in their teaching that had some quality description and the quality of these materials could be very fluctuating. In general, production of all types of video increases and video materials *not* specifically produced for pedagogical purposes is a field that increases tremendously, e.g. with video materials on YouTube and other

sites for video materials on the Internet. However, not all of these video materials are suitable for teaching and learning in higher education. Some teachers might feel uncertain whether they have the required knowledge to assess the quality of these materials.

The result that *video conferencing* is the category of video that was the second least used was somewhat surprising as video conferencing provides the possible affordances of replacing physical meetings on campus and teachers often prefer to teach in a way that they are familiar with (Holmberg, 1998). Video conferencing offers the possibility of maintaining the organisation of the classroom that teachers are familiar with, making it reasonable to assume that the use of video conferencing should be more common. However, at the time of the survey, *video conferencing* may still have had a poor reputation as it has taken a long time for the technology to mature. Technical problems due to requirements for bandwidth that could not be secured and pedagogical constraints due to poor picture and sound quality likely contributed to giving video conferencing a poor reputation (Kraut & Fish, 1995; Weinman, 2007; Wilson, 2008). In addition, it was previously only possible to see the picture of one site at a time during a video conference (Hedestig & Kaptelinin, 2002), making contact and interaction with the other participating parts difficult. All this together, contributed to the picture that the affordances of video conferencing consisted of more limitations than possibilities. Today, with modern technology, it is possible to have several sites and camera angles in picture simultaneously. However, it is likely that the previous limitations of video conferencing still influence teachers' attitudes and willingness to try and use it. Therefore, it is only natural that teachers who had never experienced the quality of HD sound and picture in a teaching situation didn't consider using it.[104]

Another reason why video conferencing was used in so relatively few courses was that, as the national study demonstrates, more than half of the course coordinators had no experience of using video conferencing in teaching. The results indicated that there was a correlation between teachers' experience in distance education and in-service training compared to those who had less experience and training. This difference is probably

104 For more information about the development of distance education, see section 2.3.

due to that, more technological knowledge was required in comparison to the other categories of video.

Furthermore, video conferencing requires special equipment and if few teachers knew how to use it and some had bad experiences of using it, there is a risk that the HEIs may not give priority to spend much money on buying new equipment for something that seems to be little in use instead of finding out what the reasons were. Also, teaching through video conferencing requires in-service training regarding how to handle the video conferencing situation, which most teachers have not received (Burns, 2002; Burns, Ryan, Lander, & Wragg, 1999; Johannesen & Eide, 2000). Teachers also often felt insecure with technology, and technical support was not always provided (Kaptelinin & Hedestig, 2004; Levine & Sun, 2002).

There is also the students' perspective and the use of video conferencing made the learning situation less flexible for the students since it reduced both the possibilities of spatial and temporal flexibility. This can be compared with a study in Australia where video conferencing was the most common, and it was also used at all universities (Smyth, Andrews, Bordujenko, & Caladine, 2011).

The results of the questionnaire can be compared to the use of video in higher education in the U.S. in the year 2000-2001, where 51% of the HEIs used live video, and 41% used recorded video. It is reasonable to assume that these figures were even higher in 2009 than in 2000-2001. Furthermore, the results from the study for this thesis can be compared to a study in higher education in Sweden from 2005 (Söderström & Westerberg). That study indicated that teachers had the least experience of communication through sound and picture (video conferencing and video recordings of lectures), and focus was instead on written forms of communication.

Video as a tool for learning was unsurprisingly the category used in fewest courses. Video production has previously required expensive hardware for recording and software for editing as well as specialised knowledge of how to use that hardware and software, limiting the possibilities for using video production in teaching. Therefore, this type of video has not been so frequently used in education. However, since the demands of hardware, software, and knowledge of how to use video are now much lower

than for earlier iterations, the use of this category of video will likely grow in the future.

Four out of six categories of video were used more by experienced than by little experienced course coordinators. Two categories of video were used more by experienced than by little experienced, (video conferencing and desktop conferencing) although the difference was minor. Three types of video or more in the same course were more frequent among experienced compared to teachers with little experience. Another difference was that it was more common among little experienced not to use any or only one category of video in comparison with more experienced course coordinators. In general, experienced course coordinators used video in more courses than little experienced, and there was also a tendency that experienced used more categories of video in the same course. A similar result is found in a study by Arya, Christ, and Chiu (2016), which suggested that the more teaching experience, the more video use and this was also cumulative over time.

Other studies (Burns, 2002; Wang & Wiesemes, 2012) showed that the most important factor for teachers to start using technology in their teaching was that they had received in-service training. Therefore, the use of video should probably increase if the course coordinators would receive in-service training in how different categories of video can be used in teaching. This assumption is supported by Caladine et al. (2010), who claimed that "many who teach or manage distance education do not have access to the knowledge and skills that make for effective and efficient use of video communications." (Caladine et al., 2010, p. 249).

Finally, there were also differences in the use of different categories of video dependent on subject areas. Within *Law and social sciences,* video was used in nearly half of the courses, depending on the category of video. With these differences between subject areas, it is reasonable to assume that certain subject matters were probably more suitable for the use of video than others. Also, that specific video categories were more suitable for certain subject matters, and the most significant difference was for *video-based materials*, which was used in 39% of the courses within Technology but only in 6% of the courses within Other areas. The lowest difference was found for video conferencing, which were used in 14% of the courses within Natural science but only in 5% of the courses within the Creative area.

SEVERAL CATEGORIES OF VIDEO IN THE SAME COURSE

In this part, results that contribute to answering the following question will be presented: *RQ 1: How is video used in digital distance education? When teachers design distance courses with video; d) how are they used?*

It is not only interesting to find out how many courses the different categories of video were used in. The survey also sheds light on whether or not more than one category of video was used in the courses and indicates that different categories were used for different purposes.

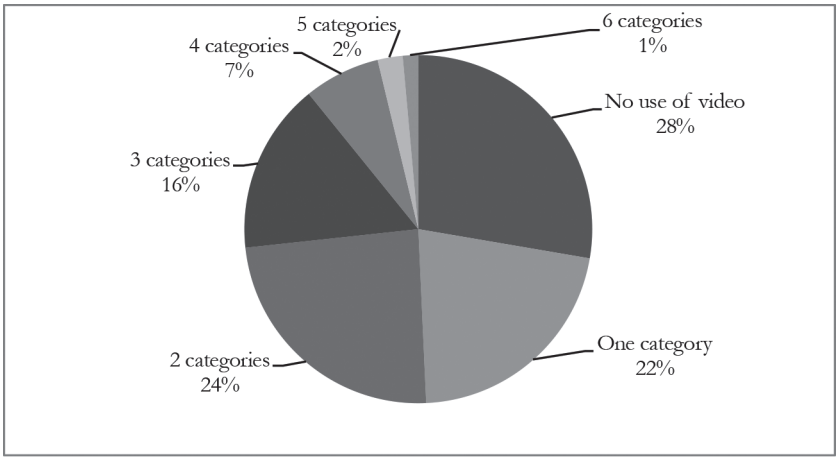

Figure 13. How many categories of video that were used in the same course. (N=1,116). (Frequency in brackets ( ). Percentages without brackets).

It was most common *not t*o use video at all, but nearly equally common was to use one or two categories of video. When three or more categories of video were used, the results showed that the more categories of video, the fewer courses and least common it was to use all six categories of video. However, in nearly half of the courses, more than one category of video was used. This result is worth noticing as it indicates that it is crucial to define which category of video that has been investigated in the research. Furthermore, it means that video cannot be viewed as one technology, but has to be considered as several categories with different possible affordances and constraints (Gibson, 1986, 2015). This result also

demonstrates that several categories were used in order to supplement each other.

In conclusion, video was used in 72% of the courses, which is a rather high figure since it is from 2009. The results from a report from 2017 indicated that 73% of the HEIs in the world used video for remote teaching and learning (*The State of Video in Education 2017. A Kaltura Report,* 2017). However, these figures are not necessarily comparable since the survey in this thesis examined number of courses where video was used and the Kaltura Report examined how many HEIs used video in distance education. However, taken together, both studies strongly suggest that video is frequently used.

RELATION BETWEEN THE NUMBER OF CATEGORIES OF VIDEO AND EXPERIENCE OF DISTANCE EDUCATION

In section 6.1, three categories of teachers were defined; *little experienced, intermediate experienced*, and *experienced*[105, 106]. When course coordinators' experience of teaching distance courses was related to the number of courses in which different categories of video was used, the strongest relationship was found for *desktop conferencing*, which was *mostly used by intermediate experienced and experienced* course coordinators. *Little experienced* typically used *video-based materials,* which has lower requirements of teachers' digital pedagogical knowledge and technological knowledge. The smallest difference regarding course coordinators' experience was for *video-recorded teaching situations*. This result indicated that the experience of distance education could have a positive influence on the use of categories of video that required more of the teachers' knowledge.

In general, *the intermediate experienced and experienced* used *more video* in the courses than *the little experienced*. It is therefore interesting to find out whether experts also used more categories of video in the same course.

105 Four informants did not answer the question how many distance course they have had and since the categorisation of little experienced and experienced is based on both experience in number of year and number of courses, these informants were omitted from this result.

106 Several categories of video could be used in the same course.

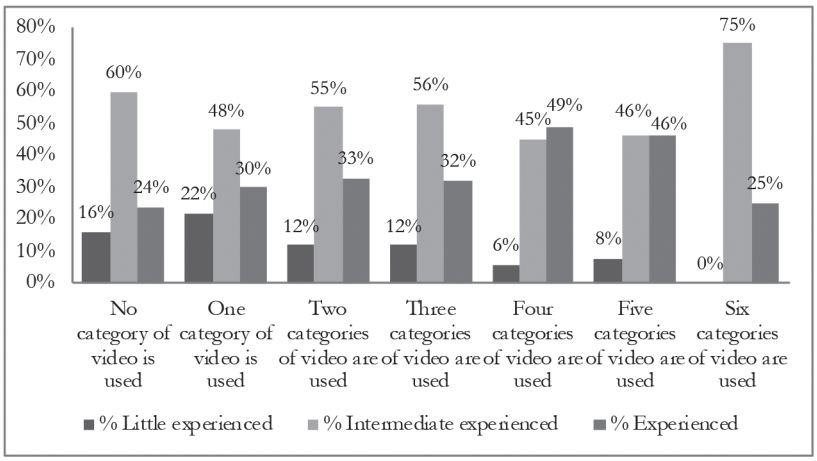

Figure 14. The relation between how many categories of video were used in the same course and the course coordinators' experience of distance education.[107]

Little experienced course coordinators typically did not use any category of video or fewer categories of video in a higher number of courses than *intermediate experienced* and *experienced.*[107, 108] Course coordinators who were *intermediate experienced* tended to use several categories of video in more courses than those who were *experienced,* except for four and five categories of video. The most significant difference was found for six categories of video as *Little experienced* did not use all categories in any courses while *intermediate experienced* used six categories in 75% of the courses and experienced in 25% of the courses. In general, course coordinators who were more experienced; thus both tended to use video in more courses and also used more categories of video in the same course.[108]

107 Four informants did not answer the question how many distance course they have had and since the categorisation of little experienced and experienced is based on both experience in number of year and number of courses, these informants were omitted from this result.

108 Answers regarding the use of categories of video were missing for 38 courses.

THE RELATION BETWEEN DIFFERENT CATEGORIES OF VIDEO AND COURSE COORDINATORS' IN-SERVICE TRAINING

Not only course coordinators' experience of distance education was related to how much they used different categories of video, but also whether they had participated in in-service training within the field of distance education.

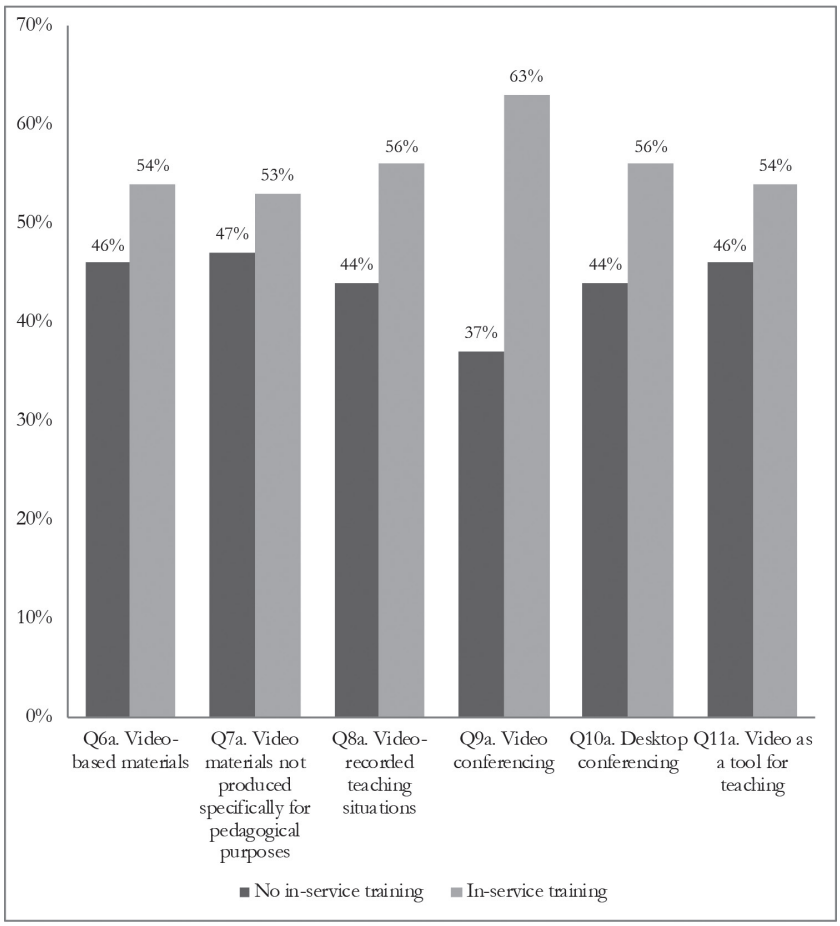

Figure 15. The relation between the use of different categories of video and course coordinators' in-service training.

Figure 15 shows that there was a relation between in-service training and the utilisation of different categories of video. Course coordinators with in-service training used the categories of video to a higher percentage. The difference was more significant regarding *video conferencing*, *video-recorded teaching situations,* and *desktop conferencing* than other categories. Particularly video conferencing and desktop conferencing demanded more of the course coordinator's knowledge.

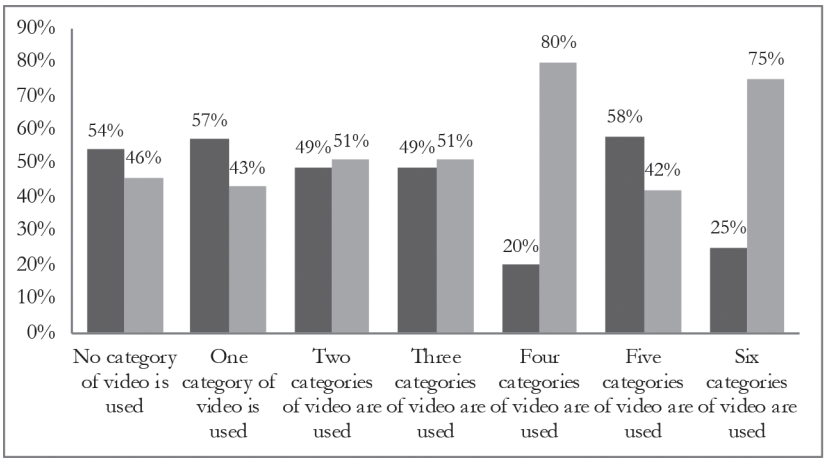

Figure 16. The relation between how many categories of video were used in the same course and the course coordinators' in-service training.[109]

It is also interesting to find out whether course coordinators with in-service training also used more categories of video in the same course. Not surprisingly, the percentage of course coordinators who did *not* use any category of video or only one category was higher for those without in-service training than for those with in-service training (see Figure 16). For two and three categories of video there was no difference between course coordinators who had participated in in-service training or not. For using four and six categories of video, the differences were particu-

109 Naturally, when discussing the results of this analysis, it is important to keep in mind that there is no information in the data regarding what is included in the in-service training and whether the use of video was a part of the courses coordinators' training or not.

larly significant. This analysis indicated that also, in-service training was a factor that influenced the use of several categories of video in the same course positively.

VIDEO - OPTIONAL OR COMPULSORY

The result regarding the number of courses in which video reported above is one part of the answer to the question: *RQ1: How is video used in digital distance education? When teachers design distance courses with video; d) how much are they used?* However, to answer this question more fully, it is also relevant to find out whether video was optional or compulsory (see Figure 17).

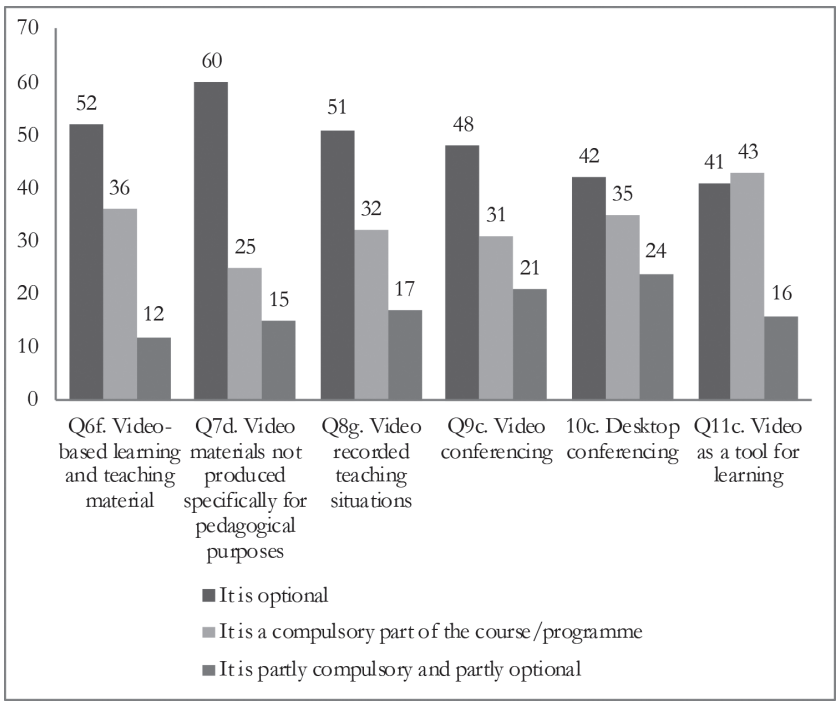

Figure 17. Whether categories of video were optional or compulsory for students.

In general, video was optional to a rather significant extent, but differences between the categories of video could be found. For example, *video as a tool for learning* was compulsory in more courses than the other five categories of video (see Table 5). This could be explained by the rules, which makes it more difficult to claim that teaching activities are compulsory unless they are examining. *Video as a tool for learning* could be more used for examination than the other categories of video in higher education, which might explain why it was to a high degree compulsory. Furthermore, there was a tendency that *video-based materials, video materials not produced specifically for pedagogical purposes,* and *video-recorded teaching situations*, were optional to a higher degree compared to *desktop conferencing*.

Table 5. The relation between whether categories of video were optional or compulsory and the course coordinators' experiences of distance education; little experienced, (Lit.), Intermediate experienced, (Int.), or Experienced, (Exp.). (Frequency in brackets ( ). Percentages without brackets).

	Q6f. Video-based materials			**Q7d. Video materials not produced specifically for pedagogical purposes**			**Q8g. Video-recorded teaching situations**			**Q9c. Video conferencing**			**Q10c. Desktop conferencing**			**Q11c. Video as a tool for learning**		
	Lit.	Int.	Exp.	Lit.	Int.	Exp.	Lit.	Int.	Exp.	Lit.	Int.	Exp.	Lit.	Int.	Exp.	Lit.	Int.	Exp.
It is optional	(43) 67	(134) 53	(69) 45	(2) 25	(36) 67	(32) 60	(14) 64	(50) 41	(42) 57	(9) 64	(15) 25	(25) 50	(6) 43	(57) 44	(42) 58	(3) 33	(31) 40	(10) 29
It is a part of the content of the course/programme and compulsory	(15) 23	(96) 38	(57) 37	(3) 38	(10) 19	(14) 26	(5) 23	(48) 39	(20) 27	(3) 21	(32) 53	(12) 24	(4) 29	(40) 31	(25) 34	(5) 56	(35) 45	(17) 49
Certain parts are compulsory, and other parts are optional	(6) 9	(25) 10	(27) 18	(3) 38	(8) 15	(7) 13	(3) 14	(25) 20	(12) 16	(2) 14	(13) 22	(13) 26	(4) 29	(34) 26	(6) 8	(1) 11	(12) 15	(8) 23
Total	(64) 100	(255) 100	(153) 100	(8) 100	(54) 100	(53) 100	(22) 100	(123) 100	(74) 100	(14) 100	(60) 100	(50) 100	(14) 100	(131) 100	(73) 100	(9) 100	(78) 100	(35) 100

Course coordinators with little experience regarded video as optional to a higher degree in relation to three categories of video; *video-based materials, video-recorded teaching situations,* and *video conferencing*. Typically, course coordinators with more experience marked that the categories of video were compulsory more often than course coordinators with little experience. Exceptions from this could be found for *video materials not produced specifically for pedagogical purposes* and *video as a tool for learning*. Among course coordinators with more experience, it was more common to have certain parts as compulsory and others as optional, compared to those with little experience. Exceptions from this could be found regarding *video materials not produced specifically for pedagogical purposes* and *video as a tool for learning*. These differences between categories of video and related to course coordinators' experience indicated that the categories of video were used in different ways. Also, the experience influenced the course coordinators' opinion regarding which was essential and less important. This means that the category of video can influence research results and it is therefore essential to define and separate categories of video in research.

HOW MUCH VIDEO WAS USED

Regarding *RQ1: How is video used in digital distance education? When teachers design distance courses with video; b) how much are the categories used?* two parts of the answer have already been presented; 1) in how many courses the different categories of video were used and 2) whether categories were optional or compulsory for students. The third part of the answer to the question refers to what extent different categories of video were used in courses.

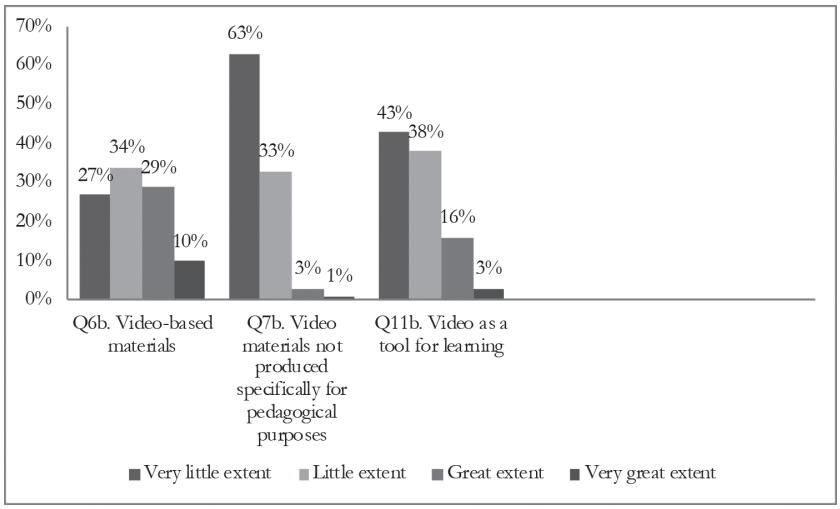

Figure 18. How much three categories of video were used.

Each of the three categories of video shown in Figure 18 were most used *to a very little extent* or *little extent*. *Video-based materials* had the evenest distribution of the three categories for *very little extent, little extent* and *great extent*. The results indicate that these three categories of video played a minor role in the pedagogical design of courses. The related item of *video-recorded teaching situations* indicates the number of times the same three categories of video were reportedly used (see Figure 19).

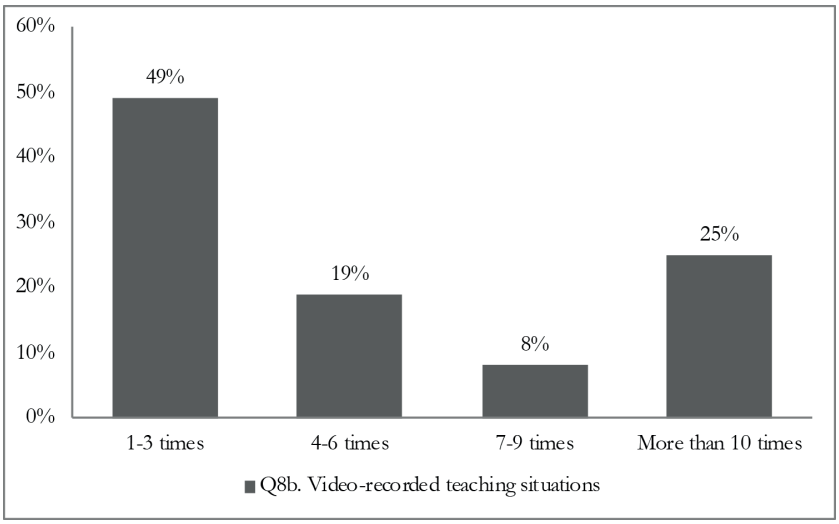

Figure 19. Q8b. How many times video-recorded teaching situations were used. (N=377).

The figure shows that *video-recorded teaching situations* were either used occasionally or regularly, but for *video conferencing* and *desktop conferencing* it is better to investigate the number of times they were used rather than whether they were used or not, e.g. *to a very little extent* or *a very great extent*.

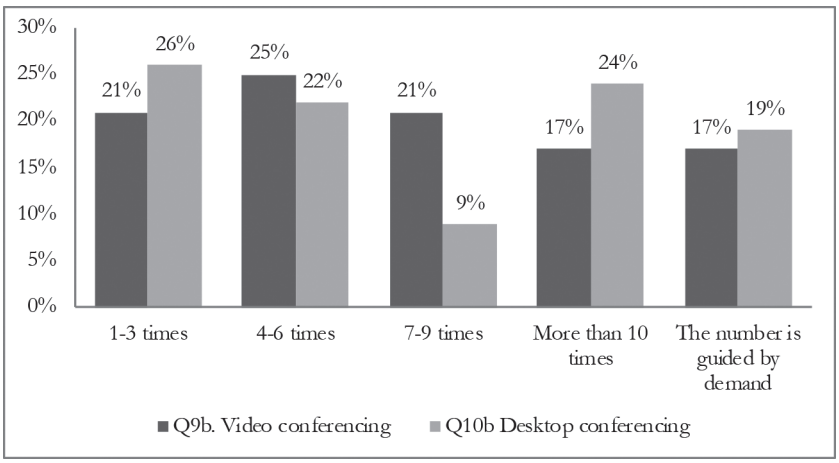

Figure 20. Q9b and Q10b. How many times video conferencing and desktop conferencing were used.

For the categories an additional alternative was added: *"the number is guided by demand"* as these categories of video are often used to replace physical course meetings. Figure 20 shows that the use of *desktop conferencing* and especially *video conferencing* was distributed rather evenly across the different alternative answers except that it was specifically less common to have 7-9 desktop conferences. It was less common that the demand guided the number of *video conferences* than for *desktop conferencing*. This might reflect that *video conferencing* demanded more planning as a video conferencing room would need to be booked in advance and it often also involves local study centres. Video conferencing equipment is often fully booked. The equipment for *desktop conferencing,* on the contrary, requires less planning as only software (often a plug-in to the browser), webcam and headset are required.

CONCLUSION

To summarize the findings in this section, I will start with the answer to the first part of *RQ 1: How is video used in digital distance education? When teachers design distance courses with video; a) which categories are used?*

Video conferencing was the category of video that was used in the *second-fewest courses*. This is an exciting result as *desktop conferencing* was instead among the three most used categories of video, although it is a newer technology than *video conferencing* and the quality of *desktop conferencing* has previously been a problem (Cunningham et al., 2010). It is of particular interest to compare the use of *video conferencing* and *desktop conferencing* as they were the only categories of video in the survey that could provide a situation that resembles the one in the classroom with synchronous communication, although at a distance (for more information regarding desktop conferencing, see sections 3.3 and 3.5-3.7). However, both technologies are often used to bridge the physical distance between teacher and students.

One reason that *video as a tool for learning* may have been reported as being used in the fewest courses depends on it being more difficult for students to make recordings, edit video, and get access to video equipment at a distance, even if the development of video has made it easier and the demands on hardware and software have decreased (Collins et al.,

2000). However, there might still be some resistance from teachers to start using this type of technology as they are not familiar with it and it may be viewed as complicated and demanding.

In general, teachers with experience and in-service training used video more and also more categories of video in the same course compared to teachers with less experience and in-service training. The categories of video that could be considered as easier to use, e.g. *video-based materials, video-recorded teaching situations* were used more by teachers with little experience in distance education while *desktop conferencing* and *video conferencing* were used more by experienced teachers.

The use also varied depending on the subject matter, which indicated that the course coordinators made use of the specific affordances (Gibson, 1986, 2015), the unique possibilities of each category of video. The course coordinators consciously used the most suitable category for each subject matter and each teaching situation.

To answer the RQ1: *b) How much are the categories of video used?* Answers to the following three aspects will be presented;

1. *in how many courses the categories were used*
2. *whether the categories of video were optional or mandatory, and*
3. *to what extent categories of video were used in the courses?*

I will start with *1) In how many courses were the categories used?* At least one category of video was used in three out of four courses, but in one out of four courses, video was not used at all. This is interesting, as *video-recorded teaching situations* in distance education might be used for replacing physical meetings on campus with lectures, seminars and laboratory work. Furthermore, two categories of video that provide live video; *video conferencing* and *desktop conferencing* might be used in distance courses in order to replace ordinary lectures and seminars. Therefore, the use of one of them may have resulted in an exclusion of the other category when answering the questionnaire. The categories of video could be divided into two main groups depending on in how many courses they were used. *Video-recorded teaching situations, desktop conferencing and video-based materials* were used in 33-42% of the courses (least used first). *Video as a tool for learning*, *video conferencing*, and *video materials not produced specifically for pedagogical purposes,* were used in 17-22 % of the courses (least used first).

2) Whether the categories of video were optional or mandatory? Generally, different categories of video were to a rather significant extent *optional* for students. This might depend on, that according to the regulations in Swedish higher education, it is often required that it is an examination in order to make a course meeting compulsory, either face-to-face or at a distance. *Video as a tool for learning* was the category of video that was compulsory to the highest degree, which might indicate that it was often used for examination. There was a tendency that *live video* was optional to a greater extent, *desktop conferencing* in particular, than the categories in recorded video.

3) To what extent categories of video were used in the courses? It was most common to use *video-based materials, video as a tool for learning,* and *video materials not produced specifically for pedagogical purposes* to very little or little extent. The highest percentages for using the category to great or very great extent was found for *video-based materials. Video-recorded teaching situations* were typically used 1-3 times. There were small differences regarding how many times *video conferencing* and *desktop conferencing* were used, except that the alternative 7-9 times was more than double as frequent for *video conferencing*. In general, the video categories were not used so much in the courses and it therefore likely that they played a minor role in the pedagogical design of the course.

Regarding the answer to the question *RQ1: d) how are the categories of video used,* more than one category of video was used in nearly half of the courses. Both experience and in-service training had a positive influence on how many categories of video were used within a course. However, from three or more categories of video, the number of courses decreased where more categories of video were used. Since certain categories of video were combined with other specific categories of video, several categories of video were probably used to complete each other. For example, *video-recorded teaching situations* were often combined with *video conferencing,* and it was common to use *video-recording teaching situations* in the same courses as *desktop conferencing*. The reasons for these combinations of video might be that *video-recorded teaching situations* have the advantages of full temporal and spatial flexibility as well as making it possible for students to watch lectures as much and as many times as they want. However, students may need to get answers to questions and for providing this opportunity, *video*

conferencing or *desktop conferencing* was used as a compliment. More answers to the question of *how video was used* will be found in the next section, 6.3.

The empirical results reported in this section support the chosen categorisation of video as respondents appear to have understood what was meant by the categories of video and distinguished between them depending on which category they were asked about. This can be seen in the following areas; 1) in how many courses a category was used, 2) whether video was optional or compulsory, 3) to which extent video was used, 4) how video was used. This result demonstrates that it is important to define which category of video that is investigated in research, something that as shown in the literature review in chapter 4 is not always the case.

6.3 PEDAGOGICAL ASPECTS OF USING OR *NOT* USING VIDEO

In this section, the answers to the following questions will be presented:

RQ1: How is video used in digital distance education? When teachers design distance courses with video; c) why are categories of video used or not used? d) how are they used?

The answers to questions *c* and *d* will be reported in the following order: first, *recorded video* and then *live video*. Even if it is not possible to say anything definitive about the affordances (possibilities and limitations) (Gibson, 1986, 2015) of video from a survey, the analysis of the results can still point to areas of possible affordances. This will be followed up later in the results of the interview study.

WHY ARE CATEGORIES OF VIDEO USED OR *NOT* USED?

