Desktop Video Conferencing Tools in Higher Education: Understanding Lecturers' Experience ⋆

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Abstract. Technological advancements facilitate new ways of conducting university lectures. Through Emergency Remote Teaching (ERT), Desktop Video Conferencing Tools (DVCT) have been adopted by higher education institutions to face the challenges of the COVID-19 pandemic. DVCT enables online, real-time education to be delivered. To understand educators' experience with DVCT, an online survey was conducted among lecturers (N = 243) at the University of Bergen (UiB) between October 12-29th 2020. In this empirical paper, we report on the findings from the Likert scale and free text questions, analyzed using quantitative and qualitative approaches. Elaborate qualitative data (18,107 words) was gathered, providing perspectives of lecturers' experiences. The main advantages of DVCT identified are flexibility and accessibility. Disadvantages concern poor student communication and interaction. Overall, the trend is mixed to low sentiments towards lecturing with DVCT, despite lecturers claiming to be confident in using new digital tools. Lecturers' experience with DVCT may be positively affected by providing them with training, emphasizing pedagogical aspects, accepting the shortcomings of ERT, and recognizing that digitalization encompasses adapting to new technologies as well as changing practices, planning, and execution.

Keywords: Desktop Video Conferencing · Emergency Remote Teaching · Higher Education · Empirical study

1 Introduction

The history of video conferencing tools (VCT) dates back to the 1870s with Bell and Watson's invention of audio wires, and Bell Lab's video phone in 1927 [5, 21]. VCT allows users to synchronously communicate through video/audio, and its popularity increased with technological breakthroughs and the Internet. Today, video conferencing is apparent in both business and education [9]. However, the adaption of Desktop Video Conferencing (DVC), defined as video conferencing through Desktop Video Conferencing Tools (DVCT), is rather recent. DVCT encompasses software such as Zoom and Microsoft Teams, that through networked devices, allows for interactive and synchronous audio, video, and data transfer where needed hardware/software is contained within the device [7]. Compared to

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traditional VCT that are studio-based, DVCT only requires personal computers and internet access [18].

DVC in higher education gained momentum in the light of the COVID-19 pandemic. Although it has long been considered suitable for small-group use only, DVC was suddenly applied to larger classes as well [7]. As Norwegian campuses shut down in March 2020, emergency remote teaching (ERT) became a de facto. ERT is described as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" [12]. The goal is to provide fully remote teaching solutions for instructions or education that otherwise would be delivered face-to-face (F2F) [12]. Hodges et al. argue that ERT differentiates itself from regular online education that should be a result of careful instructional design and planning, including dimensions such as the focus on the student/instructor role online, the student-instructor ratio, pedagogy, and feedback. In contrast, ERT cannot and does not aim to recreate a physical learning environment, but provides temporary and quick access to education.

To our knowledge, the majority of existing research on the experience of VCT focuses on how it affects students' experiences, and learning outcome [2, 9, 13]. Among papers concerning lecturers' experiences, few are dedicated to DVCT exclusively [11, 14, 24]. The pandemic has sparked new interest in research on ERT and DVC in higher education as seen in [30, 27, 10]. Our contribution to this growing area is an empirical study providing further insight into lecturers' experiences and contributing factors.

2   Related Work

Video conferencing is considered one of the most relevant and proven distance learning technologies [16]. However, it requires the instructor to understand and acknowledge that using this medium as a delivery mode impacts the teaching styles and methods [16]. Kear et al. studied the perspectives of tutors using the conferencing tool *Elluminate Live!* for the first time [14]. Although most tutors did not employ the live video feature, they reported cognitive load when dealing with several tasks, e.g. chat and whiteboard, and challenges in creating a social presence. Tutors also found it hard to motivate students to attend online lectures, experienced decreased student-tutor and student-student interaction and voiced the desire for more practice and training beforehand. Pitcher et al. argue that training is necessary to exploit the technology in the best way, and traditional lecturing styles must be modified extensively when using video conferencing [24].

