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A Study in Higher Music Education

Levinsen, Karin; Ørngreen, Rikke; Buhl, Mie

Published in:

Proceedings of the 12th European Conference of E-learning

Publication date:

2013

Document Version

Early version, also known as pre-print

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Levinsen, K., Ørngreen, R., & Buhl, M. (2013). Telepresence as Educational Practice in the Third Teaching-Room: A Study in Higher Music Education. In M. Ciussi, & M. Augier (Eds.), *Proceedings of the 12th European Conference of E-learning* (1 ed., pp. 250-257). Academic Conferences and Publishing International.
<http://www.scopus.com/inward/record.url?scp=84899543966&partnerID=8YFLogxK>

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Telepresence as educational practice in the third teaching-room – a study in advanced music education

Karin Tweddell Levinsen, Rikke Ørngreen, Mie Buhl, Aalborg University, Copenhagen, Denmark

kale@learnin.aau.dk

rior@learnin.aau.dk

mib@hum.aau.dk

Abstract: The use of Video Conferencing (VC) in educational settings is presently taking off and most research and case studies report that participants find themselves comfortable in the mediated context. However, as the use of VC becomes more common, challenges emerge that affects both the participants' experience of closeness and contact - also called *telepresence* – and the learning outcome in negative ways. We have found that some challenges to telepresence appear to the participants as opaque and intangible and leave them without appropriate prerequisites to act in useful and meaningful ways. During 2011 and 2012 we have conducted a research and development project: *Telepresence as educational practice in the Royal Danish Academy of Music (RDAM) educations* in collaboration with RDAM and their international partners within VC-based teaching and learning in the domain of world excellence advanced music education. The study draws on action design involving specially designed teaching scenarios with experienced teachers who are novices to VC. The scenarios include iteration of a series of designed activities, which allow experiments with interventions aimed to develop VC-based designs for learning in collaboration with teachers and technicians at the RDAM-end. The cases address individual tuition. Our data collecting methods include: Written reports from students, MindTape sessions, Skype interviews, focus group interviews via VC, video recordings and observation of both VC and conventional sessions. Although the study aims at advanced music education, we find the project and findings of relevance to VC-based teaching in general. Our findings suggest that telepresence encompasses the technicians' practise when facilitating the teaching sessions, while the concept displays shortcomings regarding the interpersonal relations and interaction between teacher and student(s). In order to encompass the VC-based teaching situation more fully we introduce the concept *the third teaching-room*. Additionally we have found that VC-based teaching may not only affect the teacher-student relation and agency in *the third teaching-room* but may also challenge the teachers' practice in conventional settings. In this paper we present our research findings and theoretical development regarding *telepresence* and *the third teaching-room* as they relate to VC in teaching situations.

Keywords: Telepresence, third teaching-room, video conferencing, multimodality, design for learning, music education

1. Introduction

Due to globalization, distributed campuses and technological development, distance learning performed as Video Conference (VC) teaching is becoming a common practice. In Denmark we see a growth in VC-based teaching in higher education (surgery, nursing, language teaching, ICT and learning); vocational education (teacher, social and health, and electricians education); and even high school. The teaching may vary from lectures for audiences to dialogue based teaching, student centred PBL-based and collaborative learning setups.

Teaching music at the advanced level using VC is a relative newcomer in this context. Since 2009 *the Royal Danish Academy of Music* (RDAM) has run a development project in which instrumental and vocalist teaching take place in RDAM's technological advanced VC-environment (VCE) in collaboration with international partners of world excellence, e.g. opera vocalists, instrumental soloists, members of philharmonic orchestras, conductors and composers. Video and sound is transmitted through *Internet2* that offers high performance transmission and minimum delay. At first, the implementation of VCE was experienced as "business as usual". However, challenges for the pedagogic everyday practice for students, teachers and technicians gradually emerged as they did not experience a clear distinction between technical and human factors. Therefore, a research perspective was established in early 2011 as a pre-project aiming at a large scale research project in terms of identifying appropriate research questions and a research strategy (For details see Ørngreen et al (2012)). The resulting project *Telepresence as educational practice in the Royal Danish Academy of Music educations*, running in

2012-13, focussed on the use of VC regarding individual music tuition in the domain of world excellence classical music education. The presented findings stem from our data analysis during the spring 2013.