RECORDED VIDEO

Video-based materials

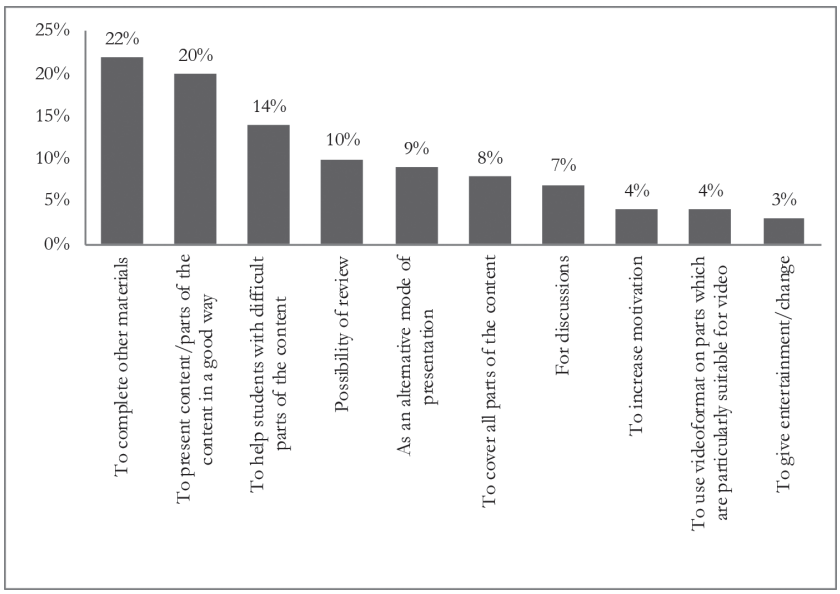

Figure 21. Q6g. Described as the three most important reasons for using video-based materials, (N=1,282 answers). [110]

It was found that the course coordinators' reported three most important reasons for using *video-based materials* related to its unique affordances for facilitating students' understanding of the content and for complementing other materials. As can be seen in Figure 21, the four alternatives

110 Only course coordinators who answered that they use this category of video received this question for 474 courses.

with 7-10% indicate potential affordances for presenting the content were reported for video-based materials; *"Possibility of review", "As an alternative mode of presentation"*, and *"To cover all parts of the content"*. Only 22 course coordinators reported "Other, namely …", which indicated that the fixed answers generally covered the course coordinators' perceived arguments for using *video-based materials*.

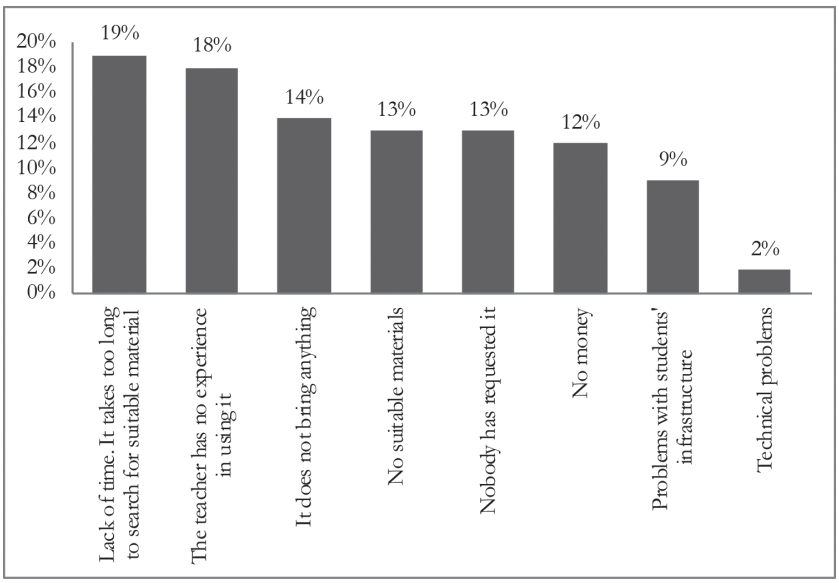

Figure 22. Q6i. Described as the three most important reasons for not using video-based materials, (N=1,123 answers).[111]

There were rather small differences in percentages between the course coordinators' reported reasons for why video-based materials were *not* used, which indicated that course coordinators' opinions were rather dispersed (see Figure 22). Two of the described most common reasons were; *lack of time to search for suitable materials* and *the teachers' lack of experience*, which were more related to the course coordinators' perspective than to the affordances of using video-based materials for student learning. The

111 Only the course coordinators of 772 courses who answered that they did not use this category of video received this question.

four following alternative answers were found to have similar results, but different reasons. The alternative *"It does not bring anything to the course/programme",* should probably not be regarded as a constraint, but rather that the course coordinators did not see any perceived benefits with the use of video-based materials. However, the alternatives; *"There are no suitable materials"* and *"No money"* demonstrated constraints. Furthermore, the course coordinators who had ticked *"Nobody has requested it"*, had probably not even considered using video-based materials and the teachers' lack of experience could be related to this option. This means that many of the essential arguments for not using video-based materials were also related to contextual or conditional reasons and not pedagogical or content-related reasons.

Open answers were more frequent for *not* using video-based materials compared to the reported three most important reasons for using this category of video.[112] This might indicate that some course coordinators did not think that the alternative answers showed their opinion. Nearly half of the open answers showed that the course coordinators had made an active choice to use something else instead of *video-based materials*.

112 N=106 answers.

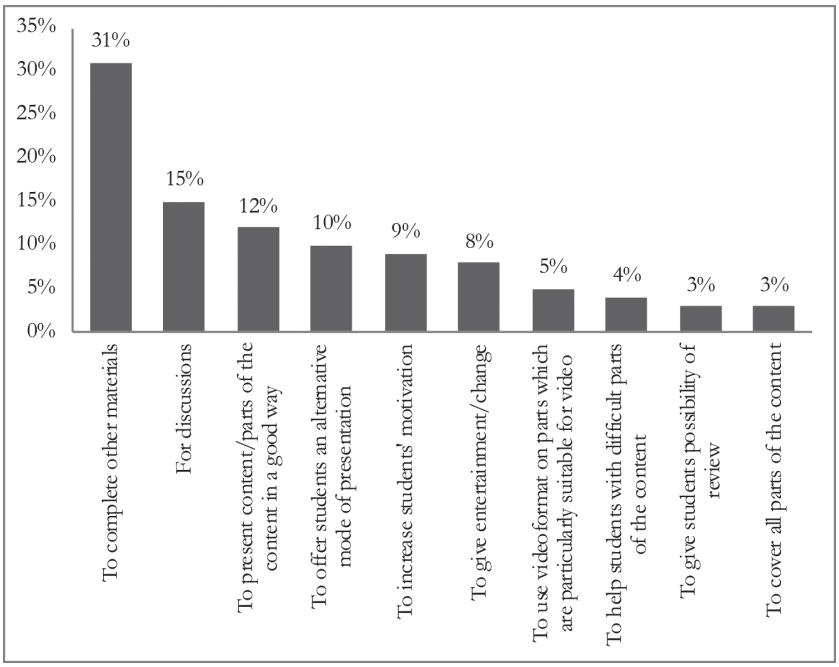

Figure 23. Q7e. Described as the three most important reasons for using video materials not produced specifically for pedagogical purposes, (N=623 answers).

As can be seen in Figure 23, course coordinators' reported the main reason for using *video materials not produced specifically for pedagogical reasons* was the possibility for complementing other materials. To use it for discussion, was the second most commonly ticked alternative, which could indicate that the course coordinators considered this category of video less important for presenting content and therefore contributing to student learning.

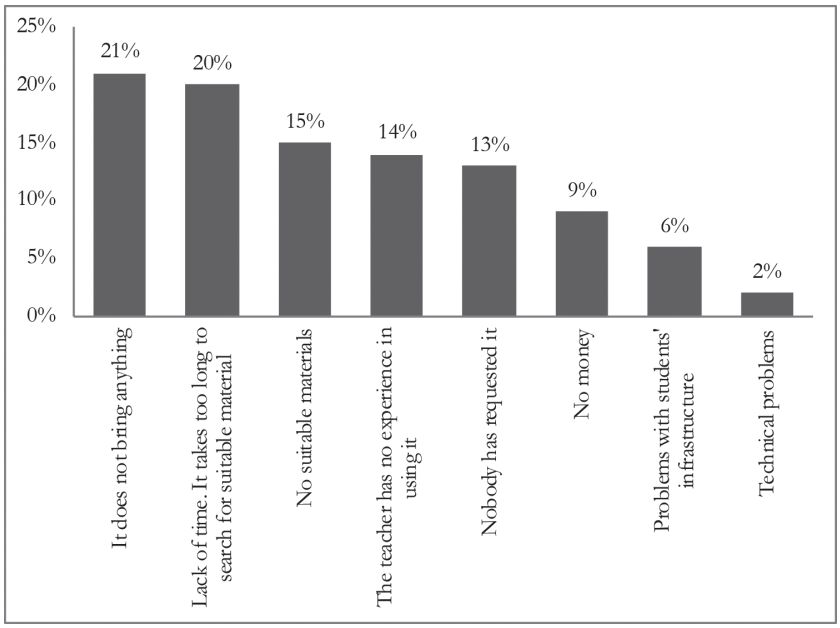

Figure 24. Q7g. Described as the three most important reasons for not using video materials not produced specifically for pedagogical purposes, (N=1,436 answers).[113]

The results for most reported alternatives were relatively equally distributed with regard to the most important reasons for *not using video-based materials not specially produced for pedagogical purposes* (see Figure 24). The most ticked alternative, *"It does not bring anything to the course/programme",* should probably not be regarded as a constraint, but rather that the course coordinators did not see any perceived benefits with the use of this category of video, which might depend on their lack of knowledge of how to use it. The following three reasons; *lack of time, no suitable materials*, and *the teachers' lack of experience* are related to constraints from the course coordinators' perspective.

113 Only the course coordinators who answered that they did not use this category of video received this question for 657 courses.

The answer *"Other, namely, …"*.[114] was found to be more common for this question in comparison with the question of why the course coordinators chose to use this category of video. About ¼ of the answers indicated that other methods were used instead. Other arguments were legal reasons, lack of resources, and lack of knowledge (12-19 answers).

Video-recorded teaching situations

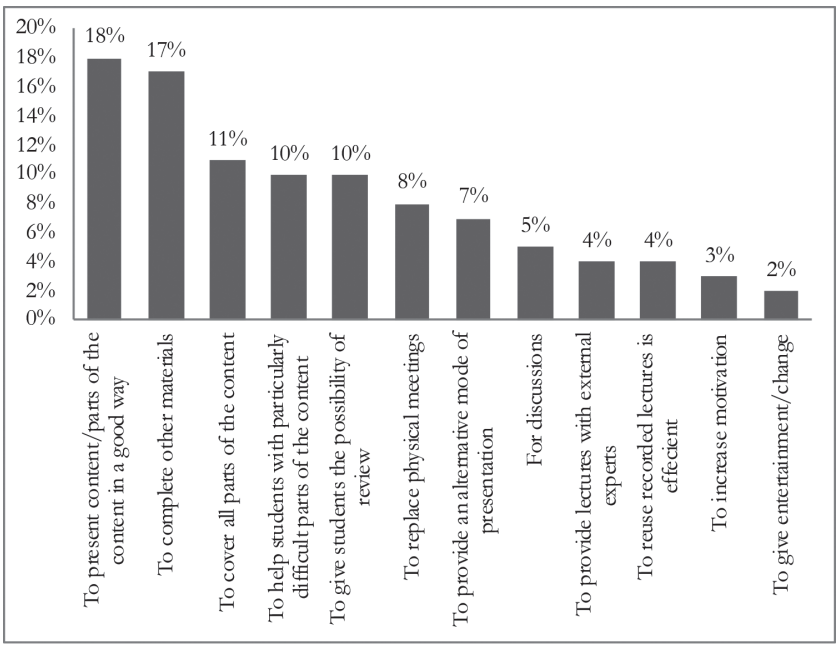

Figure 25. Q8h. Described as the three most important reasons for using video-recorded teaching situations, (N=1,011 answers).[115]

Among half of the most chosen alternatives visible in Figure 25 indicate that the reported reasons for using video-recorded teaching situa-

114 N=91 answers.

115 Only course coordinators who answered that they used video-recorded teaching situations in 377 courses received the question.

tions were diverse. Course coordinators' most important reasons for using *video-recorded teaching situations* in their courses were related to its perceived pedagogical affordances of facilitating student learning of course content; *"To present the content/parts of the content in a good way", "To complete other materials". "To cover all parts of the content"* and *"To help students with particularly difficult parts of the content".*

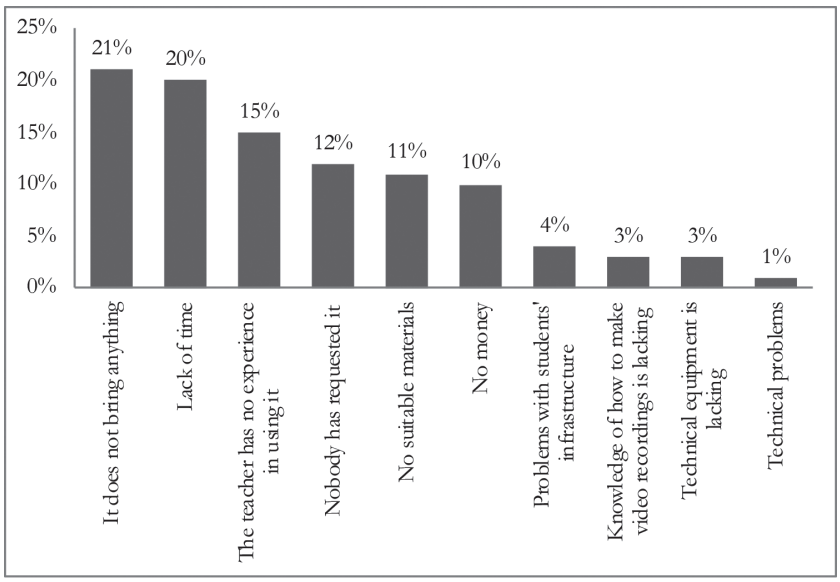

Figure 26. Q8j. Described as the three most important reasons for not using video-recorded teaching situations, (N=1,221 answers).[116]

The two most reported reasons for *not* using video-recorded teaching situations were equally important. The option; *"It does not bring anything to the course",* indicated that the course coordinators did not see or were not aware of the pedagogical benefits for this category of video and this should probably not be regarded as a constraint. Maybe they used video conferencing or desktop conferencing instead and therefore did not see the need for using video-recorded teaching situations. However, the

116 Only the course coordinators who answered that they did not use video-recorded teaching situations in 766 courses received this question.

alternative *"Lack of time. it takes too long to record teaching situations",* can be regarded as a constraint of the technology from the teachers' perspective and maybe also demonstrates a lack of teachers' resources for preparing to teach. There were rather many course coordinators who did not have any experience of video-recorded teaching situations, as that alternative was the third most common, which might have influenced that the alternative *"Nobody has requested it"* came already on 4th place. This showed that the interest for using video-recorded teachings situations was rather low, but would probably be higher today as it is getting more and more common to record lectures and the model "flipped classroom"[117] have been increasingly popular.

The alternative *"Other, namely …",* had rather many open comments, (120 comments).

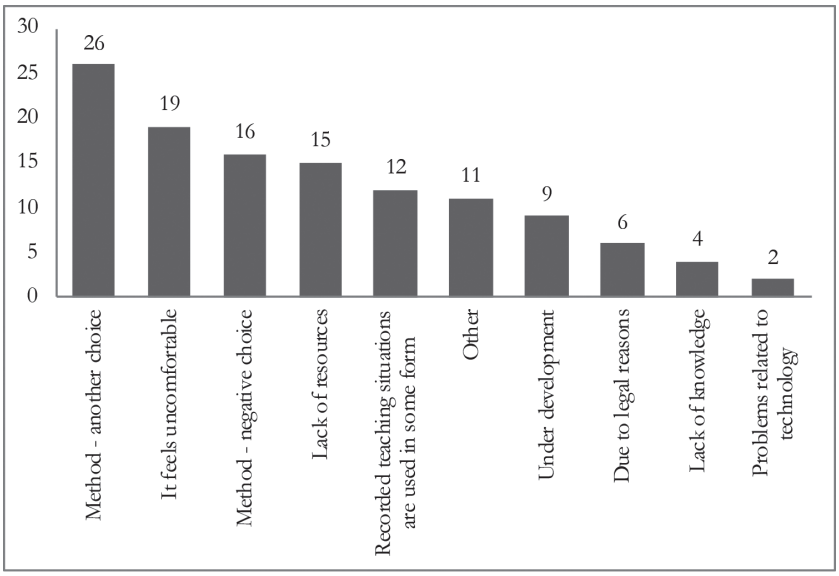

Figure 27. Q8j. Open answers: Reasons described for not using video-recorded teaching situations (N=120 answers).

117 "Flipped classroom" means that "traditional teaching is inverted in the sense that what is normally done in class is flipped or switched with that which is normally done by the students out of class." (Nouri, 2016, p. 1). Students prepare before class and video-recorded lectures is often part of the preparatory work. The time in class is spent on activities as problem-solving, analysis, collaborative work, and discussions (Nouri, 2016).

As Figure 27 shows, the most reported reason for not using video-recorded teaching situations was *"Method – another choice"*. For this item, the analysis of the answers for the alternative *"Other, namely …"* showed that one important reason was that *teachers felt uncomfortable* in the video-recording situation, which can be interpreted as a perceived constraint of the technology related to the course coordinators' perspective. In conclusion, nearly ¼ of the answers indicated that to use *video-recorded teaching situations* in the courses was not a suitable choice. The category *"Method – negative choice"* was also a common reason and *"Lack of resources"* had nearly as many answers and often referred to lack of time. It is interesting to note that *"Problems related to technology"* was the least common category for *not* using video-recorded teaching situations. This indicated that course coordinators to a low degree perceived constraints with using the technology.

Video as a tool for learning

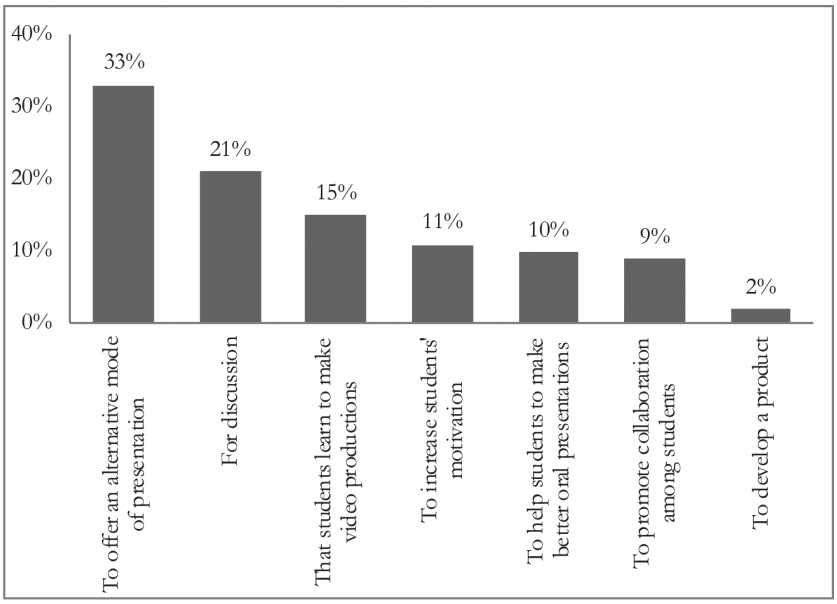

Figure 28. Q11e. Described as the three most important reasons for using video as a tool for learning, (N= 328 answers).[118]

118 Only the course coordinators of 193 courses, who answered that they used *video as a tool for learning* received this question.

"To offer an alternative mode of presentation", was found to be the most important reason for using *video as tool for learning* (see Figure 28). This indicates that the course coordinators appreciated the affordances of moving picture and sound instead of text, which video as a tool for learning offers. However, text is the most common mode in distance education (Levine & Sun, 2002). The second and third most important reported reasons were to use this category of video for *discussion* and that *students make a video production*. This is the only category of video that has this unique affordance that the students could use it for making video productions. Video productions have been used in the classrooms since the 1960s (Kucan et al., 2009; Seels et al., 2004) and are prevalent in teacher education (Santagata, 2009). In conclusion, there were often other reasons for using *video as a tool for learning* than to present the content or to facilitate students' learning of the content. This indicated that the course coordinators' perceived other possible affordances of this category of video as more important than the affordance of presenting the content to the students.

The open answer: *"Other, namely …"*, was selected by 30 course coordinators, indicating that the purpose of using *video as a tool for learning* was varied and not entirely covered by the alternative answers in the questionnaire.

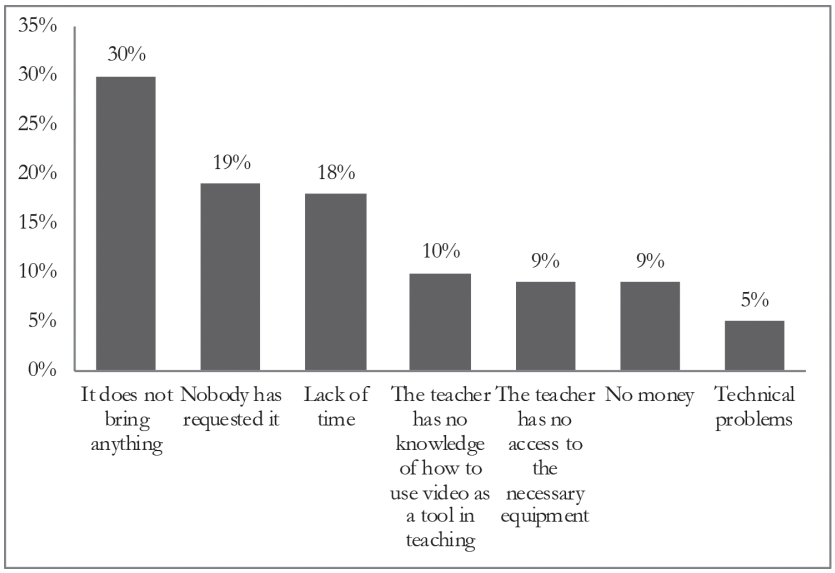

Figure 29. Q11f. Described as the three most important reasons for not using video as a tool for learning (N=1,268 answers). [119]

The most reported reason for *not* using video as a tool for learning, is not related to constraints (see Figure 29). Instead, it suggests that the course coordinators did not see or were not aware of the pedagogical benefits of this category of video. The second most reported reason, *"Nobody has requested it"*, may show that the course coordinators did not really consider implementing this category of video in their courses, but it could also be related to the particular subject matter in teacher education courses as recording and discussing students' behaviour is especially prevalent within professional education and training (Blomberg et al., 2014; Seidel et al., 2011; Strand et al., 2013). This may not be the case for all subject matters.

119 Only the course coordinators of 946 courses, who answered that they did not use video as a tool for learning received this question.

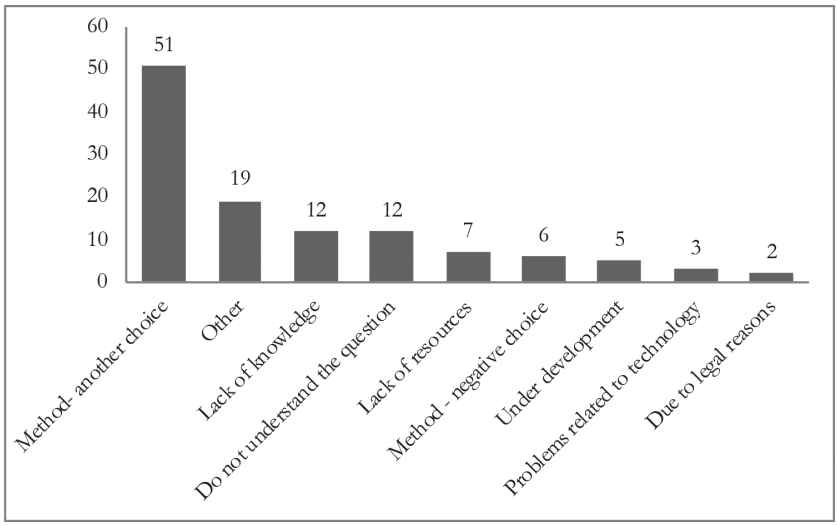

Figure 30. Q11f. Open answers: Reasons described for not using video as a tool for teaching, (N=116 answers).

Examining the reasons described when the *"Other, namely …"* option was chosen, shows that participants most often reported choosing another method (see Figure 30). It is difficult to know what the second most common response, *"Other",* means as these course coordinators did not specify what they meant, but the responses *"Lack of knowledge"* and *"Do not understand the question"* were also reasonably common. Both these responses implied that some of the course coordinators did not precisely know what was meant by the category *video as a tool for teaching* or had not considered using it. This result also indicates that problems with the technology were rare.

Video conferencing

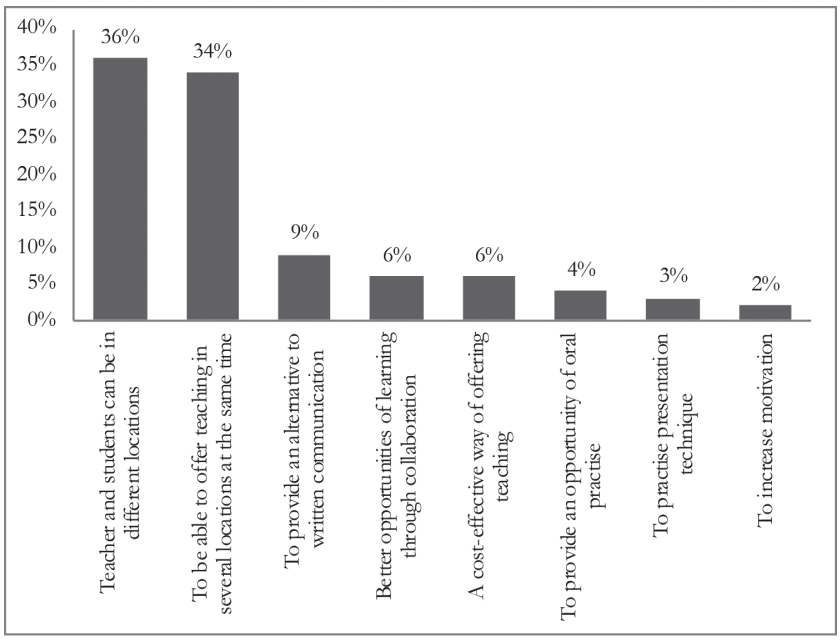

Figure 31. Q9e. Described as the three most important reasons for using video conferencing (N=428 answers).[120]

The two main reported reasons for using video conferencing in the courses points at the affordance of video conferencing to offer *spatial flexibility* in different ways, which are typical arguments for distance education; "*The teacher and students can be in different locations"* and *"To be able to offer to teach in several locations at the same time"*. Together these options accounted for as much as 70% of the answers (see Figure 32). The other alternatives had less than 10% each, indicating they were of lower importance with

120 Only the 127 course coordinators who answered that they used video conferencing in the courses received this question.

small differences between them. The alternative *"Other, namely …"* was only marked by a handful of people, suggesting that the fixed alternatives covered the arguments for using this category of video.

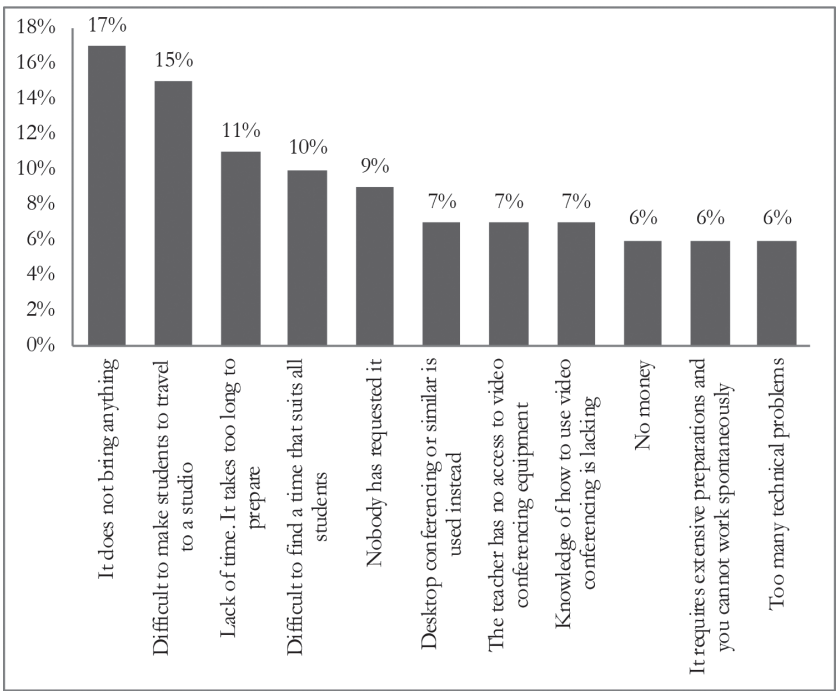

Figure 32. Q9f. Described as the three most important reasons for not using video conferencing, (N=1,612 answers). [121, 122]

The distribution across the alternative answers was equal for the reported reasons for *not* using video conferencing compared to why it was used, which demonstrated that the reasons were disparate. The most often reported reason was: *"It does not bring anything to the course/programme",* which

121 Only the course coordinators of 939 courses who had answered that they did *not* use video conferencing received this question.

122 Unfortunately, the alternative: *"There is no technical support that can help me"* was left out by mistake from the questionnaire. This may have influenced the result, but since it was possible to add an open comment, the informants still had the opportunity to bring it up.

indicated that the course coordinators did not see the potential benefits of meeting their students synchronously. This is a bit surprising as the use of video conferencing has the possible affordance of creating a similar situation to that of a physical meeting given that video conferencing has the key feature of synchronicity (see section 3.3). However, one explanation for this result could be that half of the course coordinators did not have any experience of using it and therefore, did not know about the possible affordances (see section 6.1). The second most reported reason was related to a constraint of video conferencing, that it limits spatial flexibility: *"It is difficult to make the students travel to a studio"*. Flexibility is often an essential argument for students to select distance education (Almqvist & Westerberg, 2005). Another important reason for *not* using video conferencing was the constraint that course coordinators perceived that it took too long to prepare for video conferences and they did not have that time available. According to the literature, video conferencing requires more preparation, which takes time (Dafgård, 2002; Plonczak, 2010). Given that distance students expect greater flexibility, it could reasonably be expected that the possible constraint of reduced temporal flexibility would a rather common argument for *not* using video conferencing, *"It is difficult to find a time that suits all students"*. Indeed, this reason accounted for 10% of the responses.

As more than half of the course coordinators did not have any experience of using video conferencing, it was surprising that the answer; *"Knowledge of how to use video conferencing in teaching is lacking"*, was only marked for 7% of the courses. Some knowledge and experience are often required for using video conferencing in teaching. Teachers' lack of these requirements can be a possible constraint leading to *not* using it. In conclusion, these kinds of reasons for *not* using video conferencing were more frequently selected than pedagogical arguments.

The results for the alternative *"Other, namely …"*, (N=132) showed that nearly half of the answers indicated that the course coordinators had made an active choice to use something else rather than video conferencing. In second place was *"Method – negative choice"*, which suggests that these participants did *not* want to use video conferencing. "*Lack of resources"* was the third most frequently reported alternative and most common was a lack of time.

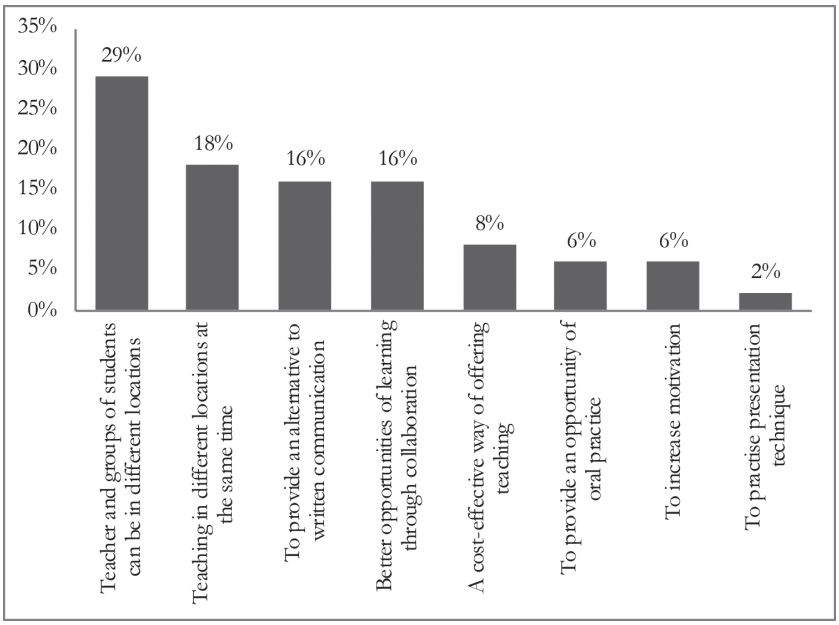

Figure 33. Q10e. Described as the three most important reasons for using desktop conferencing, (N=981 answers).[123]

As can be seen in Figure 33, the two most frequently chosen reasons for using desktop conferencing were related to the potential affordance of offering spatial flexibility, which is a common argument for students to select distance education (Almqvist & Westerberg, 2005). Also, the third and fourth most frequently selected reasons indicate the potential affordances of desktop conferencing, to provide an alternative to written communication and better possibilities for learning through collaboration. Written communication is most common within distance education (Levine & Sun, 2002) and therefore, desktop conferencing has a role in offering an alternative mode. 16% of respondents reported that they used

123 Only the course coordinators of 405 courses, who answered that they used this category of video, received this question.

desktop conferencing to support student collaboration, showing that the technology has the potential affordance of offering what Moore calls *"student-student"* interaction (Moore, 1993b), which is the type of interaction that may be the most difficult to foster at a distance.