When video conferencing made its way into higher education in the 90s the focus was on remoteness, and video conferencing was perceived as a tool for the more effective delivery of traditional pedagogies [18]. In 1995, Coventry questioned to what extent video conferencing can provide the psychological attributes of F2F encounters [4, p.23]. She placed video conferencing into a learning framework and suggested that the success of video conferencing in higher education might also depend on non-technology factors such as cost, institutional issues, and student and tutors attitudes towards the technology [4, p.12]. Townsend et al. studied the applicability of the technology acceptance model to the adoption

of DVCT [26]. The study revealed that participants who had positive anticipation towards DVCT were more likely to evaluate it positively and perform better when using it than participants with a negative attitude. Despite technology being a widely used part of teaching in Norway, Madsen et al. found that Norwegian lecturers in higher education have a negative attitude towards digital technology and tools, claiming that it is not essential for good teaching [20]. To examine whether this attitude is transferable to DVCT we asked our participants about their perceived competencies and enjoyment of using digital tools in their teaching in general, as well as explicitly using DVCT.

Emergency remote teaching has paved the way for a growing interest in the impact of remote teaching and questioned how the curriculum is prepared and students are taught. While the use of digital technologies in education is not new, educators have now been forced to quickly transition and redesign their F2F teachings. Specific pedagogical strategies meant for the classroom do not necessarily fit a digital environment [10]. This can be challenging as experienced lecturers may have established notions of what good teaching constitutes. With the pandemic being a motivator of rapid educational development it is important to be mindful of human agency when improving and designing technology [3].

Trust and Whalen found through a 2020 survey among K-12 educators that participants on average experienced over four different challenges during the shift to ERT [27]. Feeling overwhelmed with all the online learning resources and tools, students' inadequate internet access, and lack of knowledge about online/remote teaching tools was frequently mentioned. Educators generally struggled to adapt their teaching pedagogies to fluctuating situations, having to consider changes in educational directives and personal needs. It was noted that the transition to ERT would have been easier and less stressful if more time had been spent on using technology in class before the pandemic. Similar results were found by Ferri et al. who identified challenges of ERT such as technological, pedagogical, and social problems relating to lack of teachers' digital skills [6]. They suggest that institutions should provide more platforms that could be used for e-learning purposes, enhance internet access, and that it is essential to provide training and workshops for teachers and students to enhance technological and pedagogical competencies. On the contrary, a study conducted at the Norwegian University NTNU observed that nearly all computer science educators (N=22) reported having a positive change experience in the shift from F2F to online education, despite facing pedagogical challenges and prior concerns [11]. However, over half of the participants had prior experience with online teaching and nearly three-quarters had sufficient or partially sufficient competence needed for the change.

In a US ethnographic study by Furr and Ragsdale, incidental learning in five DVC courses was examined. Results showed high levels of participant frustration, technological issues, and lessened academic rigor and quality of instructional delivery [7]. The study revealed an unmet need for technical support and inadequate faculty training on how to use and troubleshoot equipment. It was also found that no faculty development on the pedagogy of teaching at a distance and specific applications to DVC were offered. All instructors and half of the

students rated student-teacher interaction as worse compared to F2F. Factors affording positive experiences and perception were informal class atmosphere, small classes (15-20 students), prior computer skills, and instructor facility with technology and distance education pedagogy. Factors that diminished a positive experience were technical problems, insufficient administrative support, inadequate training, and negative student behaviors.

Yarmand et al. have investigated interaction gaps in synchronous online classrooms using Zoom and found that instructors struggle to understand students' engagement and confusion due to students disabling their cameras and microphones, expressing it as talking into a void [30]. In turn, students were reluctant to use their cameras due to reasons such as their appearance, not seeing the benefit of it, or because they perform other activities during the lecture.

3 Methodology

Data was gathered using Google Forms, a web-based questionnaire. This method is appropriate as we wanted to form an overview of a large number of participants and gather "shallow data" [19, p.106]. 243 (275 in total) valid questionnaire responses were collected between October 12-29th 2020. Qualitative data were manually coded into categories. Each group member marked, compared, and systematized answers and emerging themes before cross-examining the data. The emerging themes from the thematic analysis are summarized in Section 5.Questions concerning digital tools are borrowed from [20].

3.1 Target Users and Sampling

The target users of this study are employees at the University of Bergen (UiB) with a job title of professor, associate professor, or assistant professor (universitetslektor), who have used/are using DVCT in lecturing. Participants were recruited through publicly available mailing lists and received an e-mail with information about the study and a hyperlink to the questionnaire. 1507 e-mails were sent. The response rate is 18.25%, with a completion rate of 88.4%.