2. Literature study

RDAM and their partners had found it difficult to find help solving their experienced challenges. We encountered the same difficulties in our pre-project during our literature studies.

Telepresence is a central concept used to describe VC and other computer mediated environments. Draper (1998) defines telepresence in two ways: 1) a technology that allows the projection of a person to a remote environment; or 2) a personal experience of either being present in the remote environment (typically manipulation of robots) or being present in a mediated environment. In 2004 and again in 2009 an extensive State of the Art-Study of VC found a majority of case studies in the report genre and few in-depth research studies, especially within surgery and nursing (Greenberg 2009). In 2011-12 we found this still to be the case. We found a few studies focusing on the participants' experience and learning from a phenomenological perspective within surgery (Augestad & Lindsetmo 2009) and performing arts (Bailey et al. 2009, Orman & Whitaker 2010, Penalba et al 2011). Some of the early findings that have become shared knowledge in the field of VC are also found in the pre-project and the full-scale RDAM-study. Most studies, including ours, report that participants express surprise of how easily they adjust to the VCE. As Marrow et al. (2002) we have found that VC scaffolds students' reflexivity and ability to solve problems. We have found the same advantages as Maruping & Agarwal (2009) in terms of immediate feedback, repertoire of multimodal sign systems and sense-modalities, synchronous communication and social closeness, along with the effect of delay on dialogue-functions as turn-taking, sequencing and repairment (Ruhleder & Jordan 2001, Marrow et al. 2002), which again affect the experience of trust and telepresence (Ruhleder & Jordan 2001). Their conclusion, which we also documented, is that the teaching situation and the students learning are highly dependent on mutual trust, which again relies on the quality of experienced telepresence during the sessions. Like Hedestig & Kaptelinin (2005) we found that breakdowns are unavoidable and that rather than trying to eliminate them, they must be overcome in order to maintain and facilitate the shared VCE as a *place* where humans can be and interact, instead of a *space* or a *configuration* of individuals and artefacts. In the process of maintaining the participants' experience of *place* in the learning situation, we have - in line with Hedestig & Kaptelinin - found that technicians become important facilitators of *place* regarding both technical and collaborative breakdowns.

The few recent examples of research that address telepresence as a personal experience or from a learning perspective originate from performing arts. The e-Dance project (Bailey et al. 2009) is a complex sensory VCE that creates "*a context for telepresent, distributed performance, and ... a data repository for choreographic reflection in/on process*" (p. 2794-5) and allows choreographer and dancers to collaborate over distance. The e-Dance project has no educational perspective so far but explores new collaborative practices made possible by telepresent technology and finds that the environment challenges both the dancers embodied experience and the choreographer's craft (ibid p. 2805). The Opera eLearning Project aims at a VCE for teaching advanced level master classes for vocalists in combination with asynchronous blended learning resources and strives to reproduce the conventional master class as seamless interaction, to overcome distance and allow students to meet great masters (Penalba et al. 2011). So far, data are not analysed from a music education perspective. Both projects focus on telepresent technology but where the e-Dance project explores new ways of agency through telepresent technology, The Opera eLearning Project aims at reproducing the conventional opera master class. Where the participants in The Opera eLearning Project adjusted to the VCE, the e-Dance project found challenges regarding the dancers' embodied experience and the choreographer's craft. We have only found one study that explores VC and telepresence from an educational perspective regarding music education. In a large quantitative study Orman & Whitaker analysed VC classes regarding: "*sequential patterns of instruction, focus of attention, amount and type of performance, eye contact, and other nonverbal behaviors*" (Orman & Whitaker 2010, p. 4) and found that students performed/played more frequently (22%) and that eye contact increased during distance lessons.