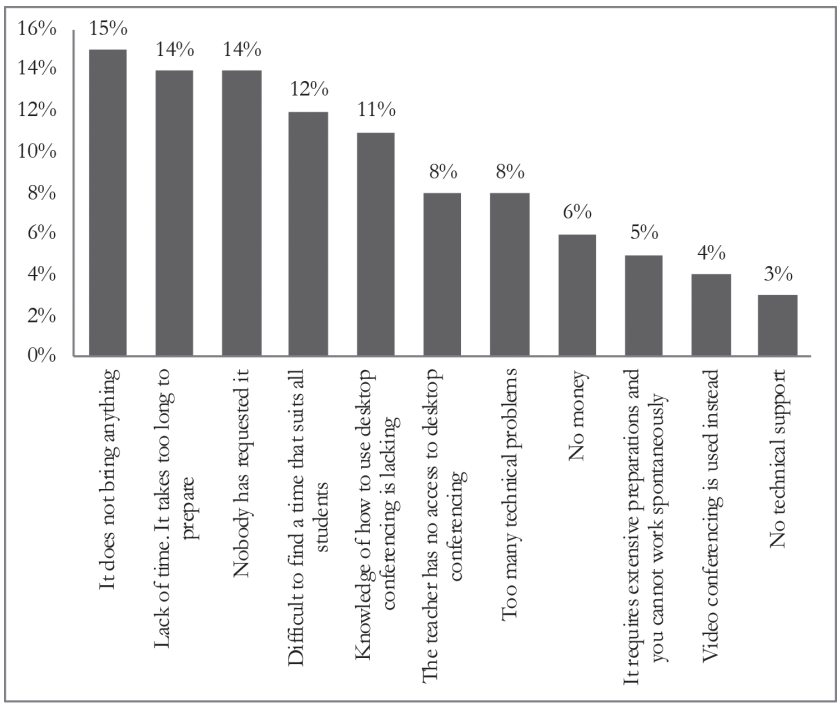

Figure 34. Q10f. Described as the three most important reasons for not using desktop conferencing, (N=1,164 answers). [124]

There was a relatively equal distribution of the five most frequently reported reasons for *not using desktop conferencing* (see Figure 34). The most reported reason, *"It does not bring anything to the course"*, showed that some course coordinators did *not* perceive the potential benefits of using desktop conferencing in their courses. This might be related to that half of the

124 Only the course coordinators of 723 courses, who answered that they do not use "desktop conferencing", received this question.

course coordinators who did not have any experience of using desktop conferencing (see section 6.1). The next four most reported reasons indicate that the course coordinators perceived using desktop conferencing as time-consuming as it took a long time to prepare, which can be considered as a constraint of the technology from the teachers' perspective. That many of the course coordinators have marked the alternative: *"Nobody has requested it"*, indicated that they probably had not even considered using it and they likely did not have so much experience of using either. As stated earlier, students often select distance education due to the search for flexibility. One constraint with desktop conferencing is reduced temporal flexibility as it requires synchronous communication, potentially explaining why many course coordinators selected the alternative: *"It is difficult to find a time that suits all students"*. Similarly, *"Knowledge of how to use desktop/web conferencing in teaching is lacking"* was also marked by many course coordinators, though this is not surprising since about half of them did not have any experience of using the technology. Some course coordinators claimed that they did not have access to desktop conferencing software and that special software must be used. This can be seen as a constraint of the technology, but could also mean that these respondents did not know whether they had access or not.

Furthermore, there were a relatively large number of informants who chose to select "*Other, namely ..*"[125] and provide a description for this item. Of these, nearly half of the answers (38) can be characterised as "Method – another choice". Fifteen course coordinators reported that they had selected another method and had a lack of resources, while lack of knowledge, under development, and problems related to the technology had between 8 and 14 responses each.

PEDAGOGICAL USE OF VIDEO

In this section, answers will be presented to the question: *RQ1: How is video used in digital distance education? d) How are the categories of video used?* The three most relevant categories for this study of distance higher education (see section 5.3) will be discussed, *video as a tool for learning, video conferencing*, and *desktop conferencing*.

125 N=105 answers.

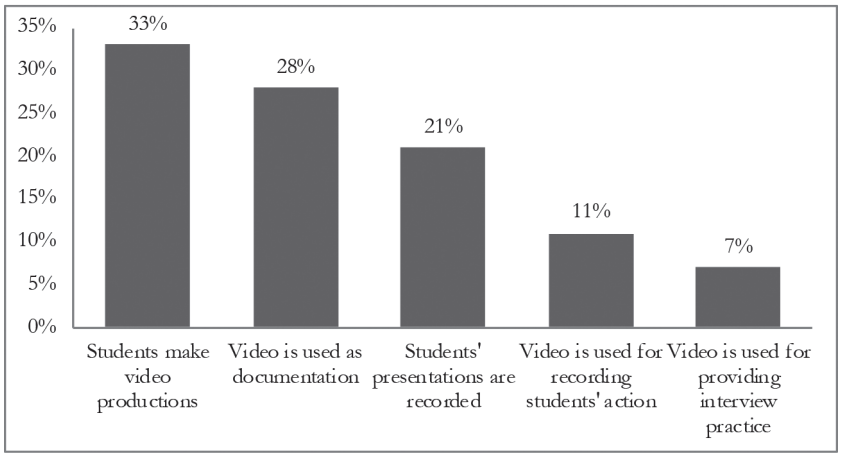

Figure 35. Q11d. How video as a tool for learning is described to be used in the course/programme (%), (N=246 answers).

Examining how video is used as a tool for learning, Figure 35 shows results indicating that the possible affordance of video, that it can be recorded, is necessary for its use as a tool for learning. When responding, participants reported most often that *"Students make their video productions"*, referring to a unique affordance of this category of video. This affordance can be defined as supporting a student-centred activity (Baeten, Kyndt, Struyven, & Dochy, 2010). Using video for *"Documenting events/places/phenomena"* was also a commonly reported activity, which Bates (2005) highlights as one of the possible affordances of video. The third most commonly selected alternative was *"Students' presentations are video-recorded"* with providing the possibility to discuss the recorded presentations afterwards relatively often used as a pedagogical tool. The two least used alternatives were; *"Video is used for filming students' action"* and *"Video is used for providing interview practice"*, both of which are more specialised uses of video as tool for learning.

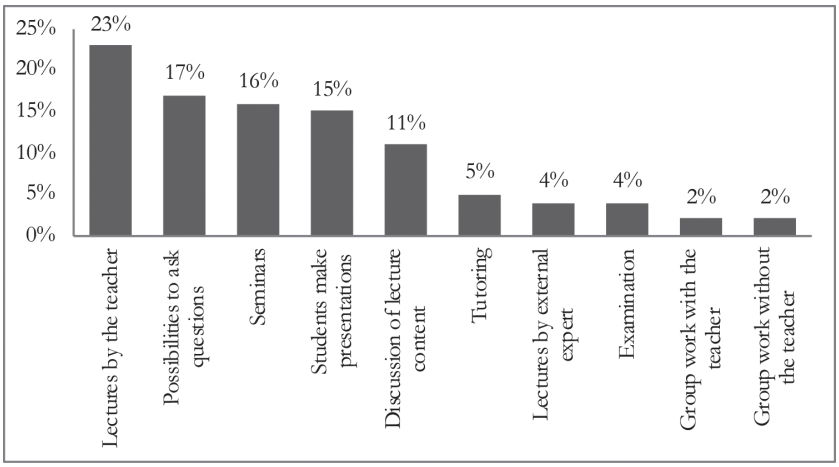

Figure 36. Q9d. How video conferencing is described to be used in the course/programme (%), (N=622 answers).

The most common activity during video conferencing was reported as *"The teacher lectured/made presentations"*. This is quite foreseeable as video conferencing, at least to some extent, is used to replace physical meetings that take place on campus and giving lectures in campus courses is one of the most common teaching methods (Biggs & Tang, 2007). This means that from a socio-cultural perspective, the result suggests that video conferencing had the affordance of mediating the teacher's lecture/presentation to the students as the teacher interacts through the technology when lecturing (Säljö, 2000, 2005; Wertsch, 1998). Though lecturing is a common campus teaching method, this most common video conferencing method will be examined further in the results of the interview study in the next chapter.

The four next most frequently reported pedagogical activities were received relatively equal selections (see Figure 36). This result indicates that video conferencing offers affordances for mediating student interaction with the teacher through the video conferencing equipment and allow them to synchronously ask questions to the teacher. They show that

video conferences are used for what Moore defines as *student-teacher interactivity* (Moore, 1993b), which is only possible with live video and when recorded. From a socio-cultural perspective, the result that video conferencing is reported to be used for *seminars* means that the seminars were mediated between teacher and students through the technology. It also means that video conferencing had the possible affordance of offering two of Moore's types of interactivity; *student-teacher interactivity* and *student-student interactivity*. Also, the alternative that *"students make presentations"* was rather frequently marked, indicating that video conferencing has the affordance of mediating students' presentations through the technology. This also demonstrates Moore's two types of interactivity; *student-teacher interactivity* and *student-student interactivity*. In addition, *"Tutoring,"*, *"External experts",* and *"Examination"* were reported less frequently in comparison with the other alternatives. That only 4% used video conferencing for external experts was a very low result. Video conferencing can provide excellent opportunities for *"Bringing in external experts"* with low costs due to less traveling. As research shows this activity is often well appreciated by students and considered to be one of the most important advantages with video conferences (Pitcher, Davidson, & Goldfinch, 2000). This result will be investigated further in the interview study. Video conferencing was also reported to be least used for *"Group work",* and similar findings have been reported by a study on Teacher training programmes in general (Åström & Högskoleverket, 2007) . The reason might be that one of the constraints with video conferencing is that unique, rather expensive equipment and specific knowledge of managing the equipment is required and that it can, therefore, be difficult for students to organise video conferences for group work.

In conclusion, when video conferencing is used, reported teaching approaches are mostly directed towards a behaviouristic perspective on student learning with a focus on teachers' transmission of course content to students by lecturing (Säljö, 2000). This means that the unique affordance of video conferencing for synchronous communication with live video that is as close to a face-to-face situation as possible, is not often exploited. With the affordances of live video, it might have been reasonable to expect that teaching approaches favouring a more socio-cultural

conception of student learning would dominate and that Moore's *student-student interaction* (1993b), e.g. in the form of group work, would have been more prevalent. Participants' reasons for using video conferencing in particular ways are examined further in the interview study.

DESKTOP CONFERENCING

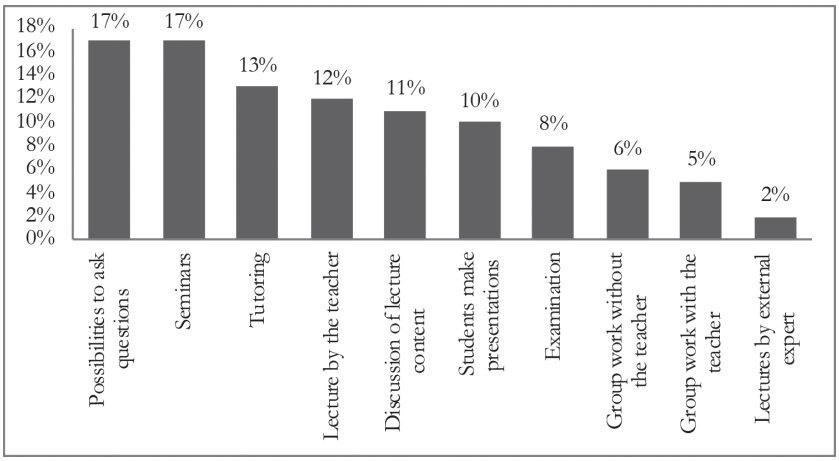

Figure 37. Q10d. How desktop conferencing is described to be used in the course/ programme (%), (N=1,450).

Turning to the use of desktop conferencing, the results shown in Figure 37 indicate that the most reported kinds of affordances perceived by participants were pedagogical in nature with a high degree of both *student-teacher interaction* and *student-student interaction* (Moore, 1993b), specifically in relation to the activities of *"Opportunities for students to ask questions"* and *"Seminars"*. Following these two activities, four other activities were nearly equally reported that also have a high degree of *student-teacher* and *student-student interaction* that can be mediated through desktop conferencing, namely "*Tutoring", "Lecture by the teacher", "Discussion of course content",* and *"Students make presentations"*. Three of these activities indicate high levels of student interaction, however, earlier research has shown that the quality of tutoring in groups is dependent on group size and when tutor-

ing large groups, there is a risk that the teacher becomes too dominant. The use of desktop conferencing may increase this problem with of a lack of equilibrium in the interaction (Borglund, 2011).

CONCLUSION

The aim of this thesis is to better understand the possibilities and limitations of video in digital distance higher education. With the theoretical lens for this thesis, the socio-cultural perspective (Säljö, 2000, 2005; Wertsch, 1998) and the theory of affordances (Gibson, 1986, 2015), this section discusses which categories of video were reported by course coordinator respondents as offering the most significant affordances for student learning. First, the answers to the first research question: *RQ1: How is video used in digital distance education? When teachers design distance courses with video; c) why are the categories of video used or not used?* Then, the answers to question *d) how are the categories of video used?* will be discussed for *video as a tool for learning, video conferencing, and desktop conferencing;* These three categories of video are especially interesting for digital distance education as they can, for example, be used to bridge the geographical distance between teacher and students.

REASONS FOR USING AND *NOT* USING VIDEO

First, discussion of the results of the survey in relation to *RQ1: How is video used in digital distance education? When teachers design distance courses with video, c. why are categories used or not used?*

Recorded video - reasons for using

One of the two most reported reasons for using *recorded video* was to complement other materials, except for when using *video as a tool for learning*. Recorded video was reported to offer the most significant affordances for learning when used as a complement to other materials. Therefore, its possible affordances for student learning can be said to be less important as a reason for its use. The other often reported reasons for using both *video-based materials* and *video-recorded teaching situations* were to present content

or parts of content in a suitable way, and for difficult parts of the content, which gave these categories of video a more central role in the design of the course compared to the other categories of recorded video. This means that the course coordinators perceived the possible affordances for learning of *video-based materials* and *video-recorded situations* to be more significant in comparison to the other categories of recorded video; *video materials not produced for pedagogical purposes* and *video as a tool for learning*. A difference in use was also found between on the one hand; *video materials not produced for pedagogical purposes* and on the other hand; *video-based materials* and *video-recorded teaching situations*. The first category was reported to be used more for discussion and to increase motivation. This means that the course coordinators perceived that *video materials not produced for pedagogical purposes* has possible affordances for providing materials for discussion and for increasing student motivation, but it was not perceived to have affordances for learning as *video-based materials* and *video-recorded teaching materials*.

By contrast to the other categories of video, the most reported reason for using *video as a tool for learning* was its affordance for offering an alternative mode of presentation. The number and types of open answers made it clear that some course coordinators did not know what was meant by the category *video as a tool for learning,* perhaps due to a lack of experience.

Recorded video - reasons for not using

The most reported reason for *not* using three categories of video; *video-recorded teaching situations, video-based materials not produced for pedagogical purposes,* and *video as a tool for learning* was that they did not bring anything, which was also among the three most reported alternatives for *video-based materials*. This result indicates that the course coordinators were not aware of the possible pedagogical benefits that these categories of video could offer or they that they judged them to be unsuitable for their specific subject matter. For *video-based materials,* the most important reason for *not* using it was reported to be lack of time - it took too long to search for suitable materials. This was also found to be a reason nearly as important for the other three categories of video. Similarly, another reason described as important for *not* using *recorded video* was that a teacher has no experi-

ence or knowledge. This was the second most frequent reason for not using *video-based materials*, the third most frequent for not using *video-recorded teaching situations,* and the fourth most frequent reasons for not using *video materials not produced for pedagogical purposes* and for not using *video as a tool for learning*. Together, these results indicate that teachers' lack of experience or knowledge of using *recorded video* is a significant constraint for using it. If teachers had more experience and knowledge, *recorded video* may have been reported to be used more often. Interestingly, problems related to the technology itself were the least marked alternative for all four categories of recorded video. This stands out as technical difficulties are often positioned as common argument for not using technology (McNaught, Kenny, Kennedy, & Lord, 1999; Shelton, 2017).

Regarding the *open answers* for using and *not* using a category of video, the results are surprising in that some of the respondents chose to write their own answers although their answers were often more or less covered by the alternative answers provided in the questionnaire. The number of open answers was higher regarding why a particular kind of video was *not* used with between 75 and 104 answers, compared to the arguments for using a category of video, which only had between 4 and 30 open answers. This may indicate some issues in the formulation of the alternatives in the *not* using a category of video items. It is worth noting, however, that from the open answers it can be seen that possible affordances for student learning were often lacking as reasons for why a particular category of video was reported not to have been used. Accounts were instead often reported exclusively in relation to teacher oriented aspects of teaching practice.

Live video – reasons for using

The most frequently reported reasons for using *video conferencing* and *desktop conferencing* were highly similar, indicating that the two technologies have similar affordances for distance education. These include that a teacher and students can be in different locations, that it is possible to offer to teach in several locations at the same time, and that it provides an alternative to written communication. Spatial flexibility is a typical argument for distance education, and the result indicates that the course coordinators

perceived this possible affordance of both video conferencing and desktop conferencing. The result also indicates that *video conferencing* is found to be common for groups of students, while *desktop conferencing* is more often used for individual students in different locations.

Live video –reasons for not using

The most frequently reported reason for *not using video* or *desktop conferencing* was that they do not bring anything to a course or programme. This is somewhat surprising since both technologies have the key features of synchronous sound and picture, and therefore have the possible affordance of replacing physical meetings. Several other important reasons were that there was a lack of time, that nobody had requested it, and that the course coordinator lacked knowledge of using these categories of video. This last reason indicates that teachers' lack of knowledge could be a key constraint in relation to these technologies, but also that with more in-service training, the number of teachers using these types of conferencing in their courses would probably increase. Finally, since both types of conferencing require synchronous communication, another important reason for *not* using them is that it is difficult to find a time that suites all students. In this sense, the use of video and desktop conferencing decreases flexibility in terms of time, which can be viewed as a constraint of these technologies. In addition, technical problems were more often considered an issue with desktop conferencing than with video conferencing, indicating that instability in the use of a particular technology is more likely to be constraint for desktop conferencing than for video conferencing.

HOW VIDEO IS USED

Next, the answers to the *RQ1: How is video used in digital distance education? When teachers design distance courses with video; d) how are categories of video used?*

Use of recorded video: video as a tool for learning

Video as a tool for learning was reported to be used due to unique affordances such as allowing students to create their own video productions, documenting events, places and phenomena, and the recording of students' presentations, which can for example offer opportunities for analysis and discussion. In general, it can be concluded that there are possible affordances of video as a tool for learning which make it useful for particular activities that could probably not be achieved without it.

Use of live video: video conferencing and desktop conferencing

Even though *video conferencing* and *desktop conferencing* are two technologies that have similar key features, such as offering possibilities for synchronous picture and sound, the results show interesting differences regarding how they are used, suggesting that they should be considered separately.

From a socio-cultural perspective, the affordance of video conferencing to mediate lectures by the teacher was found to be the pedagogical moment that is most used in video conferences. The affordances of desktop conferencing were found to a higher degree to involve possibilities for students to ask questions, to carry out seminars and to receive tutoring. The affordance of interactivity; both *teacher-student* and *student-student interactivity* (Moore, 1993b), was perceived more often in the case of desktop conferencing than in video conferencing. This might be due to student groups being smaller when desktop conferencing is used, but to better unpack this difference it will be investigated further in the interview study that follows. Even during video conferencing, a certain level of student active participation and *student-teacher interaction* (Moore, 1993b) was supported as it was used for student question asking. Group work was seldom reported, indicating a rather teacher-centred approach for both categories of conferencing (Bowden & Marton, 2004; Dupin-Bryant, 2004). The reasons for this are also examined further in the interview study along with the reasons for reported use of lectures by external experts being so low.

In conclusion, the results of the national survey study provide answers to some of the research questions such as *RQ1; How is video used in digital distance education?*

a. which categories are used?
b. how much are they used?
c. why are they used or not used?
d. how are they used?

Regarding *RQ1 d) how they are used*, the results provide answers to a certain extent, but also raises new questions. How teachers plan for video conferences and a more detailed description of how video conferencing is used is still needed. This along with the other issues raised by the survey results and identified earlier indicate the need for an interview study to gain more in-depth and more detailed knowledge of how video conferencing is used. This includes *RQ 2, How do course designers respond to the possibilities and limitations of video for digital distance education?* which has been answered to a certain extent through the survey, but more detailed information is needed regarding how teachers plan and carry out their teaching in a video conferencing environment. Similarly R*Q 3, What are teachers' attitudes and perceptions about the use of video in digital distance education?* has been answered to a certain extent, but the interview study that is reported in the next chapter will provide more detailed information concerning teachers' attitudes and how teachers perceive teaching in a video conferencing environment.

CHAPTER 7

INTERVIEW STUDY

In chapter 6, the following research questions were addressed;

RQ1: How is video used in digital distance education? When teachers design distance courses with video;

a. which categories of video are used?
b. how much are they used?
c. why are they used or not used?
d. how are they used?

RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?

The results covered six categories of video;

Recorded video

- *video-based materials*
- *video-recorded teaching situations*
- *video materials not produced specifically for pedagogical purposes*
- *video as a tool for learning*

Live video

- *video conferencing*, and
- *desktop conferencing*.

Since the national study was a questionnaire, the results provide many insights, but do not offer rich description of digital distance education practices (for more information, see section 5.2). A follow-up study was, therefore, necessary to obtain more detailed knowledge and a deeper understanding of the issues raised by the following research questions in particular;

RQ1: c) why is video used or not used, d) how is it used?

RQ2: How do course designers respond to the possibilities and limitations of video for digital distance education?

RQ3: What are teachers' attitudes and perceptions about the use of video in digital distance education?

As has been described in section 5.3, practical constraints made it impossible to include all six categories of video in the second study. Based on the results of the national study, *video conferencing* was selected to be the more thoroughly investigated category. The theoretical approach of socio-cultural perspective (Säljö, 2000, 2005; Wertsch, 1998) and the theory of affordances (Gibson, 1986, 2015) were used to frame the thematic analysis of the interviews. Drawing on this frame, the analysis is presented in this chapter with interview excerpts used to exemplify the results.

7.1 BACKGROUND INFORMATION FOR COURSE DESIGN

To better understand how the participating teachers worked with the design of distance courses, some background information will be given about their circumstances for course planning, which the teachers explained during the interviews.

The Karlstad University model for teacher education was built on the premise of a dual-mode model (see section 2.3) and all the interviewed teachers had *experience from both distance and campus education*. Most of them

were originally campus teachers who had started teaching at a distance after several years of experience from campus education. None of the teachers had made an active choice to work with either distance education or video conferencing. Some teachers expressed that they were thrown into distance education and video conferencing or even that they were ordered to do it, as one of the interviewees expressed:

1. Yes, I was thrown into; I simply had to take care of it. It was not my own choice. <Internals\\11> - § 3 references coded. Reference 3.

The teachers often had the same course at a distance and on campus, which is the most common situation within teacher education (Åström & Högskoleverket, 2007) . The model at Karlstad University could be categorised as the second model of distance education; physical meetings on campus, video conferences (which also included local study centres), and an LMS[126] (Åström & Högskoleverket, 2007) .

The interviews indicated that campus education was often considered to be *the norm* for how university teaching should be carried out and that influenced the planning of distance courses. This may be due to the dual-mode model in Sweden, which often results in that the culture of traditional higher education being particularly influential:

2. There I think there is some kind of idea of what university studies are and how they are carried out, in some way. You go and have a lecture in a lecture hall; then you have a lesson, then you have an examination … This is how I think that the idea, it might not be very easy and (pause), to change or so? <Internals\\14> - § 12 references coded. Reference 2.

Furthermore, when designing courses, many teachers claimed that campus courses were given higher priority than the distance courses. Campus courses were designed first and were the point of departure for planning

126 Learning Managing System.

and distance courses were modelled after the campus courses, which the following excerpt illustrates:

3. … that is a thing that has struck me during the years I have been working with this. […] now we are going to plan a course, but then is campus first, yes, that's right we are going to have this at a distance, … And it was planned, but it was really campus all the time, and it was going to start in, eh, August, and, then at, at the end of the spring, so, yes, it was somebody who hit upon the idea, yes, this is going to be at a distance as well, of course, yes, (laughing). <Internals\\4> - § 5 references coded. Reference 1.

The interviewed teachers noted that they designed the distance courses in two steps and that it was essential to discuss them separately as they were perceived to be significantly different. The first step was *the overall design,* which decided the organisation and structure of the entire course and the other step was *the detailed design* for the specific lesson through video conferencing. How teachers worked with the overall design will be presented in the next section.

7.2 THE OVERALL DESIGN OF DISTANCE COURSES

The results of the interviews indicate that teaching activities that generally took place on campus were often preserved and transferred to another learning environment; to video conferences or physical meetings on campus, which shows that campus was the norm for how teaching was designed. As an example of this, some teachers expressed criticism against the distance model at Karlstad University and were worried about how legal requirements concerning examinations could be secured. Therefore, they claimed that all examinations should be carried out with the students physically present during meetings on campus. Others thought that examinations could be carried out at a distance, e.g. during video conferences.

A point of criticism which the teachers brought up was the combination of the use of local study centres and video conferences. It was challenging to get enough numbers of students at each site and many students still had a long way to travel to their 'local' study centre. This meant that with this infrastructure, the aim for flexibility in order to increase recruitment was met as students still had to travel. However, while the use of video conferencing per se was not viewed as a problem, the fact that the use of video conferencing required specific expensive equipment was. On the other hand, the teachers also claimed that other forms of video-based communication were needed, e.g. recorded lectures. It could be essential to have video, but not necessarily this form as it did not solve the problem of accessibility. Desktop conferencing, on the contrary, can be used from home on your computer, although it is less suitable for groups or situations with many individual participants (Furr & Ragsdale 2002). As one teacher expressed:

4. But nowadays you can also sit at home and watch, that is live in real-time, at the broadcast, so many choose never to travel to the local study centre then. So then you can wonder over this concept if it maybe was good for 10-12 years ago. But that the development of technology has resulted in that local study centres are not such a tremendously good idea any longer. Plus that we have seen here then that, those who belong to a local study centre, they can in many cases live rather far away. So that they drive 150, 200 kilometres, one way for coming to the local study centre then. So then one can start wondering that it might be time to, there are other ways to teach at a distance and use, well, video, if you want to call it, it, or recorded lectures etc. <Internals\\6> - § 6 references coded. Reference 1.

Another point raised by the teachers was that if video conferencing was not used, there would be fewer possibilities for what Moore refers to as *student-teacher interaction* (Moore, 1993b) as students could not ask questions and get answers directly. According to Moore, *student-teacher interaction* is

an essential element of education, and it can also reduce "transactional distance" (Payne, 1999), (see section 2.5). Even if *student-teacher interaction* can also be fostered through asynchronous communication, Moore and Kearsley (2005) claim that one of the core problems with distance education is to provide synchronous oral communication despite the geographical distance. To use video conferencing is one way of solving this problem (Moore & Kearsley, 2005).

The circumstance that both physical course meetings and video conferences were included in the design of the courses contributed to special considerations and possibilities regarding how the courses were planned. Several teachers brought up *how video conferencing and physical course meetings completed each other*; e.g. activities that were difficult to perform during video conferences were scheduled for physical meetings on campus instead. However, this strategy also put *higher demands on how the teachers designed the courses:*

5. I have thought this year, what we do during the course meetings are things that we have difficult to convey through video conferencing, for example, experience, if you are out in the woods and working with maths, eh, if you are, we work with volume, and measuring, for example, such things that are important that you do, and to have water at hand for example, which facilitates, and then we want to plan them then here on campus. And, those parts, which you can carry out through video conferencing, we have planned to do in the video conferences. <Internals\\9> - § 2 references coded. Reference 2.

The teachers also described consciously thinking through how physical meetings and video conferences could be used to supplement each other, as the following excerpts illustrate:

6. We say that we are going to have a course meeting which is about conversations about pictures. Then it is very good to make a lecture in video conferenc-

ing, which then is, what is an introduction to what we are going to do. <Internals\\2> - § 7 references coded. Reference 7.

7. … and then I have tried to do, so that if I have had a video conference after that, then I have worked rather much with documenting at the course meeting, so I have been able to reuse material that we have worked, so that you in a way have been able to see; What happened here? … And then I have also, you know, used partly pictures that we have taken and documented during the course meeting … <Internals\\2> - § 7 references coded. Reference 5.

In the interviews, it is clear that the aim of using video conferencing as a mediational tool was often to show activities such as experiments at a distance. However, the teachers also noted that it was sometimes difficult to use video conferences for experiments, as the effects of the experiments could not always be mediated by the video conferencing technology since they were not visible on the screen. This constraint of the technology in this situation changed the conditions for distance student learning in comparison to campus learning (Säljö, 2000) and it was occasionally necessary to plan these types of experiments for physical course meetings instead. This could influence the teachers' pedagogical approach negatively, as the teachers described how they were not always sure that the activities could be carried out when it was most suitable in time for the pedagogical design. The teachers also felt that the use of practical exercises was more complicated than other activities, and it took more time to plan.

Regarding the ideal number of days of physical course meetings, the teachers had different opinions. In effect, some teachers argued for blended learning[127] rather than distance education.

127 The term *blended learning* is often used for *distance education* which includes physical course meetings. (Bates, 2015).

CONCLUSION

The interviews with the teachers indicated that when distance courses were designed, the norm was to follow the organisation and planning of campus courses. The model of distance education that Karlstad University had selected with physical meetings, local study centres and video conferences had some problems according to several of the teachers. Especially the constraints of temporal and spatial flexibility that the use of video conferencing occasioned were criticised by some teachers as they resulted in reduced accessibility for students. Most teachers expressed a positive attitude to the use of video, but preference solutions other than video conferencing which had the perceived affordance of increased flexibility such as recorded lectures or desktop conferencing. However, the teachers also emphasised that without video conferencing, it would be difficult to offer what Moore (1993b) calls *student-teacher interaction*. The interviews demonstrated that the teachers consciously developed strategies for how physical course meetings and video conferences could supplement each other.

7.3 PEDAGOGICAL DESIGN OF VIDEO CONFERENCES

Even though the teachers often used the same teaching activities on campus as in the video conferences in the distance courses, the teachers claimed to *design the classes with video conferences differently than the course meetings on campus*. For example, when using video conferencing, the teachers perceived that they had to focus more on providing the students with a logical structure and consciously design activities to encourage the students to participate actively and create variation in the activities. The planning for activities on campus was typically more flexible and more open to a response from the students as the teachers perceived closer contact with students. The teachers also claimed that they adapted their lessons on campus more after students' questions and the topics brought up by students.

In the following section, a more detailed view of the participating teachers' pedagogical design of video conferences will be presented. This

chapter has been divided into two sections; one for teachers' perceptions of *affordances* and another one for teachers' perceptions of *constraints*, when using video conferencing in teaching.

TEACHERS' PERCEPTIONS OF AFFORDANCES

First, a few examples of teachers' perceptions of the general affordances (Gibson, 1986, 2015) of using video conferencing in teaching. One example is the view that the use of video conferencing supports continuity. It is also viewed as making it possible to engage experts as lecturers, since they do not have to travel and therefore, both time and money is saved, a common argument for using video conferencing (Andrews & Klease, 2002). More than half of the teachers could see that the key feature that video conferencing can be recorded has the affordances of full temporal and spatial flexibility (Andrews & Haythornthwaite, 2007a; Collins et al., 2000). This made it possible for students to watch the recorded video conferences as revision as many times as they wanted and to select specific parts of the recordings for better understanding. The teachers argued that the recordings facilitated students' time planning, that they could catch up if being absent and watch the recordings when it suited the students.

Other affordances, which the teachers perceived were possibilities for social contact and activities, social presence, and oral synchronous communication. These will be described in more detail in this section.