The most represented faculties were the Faculty of Mathematics and Natural Sciences (29.6%), the Faculty of Medicine (26.7%), and the Faculty of Humanities (14.4%). For gender distribution 63% were male and 34.2% female, which reflects the gender ratio of UiB's faculty staff [29]. Over half of the participants were above the age of 50. 32.5% were in the range 41-50 years old. Only 3 participants were under the age of 30.

3.2 Survey Design

The questionnaire consists of 32 questions divided into eight sections, seeking to gather quantitative and qualitative data. It contains questions concerning participants' everyday usage of DVCT. The participants are also shown statements about digital tools and DVCT that must be answered on a Likert scale. The last sections display open-ended questions as well as background questions about the participant.

3.3   Ethical Concerns

Participants were informed about the study, its purpose and use of data on the introductory page of the questionnaire. The survey has been approved by the Norwegian Center for Research Data (NSD) [22].

4   Data and Results

In this section, empirical data is presented. Experience is a widely subjective, context-dependent, and dynamic concept, and this makes it harder to draw generalized inferences [17]. The qualitative material gathered consists of 18 107 words in total.

COVID-19 related restrictions were answered as the main motivation to use DVCT by 63.8% of participants. 17.7% of participants mentioned COVID-19 in addition to other reasons such as cost constraints and practicality. 73,3% of respondents use DVCT as a part of their teaching weekly, and 75,7% also use DVCT outside of work every week. Among the most popular tools are Zoom (98,8%), Microsoft Teams (81,9%), and Skype (63,4%). Tools such as Facetime, Google Meet, and Slack were also used. Videonotat was mentioned by some, but this is not considered a DVCT as it requires in-room equipment such as a camera and a room-microphone, and only allows for one-way audio communication. Worth noting is that Zoom has become one of the default solutions used by UiB, and Correia et al. found that it has the highest number of learning-related features such as chat, poll-tools, break-out rooms and virtual hand-raising compared to Skype, Teams and WhatsApp [3]. Although the study focuses on lecturing students, 60.9% of the participants answered that they mainly use DVCT for meetings/conferences. Only 30,9 % answered that it was mainly for lecturing.

4.1   Likert scale Statements about digital tools and DVCT

A considerable part of the questionnaire focused on lecturers' self-evaluation. The participants were asked to take a stand on four questions regarding digital tools in teaching, see Figure 1, followed by nine questions concerning their use and motivations around DVCT, Figure 2.

Although a majority (74,5%) of the respondents claim they are confident in using digital tools in general and find it easy to become familiar with new digital tools (69.9%), only 17.7% think that digital tools are essential for good teaching. This adhere to the findings of Madsen et al. [20]. Further, 25.1% of the participants agreed with the statement *It is difficult to use digital tools as an educational resource within my subject.* Digital tools encompassing everything from social media, online resources, and also DVCT. Out of the 25.1% who agreed that *It is difficult to use digital tools as an educational resource within my subject*, 19 were from the Faculty of Mathematics and 22 from the Faculty of Medicine. The experience of DVCT could be subject-dependent and affected by the lecturer's academic background. One participant explicitly stated that "The nature of my field: Chemistry - make DVCT challenging".

Few of the respondents find it enjoyable to use DVCT. The majority (72.9%), though, find it easy to use, which matches the findings relating to adapting
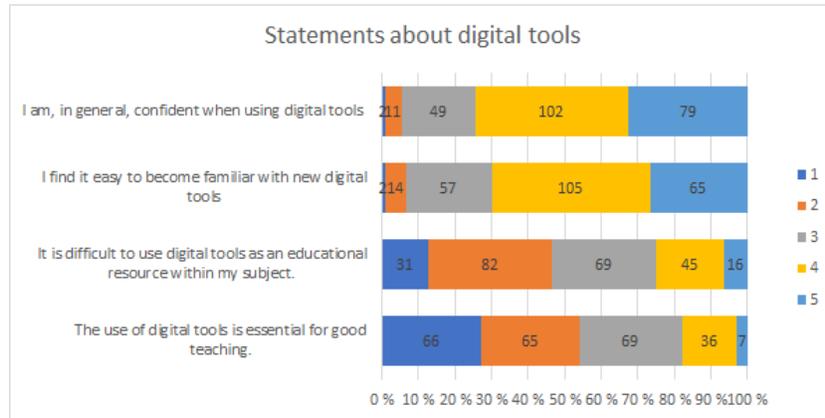
Fig. 1. Answers to statements about the use of digital tools on a Likert scale from 1 = strongly disagree to 5 = strongly agree. Answers are presented in actual numbers with a percentage scale at the bottom.

to new digital tools. Nevertheless, 63.3% of lecturers experienced more stress teaching through DVCT, and when asked if they had received adequate training in using DVCT, only 5.8% strongly agreed, while 46.9% disagreed.