Greenberg (2009, p 12) divides the literature into two positions that correspond with the recent studies mentioned above: either there *is/is not* a significant difference between VC and conventional teaching. However, in our pre-project we found both positions (Ørngreen et al 2012):

- There *is no* difference. The participants claim that VC sessions are just like conventional lessons; they experience being together in a shared place just as they are used to.
- There *is a* difference. When the experience of closeness is disturbed, the participants may find themselves without appropriate prerequisites to act in useful and meaningful ways; they experience hyper-focus during and fatigue after VC sessions that differ from conventional settings.

These aspects are not addressed in the literature and we agree with Greenberg (2009) who explains the lack with reference to Joy (2000): "... *most researchers in the field fail to control for critical factors, such as pedagogical method, prior student knowledge, and teacher and student ability*". Thus, the pre-project identifies areas where the RDAM project may contribute with knowledge that addresses fundamental challenges and options regarding VC-based teaching and learning. This is the point of departure for project *Telepresence as educational practice in the Royal Danish Music Academy*.

3. Research design and data collection

The research focus of project *Telepresence as educational practice in the Royal Danish Music Academy* became the impact of VC-based mediation on the participants *experienced telepresence, forms of dialogue, re-mediation of tacit and embodied knowledge, and management of cultural differences* as both challenges and options. The project aimed to explore, identify and develop resilient and sustainable Design for Learning-principles and teaching practices in VCE. Accordingly the empirical research was designed as typical VC-based teaching scenarios that served a double purpose: 1) study the impact of mediation on teaching and learning; 2) serve as an organisational framework for development of the educational practice from both the experience and technology perspective on telepresence.

As described earlier, *telepresence* refers to the individual experience of being present within a mediated or in a remote environment, or the technology that allows remote representation of a person. However, one person may have the feeling of telepresence while others may not have it at all. Accordingly, telepresence as an individualized concept cannot embrace the mutually shared feeling of togetherness in a mediated environment, which is a precondition for successful performance of interpersonal interaction (Ruhleder & Jordan 2001, Augestad & Lindsetmo 2009). In order to distinguish the digital mediated environment as a *space* of elements (actors and artefacts) from the mutually shared experience as a *place* where humans can be and interact (Hedestig & Kaptelinin 2005), we introduce *the third teaching-room*. By *the third teaching-room* we mean: The mutually shared feeling of being and doing together in an individual and mentally constructed merge of the VC-mediation, the near and the remote locations. Based on the pre-project and these reflections, the research questions became:

- Which factors influence the establishment and consolidation of teaching practice of respectively the novice and the experienced teacher in *the third teaching-room*?
- Which factors influence the establishment of telepresence and sustainable strategies for pedagogy and design for learning?
- Which new pedagogic approaches and designs for learning can be explored and developed as meaningful challenges for the learner?

Due to the explorative nature of our research interest and the nature of the field, the project was designed as a research and development project within the frame of participatory action research (Argyris & Schön 1996, Reason & Bradbury 2007, Nielsen & Nielsen 2010) rather than a hypothesis driven approach. Participatory action research implies close collaboration between researchers and participants and relies on mutual trust. The method allows the researchers to come close to the participants' professional life-world with a minimum of disturbance. Thus, in the project we collaborated to design interventions in an iterative process driving both the development of and research into the teaching practice and appropriate VC-based designs for learning and pedagogical principles.

We designed three scenarios. Due to practical reasons only one was realised but then in three variations. These were followed for 4 VCE-sessions and a conventional face-to-face session for comparison. All sessions were documented through observation at the RDAM-end and recorded as split-screen video showing both ends simultaneously. In order to facilitate the transformation of experiences into new interventions, the following activities were iterated: 1) (new) experiences; 2) video observation by participants reporting incident of special interest; 3) MindTape dialogue between researcher and teacher; 4) design of experiments; 5) feedback on experiments. MindTape is a dialogue-driven method, where the researcher probes and questions the teacher about why's and how's of their experience, actions and

behavior under the stimulus of replaying the recorded session (Nielsen & Christiansen 2000). The data includes written reports from students, 2 MindTape sessions with teachers, 6 student interviews using Skype, 2 VCE-based group interviews with technicians, video recordings and observation of 36 VCE-sessions and 9 conventional sessions, continued dialogue with teachers and technicians at the RDAM-end, and knowledge sharing workshops, which also included teachers working with VCE who were not part of the project. In order to use our data in the workshops and in scientific presentations, we have entered into ethical agreements with all institutions, individual teachers, and students