FOCUS ON SOCIAL ACTIVITIES

The teachers stated that social contact was important and that the model of distance education at Karlstad University with meetings at the local study centres and video conferences contributed to fostering social contact:

```
8. It has contact creating importance. I think that
it is that. Well, one has contact, one has an affili-
ation, one, eh, it is that which I think makes it
possible to get a good group in video conferencing,
to get a good study group, so to say, and, it is
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not unique for distance, it is also about this also on campus. To create, get into a group where you, function, and if the group functions, ehm, then it gives a tremendous strength for the studies, that is for success in the studies. <Internals\\12> - § 1 reference coded. Reference 1.

From a pedagogical point of view, nearly half of the teachers expressed that it was essential to use the meetings at the local study centres for collective learning processes, which can be interpreted as aligning well with the socio-cultural perspective of learning (Säljö, 2000). The teachers argued that video conferencing enriched distance education and contributed to bringing students together to solve assignments collectively as they met regularly at the local learning centres, facilitating contacts among students as natural meetings emerged. During these group meetings, the students could discuss course content and assignments, and exchange thoughts and ideas, which the teachers claimed were necessary for the education to be of high quality and can be referred to as Moore's third category of interaction, *student-student interaction* (Moore, 1993b). Teachers' descriptions of their activities can be understood as aligning with certain socio-cultural principles (Säljö, 2000). However, not all teachers gave the students group work, so in some cases, the students only attended the video conferences and arrived just before the conferences started and left as soon as they were finished.

The teachers reported that it was not primarily the use of video conferencing *per se* that promoted *student-student interaction,* but that it became natural to interact with fellow students as they met at to the local study centres when they came to participate in the video conferences. These gatherings at the local study centres had a supportive role according to half of the teachers. The meetings contributed to students receiving continuous pedagogical support in didactic activities and the flow of social contacts among teachers and students. The teachers emphasised the importance of social activities that can be understood to support social learning from a socio-cultural perspective:

9. And I also think as they come together at the local study centres, and then they often get questions which they are to discuss. […] Eh, some of the assignments are based on the group at the local study centre, so even if they are sitting at home studying, they have their group to work together with, and, yes, to trash over with questions and discussions. So that I think is very valuable, even if you compare with if it should be a distance education which completely lacked video conferencing, then I think that it gives much more, to have video conferencing broadcasts. <Internals\\8> - § 2 references coded. Reference 2.

Several of the teachers brought up that is was particularly relevant that teacher-students be trained in social activities:

10. Yes, because it is important to be social, you know as a teacher, one has to be social, you know, we notice sometimes, now and then, you get such an exceptional student, you notice how they evade from all group work, and they have hundreds of excuses and, so. You wonder whether they really will function as teachers. <Internals\\11> - § 5 references coded. Reference 5.

The teachers claimed that video conferences had the affordance of providing a social learning environment for students, both directly in the video conference and indirectly when the students met for video conferencing at the local study centres. However, *student-student interaction* (Moore, 1993b) was not often raised when the teachers discussed video conferences themselves. This may be due to the presence of many large groups of students in the video conferences constraining the possibilities.

The teachers also expressed that the use of video conferencing contributed to students feeling of belonging to a course and to a study group, which was seen as important for their motivation and self-esteem. Several teachers claimed that fewer of the students would be able to complete their studies without video conferences:

11. I think that they are tremendously important for distance students. If this course would be at a distance without video conferencing lectures, would, I don't think that as many would manage the course. That I am totally convinced of. <Internals\\3> - § 6 references coded. Reference 2.

The video conferences also had the affordances of making it possible for students to be recognised as individuals according to the teachers:

12. I think that they have, that these have tremendous importance because I think that […] everybody needs to feel a bit seen, and heard and little, eh, to get a small confirmation of that you do exist and so on. And, I think that eh, for those who sit in their hamlets, at their local study centre, then I think that it means very much, that they feel that they are in a sort of context, that there is somebody who sees them, that, that, it gives a feeling of, that these teachers actually know who we are. That you are not only an anonymous crowd. <Internals\\14> - § 2 references coded. Reference 2.

In summary, the results of the interviews demonstrate that the teachers consciously aimed at implementing different social activities in the video conferencing sessions, which can be understood to align well with a sociocultural analysis of the pedagogical opportunities of video conferencing where the affordances of the technology primarily mediated social interaction. The natural meetings at the local study centres were also crucial for student's learning and their social contacts, according to the teachers.

SOCIAL PRESENCE

As has been mentioned already, video conferencing is a rich medium with both audio and visual communication (Russell, 2004), (see section 3.3). It is also the closest approximation of a face-to-face meeting at a distance (Bates & Sangrà, 2011), something that the teachers emphasised as important for them and their students:

13. Well, but it will be very dead. Yes, well, video conferencing brings into the course, it is a plus, because we, we have those meetings, even though they are through the camera, so to say, it is a meeting. So I would not like to remove them. But they absolutely contribute. <Internals\\10> - § 4 references coded. Reference 4.

This excerpt illustrates how video conferencing functioned as the tool for mediating the meeting at a distance in an institutional context. Through this mediation, video conferencing allows *social presence* to be achieved (Rice, 1992, 1993), which is related to how much of the social presence is transferred by the medium (Rice, 1992), (see section 3.3). Creating and developing a social presence in an online environment is essential for a thriving learning environment (Elwood et al., 2014).

In summary, the teachers' answers in the interviews indicated that affordances of video conferencing contributed to the following possibilities:

- A meeting among teachers and students, which was important as there were few course meetings and without the video conferences, the teachers would hardly meet the students at all
- The course content could be both widened and deepened
- Video conferencing functioned as a complement to other teaching and learning activities, and
- Through video conferencing, it was possible to reach out with information and get in contact with students.

ORAL SYNCHRONOUS COMMUNICATION

Several of the teachers claimed that as students are different, a variety of options for communication should be offered such as asynchronous, text-based communication in the LMS-system or e-mail, and oral, synchronous communication in the video conferences. To use only written communication was not sufficient for the education to be of high quality, according to the teachers:

14. But it is probably; also, we are so different, what to say, different personalities' right to come to their right […] some do not take place in the physical room, but, eh, instead they glimmer in those reflections threads. Then, some persons are more verbal, than that they feel like sitting there writing. So it is also in another way that, eh, well, be able to express oneself in different ways. <Internals\\14> - § 3 references coded. Reference 3.

Some teachers also emphasised that students teacher education, in particular, need to *learn to communicate in different ways* in social environments and therefore, the affordances of the oral, synchronous communication that video conferencing offered are important (Keller, 2007; Moore & Kearsley, 2005). Furthermore, the teacher's expressed that students need to discuss course content and literature orally and to practise oral communication by, for example, presenting in front of an audience:

15. … I think very much of how I can get the discussions started, and if I get the discussions started even though I sit in front of a camera, and feel like an idiot. <Internals\\11> - § 9 references coded. Reference 9.

As video conferencing has the key features of synchronous audio-visual communication (Moore & Kearsley, 2005; Smyth & Zanetis, 2007), it could also support the possible affordance of *student-teacher interaction,* (Moore, 1993b), which is an essential element of education. Student-teacher interaction can reduce the "transactional distance" (Payne, 1999), which refers to the psychological distance often more frequent and evident in distance education than on campus, (see section 2.5 and 3.4).

One example of such *student-teacher interaction* that several teachers brought up was that students could *ask spontaneous questions and get answers* during video conferences. The students in the local study centres could ask oral questions and receive answers directly from the teacher. Students, who watched the video conferencing from home, could write questions in a chat, which the teachers answered orally during the video conference.

16. So the advantage with video conference, is that, naturally, as far as there is a discussion the, so this is the immediate opportunity, and they look at it in real-time then,[…] so if you have a group, it is very different between groups and so, but […], a group which is a bit more, and dare to and really dare to interrupt and, dare to say, that this we don't understand a thing about, then you have the possibility to, more directly so. Even those who watch from home at the computer, have the opportunity, for they can write in questions, which pops up on my screen then, so I see. <Internals\\6> - § 4 references coded. Reference 2.

This way of mixing oral and written communication is an interesting method of expanding the learning environment in order to give more flexible possibilities for students to participate in the course. It has developed during recent years and is relatively common today and can be commonly found in, for example, mass media like television (Highfield, Harrington, & Bruns, 2013). This is also a type of multimodal communication with video, sound, and text that is commonly used in desktop conferencing (Bates, 2005; Bower & Hellstén, 2010; Godwin-Jones, 2012; Gronn et al., 2013).

VARIATION IN TEACHING AND LEARNING ACTIVITIES

Some of the teachers brought up that in their design of video conferences they developed strategies for *creating variation* in teaching and learning activities in order to activate students instead of transferring information which could be interpreted as a behaviouristic approach to understanding learning (Säljö, 2005).

17. I think that, eh, that it has to be varied so that you should talk for a while, and then you do something somewhat practical, and then the students can discuss for a while so that they need to participate. <Internals\\9> - § 1 reference coded. Reference 1.

Creating variation is also included in the principles of the Theory of Perception, according to which "learning only happens after perception or that a permanent stimulus loses its effect if there is no variation" (Laaser & Toloza, 2017, p. 5). One example of such a strategy to create variation was that two of the interviewed teachers who taught different subject matter, had started to co-operate during the same three-hour-long video conference. Instead of having 1,5 hour for each of the two subjects, they worked together for the whole video conference and alternated between the two subjects.

The teachers also claimed to consciously aim at making use of the multimodal affordances of video conferencing. They therefore varied their presentations by using different modalities by, for example, using the document camera to show objects, or writing by hand instead of only using PowerPoint slides. The document camera also provided possibilities for showing laboratory material, which means that it had the possible affordances for mediating laboratory work to the students at a distance:

18. When I work, […] the frame is some kind of presentation which I have on the computer. But so it should be a bit more fun then, I change, […] it works very well to write something by hand then, so it becomes somewhat a livelier document. And, there I even show maths, even I show laboratory material, then I can also work with the document camera. I can, of course, hold up like this and show, but the document camera is a good complement and so, so that … <Internals\\6> - § 7 references coded. Reference 1.

When different forms of presentation were used, the teachers needed to think about shifting the picture so that the students could see what was shown from the different sources, e.g. the computer and the document camera, which required a more thorough and a special kind of design of the video conferences.

The teachers also considered it essential that the students could see that there was a logical structure between the different kinds of activities over time:

19. Without that there is some kind of thought about how these persons lecture in this course, you know. There is something which sort of can link them together in relation to the content of the course, so. And, also to show it, so it doesn't take place in some kind of, lecture or video conferencing broadcast takes place in some kind of vacuum, because it easily happens, I think. Poof, and then something else falls, and then the students can't really see how these things are connected. <Internals\\14> - § 3 references coded. Reference 2.

In summary, the results of the interviews indicate that the teachers consciously and actively design video conferences in order to create a variation in modalities and forms of teaching for students. The video conferencing environment sometimes had other affordances of variation than the classroom on campus such as with the document camera, which was standard equipment in the video conferencing studio, but not in the classroom on campus. However, teachers' aims for creating variation could also be seen as being due to the constraints in the video conferencing environment.

CONCLUSION

The most important affordances of video conferencing that the teachers reported were related to the possibilities to create a social learning environment for distance students, which can be understood as aligned well with certain socio-cultural principles (Säljö, 2000). The use of video conferencing had the affordance of directly supporting *student-teacher interaction* and *student-student interaction* (Moore, 1993b). Also, the fact that the students met regularly at the local study centres supported *student-student interaction* indirectly. Another important affordance of video conferencing was the possibility of mediating activities such as laboratory work and some of the meetings between teacher and students at a distance that typically took place on campus. The use of video conferencing made it possible to both widen and deepen the course content, to provide training in oral synchronous communication, to function as a complement to other teaching and learning activities, and made it possible to reach out with

information to students. Other affordances of video conferencing were that several modalities could be used creating possibilities for teachers to have variety during video conferences. According to the teachers, the use of video conferencing also had the affordances of supporting continuity and engaging external experts as lecturers, key outcomes of the feature that video conferencing can also be recorded offering temporal and spatial flexibility for students.

TEACHERS' PERCEPTIONS OF CONSTRAINTS

In this section, the teachers' perception of constraints (Gibson, 1986, 2015) when teaching through video conferencing will be discussed. One crucial constraint was time as a frame factor. Other examples were how the video conferencing environment changed the conditions for how the teachers could act and behave in their teaching and how they consciously developed strategies to manage particular situations. The teachers' concerns about technology more generally and how teachers perceived that technology constrained their teaching will also be discussed.

TIME AS A FRAME FACTOR

The teachers argued that the format of video conferencing required a particular type of pedagogical design as time was a constraining frame factor[128] (Dahllöf, 1971) in two ways. First, there was only *limited time available for video conferencing*, which meant that the number of teaching hours; i.e. time that the teachers spent together with students, was often less than for the equivalent campus courses. Second, *video conferencing was fixed in time*; both in respect of the schedule and in the number of hours.

Even though the video conferencing technology had the possible affordance of facilitating invitations of guest lecturers, the fixed schedule *limited possibilities for course coordinators to invite experts as lecturers,* since it was impossible to adapt dates and times based on when the experts were available. The teachers thus sometimes felt that the predefined schedule constrained their pedagogical design:

128 Examples of frame factors are physical and administrative frames, e.g. time, which can limit possibilities of teaching and interaction.

20. Yes, we get times for video conferences, which we have to follow. Eh, so it's, (pause), it doesn't get so flexible, but you, when you plan, so, so you have to, you know, eh, first you have to see, when do we have these times for video conferences. Next step, which is those lecturers who are desirable, which possibilities do they have to take part during those times? And then it gets like this: No, unfortunately, I can't make it then, but, yes, I can that day, yes, unfortunately, it's not so flexible, this system. <Internals\\4> - § 6 references coded. Reference 1.

The teachers also stated that it was difficult to get extra time for video conferences when needed since the video conferencing studios were rather fully booked. This was another constraint with the use of video conferencing.

21. No, I get times, and as a rule, it's then, the starting point is that you get one, one-half day a week. … And, eh, and, and so you can get, on charity, you can get more. It's rather much. We have three studios. And they are on the whole fully booked. <Internals\\4> - § 6 references coded. Reference 3.

This means that the use of video conferencing constrained flexibility as alterations to the schedule or possibilities for additional video conferences were almost impossible. This was often due to many local sites being connected at the same time and there was limited access to video conferencing studios. Reduced temporal flexibility and often reduced spatial flexibility are well-known constraints of the use of video conferencing (Andrews & Klease, 2002; Pitcher et al., 2000). This is an essential aspect as flexibility is one of the most important reasons for students to choose distance education (Almqvist & Westerberg, 2005).

However, it could be argued that it was not only the use of video conferencing that contributed to these constraints in flexibility. There were also differences regarding how often teachers and students met in dis-

tance courses compared to campus courses. The teachers claimed that it was easier to give space to students' reactions and comments during the lesson when they met students more often as they did on campus since they knew they would meet them again in a couple of days. In distance education, on the contrary, the teacher and students met only once a week.

Another constraint of the video conferencing technology was that it did not always work. Therefore, the teachers had to spend time certifying that all sites were connected and that the sound and picture functioned for all sites, which took time from the actual teaching. This process was time-consuming, not the least since the picture moved from one site to another every time somebody spoke or even coughed or cleared one's throat, as the picture was directed by the sound.

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22. And that means too, that when you, where you are
in a classroom, then it's rather simple, you know
when you know that you will meet those students in
two days again, and, you, then you can sort of work
on that. You can let the students' voices take more
space. Therefore, it's easier for you to, eh, get
back into the discussion and get it on the right
track. In the video conference, then you must, at
least I must, must be much more prepared, because
it's so short stipulated time, because it's, it's so
much that goes to those changes of who talks, and
to listen in that all is on place, that all have
returned, that sort and not, which I have easy to
do then: What interesting you said! And then it's
there disappears maybe that out of the picture,
oooo, so,… <Internals\\12> - § 8 references coded.
Reference 2.
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This could be understood as not being a direct constraint of the video conferencing technology, but more an effect of the way the distance courses at Karlstad University were organised with many sites connected simultaneously.

Since time was highly limited, *several activities competed for the time*. It was difficult for the teacher to choose what to prioritise during the video

conferences as many activities had to be covered within the limited time frames. For example, if there were many sites connected and many students in each group, it also took time, sometimes too long, to let students present their work and often little or no time was left for the teacher's lecture. When discussions with students were prioritised, it happened that there was not enough time left for going through the planned content. Therefore, the teacher often had to make an extra recording or put materials on the LMS for the students in order to cover all items in the planning.

23. It has been so that in certain courses, they have given an account, and they, you know, as I talked about before, but it is a choice you have to make. You have to vary between, because if you then have an assignment which they are going to give an account of in the video conference, then it nearly takes the whole time of the video conference. <Internals\\10> - § 7 references coded. Reference 2. Since I have so many groups. Eh, so it will be a pedagogical consideration, what I need the time for? Eh, (pause), yes. <Internals\\10> - § 7 references coded. Reference 3.

The teachers argued that in campus courses, it was more natural and easier to remind students several times, students had the opportunity of asking questions during the lesson, and therefore, issues could be solved directly on the spot. Since the distance teachers had less time in the video conferences, some felt it was essential to give all the necessary information during the time they met the students. However, some teachers had the opposite view and thought that there was no difference regarding the time that the teachers and students met in distance education and on campus. One teacher even argued that the campus course had less time than the distance course.

Some of the teachers claimed that they had the feeling that there was no space for spontaneous questions or discussions that were not included in the planning, even though they could not really verify that any real obstacles were preventing such spontaneous activities during the video conferences.

In summary, time was in different ways perceived by the teachers as a significant constraint of the use of video conferencing. This was partly due to how the video conferences were organised with fixed schedules, many sites and big groups of students connected simultaneously. Special equipment was required and there were only three studios available. There were also constraints of the technology of video conferencing. One example was that the teachers needed to spend time on verifying that all sites were connected correctly and that sound and picture functioned, which took time from the teaching.

Another example was that the visible picture on the system was dictated by the active sound channel, resulting in time-consuming delays when waiting for the camera to capture the person speaking. Several activities also competed for time and since the groups were big and many sites were connected, it was challenging to find time for students' to present their work or engage in discussion. Teachers described feeling a major responsibility for having time to lecture and present the content during video conferences.

HIGH DEMANDS ON PLANNING

The teachers' perceptions of the limited time for video conferencing often made them feel that more planning time was required for video conferences. More than half of the interviewees claimed that it took more time to plan for sessions in video conferencing than for the equivalent classes on campus. Even when the teachers had the same course at a distance and on campus, which made it possible to plan the courses together, it took longer time. However, there were also other reasons why planning for video conferencing took more time;

- The time for video conferencing should be used efficiently
- Teachers sometimes felt that they had to plan the whole lecture in detail, leaving no room for improvisation or students' contributions

- Teachers wanted to present the materials in video conferences in different ways and have more control over when and how to show, e.g. PowerPoint slides and video or images from the document camera[129]
- The possibilities to write on the whiteboard were limited, so the writing had to be carefully organised.

Although the teachers thought that the design of the video conferences took more time, they also argued that this could have advantages for the students. For example, having limited possibilities to write on the whiteboard could result in better structure:

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24. No, it is probably mostly this that you have to
be a little bit more structured, maybe. A bit more
methodical regarding what you write. You can't write
so much either. Instead, you have to have a clearer
picture of what I want to write. If I stand by a
board, during a lecture, then I might have an idea,
and then I write something, like that, it might be
scribbly so. It can be a pedagogical advantage with
that you have orderliness then. Because then it
will be you write more organised in a way. <Inter-
nals\\13> - § 10 references coded. Reference 5.
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The teachers thus expressed a clear need to have control over the teaching situation; designing more precisely *what to do*, *how* and *when to do it*, not only for presenting content but also for discussions:

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129 The term document camera is partly misleading as it can show images of many other types of objects than documents. A document camera is a real-time image capture device for displaying an object to an audience. The object is put on a plate which is light up from above or if transparencies or diapositives are used, the plate can be enlightened from below instead. The document camera project images of three-dimensional objects, texts, pictures etc. and some cameras have the capacity of high-definition display. It can be connected to a computer and most document cameras can send a video signal to a computer via USB-cable. The document camera has a very good capacity for magnifying and with the zoom feature it can e.g. show details of small insects or fingerprints. Some document cameras can be connected to an interactive whiteboard or be used with a microscope. http://en.wikipedia.org/wiki/Document_camera. Retrieved 6 April 2012.

25. No, but sort of more thorough. Therefore, I feel that there is not that space for free scope in the same way, which it might actually be, but I don't experience that, I don't experience that I have quite the same flexibility when I am teaching in video conferencing. Though, actually, actually, you have that. When I think about it, what is it that I really can't do? Yes, somewhere, I probably think a bit differently. <Internals\\7> - § 6 references coded. Reference 3.

The teachers even claimed that they decided in advance how many of the participating local study centres were going to answer each question and how long time the questions were going to take:

26. Eh. So I think that I do it in another way. I plan more in detail around the discussion question, eh, how I am going to think around that, and dependent on how many, if I then have 12 higher education institutions,[130] okay for this first I take in three, and to that thing I might take in only two, because it takes probably that long time and so. And I never do planning like that when I am on campus, but it just, it just happens in another way then. (Pause). In another way, I might be planning video conferencing better than campus, just because I feel that I am not quite comfortable in that. <Internals\\7> - § 6 references coded. Reference 1.

One teacher even considered video conferencing to be just a more planned form of lecturing. Since it was difficult to capture and use the small discussions which occur in the campus classrooms, she felt she had to plan the whole lecture in more detail, which thus took more time than planning a campus lecture.

130 The teacher says higher education institutions but means local study centres.

27. Then, I am more, more prepared I think that it is going to be me talking more than the students should do. Just because it is more difficult to catch those small discussions. They also get the opportunity to discuss, exactly as they do here, so the plan is broadly the same, but there is more lecturing I think during video conferences than what there is in the classrooms here. <Internals\\9> - § 2 references coded. Reference 1.

Some teachers perceived the situation as *stressful when none of the students answered their questions* and prepared some additional questions in case the students did not say anything. That also contributed to more time-consuming planning for video conferences.

28. … if I plan, it can of course also be so that I, so to say, put in some extra noise, or some extra time, because it's so that, it's close at hand to be stressed if you throw out a question, and then nobody says anything. <Internals\\14> - § 2 references coded. Reference 1. But that form requires that there is time, so than you might have, eh, also some, some prepared questions to ask, or so, to get some kind of feedback or so. I believe. Reference 2.

Even though there was only one teacher who brought up the issue of the stressful silence, this may have been a situation that many of the teachers recognised as several had developed strategies and planned for how to avoid a silent situation when nobody answered their questions.

29. And I, […] try to predict, what they will do, answer, react, and how they will and react in the video conference, while if you enter in the campus classroom, then you can see where it goes … <Internals\\12> - § 8 references coded. Reference 4.

Therefore, planning was more detailed for video conference sessions than for on campus classes and some teachers even went as far as to say that

they tried to predict what the distance students would say and do and how they would react during a video conference.

In summary, the interviewed teachers claimed that more planning was required for video conferences than for the equivalent lesson on campus. The reasons for this extended planning was that it was essential to use the time during video conferencing efficiently causing teachers to put more effort into thinking through how materials were presented. They wanted to have more control of everything they did and given that the space on the studio whiteboard was often small, it was necessary to not only make careful use of available time, but to also carefully organise how they would make use of limited space.

STUDENT-TEACHER INTERACTION

Regarding teachers' perceptions of the affordances of video conferencing, they emphasised the possibility for synchronous oral communication that made it possible to, for example, implement social activities and create social presence in the video conferencing environment. However, the communicative situation and forms of interaction were different in the video conferencing environment to face-to-face teaching according to the teachers, which could be interpreted as occasioning constraints in the *student-teacher interaction* (Moore, 1993b).

The large number of students made it more challenging to have a dialogue in the video conferencing environment according to some of the teachers. This means that the difficulty to have a dialogue was not only a constraint of the video conferencing technology, but it was also dependent on how video conferencing was used and organised. The teachers had 60-70 students connected simultaneously and therefore not all groups were visible on the screen at once. It was, therefore, difficult to see which students had not spoken and to challenge them to speak or ask questions. The restricted field of view of remote sites (Gaver, 1992, 1996) was one constraint with video conferencing, especially when many and large groups were connected:

30. Eh, it's more difficult, it becomes more that you have a dialogue with a student or a few students at a local study centre and that they have taken part in. On-campus I can see that this student hasn't said anything and then I can sort of challenge it. That possibility doesn't at the distance if I don't know everybody. Now they are up to 60, about 60-70, as we have, I think it has been even more, up to 90. And then, that possibility doesn't exist. Or, that, you don't have the capacity as a lecturer. So that, it makes a difference, that is obvious. <Internals\\3> - § 9 references coded. Reference 4.

Other examples of constraints in *student-teacher interaction* in the video conferencing environment were that the *students' facial expression, gaze, and body language* were sometimes *invisible*. This was due to several reasons such as many sites being connected simultaneously that made it impossible to show all sites in picture. Another reason was that the number of sites, up to 12-15 sites connected, influenced the quality of the picture (Caladine et al., 2010; Lazar, 2007; Shephard, 2002). Large groups of students at the local study centres also made it necessary to zoom out in order to capture as many students as possible. This made the pictures of each individual student very small, which made it impossible to perceive details, as, e.g. non-verbal cues. This means that even if video conferencing in general can have the affordances for mediating a meeting between teacher and students at a distance, there were also constraints formed dependent on the number of sites and the size of groups in each site that were connected simultaneously.

The teachers' difficulty in perceiving the students' non-verbal cues, e.g. facial expression, gaze, and body language also had the effect that teachers did not receive feedback on what they said, which more than half of the teachers brought up as a problem. This could be interpreted as *the students' social presence was lacking* (Rice, 1992, 1993). The teachers stated that they wanted to see the students' reactions to know whether the students had understood or not. This is only natural as face-to-face oral communication can be seen as a rich medium for such purposes, both socially and emotionally (Garrison et al., 2000). Verbal and non-verbal communication

occur simultaneously in a face-to-face situation and we are used to and expect to have both types in a communication situation. Non-verbal communication also aims at strengthening or modulating the verbal message (Lögdlund, 2011). When the teacher could not perceive the students' facial expressions, the communication situation was perceived as strange and constrained by the teachers. They claimed that it was also more difficult to see if the students wanted to say something or ask questions:

31. Yes, not only the dialogue but also, you know, in a classroom you get the contact. You get a contact which can be beyond ehm, beyond the dialogue, (laughs). Well, the dialogue can be with everybody, but you can also have the private contact, because it's sort of an interplay in between and which I miss in, the distance, in the video conference. I can have it with the group that is in picture right then, which I can point out. <Internals\\12> - § 11 references coded. Reference 1.

Video conferencing had the affordance of conveying social characteristics, i.e. attitudinal and emotional approaches (Collins et al., 2000; Moore & Kearsley, 2005). However, if the video conferencing equipment could not mediate non-verbal cues, then the affordance of social characteristics could be interpreted as constrained.

The teachers also thought it was *difficult to start discussions* with students, which the following example shows:

32. And, I probably don't think so much in, with, but there are probably a lot of discussions. I think very much of how I can get the discussions started, and if I get the discussions started even though I sit in front of a camera, and feel like an idiot. <Internals\\11> - § 9 references coded. Reference 9.

Nearly half of the teachers were concerned about how to activate students and *had developed specific strategies for involving students and making them participate actively* during the video conferences and engaging them in discussions. For

example, teachers required students to ask questions during video conferencing and then the teachers wrote answers in the LMS, which also contributed to solving the issue of time constraints in the video conference sessions.

However, *the students seldom asked any questions* during video conferences, which also constrained the *student-teacher interaction* and made it difficult for teachers to know whether students were participating actively or not:

33. Or, it's more difficult to see, to see whether they are engaged or not. It's more difficult to get feedback in that way then, and it's in that case if they ask questions. <Internals\\3> - § 11 references coded. Reference 11.

It was not only difficult to make the students ask questions during video conferences, but it was also hard to make them answer questions. The *teachers tried different strategies* in order to get answers, for example,

34. … and I sit and wait them out, those at a distance, but I can't sit there forever. <Internals\\3> - § 3 references coded. Reference 1.

Some of the teachers had different strategies for making the students reflect through questions from the teacher such as,

35. But then, you have to, then you ask the challenging questions to yourself. And yourself, yourself start reflecting around them and then, and then share it with them then, so that you, so that they understand this process, instead of just saying that this is how it is, it's like this, but, how do you think that it is? <Internals\\3> - § 3 references coded. Reference 2.

Several of the teachers had concluded that it was difficult to get answers to spontaneous questions for which the students were unprepared. Therefore, they addressed the questions to a specific local study centre instead:

36. Tangible questions, eh, which they are unprepared of because that doesn't work: Do you have any questions? And then, eh, then, eh, then you can, if you have prepared questions, then you can be a bit merciless in your addressing. Yes, what do you in Kungälv say, about this? Eh, and if you spice on with, yes, now this lecture, eh, discuss these questions for 15 minutes. Then you can come back and sort of more or less demand a comment. For this spontaneous, that is, becomes very difficult in this, in this environment. <Internals\\14>- § 6 references coded. Reference 4.

Teachers claimed that to ask spontaneous questions did not work because students were afraid of technology or it was easier to neglect the collective responsibility for answering the teachers' questions in the video conferencing environment since students were in different sites and maybe not even visible on the screen. The teachers' assessment of students' behaviour could be understood to align well with a socio-cultural analysis where they perceived the learning situation in terms of the mediational tool of video conferencing. How mediated action is carried out, in this case *the student-teacher interaction,* is based on our interpretations of the world, i.e. how teacher and students interpret the learning environment mediated through the video conferencing. However, the constraints of the video conferencing environment may mean that each site had to be viewed as a separate group, as this was how the sites were shown on the screen and the students also belonged to a certain local study centre. Therefore, the students did not perceive that they belonged to one larger community group with a joint responsibility to participate and answer the teacher's questions. Also, since the students themselves were sometimes not even visible on the screen during the conferences, the teachers' described them as interpreting the situation as if they were not invited to participate or even present. When making comparisons with the classroom environment on campus, the teachers argued that students normally felt a collective responsibility that someone had to answer the teachers' questions:

37. And this, I haven't got a good answer to. I only think that, I think that this with technology can frighten and that it can be embarrassing quiet in some way. Because maybe it is so that if you are in the physical room, then somebody might feel that you have a sort of responsibility, too. Yes, but somebody has to say something, and now I begin to speak then. But if you sit out there, and hide in the local study centre in Orust or somewhere else, then you might not feel that it is so important or so. Somebody else could do that because I am not even in picture or so. <Internals\\14> - § 4 references coded. Reference 1.

Furthermore, the teachers articulated that *technical limitations sometimes could be a barrier* to get in contact with the students, e.g. that the picture could be unclear, that students could be hidden behind one or several other students, which can be referred to the constraint of restricted field of view of remote sites (Gaver, 1992, 1996). The quality of sound could also be poor, which is a constraint of technology as sounds are altered by the video conferencing equipment:

38. You might hear a bit bad, they sit in one, in a room and connection and, maybe you don't see somebody who sits behind another. It can be a picture a bit blurred, and, yes, many such technical problems which can be recorded. <Internals\\4> - § 3 references coded. Reference 3.

Also, the teachers felt that it was difficult to establish contact with the students if the they only met the students on a few occasions as several meetings were required to create an individual social contact:

39. I think that depends on how many occasions I meet them in a course. … If you meet them on three occasions in a video conference, then it's not

enough to create an individual contact. You don't. It's not sort of possible. <Internals\\12> - § 11 references coded Reference 11.

The same applied for *many guest lecturers who felt unsure in the video conferencing situation* and had difficulties to make contact and foster a dialogue with the students:

40. … well, many lecturers feel uncomfortable with this situation and have difficulties in bringing about this dialogue and contact with the students. So that's something which you constantly has to work with and eh, and it's also what is revealed in the evaluations, too. That it's hard to sit listening for such a long time. <Internals\\4> - § 6 references coded. Reference 3.

One of the reasons why guest lecturers had difficulties in activating students with questions might be that they had less experience of using video conferencing in their teaching. The teachers, who did not have students in the studio, lacked the contact with students as they were often unaccustomed to being alone in the 'classroom'.

In many cases, the teachers did not receive any feedback from students on what they had said and done, which they reported making the situation awkward and difficult:

41. Well, I think it's rather hard. […] Because, especially, then when you sit in one, when you have a course where only you sit in the studio, it's, depends on how the groups are of course, how keen they are on discussing, that is, so it's difficult to get any feedback or immediate feedback on. That you can always perceive in one, in front of a group living people, sort of. So it's, it's hard to know. Was it sort of any good, or? <Internals\\6> - § 1 reference coded. Reference 1.

The lack of feedback could be interpreted as a constraint of video conferencing and it might be one of the reasons why teachers felt that *video conferencing was much more demanding and tiring* than teaching on campus, which several teachers expressed:

42. Yes, and it's about that I get, it's about this responsiveness sort of, that's how it is. I don't get the meeting, sort of, which makes that you, and that everybody says, as one, when, that is there in the coffee room, when […] somebody returns which has had video conferencing. You just sort of drops down. You are tired. And you want to talk, and you sort of want that somebody looks at you, sort of, there's something that happens in that, something that drains energy, very, very much. We have talked about it several times, yes, I know, I am absolutely not alone thinking it. It's like you perceive very palpable fatigue. <Internals\\7>§ 16 references coded. Reference 12.

Some of the teachers argued that it was *positive when students were present in the studio* as it made it easier to have discussions. Student presence also had affordances for *student-teacher interaction* more generally in the video conferences as the teachers received clearer responses to what they were saying and doing:

43. It was so horrible, and that had to do with that I was alone in the studio, but now we have, now it's so here that there are groups in local study centres, it's you know, because they sit out there in local study centre and participate in the video conferencing, but we also have a group here now. And we have got a new studio, where there is room for the students to sit. Earlier, they sat in another room, and I was sitting alone in the studio. And, that I think it was rather horrible since I feel a strong need of having, that is, you know human contact. <Internals\\8> - § 3 references coded. Reference 1.

However, *not all teachers were entirely positive to have students in the video conferencing studio*. Some teachers perceived a tension between having students in the studio and also having students at the local study centres. The teachers had the affordances of personal effect and response from students present in the studio. However, there could also be a constraint for students at a distance, if the teacher engaged more in discussion with the campus students and tended to forget about the students out in the local study centres. It was also easier for the campus students to make themselves heard, as they were in the same room as the teacher. Therefore, some teachers claimed that they would have preferred to have the campus students in another room:

44. And, if you get in a discussion, often it's the campus students, they make themselves heard more often, and I can see in them that they have questions, it's difficult to hear if it's someone at a distance, because they are zoomed out. And, I have great difficulties to perceive if those at a distance, or in the local study centres, really are in our discussion, since I don't see their facial expressions, when they ask questions … And it becomes something else, I probably would have wanted to have them in one, that they would have been sitting in another room, actually. <Internals\\3> - § 11 references coded. Reference 2.

When there were *students in the studio* for video conferencing, the teachers also had to consider them and how they could see what was happening during the lesson. This also contributed to the requirement that the teachers had to be seated on the chair and were constrained from moving around in the room:

45. And, space is then also limited, plus that now this year, you have students who sit, and they see, they look behind me, what I show. They see it on one of the screens what I show, and on the other screen, they see the current local study centre then, in

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picture. So that, in a way, you could say that you
are rooted in the office chair there then. <Inter-
nals\\6> - § 14 references coded. Reference 4.
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In order to obtain high quality of sound and image during the video conferences according to the standard of telepresence (the best possible quality), all parts must have equipment that provides high-definition as the overall quality of the picture is decided by the site that has the lowest bandwidth. Therefore, to improve picture quality, not only the equipment at the university, but also the equipment at the local study centres must be upgraded (Caladine et al., 2010; Lazar, 2007; Seay, Rudolph, & Chamberlain, 2001)[131]. However, the costs for the equipment with HD telepresence are much higher than the systems typically used in higher education. With smaller groups in each site, a smaller number of groups, and expensive telepresence equipment, distance education is less cost-effective (Caladine et al., 2010; Lazar, 2007; Shephard, 2002).

With technical improvements, it is possible to use video conferencing for two-way communication with activities other than lectures such as small group activities, student-initiated interaction, problem-based learning (Caladine et al., 2010; Smyth & Zanetis, 2007). To accomplish that, teachers must become aware of the possibilities and adapt both content and techniques to create interactive pedagogical situations (Caladine et al., 2010; Greenberg, 2009).

In summary, teachers reported that the use of video conferencing had technical problems such as unclear pictures, restricted field of view of remote fields and poor sound. These problems resulted in constraints in the communication situation and *student-teacher interaction* as non-verbal cues were not visible, the teachers did not receive feedback from students on their teaching, and the students' social presence was lacking. In order to reduce these constraints, many of the teachers described how they wanted to activate students during video conferences and had developed strategies for engaging them. Other constraints in the video conferencing environment emerged as a result of large groups in the sites and that many sites were connected simultaneously. These issues highlight that video confer-

131 For more information about telepresence, see section 3.3.

encing was originally developed for business meetings with a limited number of connected sites and participants and not for distance education at scale (Carter, 1997; Lazar, 2007; Mason, 1994; Weinman, 2007).

TEACHING IN THE VIDEO CONFERENCING ENVIRONMENT

The teachers' perceptions of teaching through video conferencing varied. About one-third of the teachers claimed that they did not like it, but some thought that it worked better when they got used to it. Most of the teachers stated that they felt *unsure at the beginning*; they did not know how to use video conferencing in teaching, how to use the technology (what buttons to push etc.), or how to act in front of the camera. The first time using the technology was perceived as a stressful and difficult experience by more than half of the teachers, for example:

```
46. ... the first lesson, you sat just straight up
and was nearly terror-struck, nearly, because you
felt, and then you saw yourself, but you can't look
like that, you get so distracted by yourself in some
way, you know, and that's of course, that's lack of
experience. <Internals\\5> - § 4 references coded.
Reference 4.
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Even if video conferencing had the affordances for mediating audio-visual communication and interactive teaching (Smyth & Zanetis, 2007), which is as close to classroom teaching on campus as possible at a distance, *the video conferencing environment changed conditions for how the teachers could act in their teaching* (Säljö, 2000). Most of the teachers expressed that the video conferencing environment constrained their possibilities to move around in the room, which they typically did when teaching on campus. More than half of the teachers claimed that they considered it to be a problem that they had to be seated on a chair when teaching. If the teachers moved away from the angle where the camera could capture them, they were not visible for the students:

47. But, I can't run around as I, like I always have done in the classroom before. I have to be seated on the chair so that I'm seen in camera then. <Internals\\11> - § 1 reference coded.Reference 1.