Answers were evenly distributed for the statement *I am less motivated when I know I have to teach using a DVCT*. 42.8% agreed that frequent use of DVCT made them more positive towards it. More than half of the respondents agreed that it takes more time to prepare a DVC lecture then F2F. 28,8% believed there was not much of a difference. Further, 80.2% claimed that students are less active in DVC lectures. When asked whether DVCT affects their relationships with the students positively, only 5% of lecturers agreed. 76.6% disagreed.

4.2   Open-ended Questions

In the following section we present findings of the open-ended questions. For the first question, **Q1:** *How did you prepare for the last lecture you gave using DVCT?* 25,9% of respondents said they prepared as they normally would with F2F. In comparison, 28.8% of participants prepared differently. One wrote, "(...) digital lecturing tolerates less downtime and hesitations, and transitions go fast, so I have to use more time to think about what to say and do so correctly". The most occurring types of extra preparation were making detailed notes, giving the students material to work with in advance, familiarizing themselves with the DVCT, and ensuring shorter session length with a focus on content presentation. Some included interactive activities such as quizzes and breakout rooms to engage students. 18.1% stated that they made a PowerPoint presentation (PPT), without specifying whether or not this was their usual habit. From [15], 92% of lecturers use PPT in their regular teaching at UiB, and it is thus fair to assume that the 18.1% add to the numbers of those who did not do specific changes.

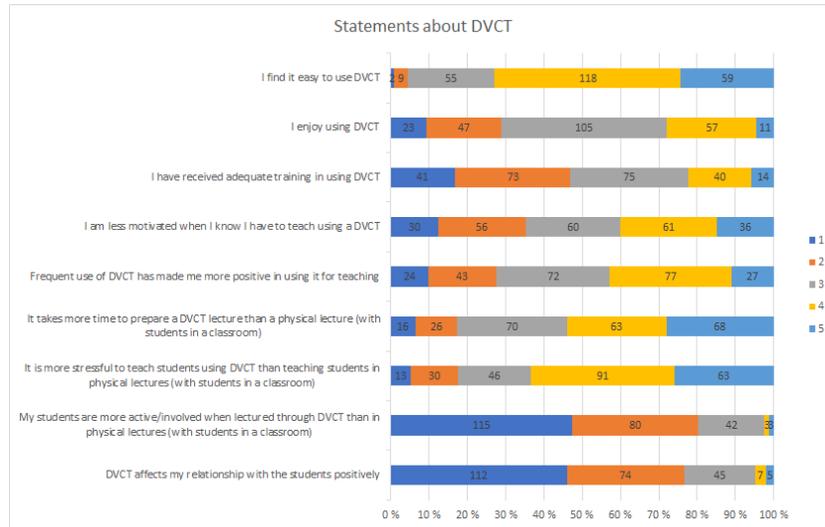The response to the second question, **Q2:** *How would you have prepared if*

Fig. 2. Answers to statements about the use of DVCT on a Likert scale from 1-5.

the last lecture had been physical (with students in a classroom instead)?, showed that 47.3% of participants would prepare the same way which comply with the answers to **Q1**. 4.1% (10) would have used the blackboard.

Due to the ambiguity of question **Q3**: *What were your expectations beforehand?* and **Q4:** *did the lecture meet your expectations?*, several responses yielded no useful data. 15.6% (38) answered that they expected less interaction from the students. 11.1% (27) answered that they had positive/neutral expectations. In total 30.8% of participants had negative expectations prior to their previous lecture and stated concerns of low student interaction, motivation, participation, and technical issues, as well as a lack of body language. One said, "For DVCT lectures I have to lower my expectations". For **Q4** a majority of the data gathered did not indicate whether the lecturers' expectations had been positive or negative. Some participants provided explanations such as "yes, the worst of it is confirmed by every lecture" or "no, the stated goal of having a plenum discussion failed miserably(...)".