4. The scenarios and findings

As mentioned above we only succeeded in realising one scenario. This scenario involved three experienced teachers being novices to VCE: 1) cello with 3 students from New World Symphony in Miami; 2) piano with 3 students; and 3) vocalists with 4 students, all from Cleveland Institute of Music. The teachers who are all internationally acknowledged performers teach at RDAM and participated from Copenhagen. In the following we present findings that are shared between the variations, followed by findings that relate to the individual variation.

As generally found and documented again in The Opera eLearning Project, the participants found VCE and *the third teaching-room* a pleasant and functional learning environment. In the Opera project master classes, where participants do not necessarily establish personal relations, participants felt comfortable, while in our project they felt that they got to know each other through the 4 VCE-sessions. They adjusted quickly to the slight delay and established a flow and intensity comparable to the experience of conventional sessions. However, as in the e-Dance project the adjustment involved changes in the teacher-student interaction, their embodied experience with their instrument and performance and the teachers' professional practice. In conventional sessions we found that the teacher touch and correct the student's physical posture, point at or even write in their score, direct the tempo by tapping and express the feel of the music by waving hands and they play together with the student. In VCE-sessions we found distinct turn-taking and an increase in eye contact just as Orman and Whitaker (2010). They also found that students played more in the mediated sessions. Here we found that whether students perform more or less, and in longer or shorter sequences depends on the instrument, types of compositions or the student's level rather than on the environment. During the knowledge sharing workshops, some of the findings came as a surprise for the teachers.

According to Penalba et al. (2011, p 2) a master class is not oriented towards teaching the instrument as mastering at a high degree of proficiency is a precondition. They claim, with reference to studies in music education, that "*... the teacher is devoted to reviewing beyond the technique the interpretation of the musical repertoire, conducting the expression ..., the emotions and artistic quality of the performance, often using images and metaphors that make it easier for the student to understand the feeling required ...*". We found the same focus on interpretation and artistic performance in conventional sessions, but as mentioned above we also found that even at this advanced level, corrections involved interventions regarding the students embodied technique, e.g. the vocalists' physical posture, the cellists' fingering and the pianists' use of the shoulder – that is, teaching both body and instrument. Accordingly, in the VCE-sessions, the non-verbalised communication had to be remediated into metaphor loaded dialogue and made explicit through gesturing and sign-making exceeding the use of metaphors and images according to Penalba et al. In conjunction with the findings above, we learned from the RDAM project that tacit elements that are difficult to remediate may vanish unnoticed from the practice.

Finally we found that the conventional sessions was dominated by an instructional approach challenged in the VCE-sessions and forcing the teachers to modify their teaching practice towards a constructivist approach. Analysis of the video recordings revealed that the distinct turn-taking and increased eye contact in the VCE-sessions produced dialogues between teacher and student. As the teacher could not point, write or demonstrate on top of the students playing, the students had look in the score and formulate suggestions themselves as words and through the instrument as input to what became reflective dialogues. Again, this is an example of changes unnoticed by the participants. In this case we find that something new emerges in the teaching session: A place for reflectivity. Confronted with these findings during a knowledge sharing workshop, the teachers explained that they actually might be more reflective regarding their teaching practise in terms of what to focus on during a session and the balance

between teacher and student agency. They also found that the benefits of this new reflectivity may inspire their conventional sessions towards a more constructivist practice. One teacher expressed that the students might understand and remember more if they write in their score themselves, rather than having difficulties pointed out by the teacher.

4.1 Cello

In the specific sessions we found differences related to the multimodal sign-systems and multi-sensory systems involved, along with the physical positioning between teacher and student due to type of instrument that affected the VCE-sessions differently. We found that the more direct similarities between conventional and mediated sessions, the less impact of mediation on the teacher-student interaction, their embodied experience and the teachers' professional practice.