One teacher expressed that *he felt uncomfortable to sit and talk in front of a screen* and that it was difficult to remember to look into the camera since the picture of the students was shown elsewhere:

48. Eh, yeas, dilemmas, there is quite a lot. Eh, partly, there are many lecturers, inclusive myself, who think that it's a, somewhat uncomfortable situation to sit and talk in front of a screen, even though you see people there then, it's still difficult, and you don't know where to direct your gaze. You are told to look into the camera, but it's tough to look into a dead camera. <Internals\\4> - § 15 references coded. Reference 1.

'Teaching is about performing' was one example of how a teacher described the issue that others emphasised as the importance of being free to act and move in the room as they wanted since that was a part of their identity as a teacher and their personal teaching style that had developed over sometimes many years. The teachers' reported that their movements in the room were often spontaneous and a way to interact with students' comments or questions and for getting in closer contact with students:

49. And you can move in front of sort of the group and so, all that is taken away in video conferencing, and, yes, one, yes, for I think that lecturing is really like entering a stage in a way. It is like that. You step up on the stage, and you go into a role very clearly. And you might want to do it as you want to do it in a way that suits oneself. If I want to go up on the right-hand side and talk a little with, only five students there about an issue, that is direct it, then I can do that, or if I want to go back, or if I want to go in, you know,

go down among the students, that is in the middle of or whatever, I can sort of decide that … <Internals\\7> - § 16 references coded. Reference 14.

Since the teachers felt restrained in the video conferencing environment, it can be interpreted that they felt 'handicapped', affecting their teaching negatively and making them feel uncomfortable. Another example of one of the constraints of video conferencing is the restricted field of view of remote sites (Gaver, 1992, 1996). The restricted field depends on 1) how much the wide-angle lens of the camera can capture and 2) the size of the screen where the video is displayed (Gaver, 1996).

Instead of being seated on a chair, the teachers claimed that they wanted to be standing, e.g. in front of a whiteboard or a SmartBoard[132]. Previously, there had been SmartBoards in the video conferencing studios, but they had disappeared, and several of the teachers reported missing them. Being seated on a chair, not being able to use a whiteboard, but only a document camera, made them feel very stiff. This was another example of constraints that the teachers perceived in the video conferencing environment:

50. I feel that I sit really very much still, you get so, yes, you sit still, there isn't so much, there isn't a board behind, which you can write … draw, but it's on the table then, on the document camera, you have, so you get very upright and fixed. <Internals\\5> - § 1 reference coded. Reference 1.

That video conferencing restricted the field of view of remote sites, made it impossible for the teachers to even rise from the chair as that would make them invisible for the students. If they disappeared out of picture, it was also the teachers' responsibility to adjust the camera to become visible again:

51. If I rise, then I immediately have to adjust camera angles and so there, so it's challenging that, in a classroom, where you move, you know, or at least, many teachers do that, you know. But here

132 SmartBoard is one example of an interactive whiteboard.

you sit, more or less fixed to that camera angle you have adjusted. You look like a presenter of a program and then switch between these two. <Internals\\6> - § 14 references coded. Reference 2.

Most teachers thought that it was too complicated to change the camera angle and therefore chose the simpler solution of not moving around. It could be interpreted that the restricted field of view of remote sites affected how the teachers acted. This also impacted the teachers' attention, which could be primarily directed toward avoiding moving out of sight from the camera instead of focusing on the content of the lesson, the pedagogical approach, and the interaction and contact with the students.

As an example, one teacher stated that when she was inexperienced, she *mostly focused on her role as a teacher and less on the students,* which resulted in mainly using the video conferencing sessions for lectures. According to Laurillard (2002), video conferencing has historically been used as a tool for one-way communication and as it is a presentational medium, and it invites to the delivery of lectures.

Teachers also mentioned that in order to prevent the video conferences from fulfilling a view of the activity as boring, it was essential *to consciously utilise the voice and face in order to engage students in what you said and did:*

52. The negative in that, that is that it can become stereotyped unless you don't make an effort. Thus, (laughing), it is so there is with everything, with all teachers' roles in some way, that you find a pattern, and then, there you are. So. So that, hm. I, but the negative is probably that you do not really understand what is required in prepara … that is to say, ehm, is required to do these, you know, this type of lectures which builds on, your voice and your face, because it is a question of, that is what it is here. So. And, that requires so much more, you know, than doing an ordinary lecture. Mm. That is

probably the weakest point in this, I think. I think that lecture in video conferencing can be extremely boring, unless you don't, hm. <Internals\\12> - § 1 reference coded. Reference 1.

One factor contributing to the teachers' feeling of uncertainty in the video conferencing situation was *their worries about technology:*

53. No, well, I, I had really, I was sort of horror-struck when I was coming into this course a year ago and was responsible for it. I didn't even know whether I could switch on this system because I had only been sitting alongside when someone else had switched on. <Internals\\11> - § 2 references coded. Reference 1.

The result was that some of them claimed that *their attention was focused on the technology*. One teacher expressed that many teachers felt restrained since they were unsure of using the technology and therefore found it more difficult to have a dialogue with students:

54. … that I and many with me are a bit restrained by us being such technical catastrophes. That it's so that we don't know, we get so obsessed by this technology, […] that we don't make it do for having this dialogue. <Internals\\14> - § 5 references coded. Reference 3.

Another teacher claimed that to be in a close-up picture with the focus on the face or the upper part of the body for the whole time was tiring. Also, the feeling of being in the middle of a live broadcast where there were no possibilities for 'repairing' mistakes contributed to some teachers' perception that a video conferencing situation is difficult, demanding and tiring. According to Laaser and Toloza (2017), this type of anxiety about making mistakes in video conferences may affect the teaching leading it to becoming less authentic than when on campus. This is exemplified in one teacher's description:

```
55. I begin to think; I begin to think that it's
rather nice. Eh, at first, I didn't think that it
was. First, I was very occupied by these buttons,
and probably still am, but now it's ehm, eh, the
feeling of standing in live broadcast can be per-
ceived as rather tough by many teachers. To, to
there, there are no possibilities of making a new
shooting or so. But that's not possible in the cam-
pus course either, … <Internals\\14> - § 4 refer-
ences coded. Reference 3.
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In summary, most teachers felt very unsure at the beginning of their use of video conferencing, but after a while, as they got more used to it, felt more comfortable. One of the most critical constraints of teaching through video conferencing which the teachers raised was that they could not move around in the room as they liked to since they would go out of the picture. The teachers claimed that the requirement to be seated on a chair constrained their teaching. The teachers also found it challenging to teach when they were alone in the studio as they lacked feedback from students. However, to have students in the studio could also be a constraint according to the teachers as there was a risk that the distance students got less attention. Also, it required that the teacher could handle both the groups at a distance and the students in the studio. Another constraint was the teachers' worries about technology, resulting in some teachers' attention being focused on technological concerns instead of on the content and the students. As video conferencing was perceived in terms of being on a 'live show' by some teachers who were afraid of making mistakes, they found the situation complicated, demanding and tiring.

HANDLING PRACTICAL ACTIVITIES

The key features of video conferencing with oral synchronous communication with audio and moving pictures were reported as having clear affordances (Keller, 2007; Moore & Kearsley, 2005), but the technology could also entail constraints according to the teachers. For example, the use of practical exercises in video conferences could sometimes be complicated and therefore required thorough planning. More than half of the teachers

claimed *to be obstructed in their teaching* in the video conferencing situation. It was not always possible to carry out certain teaching approaches of a more practical character such as trying out activities that should be experienced by students, which the teachers often described as the most useful in relation to course content. The students became invisible outside the angle that the camera could capture due to the restricted field of view of remote sites (Gaver, 1992, 1996). This means that the video conferencing environment constrained the space available for activities and made it difficult for students to move around, something that was sometimes necessary for carrying out specific tasks. Practical activities were, therefore, often excluded from the video conferences.

The teachers also found it challenging to find ways of 'translating' practical activities to something that could be shown and explained to the students and that could be mediated by the video conferencing tool:

56. … you have to be careful, which of the experiments you choose, for certain experiments can be transferred through the camera in the same way, as you can do in reality. Certain experiments work very well, certain don't work, because they are going to see it over there. You have to carefully consider, eh, more thorough, I think, what works and what doesn't work. <Internals\\13> - § 8 references coded. Reference 1.

This means that even if video conferencing was used as a mediating tool to create a classroom environment at a distance, it could also be interpreted in certain situations as a constraint on the teaching that impeded the teacher's design and pedagogical ideas.

Not being able to use practical activities or carefully having to choose those that were suitable for the video conferencing environment made some teachers perceive themselves as boring:

57. I think that I am, that you become, myself I feel restrained when I am going to have video conferencing, because I feel that I can't do as I really want to, because being, to have pre-school maths

it has very much practical maths and that, then you have to try and transfer that, how should I explain it and do it, when you can't experience it, but I have to show it through video conferencing. So that I can feel that it becomes very boring, because you really want that they should be able to try it out, to go or do what you do now, or counting with their whole body or with all their senses, or these things that you do with children. <Internals\\5> - § 4 references coded. Reference 1.

Certain practical activities also required that the students at the local study centres had access to the materials that were going to be used during the video conferences. Particularly teachers who taught subject matters which commonly involve practical activities, had tried to distribute materials to local study centres in advance in the form of lab boxes containing item such as paper, glue and materials that could be copied. These teachers wanted to use the same activities at a distance as on campus. The purpose of using the material was to help the students to participate more actively during video conferences and to create understanding among students for what they were doing. Equally, the materials could also be used the other way around with an introduction during the video conference followed by the students trying out and discussing the practical activity after the video conference:

58. I think it is a bit of both because some things you have to do in order to try it out for being able to discuss during the video conference when you talk about it so that you have an understanding for what you do. Or that you talk and do during the video conference or that you first get to know and get sort of information and knowledge and then they do lab work and discuss afterwards. (Pause). Because then, it gets a bit, I think that it gets more meaningful. <Internals\\5> - § 12 references coded. Reference 5.

This strategy also required the teachers to decide which materials they were going to use in advance and to ensure that all the local study centres had access to that material in advance or that the students brought the materials with them from on campus course. However, it was only teachers teaching more practical subject matter who brought up these problems:

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59. And, that I can do in a video conference broad-
cast, as well as I do it in the room. <Inter-
nals\\11> - § 9 references coded. Reference 8.
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The teachers who taught theoretical subject matter did not report any constraints regarding the activities that could be carried out in the video conferences.

In summary, the restricted field of view of remote sites (Gaver, 1992, 1996) and that not all activities were always visible were perceived as constraints of the video conferencing technology. This made it sometimes difficult to undertake practical activities such as chemical experiments or activities which made it necessary for students to move around. This constraint of video conferencing limited what could be carried out during video conferences according to the teachers. They, therefore, tried to find other teaching activities and ways of varying their performance, which will be described further in the following section.

HANDLING TECHNOLOGY AND TECHNICAL CONSTRAINTS

Even though video conferencing supported affordances (Gibson, 1986, 2015) for social interaction (Bates, 1997) and Moore's category of *student-teacher interaction* (1993b), teachers also perceived constraints in the interactions. One constraint was that the picture was typically directed by the sound in a video conference. If somebody in one site only said "Hmm" as confirmation to what had been said, the picture moved to that person and then back to the person speaking again. Also, when several groups uttered something simultaneously, the sound was interrupted until only one part spoke at a time, which was irritating and constrained the interaction:

60. And it's, it's this with that it really is directed by the voice, so the person, and if several talks at the same time, the sound is interrupted, that's what is … <Internals\\7> - § 16 references coded. Reference 3.

One strategy to reduce this problem was to have only one group or at least fewer groups connected simultaneously:

61. Yes, but if you only have one, then that's not the problem, because then the communications will not be interrupted. I have when I teach it's nearly always 10-12 sites which are roundabout. <Internals\\7> - § 16 references coded. Reference 6.

These issues resulted in some teachers reporting that they summarised the content of a lesson themselves instead of leaving it to students:

62. But I have to say, yes, what do you in Katrineholm say? Then they answer, but there is a sort of delay in their answer which makes, that I can't ask a, I really miss, that I can't ask the open question and then let the answers sort of come, what it does in a lecture room. And then, it becomes also, it's very difficult, then I do instead so that at the end of the distance lectures, I sum up myself. Okay, these are the five most important issues that you have to have with you. Then I can still feel that you have, have I said that, but I don't really know whether I said that again and that they still didn't understand. You know, you don't feel that it sort of comes from the students and so, but …<Internals\\7> - § 16 references coded. Reference 2.

When the teachers became *familiar* with the video conferencing situation, many of them felt more relaxed and were less worried about making mistakes, which the following excerpt illustrates:

63. And, it can of course also has to do with that you feel more confident, you know how it works, and it doesn't matter if I happened to push the wrong button, because nothing happens or so. <Internals\\9> - § 1 reference coded. Reference 1.

A couple of the teachers even went as far as to say that they thought that *teaching through video conferencing was rather enjoyable:*

64. I begin thinking that it's somewhat nice … but it's in some way, little as, I think it feels somewhat nice to come in and so you shall sort of getting started, and so these groups at the local study centres should be called out, so that in some way it feels: Now we have this day together, and then you think that all have travelled to their local study centre groups, because they think it's fun. <Internals\\14> - § 4 references coded. Reference 3.

However, other teachers claimed that they felt uncomfortable in the video conference situation as *they did not like seeing themselves in the picture*:

65. But then it's also that I don't like seeing myself in the picture, and so. So that is, so that is probably a demand that is difficult to come over, maybe. <Internals\\9> - § 1 reference coded. Reference 1.

Despite, some teachers' discomfort, in some cases *students wanted to see the teacher* when speaking and therefore demanded that the teachers not have the picture from the document camera in focus for too long with the teacher then only visible as a small square in the larger picture (picture in picture) on the screen:

66. I think that it's tough, really. You see yourself all the time. We have at least two TV-sets, and on one of them you see the students, and on the other one, you see yourself or the computer or, and

they want so very much to see us, so that we can't have the document camera on, because if we have it on, then they want so much: Disconnect it, we want to see you, they say then, because otherwise you just become a small square so. But I feel that I get very, I get very stiff, and I have surely relaxed a bit, but it's a very different way for me … <Internals\\5> - § 2 references coded. Reference 1.

There were also other examples indicating that teachers *had developed certain strategies for avoiding being in the picture*. One such strategy is that they used PowerPoint, as the following excerpt exemplifies:

67. … that the difference as I see between, that's that I use more technical aids in the video conferencing. I use more PowerPoint. I don't like to see myself in picture, (laugh). <Internals\\12> - § 6 references coded. Reference 1.

Such strategies can be viewed as contra-productive since the purpose of using video conferencing is to take advantage of its affordances for mediating a face-to-face meeting with audio-visual communication, facilitating communication and interaction (Smyth & Zanetis, 2007; Säljö, 2000, 2005; Wertsch, 1998). The rather small and unclear picture of the teacher which was shown when the teacher used PowerPoint, could not mediate the teacher's non-verbal communication. Therefore, the teacher's had low social presence (Rice, 1992, 1993) when the document camera or PowerPoint slides were displayed. This could be interpreted as if *the teachers themselves created constraints* in the communication situation with the students due to the teachers feeling uncomfortable to be in picture. However, the teachers may not have considered that students would have a need for an image of the teacher to support social contact.

The video conferences at Karlstad University were recorded and the issue that *the teachers did not like being recorded* and the reasons for not liking it were brought up by more than half of the teachers:

68. … it's recorded and people can watch it later, […] yes, it's different if it's here and now, and we talk, and I can explain again, and it can be wrong and like this, but it feels you know as it's more official here and now then. Yes, and this is something that others can watch and judge then, and the value of and so, and if it's quality and so on. So, of course, it feels as higher demands on what I say. <Internals\\8> - § 1 reference coded. Reference 1.

However, one of the teachers was positive to seeing themselves and claimed that it could contribute to improving their teaching since they could use the recordings to evaluate their own practice:

69. … I have had a terror for seeing myself recorded and hearing my voice. I still think it's sort of absolutely awful, but I see that there is an advantage with it that one can go back and watch. <Internals\\11> - § 2 references coded. Reference 2.

Such initial resistance is common as teachers are generally unaccustomed to being recorded and may be anxious about making mistakes (Laaser & Toloza, 2017).

Further, several teachers expressed that they were *dissatisfied with their performance* during video conferences and perceived that they were boring in the video conferencing situation, which the following excerpt is an example of:

70. I am extremely boring when I lecture. I am a bit sad over that. I think that I am very funny otherwise. No, but I think that I am much funnier on campus than I am at a distance. <Internals\\3> - § 9 references coded. Reference 8.

Some teachers claimed that they were dissatisfied with their way of handling the video conferencing situation, but stated that *they had not received so much help* regarding how to handle technology and the video conferencing situation:

71. And, I can feel that, that I'm not satisfied with my performance there if you say. Now, we haven't received any bigger help more than to, this is how the computer works, this is the document camera and here you have the button for the mike, here you have the button for the zoom, here look into the camera. That's what we've got, then we had experimented ourselves, what we think works and not, […] own learning and exploring, if you say, because we feel that, yes, we have to develop it, and it has to be better. So that we try and find new things or come up with new things, as then. And there we take a little help from the students and ask what they think and so. <Internals\\5> - § 2 references coded. Reference 1.

However, they were aware that their dissatisfaction was not always shared by students:

72. And I get as much surprised every time when video conferencing because I'm never satisfied with the video conferencing lectures and still the students are always very satisfied. Yes, it has been very interesting, and thank you very much, it has been great, yes great, and it has been so lively and good, […] I think sort of, that phew, how boring it was. It was only sort of, it was only me who babbled all the time, and so you take in the students now and then for discussing issues, but that, and that I also think is a sign of, that as a pedagogue, you experience it differently than the student does. It has to be like that. Or they are only very kind. <Internals\\7> - § 1 reference coded.

There were also examples of teachers having the expectation that video conferencing situations should be the same as on-campus teaching:

73. But, I think that it's, for me, since I do it so seldom as I do, you know, the result is that I want it to be as on campus. I want to sort of, I don't want it to be different, and it can never be as on campus. <Internals\\7> - § 1 reference coded. Reference 1.

Even if video conferencing has the affordance for creating a similar communication situation as a face-to-face class (Bates & Sangrà, 2011), constraints could emerge such as the restricted field of view on remote sites (Gaver, 1992, 1996) and rendering non-visible cues invisible due to low resolution or a lack of bandwidth due to many connected sites (Collins et al., 2000; Smyth & Zanetis, 2007). It is important to adapt teaching strategies and methods to the video conferencing environment to improve their design, but that requires knowledge of the differences between teaching in video conferencing and on campus (Gaver, 1992).

Some teachers expressed *a wish to transfer teaching methods from campus to the video conferencing environment:*

74. Yes, how can, how can you have a seminar so that it resembles, the seminar that you have on campus. And there we have carried through, but (pause), with somewhat varying results. It works then when it functions so that one local study centre can be a seminar group together with the seminar leader. <Internals\\4> - § 6 references coded. Reference 4.

It could be difficult to use the same methods in the video conferencing environment as on campus due to different frames and conditions. For example, there might simply be very large numbers of students in a distance course, making it difficult to carry out seminars.

In summary, even though video conferencing can be seen as supporting affordances for social interaction (Bates, 1997) and Moore's category of *student-teacher interaction*; (1993b), teachers perceived constraints on their interactions such as sometimes time-consuming and interrupted communication when picture choice was dictated by which site had active sound. The teachers claimed to become more comfortable in the video

conferencing situation with experience. However, they did not like seeing themselves in picture and they had therefore developed different strategies such as showing more PowerPoint slides for avoiding it, thus creating constraints in the communication situation with the students who wanted to see the teachers. To be recorded was perceived as even worse by the teachers and increased their anxiety about making mistakes. Some teachers claimed to want to transfer teaching methods from campus to the video conferencing environment, which could be challenging as frames and conditions were different and constraints due to technological limitation could emerge such as the restricted field of view on remote sites.

CONCLUSION

When using video conferencing, teachers perceived that there were constraints both in terms of *time* and *flexibility,* both temporal and spatial. These constraints were produced not only due to the use of video conferencing *per se*, but also due to organisational, administrative and technical circumstances. The limitations in time as a resource of teachers was related to the perception that pedagogical design was negatively affected by video conferencing. The teachers also claimed that often several activities competed for the available time. When teachers prioritised student-centred activities such as discussions and presentations of student work, there was little time left for lectures. From the teachers' descriptions, it could be interpreted that they perceived themselves as having most responsibility for presenting course content to students during video conferences, resulting in them creating additional recordings or putting additional materials on the LMS if they did not have time to present the planned content during video conferences.

The temporal constraint made it necessary for teachers to use the time during video conferences as efficiently as possible, which put high demands on teachers' planning and was more time consuming than planning for classroom teaching on campus according to the teachers. Also other circumstances such as limited space on the whiteboard in the studio and that the teachers claimed to have the ambition to vary how they presented the content during video conferences contributed to even more time being required for planning. Furthermore, that the teachers perceived

that they had to plan a whole lecture in detail, planning for how to activate students and which local learning centres were going to answer which questions. This contributed to the increased time required for planning video conferences when compared to equivalent on campus courses.

A video conferencing environment may have the affordances for supporting synchronous oral communication, social activities, and social presence. However, the way it is used and how tvideo conferences are organised with many students in each site and many sites connected simultaneously makes it difficult to take advantage of these affordances. The teachers reported perceiving constraints in the video conferencing situation, which can be interpreted as being due to the restricted field of view of remote sites (Gaver, 1992, 1996) and other technical limitations such as reduced quality of picture (Caladine et al., 2010; Lazar, 2007; Shephard, 2002) or sound. The teachers reported that students' non-verbal cues were missing, which can be interpreted as a constraint in the communication situation. This could result in students' lacking social presence (Rice, 1992, 1993) and reduced *student-teacher interaction* (Moore, 1993b) exemplified by students seldom asking or answering questions. However, some teachers claimed to have developed different strategies to increase student interaction with some positive to having students in the studio as they could then receive feedback on what they said and did. However, other teachers thought that having students in the studio complicated their teaching situation as it was easy to forget about the distance students. Video conferencing was perceived as tiring and more demanding compared to teaching on campus.

Some teachers said that they liked teaching through video conferencing, and others did not. The use of video conferencing changed the conditions for how the teachers could act in their teaching and many teachers claimed to feel constrained as they could not move around in the room as they were used to and this affected their teaching. Some teachers reported feeling uncertain in the video conferencing situation due to worries about technology or that a focus on technology took their attention from the content and the students.

Even if video conferencing can be used as a mediating tool to create a classroom environment at a distance, the results from the interviews also show that more than half of the teachers interviewed perceived con-

straints concerning the use of more practical activities. The difficulties with using practical activities constrained teaching and impeded the teacher's design and pedagogical ideas. Therefore, practical activities were often planned for course meetings instead. The result was that some teachers perceived themselves as boring and they tried to vary their performance and ways of presenting as much as possible instead.

Video conferencing was seen to provide affordances for social interaction (Bates, 1997) and Moore's category of *student-teacher interaction* (Moore, 1993b), but teachers perceived constraints in those interactions, often due to sound activity typically dictating the picture in focus. However, some teachers stated that they did not like seeing themselves in picture and to be recorded was perceived as even worse. Some teachers reported that they had even developed strategies for avoiding being in picture by intentionally showing more PowerPoint slides. However, such strategies can be interpreted creating constraints in the communication situation for students.

7.4 TEACHERS' VIEWS ON COMPETENCE AND IN-SERVICE TRAINING

TEACHERS PERCEIVED A NEED FOR IN-SERVICE TRAINING

None of the teachers had participated in formal in-service training regarding how to teach through video conferencing or how to teach in distance education. A few teachers stated that they had learnt things on their own by looking it up on forums on the Internet and by using the help function in programs. Some teachers also asked for help from students. The teachers had also received help from technical support at the university regarding how to handle the video conferencing environment or from colleagues, but it was challenging to find time to cooperate with colleagues and learn from each other:

75. Yes, I think it's good with co-operation with colleagues, because they give me the support and the experience they have, but I experience that there are many who feel that it's a unnatural, eh, way or, unnatural, sort of way to work and convey knowledge on, because I think that it's because we are not used to, and we have not been given the right, or education, or what shall you say, it's sufficient if you get some tools how to stand, or how to say or as they do on television, thus there they stand and get an education how you should be so that it becomes the right perspective in, and that, that we haven't got any. <Internals\\5> - § 2 references coded. Reference 2.

However, as Laaser and Toloza (2017) note, it is common that teachers do not receive in-service training in presenting content through audio-visual media.

A general need for pedagogical in-service training and *especially related to distance education* was repeatedly brought up by the teachers. The teachers claimed that they needed more knowledge in pedagogy than some courses in Teaching and Learning in Higher Education, particularly for those working in teacher education. There was even a suggestion that this in-service training should be compulsory. Several teachers had participated in other formal courses, but not in courses for distance education or how to teach in video conferencing. One teacher even said that teaching was often based more on trial, error and talent for teaching than on scientific evidence for why teaching should be carried out in a certain way.

DIFFICULT TO FIND TIME FOR IN-SERVICE TRAINING

Some of the teachers claimed that it was *tough to find the necessary time* to carry out in-service training specifically for distance education or for video conferencing. Other in-service training activities were competing for the teachers' time such as studying within their research field or finding new research fields in which to, studying teaching subject matter more deeply,

or catching up with what was happening within their field. In addition, if it was going to be possible for teachers to participate in-service training, it was necessary to establish the dates for the training at least a year in advance as it otherwise would be impossible to find time in the schedule as there were so many lessons scheduled. If in-service training were to be useful, the teachers felt it was also necessary to have time to practise the knowledge gained directly after the course. Otherwise, the new knowledge would soon be forgotten.

The older interviewed teachers were not generally interested in spending time learning about technology, suggesting instead that younger teachers could handle it with the rationale that younger teachers were already used to technology. There were also other issues that the older teachers gave higher priority to than learning the issue of how best to use technology in teaching:

```
76. So, that it's, but I, I don't spend time and do
not intend to, on learning so very much new within
the technical, because that I think that, those who
are younger can do that. And they have much more,
there it goes automatically into life. So. Eh, in a
totally other way. Ehm. And then you could see so
that you have a certain age eh, situation at uni-
versity which results in that many are like me,
(laughs), so it takes that you have time to the in-
service training that makes that you think that it
is still sustainable to engage in. <Internals\\12>
- § 5 references coded. Reference 1.
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Generally, however, the interviews indicate that the teachers thought that their university department had an unfulfilled responsibility for providing in-service training.

DIVERSIFIED NEEDS FOR IN-SERVICE TRAINING

Teachers had *diversified needs for in-service training*. Several expressed that they needed practical in-service training concerning how to act in the video conferencing situation, including such issues as what colours and patterns

to wear and not to wear[133], how to show things in the best way, and how to sit and move in the studio. Similarily, the issue of how to use PowerPoint in the best way for video conferencing and what fonts are most suitable were raised by several teachers:

77. I would really like to have more in-service training regarding how to behave, because that is also, hm. […] and only this that you shouldn't sit on a chair that spins if you sit and swing or something. Just those small things. Think about what you wear. Maybe you shouldn't have something spotted or so. Well, if I sit and look at how somebody with hugely patterned with spots, can be very tough and do that for one and a half hour. […]. And those, those things, and it would, it would be fun if you could, that I could do, that's as we say that you should have a styling course almost, but, but something. Hm. What kind of fonts to use and how you have to think PowerPoint and that doesn't only apply to video conferencing, but maybe, even more, video conferencing. <Internals\\3> - § 2 references coded. Reference 1.

Not surprising, given the teachers' reported difficulties with engaging students, they expressed a desire to learn about how to vary video conference lessons and to receive tips regarding how to start discussions with students:

78. No, I think that should have more, more tips and ideas regarding how to vary yourself in education, in the lectures in video conferencing. How, actually, to have some tips by somebody who has done that, and who has much experience and who can show how you in a good way tempt to discussions, can

133 Clothes with spots, checked or messy pattern etc. can be disturbing to look at for several hours, especially if there is a bad quality of picture. Certain colours are more suitable for video conferencing than others, e.g. beige and blue but not white (Dafgård, 2002).

show the material in a good way, and so, so that it gets more lively. I think that. <Internals\\9> - § 1 reference coded. Reference 1.

Also, there was a perceived need for in-service training, raised by nearly half of the teachers, regarding how to handle technology in the video conferencing situation including what worked and what did not. The teachers expressed that they wanted to have somebody with experience of teaching through video conferencing come to discuss ideas with them. Particularly teachers who were new to teaching through video conferencing felt this need:

79. And, somebody to bandy ideas with, just this, what do you think if you would try and do something in this way, or, eh, so that you had someone who sorts of knew how it worked and could answer me then, and say but that, now you are out on the wrong track, because that doesn't work in a video conference, or from a pure camera point of view, or sound point of view or whatever it is or. I would like to have somebody who could give advice. We are so used to and grab (laughs). So we run here, and bandy ideas with those we can here and whom we know have worked with this. But they, but sometimes they feel the same. They try to help us and bandy and get some ideas and so. They often say, no, but I don't like this, I don't like this way, or it's I feel also feel very new in this area. So, I have a great need for help there. <Internals\\5> - § 6 references coded. Reference 4.

TEACHERS USED THE TECHNOLOGY THEY WERE FAMILIAR WITH

In one section of the interviews, teachers were asked whether they would use video, in general, more if they had participated in in-service training. More than half of *the teachers claimed that they would use video more if they got training* in how to use it:

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80. Yes. Because you can't use something that you
not really know or are aware of. <Internals\\9> - §
6 references coded. Reference 6.
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However, a few teachers claimed that having allocated time within their work as well as access to the technology would be more important factors for increasing their use of video than in-service training. One teacher expressed the view that video would be used more in the future regardless of whether they received in-service training or not. The recording of teaching situations would also spread to campus and be used there as well according to several teachers.

Which *technology* teachers chose to use in a video conferencing situation *was closely related to the technology that they felt familiar with.* Unsurprisingly, technologies that teachers did not know how to use, were generally not used. Christ et al. (2017) claim that teachers' use of technology is closely related to their knowledge and experience of using it. Several of the teachers in this study brought up examples of technology that they did not use because they did not know how to use it and one teacher did not use any technology at all due to a lack of knowledge about how to use it.

CONCLUSION

The teachers expressed a need for in-service training, however the specifics of this need varied, with for example, needs described for training on how to act in a video conferencing situation, styling, how to behave, and how to use PowerPoint. They also expressed a need to know more about how to handle the technology in the video conferencing situation, how to start discussions, and how to vary teaching approaches. The teachers

reported having received very little in-service training and it was difficult to find time for it. Many of the teachers expressed largely using the technologies they were familiar with and, in general, claimed that they would use video more if they got training.

7.5 CONCLUSION: ANSWERS TO RESEARCH QUESTIONS

The aim of this thesis is to better understand the possibilities and limitations of video in digital distance higher education. This chapter has reported the results of interviews focused on video conferencing as one out of six categories of video used in digital distance education.

RQ1: C) WHY IS VIDEO CONFERENCING USED OR *NOT* USED?

There were a variety of arguments that the teachers brought up concerning why video conferencing was used. Important reasons were that it supported continuity, enriched distance education, made it possible to engage experts as lecturers, offered possibilities for the course content to be widened and deepened, and that it provided synchronous audiovisual communication. Other reasons were that video conferencing functioned as a complement to other teaching and learning activities and that it made it possible to reach out with information and get in contact with students. The teachers argued that the use of video conferencing indirectly facilitated contact among students, as students met regularly for video conferences at local study centres. Other arguments were that it provided a meeting place for teachers and students and that it contributed to students feeling of belonging to a course and to a study group, an aspect seen as important for their motivation and self-esteem. It was also considered important for supporting students in completing their studies, and it was perceived as having affordances for *student-teacher interaction* (Moore, 1993b), which can reduce 'transactional distance' (Payne, 1999). Many teachers emphasised the important role video conferencing had for creating social contact, activities, and social presence, which can be under-

stood to align well with a socio-cultural analysis of important conditions for learning (Säljö, 2000) where the affordances of video conferencing can be seen to mediate social interaction.