When asked **Q5:** *Did any problems arise?* 58% did not experience any, while 39.1% reported various difficulties, either technical or student-related. Technical complications included break-out rooms, connection, sound/video sharing, or the functionality of the DVCT. For student-related issues, preparedness and participation (no camera, silence) were the main issues. One lecturer stated "(...) but it just does not work when students do not engage, leave their cameras off, and use the chat instead of speaking. We might as well communicate by email."

4.3   Open-ended: Strengths and Weaknesses

When asked about the strengths of DVCT, 80% of participants managed to list at least one. Only 14 lecturers stated that DVCT has no strengths at all, and

one exclaimed "I would strongly discourage attempts to fish for positive sides of the current madness (...)". 8 participants specifically said that communication or participation from students works well with DVCT, saying "students feel more comfortable asking questions", and "efficiency, more questions on chat in big lectures". Flexibility was also mentioned as one does not need to book a class-room. 11.5% (28) found the option to record lectures advantageous. Recorded videos enable students to review material whenever. One said that "(...) It can be recorded and uploaded for later watching which makes students concentrate on what I am telling them rather than on taking notes(...)". Nonetheless, some lecturers commented that knowing that all their mistakes would be recorded made them nervous. Another frequently mentioned advantage is that COVID-19 can't spread between the participants. Various respondents pointed out how DVC lectures are not ideal, but the best solution to the current crisis. One participant said that it "can emulate a feeling of co-presence (if everyone has their camera on)". Others strongly argued that DVC lectures can never compare to physical lectures. Arguments concern social and physical presence, stating that conveying practical knowledge is hard. Such a comparison may be unjust, as DVC not only is a different medium but in this case influenced by the hurried and unprepared nature of ERT.

The respondents identified more weaknesses than strengths of DVCT. 83,9% of respondents mentioned that the communication with the students was worse compared to F2F. Attributing factors are less body language and passiveness from students, such as not answering or asking questions. Some lecturers mentioned how it affected them negatively by creating distance and making it hard to spontaneously communicate or use humor. One respondent said "No human contact. A whole lot gets lost in translation, and teaching into an empty void is exhausting. Teaching in person is exhausting, too, but then we build energy together in the classroom/auditorium." Concerns about students being distracted were also noted, with two respondents saying "It is very easy to zone out as a participant or to be distracted by other things(...)" and "It's easy for everyone to be distracted, like when they are watching TV. Which in effect they are. It's hard to get people actively involved in the same way". These findings are supported by [27] who reported that several of the educators in their study struggled with supporting student engagement and perseverance during ERT, as well in [30]. Technical challenges and weaknesses are specifically referred to by 8 respondents.

5 Summary and Discussion

In this empirical study, we have investigated lecturers' experience with DVCT during the COVID-19 pandemic. 243 participants provided us with insights into their personal experiences noting the strengths and disadvantages of DVCT. In the next section, we will summarize and discuss the main themes that emerged.

Negative expectations and experiences: Negative expectations ahead of their previous lecture were noted by one-third of the participants, stating concerns regarding low student interaction, motivation, participation, and technical

issues. Some participants had to mentally prepare to talk to black screens, assuming students would leave their cameras off. Overall the trend is mixed to low sentiments towards teaching with DVCT, and there is a discrepancy between the noted confidence of the lecturers and their experience.

39.9% of lecturers are less motivated when lecturing using a DVCT. Over 60% feel more stressed, and less than one fifth enjoy it. Townsend et al. showed that participants who had negative anticipation towards DVCT were more likely to evaluate it negatively, but our data is insufficient to explore this further [26]. However, over 40% believed that frequent use of DVCT has made them more positive towards it, implying that the overall attitude and experience of DVCT can be improved in line with more experience of using the tools.