Figure 1: Screen dump of Split screen recording showing far-end (Miami) and near-end (Copenhagen)

We found cello to be most easily transferred to VCE as the participants are placed front towards each other in both conventional and VCE-sessions, while body posture and hand movements are visible in detail in both total and medium camera views (Figure 1).

Here we touch the opposing views on VCE found in the literature study: There *is/is not* a difference. In our study we found experiences grading from no difference to a lot of difference. According to Dolezal (2009, p. 213) “*the human subject is an embodied subject, woven into the fabric of the world ... such that in matters of perception and experience one cannot be said to precede the other.*” Being a lived body is a lifelong learning process, meaning our interpretations are plastic and according to Armel and Ramachandran (2003) they are categorized by the central nervous system as a part of our bodily self from earliest childhood. As long as these categorizations are not challenged seriously, we adjust and modify our plastic embodied experience without even noticing. When the setup, as in the eDance project or more subtle during incidents in our VCE-sessions, disturb the body schema we have to change our perception of the lived body and reconstruct even at the level of our central nervous system. However, in order to do so we have to become conscious of the disturbance or mismatch and we have to work consciously to adapt our body schema to the new experience. In 1896 spectators of a moving picture of a train coming towards the camera were frightened and unconsciously guided by their embodied experience of how to act to danger – they did not want to be run over by the train. In order to percept the train as a representation of a train, people had to change body schema on a deeper level. In the case of moving images people saw the machinery and learned to percept the representation. The challenge for VCE is that, figuratively speaking, “the machinery” = *third teaching-room* is invisible and in some cases people keep “running away from the train”. Here we find that methods as MindTape (Nielsen & Christiansen 2000), peer to peer supervision and knowledge sharing reveal “the machinery” and help to produce the conscious awareness necessary for working on the body schema.

4.2 Vocalist

For vocalists, their full body is the instrument and both teacher and students need to see the full body posture as well as facial details. In conventional sessions the student and teacher have to build trust in order to feel comfortable when physical closeness trespass their personal zone of proximity. In the VCE-

sessions this is remediated to extreme close-ups of facial details. Telepresent technology affords this but being object to or viewer of these extreme close-ups may personally and socially challenge the experienced telepresence and accordingly also the experience of *the third teaching-room*. The sound is another challenge as the voice sound is closely connected to the singer's body posture, control of breath and body movement. Therefore, it becomes an issue how different the transmitted sound is from its source in the far-end. Although *Internet2* offers the highest quality of sound transmission, the physical acoustics in near- and far-end together with the technicians choice of representing the sound through mixing, affect the shared experience of sound in *the third teaching-room* and the participants' frame of reference. During a knowledge sharing workshop we learned that these issues are also relevant to wind instruments and even that some instrumental sounds are interpreted as noise by the telepresent technology and subsequently suppressed.



Figure 2: Split screen recording. The teacher and the student work with tensions in the student's jaw.

From this we learn that the experienced *third teaching-room* does not depend on a naturalistic mediation striving to reproduce the *real thing*. Being in *the third teaching-room* is a matter of being able to see and hear what is needed when it is needed and being able to act and interact in appropriate ways. In order to achieve this, the technicians have to be sensitive to the relation between telepresent technology and the participants experience and run a parallel *third facilitators' room* where they collaborate without disturbing the teacher and the students.

4.3 Piano

Piano differs from cello and vocalists as the teacher and student are always placed side by side in conventional sessions. Here observations revealed that direct eye contact and speech are rare, while awareness of gestures using peripheral focus is dominant. Often the teacher plays on top of the student to attract attention, stands behind the student making hand gestures in the student's peripheral view, or underlines details in the score with a pencil while the student is playing. Peripheral focus, marking with a pencil or pointing cannot be transferred to VCE. These activities have to be re-mediated and with piano we saw that the construction of *the third place* came to rely heavily on eye contact and metaphor loaded speech. In order to solve this challenge we experimented with camera settings (figure 3 and 4). We found a specific solution in the piano case where both teacher and student(s) felt comfortable and during a knowledge sharing workshop we learned that these issues are also relevant for church organ.