The teachers argued that video conferencing was *not* used for certain practical activities as video conferencing had constraints. For example, some laboratory experiments could not be mediated through the video conferences as what happened was not visible for students. The restricted field of view on remote sites was another constraint (Gaver, 1992, 1996) that limited the possibilities to use video conferencing for activities that required space for students to move around. It was sometimes difficult to use video conferencing for external experts' lectures as the schedule was fixed and nearly impossible to change.

RQ1: D) HOW IS VIDEO CONFERENCING USED?

The teachers reported using video conferences for going through and presenting course content with the support of, for example, a document camera. The document camera was also used for showing laboratory material, which means that it was perceived as having affordances necessary for mediating laboratory work for students at a distance. The teachers also said that video conferencing was used for giving students the possibility to ask spontaneous questions and get answers directly from teachers. However, it was reported to be little used for discussions and for student presentations as these activities were seen to be particularly time-consuming when many sites and large groups of students were connected.

RQ2: HOW DO COURSE DESIGNERS RESPOND TO THE POSSIBILITIES AND LIMITATIONS OF VIDEO CONFERENCING FOR DIGITAL DISTANCE EDUCATION?

Many of the possibilities that the teachers brought up are described under the sections on why video conferencing is used and how it is used. Here the focus will instead be on the limitations that the teachers described and how they reported responding to them.

A significant limitation with the use of video conferencing was *time*, even though this could be understood as not being a direct constraint of the video conferencing technology itself, but rather an effect of how teacher education at a distance was organized at Karlstad University. The time available for video conferencing was limited and it was also fixed. The latter made it difficult to invite guest lecturers as a prerequisite was that they were available when the video conferences were scheduled. The teachers claimed that it was also challenging to have extra time when needed, as there were many sites connected simultaneously and there was limited access to video conferencing studios. The teachers, therefore, reported solving the problem with limited time for video conferences by, for example, recording an additional lecture or by putting materials on the LMS. Another factor that reduced the time for the actual teaching were constraints more directly related to the technology of video conferencing as it was necessary to spend time on verifying that all sites were connected and that the sound and picture functioned. Due to the limited time available, several activities competed for time and the interviewed teachers claimed that it was difficult to decide what to prioritise. For instance, they reported facing the choice between presenting course content or engaging in activities such as discussions or students presenting their work.

Since the teachers perceived that the available time for video conferencing was limited, the time had to be used as efficiently as possible. The teachers claimed that they had to spend more time on planning than for the equivalent lesson on campus and they had to do detailed planning of the whole lecture leaving little opportunity for improvisation or for student contributions. They expressed that they felt a need to have control of the teaching situation and that they, therefore, designed *what to do, how* and *when to do it* in detail. For example, the teachers planned in advance how many local study centres were going to answer specific questions and the time for these questions. Some teachers reported that it was difficult to get students to answer the questions and that it was stressful when nobody answered which led to some teachers preparing extra questions that also contributed to the need for planning time.

Even though video conferences were perceived as offering the affordances necessary for mediating laboratory work, the teachers reported having to select experiments and practical work very carefully. Some activ-

ities did not work in the video conferencing environment since what happened was not visible or space to move around was required for carrying out the activities. These activities were instead carried out during course meetings, which put higher demands on the teachers' planning.

Due to the above-mentioned limitations in using practical activities and experiments during video conferences, some teachers argued that they sometimes perceived themselves as boring in the video conferencing environment, since the possibilities for offering variation were limited. Therefore, they had developed strategies for creating variation in teaching and learning activities to activate students. For example, two teachers worked together and combined their two subjects during three hours video conference instead of having 1.5 hours for each of the subjects.

Another strategy was that the teachers consciously aimed at making use of the multimodal affordances of video conferencing. They described having the ambition to vary their presentation by using different modalities such as using the document camera showing objects and laboratory material and writing on a whiteboard instead of using PowerPoint. This resulted in more time for planning being required as they wanted to have control over what they were going to show and how it was presented. Also, the limited space on the available whiteboard in the studios made it necessary to carefully organise writing, which could be an advantage for students but also required more time for planning. The fact that the teachers used different methods for presenting had the effect that they had to think about shifting the picture between different sources, which required a more thorough and unique kind of design for the video conferences.

The teachers claimed that the communicative situation and the forms of interaction were different in the video conferencing environment to on campus courses, which could be interpreted as constraints. For example, a restricted field of view on remote sites (Gaver, 1992, 1996) is a constraint with video conferencing that becomes especially apparent when many and large groups of students are connected simultaneously.

Another constraint that the teachers argued influenced the communication situation negatively was that students' facial expressions, gaze, and body language were sometimes invisible, due to many connected sites with large groups of students leading to reduced picture quality. According to the teachers, this problem also emerged when they were alone in

the studio as they did not receive any feedback from students, but some teachers reported that it could also be challenging to have students in the studio. First, the teachers had to handle both the students in the studio and at a distance and verify that all students could see the teacher and what they showed or wrote. Second, there was a risk that a teacher would engage more with the students in the studio than with the students at a distance. Therefore, some teachers preferred that the students were in another room instead of in the studio. However, the effect was that the teachers expressed that they did not receive a response to what they were saying and doing, which created an unnatural communication situation. The lack of response could be interpreted as the students' lacking social presence (Rice, 1992, 1993), making it difficult for teachers to know if the students had understood or if they wanted to say something or ask questions. Video conferencing has the affordances for conveying social characteristics such as attitudinal and emotional approaches (Collins et al., 2000; Moore & Kearsley, 2005), but if a video conferencing technology can not mediate non-verbal cues, the affordance of social characteristics could instead be interpreted as constrained. This may have contributed to teachers expressing that it was difficult to start discussions with students and that students seldom asked questions, which constrained *the student-teacher interaction* (Moore, 1993b). The teachers had different strategies for overcoming these constraints such as waiting until a question was finally answered, asking questions to themselves and answered them, and addressing questions to specific local study centres.

Even though video conferencing can be perceived as offering the affordances for mediating audio-visual communication and interactive teaching (Smyth & Zanetis, 2007), which is as close to classroom teaching on campus as possible at a distance, *the video conferencing environment changed conditions for how the teachers could act in their teaching* (Säljö, 2000). Many teachers claimed that the video conferencing environment constrained their possibilities to move around in the room, which they were used to when teaching on campus. They reported feeling uncomfortable and constrained in their teaching when restricted to sitting on a chair, talking in front of a screen with the picture of the students shown elsewhere. This resulted in teachers having less focus on their teaching and interaction with students as they attended to staying in picture.

Video conferencing can be seen as supporting affordances for social interaction (Bates, 1997) and Moore's category of *student-teacher interaction*; (1993b), but the teachers in this study also perceived constraints on their interactions. One such constraint dependent on the technology was that the choice of picture was dictated by the active sound, which had the effect that as soon as somebody coughed or said "hmm" as a confirmation to what had been said, the picture shifted from the person talking to that person and then back again. Another constraint of the technology was that the sound got blocked when participants from several sites spoke simultaneously. Some teachers reported that they tried to prevent this and therefore summarised the content of the lesson themselves instead of engaging the students.

RQ3: WHAT ARE TEACHERS' ATTITUDES AND PERCEPTIONS ABOUT THE USE OF VIDEO CONFERENCING IN DIGITAL DISTANCE EDUCATION?

Some teachers expressed that they were rather uncomfortable in the video conferencing environment from the beginning, but that when they became more used to it, they felt more relaxed and less scared of making mistakes, and some even thought it was rather enjoyable. Many teachers reported that they did not like to see themselves in picture and to be recorded was perceived as even worse. Some teachers argued that they had even developed strategies such as extensively using PowerPoint to avoid being in picture. Several teachers claimed that they were dissatisfied with their performance and how they handled the video conferencing situation, and some perceived themselves as boring. Video conferencing can be seen to offer the affordances necessary for creating a similar communication situation to a face-to-face class (Bates & Sangrà, 2011), but the use of the technology changes the teaching environment and constraints emerge such as the restricted field of view of remote sites and the lack of non-verbal cues. Some teachers claimed that they wanted to use the same methods in the video conferencing situation as on-campus and this can be interpreted as the lack of awareness about the differences in conditions that come with changes in technology.

CHAPTER 8
CONCLUDING DISCUSSION

In this final chapter of the thesis, first, the answers to the research questions and the most critical findings from both studies will be presented and discussed. Second, the limitations of the two studies regarding methodology, design, and theory will be discussed. Third, implications will be given and suggestions for further research will be made, and lastly, an overall conclusion to the thesis will be given.

8.1 DISCUSSION OF FINDINGS

The context of this thesis is digital distance education. One of the main issues in distance education is how to bridge the geographical distance between teacher and students and among students. With this issue in mind, the digitalisation of distance education is crucial as technology development provides improved possibilities for teaching, learning, interaction and communication between teacher and students and among students at a distance. Video, which is the focus of this thesis, is an essential part of that development.

Most research on video in digital distance higher education takes a student perspective (see e.g. Chen & Willits, 1998; Knipe & Lee, 2002; Reisslein, Seeling, & Reisslein, 2005; Zao, 2011) or investigates teacher behaviour (see e.g. McKenzie, Witte, Guarino, & Witte, 2002; Schutt et al., 2009). Taking another approach, this thesis contributes to new knowledge with two studies carried out from the teachers' perspective with teachers' voices conveying how they perceive and experience the use video in digital distance teaching.

In this chapter, the findings from both the survey national study (NS) and the interview Karlstad study (KS) will be synthesised. The NS gave an overview of the use of video in Swedish digital higher distance education. The KS gave richer details of video conferencing in particular that complement the results of the NS. The research questions have already been addressed in relation to each of the two studies in chapters 6 and 7, but the focus in this chapter is on interpreting the results of the two studies together in order to achieve a more complete picture to fulfil the aim of this thesis: To better understand the possibilities and limitations of video in digital distance education.

EXPERIENCE AND IN-SERVICE TRAINING INFLUENCED THE USE OF VIDEO

Experience in distance education and in-service training were factors that influenced how much video was used and which categories of video were used (NS). Half of the course coordinators were to a rather high or a high extent inexperienced regarding distance education, and more than half of them had not participated in any in-service training at all within the field of distance education (NS). Furthermore, time spent on training was generally short with about half of the course coordinators who had any training at all, having less than a week, with most reported training taking the form of informal seminars and workshops (NS). These results indicate that teachers in Swedish distance higher education mostly teach without in-service training within the field of distance education (NS). This picture from the national perspective was confirmed by the KS in which none of the interviewed teachers had participated in in-service training on distance education or video conferencing. The teachers reported a perceived need

for training on how to handle video conferencing situations and sought topics such as how to behave, use the technology, which style to use, and how to use PowerPoint (KS). In general, teachers with less experience in distance education and less in-service training tended to use video less, both in terms of fewer courses and fewer categories of video in the same course (NS). The categories of video these teachers used most included *video-based materials and video-recorded teachings situations*, categories with lower demands on teachers' knowledge than *video conferencing and desktop conferencing*. These more demanding categories were used more by experienced distance teachers and those who had participated in in-service training. In addition, more than half of the teachers claimed that they would generally use video more if they got training in how to use it (KS).

These results highlighting the need for in-service training and the effects of experience with using video confirm a 2016 study that indicated that the more teaching experience teachers have, the more they use video, and that this effect was also cumulative over time (Arya et al., 2016). The results of this thesis also extend those of earlier studies that have found that in-service training is the most important factor for teachers when starting to use a technology (Burns, 2002; Wang & Wiesemes, 2012), including video conferencing (Burns et al., (1999); Johanneson & Eide, (2000). Lack of in-service training can also be an essential hindrance for using video (*State of Video in Education 2019. Insights and trends*, 2019).

OTHER REASONS FOR USING OR *NOT* USING DIGITAL VIDEO

The results of both studies indicate that teachers' decision to use or *not* to use video also depends on factors other than experience and in-service training in distance education. In the Karlstad study (KS), video conferencing was a part of the infrastructure for teacher education at a distance, so the teachers could not choose whether to use it or not. However, in the NS, half of the course coordinators had no experience of using desktop conferencing and video conferencing, with video conferencing the second least reported category of video use. This result fits with the result that video conferencing was most used by teachers with extensive experience in distance education and in-service training (NS). However, it does

not explain why desktop conferencing, on the contrary, was the second most reported category of video use. One reason for this difference could be that desktop conferencing offered the possibility of spatial flexibility (Bates, 2005; Godwin-Jones, 2012; Panton, 2005), while video conferencing reduced it (Collins et al., 2000; Russell, 2004). Flexibility is an essential argument for selecting distance studies (Almqvist & Westerberg, 2005; Harrison, 2015; Mårald & Westerberg, 2006a) and flexibility in different forms was also reported to be the most important reason for teachers' decision to make use of either desktop or video conferencing (NS).

Another reason for the differences in frequency of use found in the NS may be that although desktop conferencing has the affordances necessary for supporting a meeting at a distance, it does not require a specific studio with expensive equipment as video conferencing does. The requirements may be as low as a web browser, a microphone and a webcam which most modern laptops having these built-in. The result that video conferencing was the second least used category and desktop conferencing the second most used category of video (NS) can be compared to a study conducted in Australia in 2008 and 2009. It showed that video conferencing was used in all 22 of the responding institutions in contrast to the NS conduct in this study. Desktop conferencing was less common as it was only used in 15 institutions (Smyth et al., 2011). This shift from video conferencing to desktop conferencing may be related to greater availability of the necessary equipment for desktop conferencing in the years since 2008.

In the NS, the most frequently reported reason for using *video as a tool for learning* was to make use of the possible affordances "*To offer an alternative mode of presentation*", *"For discussion*" and for activities where *"Students make a video production*". That students can make a video production is a particularly important affordance, which applies only to this category of video.

In general, the most common alternative that the teachers reported for *not* using both live video and recorded video was that *it did not bring anything*[134] and *lack of time* (NS). This result can be interpreted as many of

134 This was the most important alternative for three out of four categories of recorded video and live video and was among the three most important alternatives for *video-based materials*.

the teachers viewing video as having no possible affordances for students' learning. However, it could also be related to teachers' lack of experience of using video. For teachers who have never used it, it would be difficult to assess the possible affordances for students' learning, which could be interpreted as a constraint.

Another reason reported for *not* using video, *lack of time*, varied in frequency between the categories of video (NS). For *video-based materials* and *video materials not produced for pedagogical purposes,* which are categories of recorded video, the alternative, lack of time, was formulated as; *"Lack of time. It takes too long to search for suitable materials"*. This was also supported by that the alternative *"There are no suitable materials"*, which was the third or fourth most reported option for these categories of video (NS). The use of recorded video could thus be increased if teachers were supported in cooperating more by giving each other tips on useful video materials, and through *video-based materials* being made searchable. For the other categories of recorded video, the alternative was formulated as only *"Lack of time",* which could also be interpreted as an argument related more to conditions for teaching, i.e. frame factors (Dahllöf, 1971), than pedagogical arguments. Several earlier studies have shown that teachers' workload and lack of time are main factors that reduce adaptation of technology in education (Bondaryk, 1998; Leigh, 2000; McNaught et al., 1999; Shelton, 2017).

For *live video*, lack of time could instead be interpreted as a constraint of video itself as the course coordinators reported that one of the most common reasons for not using video was; *"Lack of time. It takes too long to prepare"* (NS). More detailed descriptions of why it took longer to prepare were found in the KS where time was often described as one of the most critical constraints when using video conferencing in teaching.

HOW CATEGORIES OF DIGITAL VIDEO WERE USED

The results of both studies show that all six identified categories of video were used mainly as supplements to other resources[135] (NS and KS). In general, video was little or relatively little used and it was a largely optional part of a course structure, though differences between the categories of video could be found (NS).

Video as a tool for learning was most often selected and used based on specific affordances for particular kinds of teaching and learning activities that could not be carried out through any other category of video (NS). The most common use was that students made *video productions, that they documented events/place/phenomena* in, and *that students' presentations were video-recorded*. Other studies have shown that this category is mainly used in teacher education for reflection, self-evaluation, assessment, and portfolios (see e.g. Blomberg et al., 2014; Calandra et al., 2014; Christ et al., 2017; Fadde & Sullivan, 2013; Martin & Siry, 2012; Shanahan & Tochelli, 2014). The use of this category has probably been increasing as there are more studies from 2011 and later than from earlier on (see e.g. Admiraal et al., 2011; Bakker et al., 2011; Blomberg et al., 2014; Blomberg, Stürmer, & Seidel, 2011; Calandra et al., 2014; Christ et al., 2017; Fadde & Sullivan, 2013; Kong, 2010; Martin & Siry, 2012; Seidel et al., 2011; Strand et al., 2013; Tugrul, 2012; Zhang et al., 2011).

Video conferencing and *desktop conferencing* have similar key features in that they are both forms of live video, they can both be used to bridge geographical distance, they both offer synchronous communication (Collins et al., 2000), and they are often as close as possible to the experience of a physical meeting at a distance (Gaver, 1992, 1996). However, the NS showed that there were differences in how these two types of video were used.

135 The only exception was *video as a tool for learning*, which did not have this alternative as it was not suitable for this category of video.

In video conferences, a teacher-centred approach[136] with lectures was most common (NS and KS). This suggests the adoption of largely behaviouristic models of learning with the teacher's role being to transfer knowledge to students (Biggs & Tang, 2007; Bowden & Marton, 2004; Säljö, 2000). A study by Andrews and Klease (2002) showed that students preferred interactive learning and disliked talking head presentations by the teacher in distance education. The KS suggested explanations for why lectures were the most common activity with time as a key constraining factor. Participating teachers expressed that it was challenging to spend time on activities like student presentations as there were often many conferencing sites connected and time was needed for covering required content. This resulted in some of the teachers excluding student presentations from the activities during video conferences. Interestingly, research by Gillies (2008) suggests that students do not appreciate when video conferencing is used for student presentations and the KS shows that when teachers give priority to discussions with students, they perceived increased time pressure. To solve this problem, many teachers reported either pre-recording lectures or publishing other materials on the LMS.

Similar to findings reported by Smyth (2005), the teachers in this study argued that many activities had to be covered within limited time frames, which resulted in a competition between the activities such as student-centred activities and delivery of content. This indicates that the teachers felt a strong responsibility for delivering content to students during video conferences (NS and KS), a perception reinforced by research such as Pitcher et al. (2000) that describes an essential aim of using video conferences as delivering content effectively through teacher-led approaches. Comparing video-conferencing to classroom teaching, an investigation by Plonczak (2010) suggests that the use of video conferencing results in a greater emphasis on content delivery than in classroom situations, setting higher demands on teacher's knowledge of subject matter. The results from the NS demonstrate that the teachers were aware of this problem as

136 Example of teacher-centred approach: "strong emphasis on teacher control and coverage of academic content in much conventional didactic teaching" (Cannon & Newble, 2000, p. 321 in Lea, Stephenson, & Troy, 2003).

one of the most frequently reported disadvantages of video conferencing was the low degree of interactivity.

Another plausible explanation for why lectures were the most common activity was that a video conferencing environment also entails higher demands on teachers' knowledge of technology. Earlier research indicates that the degree of *student-teacher interaction* (Moore, 1993b) can be affected by teachers' knowledge and experience of video conferencing, with more experienced teachers using technology more effectively and teaching more confidently in a video conferencing situation than those with limited experience (Daunt, 1999; Lögdlund, 2011; Seay et al., 2001). The teachers in the KS claimed to be unsure of handling the technology, and they, therefore reported being more focused on their performances as teachers delivering content than on the needs of their students (KS). Based on the results of the KS, this uncertainty about the technology can be argued to be negative for *student-teacher interaction*. It is therefore essential that teachers get in-service training in order to gain knowledge of both possibilities and constraints and how to make the best use of teaching methods to reduce or eliminate problems in video conferencing situations (see e.g. Andrews & Klease, 1998; Ardley & Aldemir, 2016; Burns, 2002; Burns et al., 1999; Caladine et al., 2010; Dobbs, 2004b; Freeman, 1998; Johannesen & Eide, 2000; Knipe & Lee, 2002; Schiller & Mitchell, 1993; Wynn, 1997).

With earlier generations of the technology, a low degree of interaction in video conferencing settings was sometimes 'blamed on' low bandwidth and poor audio and video quality. However, the results in both of the studies in this thesis indicate that better technology did not make a difference, as technical problems were one of the least expressed arguments for *not* using video.

The teachers interviewed in the KS were concerned about the low degree of interactivity in their courses and brought up several examples of how they had developed strategies for encouraging students participate more actively. For example, teachers prepared questions, required the students ask questions during the video conferencing that they then responded to on the LMS, and addressed questions to a specific local study centre as it was difficult to get an answer to spontaneous questions for which the students were unprepared. (KS). It can be interpreted from the

interviews that the teachers typically held perspectives on learning that are commensurate with socio-cultural theory (Säljö, 2000, 2005) through their various descriptions of strategies for activating students. In this sense, the KS showed that the teachers' tried to teach according to two conflicting paradigms. They aimed at teaching according to a participatory model which is well aligned to a socio-cultural perspective (Säljö, 2000, 2005), but they also relied on transfer pedagogy (Bowden & Marton, 2004) in the sense that they were responsible for transferring particular content to the students. This means that video conferencing was mostly used for teacher-centred teaching and that student-centred activities (Palak, 2005) were less frequent (NS and KS). Especially when the dual-mode model is used and teachers teach the same course both on campus and at a distance, as the teachers in the KS did, there is a danger that teaching methods used in the classroom are simply transferred to the video conferencing environment without consideration that this technology requires creative thinking and adaption of strategies to its affordances and constraints.

However, the literature shows that a high degree of interaction can be achieved through video conferencing provided that there are small groups of students and few sites connected (Burke, Lundin, & Daunt, 1997; Mason, 1994). Andrews and Klease (2002) claim that the use of video conferencing could contribute to a change toward more student-centred teaching[137], however, if that is going to be achieved, the conditions must be somewhat different from those reported by the teachers in the KS.

When *desktop conferencing* was used, the course coordinators claimed that there was a higher degree of what Moore calls *student-teacher interaction* (1993b) compared to video conferencing, as providing opportunities for asking questions and for having seminars were the most common uses (NS). *Tutoring* was the third most common use and was more common for desktop conferencing than for video conferencing. This supports the perception that there is a higher degree of *student-teacher interaction* when desktop conferencing is used compared to video conferencing. This can be understood to be an important distinction between the two conferenc-

137 *student-centred teaching* can be defined as "ways of thinking and learning that emphasize student responsibility and activity in learning rather than what the teachers are doing" (Cannon & Newble, 2000, s. 321, in Lea et al., 2003).

ing technologies because an increased student interaction has been shown to affect student discourse positively (Bower & Hedberg, 2010) and its pedagogical importance is widely asserted (Bower, 2011; Kear et al., 2012).

Another possibility with video conferencing, which is often emphasised in the literature is that it provides opportunities for bringing in *external experts* at lower cost than with physical meetings (Smyth, 2005). However, this possibility was very little used according to the NS with possible explanations for this absence of use given in the KS. Several teachers claimed that it was impossible to make changes to course schedules that were set well in advance and that it was thus difficult to accommodate invited experts. Furthermore, interviewed teachers also reported that external experts tended to feel unsure about participating in a video conferencing environment and therefore, often refused to take part.

In conclusion, these results can be interpreted as suggesting that distance teachers are careful to *use video consciously* and that their selections of different categories of video *are dependent on pedagogical considerations, the affordances of the category of video, and the specific situation.*

AFFORDANCES AND CONSTRAINTS OF THE VIDEO CONFERENCING ENVIRONMENT

Video conferencing plays a significant role in the form of distance education studied here and the teachers referred to many potential affordances from both a teacher and a student point of view (NS and KS). For example, the technology of video conferencing has the affordances (Gibson, 1986, 2015) for mediating a teaching and learning environment that can be seen as broadly similar to the one found in classrooms. In this sense, when it is not possible to have face-to-face meetings, social presence can instead be created through video conferencing (Keller & Lindh, 2011). However, even such an environment can be similar to a classroom situation in some respects, the use of video conferencing technology changes the conditions for teaching and learning as it influences how we think and interacts with others and with our environment (Säljö, 2000).

Video conferencing has the affordance of offering meetings despite geographical distance, which was considered to be its most important advantage in general (NS) and which was also an important reason for

why it was used in Karlstad (KS). Also, the KS showed more specific advantages that can be understood in terms of a socio-cultural perspective such that that learning is situated and developed through social practices and in the interaction between the individual and the group (Säljö, 2005). Many teachers also brought up possible affordances of social contact and social presence; recognition of the students as individuals, helping them to complete their studies, providing opportunities for asking spontaneous questions and getting answers directly, and reaching out with information and getting in contact with students (KS).

Other advantages were that the use of video conferencing made it possible to widen and deepen course content; it complemented other teaching and learning activities and offered different affordances of communication (KS). A study by Andrews and Klease (2002) indicated that video conferencing was especially useful for teaching situations involving the exploration of difficult concepts when opportunities for immediate questioning and answers are of vital importance. To use video conferencing was also an alternative to written communication according to the teachers (NS and KS) that can help students with different preferences, a result supported by similar findings from other research (Bowden & Marton, 2004; Fry, Ketteridge, & Marshall, 2003).

Specific *constraints* that can emerge with video conferencing in distance education were also revealed including problems with many and large groups, adaptation to new technology which might differ in different sites, and reduced levels of interaction (Seay et al., 2001). For example, as there were many sites connected (KS), it took time when the picture moved from one site to another as soon somebody uttered something, as the picture was directed by the sound. The technology of video conferencing was initially developed for business meetings with totally different circumstances (Carter, (1997); Lazar, (2007); Mason, (1994); & Weinman, (2007). The number of participants in a business setting is generally restricted to those than can be seated around a table at each site. However, these conditions changed radically when teachers and students tried to use the same technology for simultaneous connection with sometimes 30-80 students at each of twenty local study centres (Andrews & Klease, 2002). With the technology used by teachers in the studies of this thesis, it was generally only possible to see two sites on a screen simultaneously due to

technical constraints. The interviews in the KS suggest that this limitation negatively influenced interactivity and student engagement.

That the model for courses at Karlstad University was developed for mass education can be understood as creating problems with interactivity (KS) in ways similar to those shown in other studies (Andrews & Klease, 2002; Burns, 2002; Freeman, 1998; Pitcher et al., 2000). Freeman (1998) argues that video conferencing should not be used in a mass lecture context unless the following requirements are fulfilled: teachers are a) motivated to participate, b) confident with the course content, c) competent in crowd control, d) have participated in in-service training, and e) have reliable and efficient technical support. Furthermore, Schiller and Mitchell (1993) have found that as few as 35 students across three sites might be too many and that four sites is the maximum number of connected sites possible if effective interaction is to be maintained. These limits are not solely related to technical constraints, but instead, to the difficulty of achieving a high degree of *student-teacher interaction* with many and large groups. This risk for video conferencing to foster a low degree of interactivity is well recognised in the literature (see e.g. Bollom, Emerson, Fleming, & Williams, 1989; Burke et al., 1997; Freeman, 1998; Pitcher et al., 2000; Schiller & Mitchell, 1993; Seay et al., 2001). For example, a study by Freeman (1998), demonstrated that reduced *student-teacher interaction* was considered a problem by 25% of the students in a video conferencing environment. Going further, Laurillard (2002) argues that in general *student-teacher interaction* and *student-student interaction* by Moore's (1993b) definition are rare in video conferencing environments.

Regarding the course coordinators' general experience of using *video conferencing* and *desktop conferencing* in the studies of thesis, a low degree of interactivity was seen as a critical disadvantage, primarily when *video conferencing* was used (NS), (see section 8.2). They reported that constraints on how teachers could act were one of the most important disadvantages with *desktop conferencing* and even more so for *video conferencing*. This is challenging to interpret, but the KS provided more in-depth knowledge. It shows that the teachers felt restrained in their freedom of movement compared to campus education as they had to be seated on a chair when teaching to avoid disappearing from the picture. A similar result to this was identified in a study by Lögdlund (2011) that showed that the teacher

could be 'chained' to a single position when there was no technician present to manage the camera so that the teacher was in picture when moving around. A teacher's spontaneous movement in a room is a way to interact with students' comments and questions and to get in closer contact with them. It is also an aspect of non-verbal immediacy behaviours that influence students' learning and motivation and the teacher-student relationship positively (Frymier & Houser, 2000; Gorham, 1988). The fact that the teachers in the KS could not do move around without adjusting the camera themselves, was perceived to be a significant. It meant that the teachers could not express their personal teaching style, something experienced teachers have developed over a long time and which is a part of their professional identity (KS). This made them feel 'handicapped', uncomfortable, and restrained in their teaching. They reported that it influenced their teaching negatively, a result in alignment with earlier studies that have examined constraints in the video conferencing environments such as a study by Jonsson (2004) that demonstrated that settings with projection screens, fixed rows, and technical equipment on desks made teachers feel restrained.

Another reason that the teachers reported feeling restrained and stiff was that they could only use a document camera and not a whiteboard or a SmartBoard as they typically would in a campus courses (KS). Writing by hand on a whiteboard or SmartBoard "is a strategy for creating a sense of intimacy" (Lögdlund, 2011, p. 97) and reduces students' feelings of participating in a technical broadcast (Lögdlund, 2011).

The teachers were worried that their attention was too focused on technology and on how to handle it in the video conferencing environment. This was due in part to needing to cope with aspects such as shifting camera angles and zooming as additional tasks to their teaching (KS). This result partly mirrors earlier studies showing that distance teachers have many simultaneous tasks to manage other than teaching that can contribute to a feeling of being restrained such as operating the camera in front of them, the computer on the table, and the projected picture on the screen of the computer (Freeman, 1998; Hedestig & Kaptelinin, 2002; Jonsson, 2004). Confirming the results of studies by (Daunt, 1999; Lögdlund, 2011), the teachers who participated in this thesis, argued that they were so concentrated on their role and handling the technology that they

tended to forget about the distance students (KS). However, the results of the KS go further to show that a consequence is that teachers tend to stick with the technologies they are familiar with.

For *desktop conferencing,* technical problems were particularly emphasised as a reason for why it was not used. Also, Cunningham et al. (2010) reported problems with communication due issues such as a poor connection, poor sound quality, and poor synchronisation of the video channel. However, students compensated by developing strategies such as using a text chat, nodding or shaking their head to give a response about whether the communication worked or not (Cunningham et al., 2010).

The KS also showed that the teachers felt uncomfortable in the video situation; they did not like to 'talk to a screen' because they lacked the students' spontaneous response to what they said. They also felt that recording video conferences was even worse than having live video conferences. The recordings were perceived as increasing the pressure to be correct, as the recordings were saved and could be watched and criticised afterwards. This can be related to the results of the NS, as relatively many course coordinators stated that they felt uncomfortable when teaching situations were recorded. In addition, some of the teachers claimed that it was tiring to teach through video conferencing as it could be compared to being in a close-up picture focused on the face or the upper part of the body for a long time or on being in the middle of a live broadcast where it is impossible to 'repair' any mistakes. Related to this, a way that teachers reported feeling constrained that is specific to teachers of practical subjects and that has not received attention in earlier research, is difficulties in carrying out specific practical exercises. These teachers reported that it is sometimes particularly difficult to teach practical exercises in ways that are visible in a video conferencing environment (KS).

When there were students in the video conferencing studio, the teachers needed to take these students into consideration which conflicted with the requirement to be seated on the chair without moving as the distance students would not see them otherwise. Some of the teachers were positive to having students in the same room as they could get a direct response that made them feel more at ease. Others thought it was better when the students sat in another room as they were aware of the fact that

they tended to forget the students at a distance and focus too much on the students in the room.

There were also other disadvantages identified regarding teaching such as several of the teachers in the KS claiming that it was challenging to have direct contact with students and that they had too little control over activities. Since there were often many groups and many students in each group connected at the same time the result was that a) the teachers did not see all participating students or groups in picture at the same time and b) it was challenging to interact with the students. Teachers' perceptions of students' nonverbal responsiveness are crucial for how teachers perceive their teaching effectiveness and satisfaction (Mottet, 2000). To not be able to see all participants also influenced interaction negatively according to the KS. The results show that it was challenging to have both on-task and off-task communication and that the model of distance education the participating teachers followed required them to plan for ways of mitigating the situation.

Furthermore, the teachers in the KS perceived that it was more challenging to activate students in the video conferencing environment compared to on-campus courses and therefore, developed different strategies for supporting student interactivity and opportunities for dialogue, (see section 8.2). Another difference from a face-to-face meeting was the difficulties in having direct contact with students, especially when there were large groups of students in each site and many sites were connected simultaneously. For such circumstances, there were constraints in the communication situation as teachers reported difficulties in seeing students' facial expressions, gaze, and body language through the camera and screen. This was problematic since the teachers could not receive feedback, which is essential from a socio-cultural perspective on learning as non-verbal cues are a key mediating tool for expression and part of what Vygotskij refers to as *language* (1978). The situation rendered teachers uncertain of whether or not students had understood or if they wanted to say or ask something.

CHANGED CONDITIONS FOR DESIGN AND PLANNING OF TEACHING

Designing and planning is always a considerable part of a teacher's work, but according to the interviewed teachers, designing for digital distance education and particularly for teaching through video conferencing means more thorough planning as well as other kinds of planning (KS). As has been reported in other studies, distance education in general results in higher demands (Freeman, 1998; Hedestig & Kaptelinin, 2002; Johannesen & Eide, 2000; Plonczak, 2010). These higher demands can include such aspects as structure, precise information, student support for planning and carrying through their studies, and pedagogical adaptation (Åström & Högskoleverket, 2007) . In this thesis, the course coordinators claimed that there were higher demands on planning both for desktop conferencing and video conferencing and it was interesting that this could be considered to be both an advantage and a disadvantage (NS).