About 40% of lecturers claimed they have not received adequate training in using DVCT, and some sought colleagues for help. Half of the educators in [11] consulted coworkers when transition to online education. Several lecturers encountered problems during their last DVC lecture, and perceptions may change towards the negative. Although issues can diminish over time, already established negative attitudes may be hard to correct. Technical- and student-related problems were frequently mentioned which match the findings in contemporary literature [7, 2]. Checking the physical equipment, internet connection, and testing that sound and video run smoothly before the lecture may diminish issues at run-time. Yet, it requires that the lecturer have the time and knowledge to do so. UiB offers online guides on how to use Zoom, but providing extensive training on how to utilize the tools may be beneficial. Experience can make the lecturers increasingly confident in teaching through DVCT and in turn, partially reduce feelings of stress and anxiety. Nevertheless, offering instructions does not imply that the lecturers would put them to use. And although most institutions would have some resources to assist their staff, there is no guarantee that they can meet the disproportionate scale-up of ERT. This was an apparent issue in [7] where the overstretched technical support staff was unable to meet the needs of assisting faculty and students before, during, or after DVCT sessions.

The experience of DVCT is presumably also subject-dependent, and the subject in question should be thoroughly considered when discussing challenges and improvements. For example, Computer Science may face fewer challenges when moving the education online compared to other subjects [11]. One respondent teaching music expressed frustrations due to delay and poor audio quality with DVCT. Other lecturers were perfectly able to continue more or less as usual.

Preparing for a digital environment: 44% of respondents said that they prepared for DVC lectures as they would for F2F lectures by making PPTs and notes, which may influence their experience negatively. By preparing DVC and F2F lectures the same way there is an underlying expectation that both environments fulfill the same needs/requirements unconditionally. Perhaps the lecturer does not know how or does not want to tailor the lecture to the new environment. Limited time to restructure the material is a common problem when transitioning to ERT. Without much instructional guidance educators will turn to what they feel is natural real-time communication and try to replicate the

classroom in videoconferencing virtual meetings [3]. Among participants who did prepare differently, some spent time familiarizing themselves with the DVCT by signing in and checking sound, lighting, and breakout rooms, as well as practicing in front of the camera. Others simplified and shortened existing PPTs, and spent time thinking about how to activate students.

One participant specifically noted that less focus should be on technology and more on teaching pedagogically in a new environment. A suggestion would be to add more breaks and interactivity to the lecture. Tasks, animations and videos, could enhance the students' attention span, however, this requires resources, pedagogical, as well as technological [8]. Some participants used polls and breakout rooms to engage students with mixed success. Others handed out the PPT and online resources in advance. More training in using digital tools as well as adapting the lectures is supported by [14, 27, 7]. Several pedagogic practices have been contextualized to suit ERT. Some of these are to create an inclusive and open environment, to divide content into smaller units, engage students by providing a variety of teaching methods and tools, and to set a guideline for active participation [13]. Hodges et al. suggest that the shift to ERT in a time of crisis requires that the faculty take more control of the course design, development, and implementation process. They also mention that institutions must rethink the way instructional support units do their work [12]. Digitalization should be considered an organizational task, resulting in change and support on multiple layers, as the technology itself does not result in change and development [23]. Guiding lecturers from a pedagogical standpoint, can make lecturers more confident in their teaching and reflect positively on the students. One should also encourage discussion and ideation among lecturers.

Student interaction and relationship: The majority of participants answered that the communication with the students was difficult through DVCT, and over 70% said that the lecturer-student relationship was negatively affected. Student-related issues were also frequently mentioned when asked if any issues arose during their last lecture. Some participants complained that students did not answer the questions asked, remained quiet when put into breakout rooms, or became sleepy during the lecture. Others stated that it was difficult to interact with students one-on-one through DVCT and that students sometimes would partake in the lecture while performing other activities, making them unable to participate actively. Other problems concerned the failure of students' equipment or students showing up unprepared. We did not inquire about class size but one participant specifically said that the students would leave their camera off in classes with more than 20 people. This corresponds to [7] who found that smaller classes work best for DVC where a decline in student participation and instructor control were seen in courses exceeding 15-20 students. A minority of lecturers experienced positive changes in student behaviors through DVCT such as them being more active and involved.