The general finding is that in VC-sessions the student(s) and the teacher do not necessarily need identical telepresent technology setups. Both parties need a setup to supports eye contact during dialogue. Where teachers need overall and detailed views of students, students need to maintain awareness of the teacher and to catch cues while playing. With the technology satisfactorily set up we found that if the teacher forgot to maintain eye contact when commenting on critical issues, e.g. the student's embodied feel for the piano, *the third teaching-room* became an unpleasant place for the

student. This is an example of the importance of the concept *the third teaching-room*. As both breakdown and repairment is a matter of mutual rebuilding trust they cannot be embraced by the individually oriented concept *telepresence*.

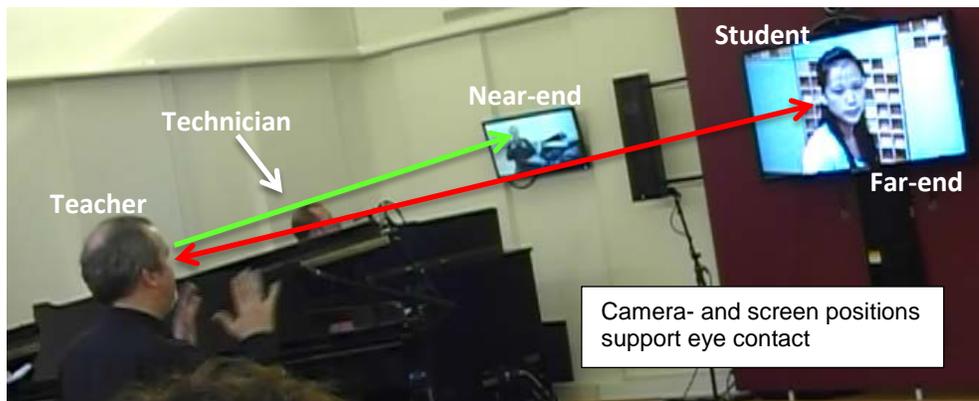


Figure 3: Copenhagen setup. Red arrow: Teacher - student eye contact. Green arrow: The teacher follows his own near-end representation. In the background: the technician.



Figure 4: Split-screen recording. The teacher follows body posture on the total and fingering in the close-up picture-in-picture. The student uses her far-end monitor for sideways glances and peripheral views of the teacher.

5. In Conclusion

The literature study pointed at two opposing views regarding VCE and telepresence: There *is/ is not* a difference. However, we found that the participant experienced (almost) no difference while our analysis revealed a graduation of differences from minor to rather radical changes that all seemed to happen unnoticed. We have not yet identified elements of importance that have vanished, but we have found that the reflectivity emerging in the VCE-sessions was not recognized as a driver of learning. Reflectivity as an option for teaching was first recognized during the knowledge sharing workshop where some of the teachers began to see advantages of applying constructivist teaching practice in conventional sessions too.

The apparent simplicity of the cello sessions led us towards an understanding of the mechanism producing the phenomenological experience of no difference even when differences are obvious. The challenge for VCE-teaching is that we as humans rely on our body schema, which produces blind spots regarding these differences until we are forced to make changes. We found that the teachers need to see “the machinery” from the outside in order to become conscious of where and how they can develop their teaching practice. The vocalist sessions were more complex and from that we learned that the experience of telepresence and *the third teaching-room* depend on available and affordable options for agency and interaction, rather than naturalistic mediated representations. Finally we found in the piano sessions that teachers’ and students’ needs are different and this should be considered when designing for teaching and learning in VCE. In all these processes, we found that technicians in both ends play an important role

as mutual creators of *the third teaching-room*, facilitators of trust and turn-taking, as they perform the sound and image mixing, as well as being caretakers of technical breakdowns during sessions.

6. Acknowledgements,

The project is supported by research funds from the Danish Ministry for Culture and The Royal Danish Academy of Music special development funds. Thanks to students, staff and technicians from The Royal Danish Academy of Music. Thanks to students, staff and technicians from Cleveland Institute of Music, Ohio and New World Symphony in Miami, Florida.

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