The KS provided more detailed information regarding how the teachers planned for video conferences, expanding on earlier results that show some of the challenges (Freeman, 1998; Schiller & Mitchell, 1993). For example, the limited duration of time and the fixed schedule for video conferences made it necessary for teachers to plan particularly thoroughly. For example, teachers had to be concise and structured, to plan exactly which PowerPoint slides they intended to show, carefully think through how they structured their notes on the whiteboard, which local study centres they would direct questions to, prepare extra questions for when the students did not ask their own, and some teachers even wrote a manuscript for their lectures, something they did not do for campus teaching. In addition, the teachers in the KS reported consciously planning for activating students and creating variation during video conferences. When analysing all the ways that teachers planned for the teaching situation, it became clear that teachers tend to focus on maintaining control of the video conferencing situation (KS).

Furthermore, the teachers with practical exercises and laboratory work put an extra effort in deciding which activities could be carried out in the video conferencing situation and which were more suitable for in-class sessions, so that the video conferences and course meetings comple-

mented each other and that each form was used in the most appropriate way (KS). As a consequence, this was seen as negatively influencing pedagogical planning if certain activities had to be postponed until an occasion when there was a course meeting instead of carrying them out when it was most suitable according to the teacher's pedagogical strategy. This situation yields a unique and perhaps negative feature of how skill training or skill directed training can be carried out if done so at a distance. However, although the teachers in the KS claimed that the planning of video conferencing took more time, they also reported that careful planning could be beneficial for students as the structure of lessons became clearer.

The teachers also had to consider the distribution of needed materials to local study centres in advance, for example, if specific visuals were difficult to see through the document camera or if the students were going to work with specific materials. This distribution involved extra work and put an additional burden on the teachers (KS), but this effort is essential to the effectiveness of the video conferences and has a positive influence on student learning (McKenzie et al., 2002).

CONCLUSION

The NS study gave some answers to the research questions, but also raised new questions that created a need for more detailed information for understanding how categories of video were used and how teachers experienced the use of video, especially regarding video conferencing. The KS supplemented the results of the NS and gave a deeper and broader picture of the possibilities and limitations of using video conferencing for teaching, how it affects the planning and design of distance courses, and what to consider when facilitating teaching with digital video.

In the next section, limitations in the methodology and design of the two studies will be discussed.

8.2 LIMITATIONS IN METHODOLOGY AND DESIGN

THE NATIONAL STUDY

The (NS) was *a national study,* and the questionnaire was sent to all the course coordinators who had a course marked as a distance course on the national study portal, www.studera.nu. This means that the sampling approach should not have influenced the validity, but that validity is influenced by coordinators who did not complete the questionnaire. Every tenth coordinator who did not complete the questionnaire was contacted, but no clear reasons for not participating emerged. Despite this, it is a well-known problem that the definitions of a distance course vary and are unclear (see section 2.1). Therefore, it is likely that some of the missing questionnaires could be related to courses that were *not* distance courses. The fact that *distance education can be defined in different ways* has also been observed in other investigations (Amnéus, 2011; Gröjer et al., 2017). However, a similar number of Swedish distance courses to the number represented in the NS was found in other investigations during the same year of data collection (Amnéus, 2011). This indicates that most of the active distance course coordinators during that year were included in the NS study. However, it is likely that of those that are missing, course coordinators who had courses in which *video was not used* are over-represented since they may have been less motivated to answer the questionnaire despite the emphasise in the missive, that it was also important to receive answers from those who did not use video.

The concept of 'video' is problematic as it is used in everyday language and refers to both video for entertainment and other purposes such as teaching and learning. Some of the questionnaire responses revealed that specific course coordinators were unfamiliar with some of the categories of video named, something especially evident for the 'video as a tool for learning' category. Even if the categories were explained in the questionnaire, this still caused some uncertainty regarding the responses. This applies particularly to the difference between video conferencing and desktop conferencing and in order to avoid misunderstandings, the definition was supplemented by a picture in the questionnaire.

The possibility for respondents *to go back and forth in the questionnaire* turned out to cause several problems when the results were analysed. Some of the answers had to be dropped due to contradicting answers or incomplete data sets. Another issue was that the course coordinators were asked to answer the questions for each course they taught, which greatly complicated the analysis, although it also resulted in more information as more courses were covered. The questionnaire was built in such a way that the course coordinators could copy the answers from one course to another by one click if they used the six categories of video in the same way. However, no course coordinator answered the questionnaire for more than five courses despite some of them having coordinated up to 24.

The use of multiple-choice questions entails specific problems with construct validity. One problem is to cover all the potential answers and another is that the questionnaire could be biased as the researcher constructed the answers. Therefore, an alternative open-ended option was also provided. This alternative was used by respondents rather little for questions regarding why the course coordinators used a specific category of video but was much more frequently used for the reasons why they did *not* use a particular category of video. However, the open answers were very often similar or identical to the given alternatives, indicating that there were other reasons for why the respondents wanted to write their answer instead of just ticking an option.

Another problem with multiple-choice questions was that it was necessary to limit the number of alternatives that could be marked as there is a risk that some respondents would otherwise mark all the alternatives. However, when the number of alternative answers that can be ticked is limited, competition between the answers emerges. The respondents often react in one of two ways. Some respondents choose all options that had a similar meaning in order to emphasise how important an issue is. Others instead choose to mark different options with the argument that one of the similar alternatives is enough and it is more important to bring up additional aspects. Finally, for the question of why the use of desktop conferencing was reported infrequently, one of the alternative answers, "technical support", was omitted by mistake. However, this likely has limited influence on the results as the respondents had the opportunity to write this alternative as an open answer.

THE KARLSTAD STUDY

The KS has to be seen in relation to the NS as the aim was to find answers to questions that emerged after analysing the results of the questionnaire and enrich knowledge of the use of one of the categories of video in the questionnaire; video conferencing. Planning, organisation, and realisation of research always means that choices have to be made and that the result is influenced by these decisions (Cohen et al., 2007). The interview study with Karlstad University provided valuable in-depth knowledge on *how* and *why* video conferencing is used in teacher education at a distance. The results also indicate how teachers perceive the use of video conferencing and how it influences the design and planning of distance courses and lessons, both for course meetings on campus and at a distance. However, Karlstad University had developed a unique model for distance education, and by examining the circumstances at Karlstad University, there is no guarantee that the results are valid for other HEIs that utilise video conferencing in other ways.

The purpose of choosing to conduct qualitative interviews was to increase the value of the information gained with a more in-depth and more complete picture of the phenomenon that was studied (Holme et al., 1997). Therefore, a conscious and strategic choice was made to include teachers with as many different subject matters and different programmes within teacher education as possible. The analysis of the results indicates that this choice contributed more aspects of the possibilities and constraints of the use of video conferencing being revealed when compared to studies of teachers who all teach the same type of subject matter. For example, this choice revealed that teachers who use practical exercises experience more constraints in the video conferencing situation than teachers who have theoretical subject matters.

In the KS, the distance teachers were in focus and the results are more their story than the researcher's. Even if a guide for questions was used, the questions were relatively open as it was essential to avoid over directing the interviews (Holme et al., 1997). The teachers made their own choices regarding what they wanted to emphasise, and the information was to a high degree directed by the teachers' reflections and the issues they chose to bring up. This had both pros and cons. It was positive as it resulted

in unexpected issues emerging that contributed to a more complete picture with more aspects covered. However, it may also have negatively influenced internal validity. The interviewed teachers could have forgotten or otherwise avoided bringing up specific issues and there might also have been misinterpretations between the interviewer and the teachers, although the full transcript of an interview was sent to the teacher for corrections to minimize these kinds of issues. However, the open questions also made it more complicated as the interviews had to be analysed more inductively by searching for different themes and it was challenging to find a structure in the resulting themes.

In an interview situation, it is impossible for the interviewer not to influence the interviewee (Lantz, 1993). The fact that the interviewer in this study had experience of teaching distance courses and using video conferencing can both be seen as an advantage and a problem. The circumstances were very well known in the sense that I was familiar with the situation and its limitations and had an understanding of the teachers' situation. However, as the interviewer, I may have been regarded as an expert, which might have influenced what the teachers felt comfortable expressing. Therefore, I deliberately refrained from discussing different solutions and what she would have done in the same situation, which the teachers sometimes asked for.

HOW DID THE CLASSIFICATION SYSTEM FOR DIGITAL VIDEO WORK?

The review of research in chapter 3 showed that the concept of *video* could be related to many different types and classifications of video, not least because *video* also can be associated with entertainment, which is a very different purpose and environment than its use in higher education. Furthermore, video is seldom explicitly defined in research, and sometimes several categories of video are investigated in the same study without taking their different affordances and how these can affect results into consideration. This can be seen as a problem for research in this field and to avoid it, it is crucial to define what is meant by 'video' (Mitra et al., 2010).

By drawing on a socio-cultural perspective (Säljö, 2000, 2005), the theory of affordances (Gibson, 1986, 2015), and the literature to define the

affordances (possibilities and constraints) of video, a classification system was created as part of this thesis (see section 3.4). This new system has been tested and empirically investigated in two ways. It has been used in a) the overview of research on video and b) the two studies in the thesis.

All the studies in the review of research could be categorised according to the proposed system of classification of digital video. In the NS, the results regarding mainly *six aspects* of the use of video demonstrated the importance of defining and investigating each of the six categories separately. These aspects were 1) the course coordinators distinguishing between the categories when they answered which category or categories they used in the courses, 2) the course coordinators' arguments for using or *not* using a category were different depending on the specific affordances of the category, 3) different categories were used for different purposes, 4) differences regarding how much each category was used, 5) differences in use related to the course coordinators' experiences of distance education were found, and 6) differences in use between the categories of video, depending on whether the course coordinators had participated in in-service training or not. In this sense, *the proposed system of classification of video was successful* and contributes to the field by showing promise for further use in other research on video in distance education.

One of the most important results of the NS was that clear differences in affordances between the categories of video could be identified showing that it is critical to define the category of video under investigation. Not least, this study makes it clear that definition of the categories of video implicated is a prerequisite for reliability and validity in research on video.

8.3 IMPLICATIONS

TEACHERS' BACKGROUND AND THE USE OF VIDEO

Teachers' attitudes and acceptance of technology are key aspects for teaching successfully with technology (Yuen & Ma, 2008). Therefore, in-service training is essential for being able to teach in digital distance education and use technology with appropriate teaching approaches (Bates & Sangrà, 2011). The results of several studies demonstrate that it is specialised in-service training is crucial for teachers (Compton, 2009; Sun, 2011; Wännman Toresson & Östlund, 2002), particularly in relation to *video conferencing (Burns, 2002; Johannesen & Eide, 2000; Plonczak, 2010; Wang & Wies*emes, 2012) and *desktop conferencing* (Bower, 2011; Cunningham et al., 2010). Unfortunately, studies suggest that many teachers and course coordinators do not have the necessary knowledge and skills to use video communication effectively (Caladine et al., 2010) and that they do not receive in-service training in using audio-visual media (Laaser & Toloza, 2017). Despite these damning results, studies investigating distance teachers' experiences of distance education or how common it is that they have participated in in-service training are lacking. Findings from the NS in this thesis show that half of the course coordinators were highly or very highly inexperienced in distance education and that more than half of them had not participated in any in-service training at all within the field. Furthermore, none of the teachers in the KS had participated in in-service training regarding either distance education or video conferencing, although many of them expressed a need for it.

Therefore, it is an important result that the NS showed a correlation between, on the one hand, course coordinators' experience of distance education and participation in in-service training, and on the other hand their use of video in distance courses. Teachers with experience from distance education and in-service training in distance education used video in more courses and also, used more categories of video in the same course compared to teachers with less experience and without in-service training. This can be interpreted as meaning that the use of video would increase

if teachers received in-service training, something that more than half of the teachers in the KS agreed with. Furthermore, the NS indicated that degree of experience also affected which categories of video course teachers used. Categories which might be seen as easier to use such as *video-based materials* and *video-recorded teaching situations* like lectures, were used more by teachers with little experience in distance education than by experienced teachers. *Video conferencing* and *desktop conferencing*, which can be seen as more challenging to use, were used more by experienced teachers than teachers with less experience. The respondents in the NS were course coordinators and not 'just' teachers and it is reasonable to assume that they were relatively experienced as less experienced teachers would probably not be assigned to be course coordinators. Therefore, it is an important result that as many as half of the course coordinators did not have any experience of video conferencing or desktop conferencing and only one third had experience of both. It is less likely that teachers would use technology that they are unfamiliar with as a study by Christ, Arya, and Chiu (2017) demonstrated. As the KS confirms, teachers mostly use the technologies they are familiar with.

The results of this thesis underscore that in-service training is crucial for increasing teachers' knowledge of *the affordances* (Gibson, 1986, 2015) of video for pedagogical purposes, so that teachers know of both *possibilities and constraints,* how to make the best use of video, and how to reduce or even eliminate problems (Andrews & Klease, 1998; Ardley & Aldemir, 2016; Burns, 2002; Burns et al., 1999; Caladine et al., 2010; Dobbs, 2004b; Freeman Herreld & Schiller, 2013; Freeman, 1998; Johannesen & Eide, 2000; Knipe & Lee, 2002; Schiller & Mitchell, 1993; Wynn, 1997).

AFFORDANCES OF DIGITAL VIDEO

From the literature review in this thesis, it is clear that it is most common to investigate only one or sometimes two categories of video. However, findings from the NS show that three categories of video are commonly used in a national perspective; *video as a tool for learning, video conferencing* and *desktop conferencing*. The most commonly reported use of *video as a tool for learning* was that students made video productions, that video was used as documentation, and that student s' presentations were recorded. For *video*

conferencing the most common uses were lectures by the teacher, possibilities for students to ask questions, seminars, and that students made presentations. Since several categories of video are investigated in the same study, the result also showed that there were differences between *video conferencing* and *desktop conferencing* as the former was mostly used for lecture by the teacher and the latter was mainly used to create possibilities for students to ask questions, seminars, and tutoring. This indicates a higher degree of *student-teacher interaction* (Moore, 1993b) than for video conferencing. There is a need for more studies of multiple categories of video such as the NS that would provide more knowledge about the differences in use between them.

Teachers' most reported *reasons for using different categories of digital video* have not been clearly addressed in previous studies and the NS offers important insights in this area. For *recorded video* (except for *video as a tool for learning*), the most frequent reasons for use reported were to complement other materials and to present content. Specifically, *video-based materials* and *video-recorded teaching situations* offered useful affordances for learning according to the NS. The most reported reason for using video as *a tool for learning*, was to offer an alternative mode of presentation. The affordances of spatial flexibility and an alternative to written communication were the most reported reasons for using *live video,* and a similar result was found in the KS.

However, it is not only essential to investigate the most common reasons for using video, but also why teachers decide *not* to use video. The most reported reasons for not using *recorded video* in the NS were that it did not bring anything, and that the teacher lacked experience or knowledge. This indicates that, unsurprisingly, a teachers' lack of experience or knowledge of using *recorded video* is a constraint for using it. Similarly, for *not* using *live video*, one of the most reported reasons was also that it did not bring anything with other reasons being a lack of time, that nobody had requested it, and that the course coordinator lacked knowledge of using it. This indicates that a teacher's lack of time and knowledge are constraints for this video category, too. Added to these reported reasons, another important reason for why teachers decide *not* to use video conferencing are constraints in spatial flexibility. It was reported that it is difficult to

get students travel to a studio, a constraint that does not exist for desktop conferencing.

For *video conferencing*, several studies (see e.g. Burns, 2002; Johannesen & Eide, 2000; Mottet, 2000; Plonczak, 2010) have demonstrated that teachers perceive constraints in the teaching environment. Technical problems such as poor sound quality, insufficient and inappropriate types of microphones, lack of screens, and the lack of tiered seating have been found to constraint interaction (Burns, 2002). In addition, teacher's perceptions of students' nonverbal responsiveness has been found to be significantly lower in a video conferencing environment than in a face-to-face classroom (Mottet, 2000). Findings from the NS suggest that the most important disadvantage of using video conferencing in teaching, from a teacher's perspective, is that teacher action is constrained, something about half of the teachers with experience of video conferencing claimed. The results of the KS gave some explanations as to why most of the teachers felt constrained in their actions. One example was that they could not move around in the room as they were used to in face-to-face classroom situations since they needed to sit on a chair to be visible for remote students. To be free to move around spontaneously, to get in closer contact with students and to interact with students was discussed as an important part of their identity as teachers and for their personal teaching styles which some had developed over many years. Another reason was that they felt uncomfortable with sitting and talking in front of the screen, not seeing the students. This was discussed as difficult as teachers struggled to remain oriented toward the camera instead of looking at the students on the screen. Today, there are newer cameras, which can automatically follow a speaking person. It would be interesting and important to investigate whether the use of these cameras could reduce the problems that the teachers in the KS perceived by allowing teachers to move around freely.

Previous studies (see e.g. Bollom et al., 1989; Burke et al., 1997; Freeman, 1998; Pitcher et al., 2000; Schiller & Mitchell, 1993; Seay et al., 2001) have reported problems with communication and low degrees of *student-teacher interaction* and *student-student interaction* when video conferencing is used. This thesis has confirmed that a low degree of interactivity is still a problem with both the NS and the KS showing that it is especially challenging to foster interactivity in a video conferencing environment. The

NS reveals that constraints in interactivity are the second most important disadvantage of using video conferencing for teachers. Also, the teachers interviewed in the KS perceived constraints in interactivity and the results offer some explanation for the phenomenon.

One explanation is that when a large number of students are connected, it is challenging to have a dialogue, especially as when there are so many students that not all are visible on the screen. When a teacher cannot see all students, they describe struggling to keep track of which students have already spoken and asked questions. Another explanation is that the restricted field of view on remote sites (Gaver, 1992, 1996) is a constraint in the video conferencing environment that affects *student-teacher* and *student-student interaction*. Findings from other studies (see e.g. Burns, 2002; Mottet, 2000) have reported that it may be difficult to perceive non-verbal cues in a video conferencing environment, but these studies do not give explanations as to why this affects interaction and communication negatively.

The analysis of the findings in the KS indicate that *non-verbal cues* are critical in the communication situation as they strengthen or modulate the spoken message (Lögdlund, 2011). We are used to having both verbal and non-verbal communication simultaneously when we meet face-to-face. When non-verbal cues are missing, the communication situation can be perceived to be strange and constrained. Another reason why non-verbal signals are essential is that they function as feedback to the person speaking and if non-verbal signals are lacking, it can be understood as *the students' social presence lacking* (Rice, 1992, 1993). When the teachers in the KS could not see students' non-verbal signals, they did not receive feedback on what they said and therefore, perceived the communication as if they were talking to a 'wall'. With newer technologies such as higher resolution video, there are better possibilities to see non-verbal signals (see e.g. Park, 2013). It would be very interesting to investigate whether such newer technologies could reduce the problems of a low degree of interaction and improve the communication between teacher and students in video conferencing settings.

In the literature, it is often argued that due to reduced travel costs, video conferencing offers excellent possibilities for 'bringing in *external experts'*, which is highly appreciated by students and positioned as one of

the most important advantages of the technology (Pitcher et al., 2000; Smyth, 2005). However, findings from the NS reveal that external experts were engaged in only a few courses, and that this was considered to be one of the least important reasons for using live video. The teachers in the KS reported that external experts were rarely used due to a fixed schedule with specific days and times for each course, which was nearly impossible to change. Another reason was that external experts often felt uncomfortable in a video conferencing environment and therefore often refused to participate through video conferencing.

Several studies have shown that teaching through video conferencing makes it necessary to plan more thoroughly (see e.g. Johannesen & Eide, 2000; Keller, 2007; Plonczak, 2010). Findings from the NS show that higher demands on planning were experienced by nearly one-third of the teachers. However, interestingly this increase in planning demands was viewed as being advantage by roughly as many teachers who considered it to be a disadvantage. Further, results from the KS reveal that limitations in available time for video conferences also creates higher demands for planning with teachers perceiving that their available time needed to be used as efficiently as possible. They also often felt that they had to plan an entire lesson in every detail, which gave no room for improvisation or for student contributions. The reasons given were that they often had an ambition to present materials in different ways and felt a need to have control over the teaching situation through such considerations as when and how to show PowerPoint slides or images from a document camera, and which local study centres would answer specific questions. Another reason was that they had to organise their writing on the whiteboard carefully as space was limited, which could have the advantage of leading to improved structure. The teachers' aim for variation during video conferences also put higher demands on planning and they also had to consider that not everything they did would be visible on the screen. For example, specific chemical experiments and some practical exercises that students needed to perform were not considered suitable for a video conferencing session. This also put higher demands on teachers' planning as they had to plan those activities for physical meetings on campus instead (KS).

PROPOSED TYPOLOGY

Specifically within teacher education, several attempts have been made to develop a system of classification of video such as that of Masats and Dooly (2011) (see section 3.4 for more examples). However, the categories tend not to be comparable as they are not on the same level, or they are very specialized, which means that only specific categories are covered while others are lacking. The typology developed for this thesis has proved useful in both the NS and the literature research and may be useful in future research. Specifically, the NS showed the importance of investigating different categories of video separately as there it revealed differences in results between them. This suggests that at the very least, it is crucial to define which category of video is investigated in a study. Of particular relevance, the literature review in this thesis has identified a lack of research on the use of video materials *not* produced for pedagogical purposes in teaching. While the NS shows that this category may not yet widely be used for student learning, it is still important to know more about how it can be used most effectively.

MAINSTREAM USE OF TECHNOLOGY AND MEDIA

It is important to emphasise that this thesis is a systematic study investigating *the mainstream use* of technology and media in contrast to many other studies focusing on the use of new technologies for teaching by a selected group of enthusiastic teachers. Studies of mainstream use are rare in the area of educational technology, not only in research on video, but also for other technologies and media (Lundin, Bergviken Rensfeldt, Hillman, Lantz-Andersson, & Peterson, 2018). Instead of examining established practices and the ways that technologies become part of mainstream teaching practices, studies are often small and local in character and conducted by colleagues who are passionate about trying new tools in their teaching. Their value for understanding the broad implementation of digital tools is limited (Lundin et al., 2018). The continuous development of new technologies with potential use in teaching and learning makes it essential to understand better how they become mainstream teaching tools and not just focus on 'what works' for a select few teachers and students (Hender-

son, Selwyn, & Aston, 2017). A contribution of this thesis, then, is that it can serve as an example of how systematic research of mainstream use can be conducted. This is especially relevant regarding the rapid development of new technologies of video with potential use in teaching and learning. Examples of new technologies and new ways of using technologies that have recently been implemented in education and which could be considered in terms of mainstreaming are VR (Virtual Reality) (Izard et al., 2018), AI (Artificial Intelligence) (Dennis, 2018; Popenici & Kerr, 2017), video-based recorded online discussions (e.g. Flipgrid)[138] (Green & Green, 2018), asynchronous video feedback comments (Thomas, West, & Borup, 2017), 360 degree video (Theelen, van den Beemt, & den Brok, 2019), MUVLE (Multi-User Virtual Learning Environments)[139] (Campbell et al., 2016). While each of these new technologies has different affordances and constraints, it can be argued that they are likely to follow a similar path to digital video if and when they become mainstream tools for teaching and learning in digital distance higher education. Therefore, the insights in this thesis may be beneficial for understanding their potential as mainstream technologies for digital distance teaching and learning.

8.4 CONCLUSION

The aim of this thesis is: *To better understand the possibilities and limitations of video in digital distance higher education.* Both the NS and the KS have contributed to fulfilling this aim. The results of the NS unpack how six categories of video are used. As all these six categories are investigated in the same study, it is possible to make a comparison of the use between the categories, highlighting differences and how teachers consciously select the category to use dependent on its affordances and constraints. The results indicate that *recorded video* is mostly used as a complement to other materials, and that *live video* is often used for bridging the geographical distance

138 A cross-platform (available on the web and as an app) with video and audio for short video-recorded discussions among students (Green & Green, 2018).

139 A mixed reality space, combining 3D modelling tools, 360 panorama video and 2D holograms where students and teacher can meet virtually (Campbell, Santiago, Hoo, & Mangina, 2016).

between students and teacher and for social contact. Even though both video conferencing and desktop conferencing have similar affordances, the NS demonstrates a surprisingly large difference in their use with desktop conferencing the second most used type of video and video conferencing the second least used.

This thesis indicates that live video is used in many courses in Swedish digital distance higher education. It is therefore essential to update the definition of distance education from the Swedish Higher Education Authority in order to include also synchronous communication, e.g. live video. The present definition is focusing mostly on asynchronous communication: "Education based on teaching where teachers and students most of the time are spatial and temporal separated." (Callerholm & Enström, 2016).

Experience of distance education and in-service training are two factors that influence *how* and *how much* video is used. Categories which require less knowledge are typically used more by teachers with less experience and in-service training.

The results from the NS indicate that both desktop and video conferencing entail higher demands on teachers' planning than other categories of video and the KS gives a more detailed picture of how teachers perceived a need to plan the smallest details for video conferences, including which questions to direct to which local study centre. The NS shows that one of the most critical disadvantages with video conferencing is that teachers feel constrained in their teaching, an important result that the KS provides more detailed information on. In the video conferencing environment, teachers generally have to be seated on a chair and cannot move around, as they disappear out of the picture as soon as they move (KS). This makes teachers feel constrained in their teaching as they are used to moving around freely in classrooms on campus. A limited possibility to write on the board is another limitation, which also makes teachers feel constrained in their teaching. The teachers perceived that it is challenging to teach in a video conferencing environment since the large and many groups often make it impossible to see and interpret the students' non-verbal cues and that only a limited number of students can be seen on the screen at a time. However, these should only be understood as symptoms

of the difficulties that are created in a communication situation with too many students in each site and too many sites.

The result from the KS that distance teachers do not reflect more about the reasons *why* it is difficult to have a high degree of *student-teaching interaction* is surprising. They suggest that teachers may not consider that the reasons for issues occurring in a class can be the communication situation and that the conditions for communication in a video conference are so different compared to communication situations they may be used, particularly when used to teaching on campus. Teachers must become aware of the different conditions for communication on campus and in a video conferencing situation so that they do not have the expectation that the communication situations are the same. With knowledge of the different conditions for communication, teachers can focus on reducing complications such as by having smaller groups and fewer students, and by aiming to have a whole class on screen at a time. Other ways of dealing with these disadvantages could be that the teachers understand the importance of eye contact and that they look into the camera when speaking and that they try to pay attention to each and every student. Also, that the teachers try to see the communication situation from the student's perspective and not only from their own, may make a difference.

The results regarding the use of video in this thesis are not only important for distance education, but they can also inform practice in campus education as video is used more and more in teaching there (and in many other areas as well). For example, the increased interest in the 'flipped classroom' teaching method (Lundin et al., 2018) often involves the use of video, which means that students watch video (a recorded teaching situation such as a lecture or video as learning materials) before coming to class and meeting fellow students and the teacher (Raths, 2014; Sams & Bergmann, 2012, 2013). Since students have prepared by watching the video, the time together in class can be spent more effectively on discussing the content and collaborating with support from the teachers instead of being used for lecturing. 'Flipped classroom' is only one of several areas where digital video is increasingly important in teaching and learning (Baepler, Walker, & Driessen, 2014; Bull, Ferster, & Kjellstrom, 2012). Another use of video that is increasing renders students as not only consumers of video, but also as producers, opening up the category 'video as a tool for

learning'. The development that we now see, which did not exist during the empirical studies for this thesis, is that smartphones are used by students for creating videos. This often means that students respond to each other through video, a development that emerged and began to become popular in early 2019. People have been using social media for sending video since about 2009 (Lehman, Dufrene, & Lehman, 2010; Multisilta, Suominen, & Östman, 2012), but the implementation of new media in formal education is often slow. This new way of using video means a critical shift in perspective (Greenberg & Zanetis, 2012) as students become producers of video that also complicates the situation. As Bates (2005) notes, "Of all the media available to educators, television and video come in the most diverse forms, have arguably the greatest potential for teaching and learning, and are probably the least well used" (p. 90). While fully reaching the enormous potential of video in its different forms for teaching and learning may be out of reach, this thesis shows that despite the relatively slow pace of technology adoption in formal education the mainstream use of video in distance education does make significant use of the technology.

By unpacking the use of video in digital distance higher education, this thesis contributes with both deeper knowledge about how video can be used in teaching and learning and with a greater understanding of how technologies become mainstream educational tools. The approach and insights developed here can help guide the ways that emerging technologies in education are understood and support the spread of best practices at scale.

CHAPTER 9

SWEDISH SUMMARY

KAPITEL 1
INTRODUKTION

Den forskning som finns inom distansutbildning i högre utbildning fokuserar fr.a. på asynkron,[140] text-baserad kommunikation, t.ex. diskussionsforum (se t.ex. Akarasriworn & Heng-Yu, 2013; Akin & Neal, 2007). Forskning om användningen av synkron kommunikation,[141] t.ex. vissa kategorier av video är sällsynt (Hansch et al., 2015). Mer forskning behövs därför om synkrona kommunikationssätt, eftersom t.ex. video ännu inte används till sin fulla potential (Laaser & Toloza, 2017). Dessutom inrik-

140 Kommunikation som ej är i realtid.

141 Samtida kommunikation.

tar sig den forskning som finns fr.a. på studenternas perspektiv. (Meskill & Anthony, 2014). Forskning om hur lärare designar och undervisar på distans med video är till stor del outforskat. Mer kunskap om detta behövs, inte minst som video spås bli det dominerande mediet på internet i framtiden (Hansch et al., 2015; The State of Video in Education 2017. A Kaltura Report, 2017).

Den snabba utvecklingen inom distansutbildning har medfört att många lärare undervisar på distans utan ha blivit förberedda på det eller fått fortbildning inom distansutbildningsområdet (Compton, 2009; Sun, 2011; Wännman Toresson, 2002). Distansutbildning ställer högre krav på lärares förmåga att planera och organisera kurser, att presentera kursinnehåll, ge respons till studenter och skapa interaktiviteter mellan studenter. (Wännman Toresson, 2002).

SYFTE OCH FORSKNINGSFRÅGOR

Syftet med denna avhandling är att bättre förstå möjligheter och begränsningar med användning av video i digital distansutbildning inom högre utbildning. Forskningen i den här avhandlingen har tre analysobjekt: 1) video, 2) distanskurser och 3) distanslärare. Följande forskningsfrågor kommer att besvaras i avhandlingen:

Fråga 1: Hur används video i distanskurser i högre utbildning?

a. vilka kategorier av video används?
b. hur mycket används de?
c. varför används de eller används de inte?
d. hur används de?

Fråga 2: Hur ser kursansvariga lärare på möjligheter och begränsningar med användning av video i digital distansutbildning?

Fråga 3: Vilka är lärares attityder till och hur uppfattar de användningen av video i digital distansutbildning?

KAPITEL 2
DIGITAL DISTANSUTBILDNING

DEFINITION

Det finns många olika termer för distansutbildning på svenska, t.ex. nätbaserat lärande, webbaserat lärande, e-lärande, m.m. (Dafgård, 2002). Jag har valt att använda begreppet 'distansutbildning' i avhandlingen, dels för att den engelska översättningen används i Europa, men även för att det är ett mer generellt begrepp medan en del andra, som används, är mer specifika. I avhandlingens studier är det många kurser som ingår och de har bedrivits på olika sätt.

Distansutbildning definieras på följande sätt i avhandlingen:

> "Distansutbildning är planerat lärande som normalt sker på en annan plats än där undervisningen sker, den kräver speciell kursdesign och undervisningsteknologier, kommunikation genom olika teknologier och särskilda organisatoriska och administrativa rutiner (Moore & Kearsley, 2005, p. 2).[142]

DISTANSUTBILDNINGENS UTVECKLING

Distansutbildningen har en lång historia från korrespondenskursernas tid (Bates, 2005; Holmberg, 1998) och fram till digital distansutbildning. Man brukar tala om olika generationer av utveckling , men dessa har förekommit parallellt (Garrison & Anderson, 2003). Teknologins utveckling har ofta varit den drivande kraften. Det är dock viktigt att understryka att de pedagogiska modeller som har utvecklats från självstudier utan något stöd från lärare till samarbetslärande mellan studenter på distans har större betydelse än att teknologierna har fått nya funktioner. En viktigt steg i utvecklingen var det som ofta kallas den tredje generationen distansutbildning, som innebär att synkron kommunikation, t.ex. via video-konferens (Moore & Kearsley, 2005) blev möjlig. Den mest betydelsefulla utvecklin-

142 Author's translation.

gen var dock internet (Taylor & Swannell, 2001), som gjorde det möjligt att inte bara presentera innehåll utan också ge ökade möjligheterna till kommunikation och interaktion mellan lärare och studenter trots geografiska avstånd, vilket är centralt för hög kvalitet i utbildning (Holmberg, 2006).

Två nyckelbegrepp i avhandlingen, som behövs för att förstå den teoretiska utgångspunkten är interaktion och kommunikation. (Bates, 1997). Moore klassificerar interaktion i tre kategorier (Moore, 1993b):

- Interaktion mellan student och (kurs)innehåll
- Interaktion mellan student och lärare
- Interaktion mellan studenter.

Interaktion mellan student och innehåll är en förutsättning för utbildning (Moore, 1993b). Interaktion mellan student och lärare är inte lika nödvändig, men ändå en väsentlig del av utbildning. Interaktion mellan studenter är den typ av interaktion, som är svårast att få till stånd på distans (Moore, 1993b)

Kommunikation är central för all utbildning och det finns olika modeller för kommunikation i en utbildningsmiljö och eftersom aspekten av kommunikationssätt är central för video har denna med tre faktorer valts (Kress, 2010). 1) social interaktion, 2) utbyte i processen att skapa mening och 3) 'kommunikationssätt' och dess möjligheter och begränsningar (Selander & Kress, 2010). Exempel på kommunikationssätt är bilder (stillbilder och rörliga bilder, t.ex. video), text, färg, ljud, 3D modeller, agerande och gester (Kress, 2010).