Several lecturers said that DVC lectures would work better if all students had their cameras on. Being unable to see students' faces and "read the room" is challenging as the lecturers are given no clue on how the class is received. They

further voiced their concern for the students' social and physical presence, and that it is hard to convey practical knowledge. It was mentioned that teaching through DVCT was easier in classes where students already knew each other beforehand. Solving the problems of inactive students or students not turning on their cameras is hard, as forcing students to use their cameras might not be eligible due to privacy concerns or the lack of technical equipment. The university could try to encourage them turn on their cameras, and the lecturers could give them material in advance that would be discussed or presented during class. As the lecturers in our study become unmotivated by passive students, perhaps dividing the students into smaller groups could create a safer environment where they feel more comfortable participating. Some of the answers received do however imply that smaller groups does not necessarily make the student speak. Yarmand et al. found that the chat function could be used as an alternate way of engaging students, but this requires the lecturer to pay attention to the chat while speaking [30]. One lecturer tried asking questions in the chat which did not yield any response, while others experienced that students asked more questions through chat than they would F2F. When presenting our findings for UiB's Teaching and Learning in Higher Education (TeLEd) research group, it was suggested that an open dialog between the lecturers and their students about the challenges surrounding DVCT from a lecturers' perspective may encourage understanding and compassion on both sides.

The data gathered shows that the respondents are generally confident when using digital tools and that they find it easy to become familiar with new ones. However, the majority still insist it takes more time to prepare DVCT lectures, and they do not enjoy using them, experiencing stress and lack of motivation. Even though the general trend is low sentiment towards lecturing with DVCT there are individual differences. The subject in question and student participation color the lecturer's experience. The context comes across as a crucial factor as about two-thirds of lecturers mostly use DVCT for meetings. One lecturer said DVCT was a good solution for meetings with few but engaged participants, but not for lecturing, unless the lecture is a monologue. Participants did not experience the shortcomings of DVCT to the same extent in meetings. The specific DVCT in question may also be a contributing factor.

When going through the qualitative data, respondents showed strong emotions when expressing their opinions. This may be a byproduct of being forced to use DVCT and should be taken seriously. Understanding the emotional dimension is important because emotion and cognition are closely intertwined [1]. Additionally, we propose to investigate how the experience differs across different fields, as not all fields rely on traditional lectures. In this study, we looked at the experience of using DVCT to lecture in general but looking at the differences between tools and synchronous and asynchronous video may provide new insights.

5.1   Limitations

As the survey was only sent to employees with certain job titles, there is a chance that not all lecturers were invited. The sampling is done by self-selection, and those who accepted the invitation may have strong opinions on the topic. We initially tried to conduct a snowball sampling [25, p.261] at the Western Norway University of Applied Sciences, but received less than 5 responses. Thus the data only reflects UiB. We recognize that the generalizability is limited, but we believe that the data gathered may be useful in bringing further insights into the topic.

Recall bias should be considered when asking participants to describe past experiences [28]. The majority of the respondents answered our questionnaire in English. This minimizes translation bias, but some nuances may fall through as most of the respondents presumably are native Norwegian speakers.

We have not differentiated between those using DVCT as a standalone tool or those who use hybrid solutions where some participants are physically present with the lecturer. A couple of respondents said that DVCT is a good addition to physical lectures. This should be studied separately. We have not paid attention to different DVCT. While they share the same basic functionality, some features differ. Our focus has been on live instructions, but some participants did also rely on pre-recorded videos which will require different skills from the lecturer than conducting live online lectures.

Some participants mentioned that we have not made a distinction between those who do not typically use the lecture format (i.e. they mainly use fieldwork or group sessions) and those who mainly lecture in the traditional sense of talking in front of a classroom. Since we did not define what we meant by "a lecture", and did not specifically distinguish between teaching and lecturing, there may be discrepancies in how the participants understood our questions. There is room for further exploration of how different teaching styles conform with DVCT.

6   Conclusion

In this study we have identified several factors contributing to lecturers' experience with teaching through DVCT, including lack of training, negative expectations, stress and lacking student communication/participation. Some of these can be eliminated through extensive training of lecturers on how to use DVCT, as well as how to conduct interactive and pedagogically sound lectures. By bringing greater awareness to how lecturers feel and experience DVC, one can proceed to plan strategies and intervention to help foster positive experiences and confident lecturers. This can be done through workshops, peer-support and trial-and-error of lecturing with DVCT. Familiarizing oneself with DVCT and how to lecture in such an environment before a time of crisis, may not only promote positive experiences on the behalf of both lecturers and students, but also ensure the continuity of good education. One should also look at factors beyond the lecturer such as the educational institution, available resources, and students' needs and wishes to provide high-quality education even in times of emergencies.

Acknowledgments

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