Andra viktiga begrepp är teknologier och media. Gränserna mellan dem kan ibland flyta ihop (Bates, 2015; Moore & Kearsley, 2005), men i huvudsak kan man säga att "Det är teknologin som är medlet för kommunikationsmeddelande och meddelandena (innehållet) finns representerade i mediet." (Moore & Kearsley, 2005, p. 6).[143] Teknologier har funktioner (Andrews & Haythornthwaite, 2007a) och kan kategoriseras i 'inspelad' och 'interaktiv' video (Moore & Kearsley, 2005). Ett Skypemöte är ett exempel på en interaktiv teknologi och ett klipp på YouTube är ett exempel på en inspelad teknologi. En viktig princip för användning av

143 Author's translation.

teknologier i distansutbildning är att ingen teknologi är den lämpligaste och bästa för alla sorters meddelanden till studenter överallt (Laurillard, 2002; Moore & Kearsley, 2005). Det viktigaste är inte att sträva efter att välja rätt teknologi utan hur man ska välja teknologi, den mest lämpliga för en särskild undervisningssituation, och hur man ska använda teknologin (Laurillard, 2002). Syftet med att använda teknologier i utbildning ska vara att det ska tillföra ett mervärde till studenternas lärandesituation (Garrison & Anderson, 2003; Laurillard, 2008; Moore & Kearsley, 2005). Användningen av teknologier har både möjligheter och begränsningar och båda dessa aspekter måste övervägas när val beträffande teknologi ska göras, inte minst viktigt är att reflektera över hur teknologin ska användas (Belanger & Jordan, 2000; Koehler & Mishra, 2008).

Karakteristiska egenskaper för media kan delas in i social närvaro och rik media (Rice, 1992). Social närvaro beror på hur mycket av den aktuella sociala närvaron som mediet kan överföra (Rice, 1992). I social närvaro ingår inte bara ord utan även icke-verbala signaler som ansiktsuttryck, gester, kläder, vart blicken riktas samt andra verbala signaler som betoningar etc. När det gäller rik media, föreslår Daft and Lengel (1986) en lista där kommunikation öga-mot-öga är på första plats, telefon på andra och skriftlig kommunikation på tredje och platserna därefter.

Digitalisering har ökat möjligheterna för distansutbildning, t.ex. genom att skapa möjligheter för interaktion mellan student-student (Moore, 1993b).

Den här avhandlingen fokuserar på en instans av fenomenet digital distansutbildning, nämligen videoteknologi.

KAPITEL 3
VIDEOFORSKNING

Det finns många definitioner av video, men i den här avhandlingen definieras video som digitala rörliga bilder och ljud, inkluderar både video och tv, vilka används i högre utbildning. Digitaliseringen har haft stor betydelse för videons utveckling och med den har det blivit lättare att producera, distribuera och redigera video (Brunvand, 2010; Collins, Neville, & Bielaczyc, 2000; Martin & Siry, 2012; Masats & Dooly, 2011).

’Video’ som begrepp är problematiskt, eftersom det används i dagligt tal och sätts i samband med underhållning, utbildning och lärande och även andra syften. Detta kan vara orsaken till att video sällan definieras i forskningen (see e.g. Mitra, Lewin-Jones, Barrett, & Williamson, 2010). Detta skapar oklarheter om vilken typ av video som har undersökts och det förekommer också att flera typer av video blandas i en undersökning och slutsatser dras utan att man reflekterar över om de olika typerna kan ha påverkat resultaten. Flera försök har gjorts för att klassificera video, särskild inom lärarutbildningen (see e.g. Masats & Dooly, 2011), men kategorierna är svåra att jämföra, eftersom de är på olika nivåer eller också är de så specifikt inriktade mot vissa områden, att andra områden inte täcks in. Med forskningsöversikten i avhandlingen som utgångspunkt har ett förslag till klassificering tagits fram som är inriktad mot ’metod för användning’. Den föreslagna typologin bygger på pedagogisk användning av video, dvs. lärarens syfte med att använda video. Klassificeringssystemet har två huvudgrupper: inspelad video och interaktiv video. I inspelad video finns fyra undergrupper och i gruppen interaktiv video finns två undergrupper:

Inspelad video:

- Video som läromedel
- Video-inspelade undervisningssituationer
- Video som inte är producerat för pedagogiska syften, men som används i undervisning och lärande
- Video som verktyg för lärande:
    - att studenterna gör videoproduktioner eller
    - att studenternas agerande spelas in och diskuteras utifrån inspelningen, t.ex. inom professionsutbildningarna

Interaktiv video:

- videokonferens
- desktopkonferens (som t.ex. Skype)

KAPITEL 4
TEORETISKA UTGÅNGSPUNKTER

Det socio-kulturella perspektivet (Vygotskij, 1978) uppstod som reaktion mot det behavioristiska sättet att se på lärande där lärare har en mycket central roll som kunskapsbärare, som byggde på att läraren kan överföra sin kunskap till studenten, t.ex. genom att föreläsa. Det socio-kulturella perspektivet kan användas för att förstå lärande, utveckling av kunskap och färdigheter i sociala praktiker (Säljö, 2000). Vygotskilj (1978) framhåller att det inte är bara språket, som har en central roll i kommunikationssituationer, utan också icke-verbala signaler, såsom gester, ansiktsuttryck och kroppsspråk är en del av kommunikationen. De icke-verbala signalernas uppgift är att förstärka och nyansera till det talade språket (Lögdlund, 2011; Selander & Kress, 2010). Video kan erbjuda både det talade språket (i form av ljud) och icke-verbala signaler (i form av rörlig bild), som är en mycket viktig del av kommunikationssituationen mellan människor. Det kan användas för att förstå samband mellan å ena sidan mänskligt medierad handling och å andra sidan kulturella, institutionella och historiska kontexter (Wertsch, 1998).

Sett från ett socio-kulturellt perspektiv, medierar vi när vi handlar och uppfattar världen runt omkring oss. Det innebär att vi interagerar med medierande verktyg, t.ex. teknologier (Säljö, 2000, 2005; Wertsch, 1998). Medierande verktyg kan vara fysiska verktyg såsom teknologier, men det kan också vara språk (Säljö, 2000, 2005). För att förstå hur vi lär är det viktigt att reflektera över hur vi interagerar med verktyg och vad som händer i denna interaktion. Användningen av verktyg löser inte problemet med lärande, men de förändrar och påverkar villkoren för lärande (Säljö, 2000), eftersom verktygen inverkar på hur vi tänker och interagerar med andra och med vår omgivning (Säljö, 2000).

För att kunna analysera och förstå lärares användning av video och skälen till hur det används är det lämpligt att kombinera det socio-kulturella perspektivet (Säljö, 2000) med affordance-teorin,[144] som kan använ-

144 Det är svårt att översätta affordance-begreppet till svenska. Det betyder både möjligheter och begränsningar, men också vad teknologin erbjuder användaren.

das för att analysera möjligheter och begränsningar med teknologier (Gibson, 1977; Koehler & Mishra, 2008).

Användningen av begreppet 'affordances' (möjligheter och begränsningar) relaterar i ett brett perspektiv till specifika systems egenskaper, som möjliggör och uppmuntrar till vissa av studenters handlingar och beteenden (Koehler & Mishra, 2008). Användning av teknologi kan både underlätta och hindra studenters lärande beroende på 'affordances', teknologins möjligheter och begränsningar (Andrews & Haythornthwaite, 2007b). 'Affordances' relaterar till studenters och lärares möjligheter att kunna kommunicera och skapa sociala relationer med andra, bli synliga i en webbaserad miljö, se och använda data och information, skapa och visa innehåll m.m. För att 'affordances' ska kunna realiseras, måste teknologin användas på ett sådant sätt att det är möjligt att dra nytta av möjligheterna, d.v.s. att både lärare och studenter måste ha kunskap om hur nya funktioner kan användas och inte vara rädda att använda dem av olika orsaker.

Genom att identifiera begränsningar, är det möjligt att förstå hur dessa uppstår och vilka effekter de har. Med denna förståelse för hur t.ex. användningen av video påverkar interaktion, kommunikation och samarbete är det möjligt att utveckla teknologin och påverka designen för att reducera eller eliminera begränsningar (Gibson, 1977; Koehler & Mishra, 2008). Även om begränsningar kan identifieras från ett generellt perspektiv är sociala aktiviteter alltid situerade. Det gäller naturligtvis också begränsningar och vilken teknologi som har använts (Gaver, 1992).

KAPITEL 5
METODER

Med syfte att ge en generell och detaljerad bild över användningen av video i digital distansutbildning, har två studier genomförts inom ramen för avhandlingen. För att få en översikt över hur olika kategorier av video har använts, har en nationell, webbaserad enkätundersökning skickats ut till samtliga kursansvariga lärare som hade en kurs registrerad som distanskurs på www.studera.nu hösten 2009. Svarsfrekvensen var ca 50% och det är 740 kursansvariga lärare, som har besvarat enkäten om 1 246 kurser och sex kategorier av video.

Med resultatet från enkätstudien som utgångspunkt har användning av videokonferens valts ut för en uppföljande studie. Videokonferens är en videokategori som är särskilt intressant, eftersom den ofta används för att överbrygga det geografiska avståndet mellan lärare och studenter i distanskurser. Resultatet av enkätstudien, visar att Karlstads universitet har lång erfarenhet av att bedriva distansutbildning, inte minst när det gällde att använda videokonferens. Valet föll på att undersöka ett program i stället för fristående kurser och genom att välja lärarprogrammet, blev det stor variation beträffande ämnen. Karlstads universitet valdes på grund av lång erfarenhet av distansutbildning och att enkätstudien visade att lärarna där använder video mer än på andra lärosäten. En intervjuundersökning med 13 lärare inom lärarutbildningen på distans genomfördes för att få mer detaljerad kunskap om vad det innebär att planera och genomföra distanskurser genom videokonferens.

KAPITEL 6
ENKÄTSTUDIE

Mer än hälften av de kursansvariga lärarna kunde kategoriseras som att de hade en viss erfarenhet av distansutbildning.[145] Emellertid kunde över hälften av lärarna kategoriseras som antingen erfarna eller mindre erfarna, vilket är förvånande.

Mer än hälften av de kursansvariga lärarna hade inte fått någon fortbildning alls inom distansutbildningsområdet. De lärare som hade fortbildning, hade deltagit i informella fortbildningsinsatser såsom seminarier och workshops. Fortbildningen hade också varit blygsam i tid eftersom mindre än hälften av dem hade deltagit i fortbildning motsvarande mindre än 7,5 hp.

De tre mest rapporterade fördelarna, både när det gäller videokonferens och desktopkonferens hänger samman med det faktum att dessa teknologier har potentiella möjligheter med muntlig och visuell kommunikation mellan grupper och individer som befinner sig på olika platser. Möjligheten med rumslig flexibilitet är också ett av huvudargumenten för

145 Viss erfarenhet definieras som: mer än fem års erfarenhet och mindre än elva kurser/program eller att ha haft mindre än fem års erfarenhet och mer än sex kurser/program.

distansutbildning. Detta betyder att de kursansvariga lärarna uppskattade att båda teknologierna kunde erbjuda möjligheten med ett komplement till skriftlig kommunikation (Gibson, 1986, 2015), om än mer när det gäller desktopkonferens än videokonferens.

En jämförelse mellan nackdelar när det gäller att använda videokonferens och desktopkonferens visar att möjligheter i relation till särskilda sätt att använda de två teknologierna spelade en viktig roll. Till exempel var studenternas tekniska problem en betydande begränsning när det gäller desktopkonferens men inte för videokonferens. Desktopkonferens används framför allt av enskilda studenter utan teknisk support medan support ofta är tillgänglig under videokonferenser. Det är också färre typer av utrustning inblandad under videokonferenser som kan orsaka problem, eftersom det framför allt används för grupper av studenter och inte av enskilda studenter såsom desktopkonferens används.

Att nästan hälften av de kursansvariga lärarna hade markerat svarsalternativet: "Användningen av videokonferens begränsar hur jag kan agera i undervisningssituationen" som en nackdel var mycket intressant, eftersom det visar att videokonferensteknologin kan medföra eventuella begränsningar (Gibson, 1986, 2015). Genom att identifiera begränsningar som detta, kan det bli möjligt att förstå hur och varför de det blir sådana begränsningar och dess effekter (Gibson, 1977). Detta kan bidra till att förbättra teknologin och utveckla designen i syfte att reducera eller till och med eliminera begränsningar (Gibson, 1977). Resultatet att videokonferens begränsar hur många av de kursansvarig kan agera i sin undervisning är jämförbara med Burn's resultat (2002), att lärare inte ansåg sig vara tillräckligt trygga att använda videokonferenssessioner för att undervisa om innehållet, vilket resulterade att videokonferenser framför allt användes till introduktioner och repetitioner i stället. Jonsson (2004) har funnit liknande resultat att lärare hävdade att de kände sig begränsade p.g.a. hur projektordukarna var disponerade på väggen, fixerade rader och den tekniska utrustningen på borden. Dessutom måste läraren koncentrera sig på tre olika vinklarna: kameran framför sig, datorn på bordet och den projicerade bilden på skärmen (Jonsson, 2004). Det här vore mycket intressant att undersöka närmare.

Dessa resultat visar också att det är mycket viktigt att studera kategorin videokonferens separat från kategorin desktopkonferens, eftersom denna

studie visade att det var skillnader i möjligheter mellan teknologier. Det visade också att den kategori som undersöks måste definieras. Tidigare forskning har inte alltid tagit hänsyn till dessa skillnader (Akarasriworn & Heng-Yu, 2013; Bower, Kennedy, Dalgarno, & de Barba, 2012; Candarli & Yuksel, 2012).

Videokonferens var den kategori video som används i näst minst antal kurser. Det är ett intressant resultat, eftersom desktopkonferens i stället var bland de tre mest använda kategorierna av video, även om det är en nyare teknologi än videokonferens och desktopkonferensens kvalitet tidigare har varit ett problem (Cunningham, Fägersten, & Holmsten, 2010). Det är särskilt intressant att jämföra användningen av videokonferens och desktopkonferens, eftersom de var de enda videokategorierna i enkätundersökningen, som kunde erbjuda en situation med synkron kommunikation, som liknar den i klassrummet, men på distans. Dessa två kategorier används ofta för att överbrygga det geografiska avståndet mellan lärare och studenter.

En anledning till varför video som ett verktyg för lärande användes i minst antal kurser kan bero på att det skulle kunna bli svårare för studenter att göra inspelningar, redigera video och få tillgång till videoutrustning på distans, även om utvecklingen av video, har gjort det lättare och kraven på hårdvara och mjukvara har minskat (Collins et al., 2000). Det kan emellertid fortfarande finnas ett visst motstånd från lärare att börja använda denna typ av teknologi, som de inte känner till. Det finns en risk att de tror att det är mer komplicerat och krävande än det egentligen är.

Generellt sett, använde lärare med erfarenhet och fortbildning video mer. Dessa lärare använder också fler kategorier video i samma kurs jämfört med lärare med mindre erfarenhet och mindre fortbildning. Videokategorier, som kan anses som lättare att använda, t.ex. videobaserade läromedel och videoinspelade undervisningssituationer användes mer av lärare med lite erfarenhet av distansutbildning medan videokonferens och desktopkonferens användes mer av erfarna lärare.

Åtminstone en kategori av video användes i tre av fyra kurser, men i en av fyra kurser, användes inte video alls. Det här är intressant, eftersom videoinspelade undervisningssituationer kan användas i distansutbildning för att ersätta fysiska möten på campus med föreläsningar, seminarier och laborationer. Dessutom kan två videokategorier erbjuda synkron

video, dvs. videokonferens och desktopkonferens, för att ersätta vanliga föreläsningar och seminarier i distanskurser. Videoinspelade undervisningssituationer, desktopkonferens och videobaserade läromedel användes i 33-42% av kurserna (minst använd först). Video som verktyg för lärande, videokonferens och videomaterial som inte var producerade särskilt för pedagogiska syften, användes i 17-22% av kurserna (minst använd först).

Generellt sett användes videokategorierna inte så mycket i kurserna och därför är det rimligt att anta att de spelade en mindre betydelsefull roll i den pedagogiska designen av kurserna.

De empiriska resultat som har rapporterats i den här delen stödjer den valda kategoriseringen av video, eftersom respondenterna verkar ha förstått vad som menas med de olika videokategorierna som de har fått frågor om och kan skilja mellan dem beroende på vilken kategori de fick frågor om. Det har undersökts inom följande områden: 1) I hur många kurser används en kategori, 2) om video var frivilligt eller obligatoriskt. 3) hur mycket video användes. 4) hur video användes. Detta resultat illustrerar hur viktigt det här att definiera t.ex. vilken videokategori som är undersökt i forskning, något som har visat sig inte alltid är fallet enligt litteraturöversikten i kapitel 4.

PEDAGOGISKA ASPEKTER KRING ATT ANVÄNDA ELLER INTE ANVÄNDA VIDEO

Ett av de två mest rapporterade skälen för att använda inspelad video var att komplettera annat material utom för video som verktyg för lärande. Inspelad video uppfattades erbjuda de bästa möjligheterna till lärande när det användes för att komplettera annat material. Dess potentiella möjligheter för studenters lärande (Gibson, 1986, 2015) var därför mindre viktiga som orsak till att använda denna videokategori. Det andra mest rapporterade skälen till att använda både videobaserade läromedel och videoinspelade undervisningssituationer var att presentera kursinnehåll eller delar av kursinnehåll på ett lämpligt sätt samt att det användes för svåra delar av innehållet, vilket gav dessa videokategorier en mer central roll i designen av kursen jämfört med övriga videokategorier av inspelad video. Detta betyder att de kursansvariga lärarna i högre grad uppfattade

de potentiella möjligheterna för lärande för videobaserade läromedel och videoinspelade undervisningssituationer (Gibson, 1986, 2015) jämfört med de andra videokategorierna i inspelad video: videomaterial som inte var producerat för pedagogiska syften och video som verktyg för lärande. Det fanns också en skillnad i användning mellan å ena sidan videomaterial som inte var producerat för pedagogiska syften och å andra sidan videobaserat läromedel och videoinspelade undervisningssituationer. Den första kategorin rapporterades användas mer för diskussioner och för att öka studenters motivation. Detta betyder att de kursansvariga lärarna uppfattade att videomaterial som inte producerats för pedagogiska syften hade potentiella möjligheter att erbjuda material för diskussioner och för att öka studenters motivation, men lärarna uppfattade inte att denna videokategori hade liknande möjligheter för lärande (Gibson, 1986, 2015) som videobaserat läromedel och videoinspelade undervisningssituationer.

I motsats till de andra videokategorierna, var den mest rapporterade orsaken till att använda video som verktyg för lärande, dess möjligheter att erbjuda ett alternativt sätt att presentera (Gibson, 1986, 2015). Utifrån det antal svar och de typer av öppna svar, blev det tydligt att en del kursansvariga lärare inte visste vad som menades med kategorin video som verktyg för lärande, antagligen mest beroende på bristande erfarenhet.

De mest rapporterade orsakerna för att inte använda tre videokategorier: videoinspelade undervisningssituationer, videomaterial som inte var producerat för pedagogiska syften och video som verktyg för lärande var att de inte tillförde någonting, vilket också var bland de tre mest rapporterade orsakerna till att inte använda videobaserat läromedel. Detta resultat visade att de kursansvariga lärarna inte var medvetna om de potentiella pedagogiska fördelar som dessa videokategorier kan erbjuda eller att de var olämpliga för deras särskilda ämne. När det gäller videobaserat läromedel, var den viktigaste orsaken till att inte använda det ont om tid – det tog för lång tid att söka efter lämpligt material, vilket var ett nästan lika viktigt skäl for de andra tre videokategorierna. En annan viktig orsak som beskrevs för att inte använda inspelad video var att läraren inte hade erfarenhet eller kunskap. Detta visade att lärarens brist på erfarenhet eller kunskap om att använda inspelad video var ett hinder för att använda det (Gibson, 1986, 2015). Om lärare hade mer erfarenhet och kunskap, skulle inspelad video förmodligen användas mer. Teknikrelaterade problem var

det minst markerade alternativet för alla fyra videokategorierna av inspelad video, vilket är intressant eftersom det ofta används som argument för att inte använda video (McNaught, Kenny, Kennedy, & Lord, 1999; Shelton, 2017).

De viktigaste orsakerna till att använda videokonferens och desktopkonferens var i hög grad desamma eller åtminstone liknande och visade att de två teknologierna hade liknande möjligheter (Gibson, 1986, 2015), som att lärare och studenter kunde vara på olika platser, att det var möjligt att erbjuda undervisning på flera ställen på en gång och att de erbjöd ett alternativ till skriftlig kommunikation. Rumslig flexibilitet är ett typiskt argument för distansutbildning och resultatet visade att de kursansvariga lärarna uppfattade denna potentiella möjlighet för både videokonferens och desktopkonferens (Gibson, 1986, 2015). Resultatet visar att videokonferens var mest vanligt för grupper av studenter och att desktopkonferens var mest frekvent använt för individuella studenter på olika ställen.

Den viktigaste orsaken som lärarna angav till att inte använda videokonferens och desktopkonferens var att det inte tillförde någonting till kursen eller programmet. Det är lite förvånande, eftersom båda teknologierna har nyckelfunktioner som synkront ljud och synkron bild and därför erbjuder den potentiella möjligheten att ersätta fysiska möten (Gibson, 1986, 2015). Flera andra viktiga orsaker var att det var ont om tid, att ingen hade efterfrågat det och att en del av de kursansvariga lärarna inte hade kunskap om att använda denna videokategori. Den sistnämnda orsaken visade att lärarna brist på kunskap kunde vara ett viktigt hinder för att använda dessa teknologier (Gibson, 1986, 2015), men med mer fortbildning skulle förmodligen antalet lärare öka, som använder dessa typer av synkron kommunikation i sina kurser. Slutligen, eftersom båda typerna av konferens, fordrar synkron kommunikation är en annan viktig orsak till att inte använda dessa teknologier att det var svårt att hitta en tid som passade alla studenter. I den meningen, minskar flexibiliteten i tid när man använder video- och desktopkonferens, vilket kan ses som en begränsning i dessa teknologier. Dessutom var det vanligare med tekniska problem när desktopkonferens användes än när videokonferens användes, vilket visar på att instabilitet i användningen av en viss teknologi troligare utgör ett hinder för desktopkonferens jämfört med videokonferens.

KAPITEL 7
INTERVJUSTUDIE

GENERELL DESIGN AV DISTANSKURSER

Intervjuerna med lärarna visade att när distanskurser skulle designas var det norm att följa organisation och planering av campuskurser. Modellen för distansutbildning, som Karlstad universitet hade valt med fysiska möten, lärcentra och videokonferens hade några problem enligt flera av lärarna. Särskilt begränsningarna när det gäller tidsmässig och rumslig flexibilitet var emellanåt kritiserade av en del av lärarna när det gäller videokonferens, eftersom den resulterade i begränsad tillgänglighet för studenter. De flesta lärare uttryckte en positiv attityd till användning av video, men föredrog andra lösningar än videokonferens, som de upplevde hade möjligheter med ökad flexibilitet såsom inspelade videokonferenser eller desktopkonferens. Lärarna underströk emellertid att utan videokonferens skulle det bli svårt att erbjuda det som Moore (1993b) kallar student-lärarinteraktion. Intervjuerna visade att lärarna medvetet utvecklade strategier för hur fysiska kursträffar och videokonferenser skulle kunna komplettera varandra.

PEDAGOGISK DESIGN AV DISTANSKURSER

När lärarna använde videokonferens upplevde de att det fanns begränsningar, både när gäller tidsmässig och rumslig flexibilitet. Dessa begränsningar orsakades inte enbart av videokonferens i sig, men berodde också på organisatoriska, administrativa och tekniska omständigheter. Begränsningarna i tid gjorde att lärarna upplevde att deras pedagogiska design påverkades negativt. Lärarna hävdade också att flera aktiviteter konkurrerade om den tillgängliga tiden. När lärarna prioriterade student-centrerade aktiviteter såsom diskussioner och presentationer av studenters arbete, fanns det lite tid kvar för föreläsningar. Från lärarnas beskrivningar kan man tolka det som att de upplevde sig själva som att de hade mest ansvar för att presenter kursinnehåll för studenterna under videokonferenserna, vilket resulterade i att de gjorde ytterligare inspelningar eller lade ut ytter-

ligare material på lärplattformen, om de inte hade tid att presentera det planerade innehållet under videokonferenserna.

De tidsmässiga begränsningarna gjorde det nödvändigt för lärarna att använda tiden under videokonferenserna så effektivt som möjligt, vilket enligt lärarna ställde höga krav på lärares planering och var mer tidskrävande än att planera för undervisning på campus. Också andra omständigheter, såsom begränsat med utrymme i studion och att lärarna hävdade att de hade ambitionen att variera hur de presenterade innehållet under videokonferenser bidrog till att ännu mer tid behövdes för planering. Dessutom upplevde lärarna att de behövde planera hela föreläsningen i minsta detalj, planera för hur de skulle aktivera studenterna och vilka lärcentra som skulle besvara vilka frågor. Detta bidrog till att mer tid för planering av videokonferenser behövdes när man jämför med motsvarande kurs på campus.

En videokonferensmiljö kan ha möjligheter att stödja synkron muntlig kommunikation, sociala aktiviteter och social närvaro. Det sätt som videokonferenser är organiserade med många studenter på varje ort och många orter uppkopplade samtidigt gör det dock svårt att dra fördel av dessa möjligheter. Lärare rapporterade att ha upplevt begränsningar i videokonferenssituationen, vilket kan tolkas som att det beror på den begränsade vyn, som kan visas från andra orter (Gaver, 1992, 1996) och andra tekniska begränsningar såsom sämre bildkvalitet (Caladine, Andrews, Tynan, Smyth, & Vale, 2010; Lazar, 2007; Shephard, 2002) eller ljud. Lärarna rapporterade att studenters icke-verbala signaler saknades, vilket kan tolkas som en begränsning i kommunikationssituationen. Detta kan medföra att studenter saknar social närvaro (Rice, 1992, 1993) och begränsad student-lärar-interaktion (Moore, 1993b) vilket kan göra att studenter sällan frågar eller svarar på frågor. Vissa lärare hävdade emellertid att de hade utvecklat olika strategier för att öka studenternas interaktion. En del lärare var positiva till att ha studenter i studion, eftersom de då kunde få respons på det som de sade och gjorde, men andra lärare ansåg att det också komplicerade deras undervisningssituation eftersom det var lätt att glömma bort distansstudenterna. Videokonferens upplevdes som tröttande och mer krävande jämfört med undervisning på campus.

Vissa lärare sade att de tyckte om att undervisa via videokonferens och andra gjorde det inte. Användningen av videokonferens ändrade villkoren för hur lärarna kunde agera i sin undervisning och många lärare hävdade

att de kände sig begränsade, eftersom de inte kunde röra sig runt i rummet som de var vana vid och detta påverkade deras undervisning negativt. Vissa lärare kände sig osäkra i videokonferenssituationen beroende på oro för teknologin eller att focus på teknologin tog bort deras uppmärksamhet från innehållet och studenterna.

Även om videokonferens kan användas som ett medierande verktyg för att skapa en klassrumsmiljö på distans, visar resultaten från intervjuerna också att mer än hälften av de intervjuade lärarna upplevde begränsningar när det gällde att använda sig av mer praktiska aktiviteter. Svårigheterna med att använda praktiska aktiviteter begränsade undervisning och inverkade negativt på lärares design och pedagogiska idéer. Därför förlades praktiska aktiviteter ofta till kursträffar i stället. Det resulterade i att vissa lärare upplevde sig själva som tråkiga och de försökte variera sitt framträdande och andra sätt att presentera så mycket som möjligt.

Videokonferens ansågs erbjuda möjligheter till social interaktion (Bates, 1997) och Moore's student-lärar-interaktion (Moore, 1993b), men lärare upplevde begränsningar i dessa interaktioner, ofta beroende på att ljudet styrde vilken bild som var i focus. Lärare deklarerade dock att de inte tyckte om att se sig själva på bild och att bli inspelad upplevdes som ännu värre. Vissa lärare berättade att de till och med hade utvecklat strategier för att undvika vara i bild genom att avsiktligt visa fler Power-Point-bilder. Sådana strategier kan emellertid tolkas som att de skapar begränsningar i kommunikationssituationen för studenter.

LÄRARES SYN PÅ KOMPETENS OCH FORTBILDNING

Lärare uttryckte ett behov av fortbildning, men de specifika behoven varierade, till exempel med behov av att veta hur man ska agera i videokonferenssituationen, styling, hur man ska uppträda och hur man ska använda PowerPoint. De uttalade också ett behov av att veta mer om hur teknologin i videokonferenssituationen ska hanteras, hur man får igång diskussioner och hur man kan variera sin undervisning. Lärarna hade fått mycket begränsat med fortbildning och de tyckte också att det var svårt att få tid till det. Rent allmänt uttryckte många av lärarna att de använde den teknologi de kände till och generellt sett, hävdade de att de skulle använda video mer om de fick fortbildning.

KAPITEL 8
DISKUSSION

Kontexten för den avhandlingen är digital distansutbildning och en av svårigheterna med distansutbildning är att överbrygga det geografiska avståndet mellan lärare och studenter. Digitaliseringen spelar stor roll för förbättrade möjligheter för undervisning, lärande, interaktion och kommunikation. Video, som är i fokus för denna avhandling har stor betydelse för denna utveckling.

Syftet med avhandlingen är att bättre förstå möjligheter och begränsningar när det gäller användning av video i digital distansutbildning. Både den nationella studien (NS) och Karlstad-studien (KS) har uppfyllt detta syfte.

Resultatet visar hur sex kategorier av video används. Alla dessa sex kategorier är undersökta i samma studie, vilket gör det möjligt att göra en jämförelse av användningen mellan kategorierna och se skillnader och hur lärare medvetet väljer kategori beroende på dess möjligheter och begränsningar.

Resultatet visar att inspelad video framför allt används som komplement till annat material och att interaktiv video ofta används för att överbrygga det geografiska avståndet mellan studenter och lärare och för social kontakt. Även om både videokonferens och desktopkonferens har liknande möjligheter, visar NS en förvånande stor skillnad beträffande i användningen. Desktopkonferens var den näst mest använda kategorin och videokonferens den näst minst använda.

Erfarenheter av distansutbildning och fortbildning är två faktorer som påverkar hur och hur mycket video används. Kategorier som kräver mindre kunskap används framför allt av lärare med mindre erfarenhet och fortbildning.

Resultaten från båda studierna visar att videokonferens ställer högre krav på lärares planering än andra typer av video och KS ger en mer detaljerad bild av hur lärare uppfattar ett behov av att planera de minsta detaljer för videokonferens, till och med vilka frågor de ska ställa till respektive lärcenter.

NS visar att en av de viktigaste nackdelarna med videokonferens är att lärarna känner sig begränsade i sin undervisning, ett intressant resul-

tat som KS ger mer detaljerad information om. I videokonferensmiljön, måste lärarna sitta på en stol när de undervisar och de kan inte gå omkring, eftersom de då försvinner ur bild. Detta gör att lärarna känner sig begränsade i sin undervisning, eftersom de är vana att röra sig fritt i klassrummet på campus. En begränsad möjlighet att skriva på tavlan är en annan begränsning, som gör att lärarna också känner sig hindrade i sin undervisning. Lärarna upplever att det svårt att undervisa i videokonferensmiljön, eftersom stora grupper och många studenter ofta gör det omöjligt att se och tolka studenternas icke-verbala signaler och att bara ett begränsat antal studenter i taget kan synas på skärmen. Detta ska dock förstås som svårigheter som uppstår i en kommunikationssituation med för många studenter på varje lärcenter och för många lärcenter uppkopplade samtidigt.

Resultatet beträffande användningen av video i den här avhandlingen är inte bara betydelsefullt för distansutbildning, men det kan också informera praktiken i campusutbildningen, eftersom video används mer och mer där (och inom många andra områden också). Till exempel har det blivit ett ökat intresse för undervisningsmetoden 'flipped classroom' (det omvända klassrummet) Lundin, Bergviken Rensfeldt, Hillman, Lantz-Andersson, & Peterson, 2018), som ofta innebär användning av video. Studenterna tittar på video (en inspelad undervisningssituation som t.ex. föreläsning eller video-baserat läromedel) innan de kommer till klassrummet och träffar kurskamrater och läraren (Raths, 2014; Sams & Bergmann, 2012, 2013).

Ett annat sätt att använda video som ökar är att studenter inte längre bara är konsumenter av video, men också producenter, vilket kan knytas till kategorin 'video som verktyg för lärande'. Utvecklingen som vi ser nu, fanns inte då de empiriska studierna för denna avhandling gjordes, är att mobiltelefoner används av studenterna för att skapa videor. Detta innebär ofta att studenterna ger varandra återkoppling genom video, en utveckling som har uppstått och som började bli populär i början av 2019.

Människor har använt sociala medier för att skicka videor sedan omkring 2009 (Lehman, Dufrene, & Lehman, 2010; Multisilta, Suominen, & Östman, 2012), men implementationen av ny media i formell utbildning är ofta långsam.

Detta nya sätt att använda video innebär ett viktigt skifte i perspektiv (Greenberg & Zanetis, 2012), eftersom studenterna blir videoproducenter

vilket också komplicerar situationen. Bates (2005) noterar: "Av all media som finns tillgänglig för lärare, tv och video kommer i flest variationer och har utan tvekan den största potentialen för undervisning och lärande och är förmodligen de minst väl använda (s. 90).

Medan användning av videos fantastiska potential i olika former för undervisning och lärande inte är inom räckhåll (i alla fall inte ännu), visar den här avhandlingen att trots den relativt långsamma takten när det gäller implementation av teknologier i formell utbildning, kan man se att även när det gäller 'vanlig' användning av video i distansutbildning används teknologin på ett mer utvecklat sätt.

Genom att undersöka användningen av video i digital högre distansutbildning, bidrar den här avhandlingen till både djupare kunskap om hur video kan användas i undervisning och lärande och till större förståelse för hur teknologier kan bli 'vanliga' verktyg för lärande. Den insikt som avhandlingen har bidragit till kan visa på sätt som kommande teknologier, som ska användas i utbildning, kan förstås och ge stöd åt spridning av beprövad erfarenhet i större skala.

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