

Now you (don't) see me – Camera use in online course settings

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Abstract: The COVID-19 pandemic has accelerated the transformation towards online and hybrid teaching. While these modalities have been shown to have many beneficial aspects, they can also limit the social presence and collective engagement in learning activities. In this paper, we present exploratory observations on the role of video features in online and hybrid course settings during the pandemic. By analyzing survey data from three university courses in 2021/2022, we identify different explanations for students' behavior in regulating their social presence by turning their cameras on (or rather off). We suggest that the benefits of cameras are highly contextual and may conflict with students' specific goals and expectations, as well as their territorial habits, which should be taken into account when designing course content and didactic methods.

Keywords: Camera use, online teaching, computer-mediated communication, social presence

1 Introduction

With the advent of the COVID-19 pandemic, teaching activities quickly transitioned to online settings worldwide. While this allowed instruction to continue, it radically changed the social environment of the classroom into a dispersed crowd of individuals rather than a collective learning community of students.

Beginning in the fall semester of 2021/2022, our business school allowed and (technically) enabled us to teach courses in hybrid classrooms, with some students on campus and others online. This allowed us to conduct an explorative study to investigate students' behavior in online settings compared to hybrid courses regarding social presence and camera use.

In terms of learning outcomes, recent literature suggests that online instruction should perform as well as face-to-face instruction in most cases [DS21a, MM21]. When comparing learning outcomes in face-to-face and hybrid distance courses, Daigle and Stuvland [DS21b] found that perceptions of social presence significantly predicted learning performance, far more so than modality.

Building on these observations, we were interested in comparing student ratings between hybrid (in-person or online attendance) and online-only courses, i.e., whether students who participated in in-person classes in one of the courses would evaluate their experience

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differently than students who attended online only. Anecdotal evidence from our early COVID-19 emergency online classes indicated that students were passive participants and were reluctant to activate their video cameras, even when asked to do so. Because such behavior is likely to affect perceptions of collective social presence, we asked the students to provide reasons for using or not using the camera.

Against this background, in this paper, we present our findings on the following explorative research question: *How do participants use their video cameras in online courses and why?*

The results of this work are relevant to the design of future high-quality courses that not only impart knowledge but also embed students in a community of practice. The demand for flexible course formats has grown steadily over the last decade and has been further accelerated by COVID-19. We, therefore, do not expect it to slow down any time soon.

2 Related work

To address our research question, we focused on social presence, an important construct in computer-mediated communication, and its implications for online teaching, as well as the associations of social presence with technological support, especially the role of visual representations such as video.

Research on camera use suggests the benefits of video activation in terms of social presence [Ba20, CS21, SVA22]. However, negative aspects, such as invasion of privacy or technical problems that jeopardize the proper use of the video function, have also been discussed as justifications for not using a camera [CS21, SVA22]. The negative impact of perceived privacy on social presence is a well-known phenomenon and challenge in distance learning situations [TM02].

Computer-mediated communication technologies have long been studied in terms of how, to what extent, and with what effects they can convey social information. Media richness theory [DL86] attempts to compare communication media according to their “richness” and their ability to convey social cues, hypothesizing that richer media (e.g., video conferencing) should be more effective when communicating ambiguous information.

In their theory of media synchronicity, Dennis and Valacich [DV08] suggest that it is not the richness of a medium that is important, but its synchronicity, i.e., the extent to which communication participants are working together on the same tasks. They propose that lower synchronicity is required for conveyance processes (i.e., less need to transmit and process information simultaneously) than for convergence processes (i.e., the greater need to transmit and process information quickly to develop a common understanding). Suitable media for low synchronicity would be documents or email and for high synchronicity face-to-face meetings or video conferences [DV08, p. 589].

The common assumption of the above research is that certain characteristics of a medium can increase or decrease social presence, with most finding that face-to-face conversations are the “gold standard” for achieving social presence. Other research suggests that individuals can adapt to different communication media to achieve their goals, such that environments with fewer communication cues can produce the same social presence, although it may take longer to establish [OBW18, p. 3]. Rettie [Re03] suggests that, while media richness and social presence are important, individuals choose communication channels primarily according to the degree of desired connection.

From a more practical perspective, research has identified various antecedents of social presence and how to address them through technology, such as visual representation, interactivity, audio quality, and haptic feedback [OBW18]. For online learning environments, the role of video seems particularly interesting. While the visual representation of participants (e.g., avatars, profile pictures) has consistently been found to improve social presence, Oh et al. [OBW18] report that less than half of the studies reviewed found that adding video to audio improved social presence. This indicates that increasing immersion does not necessarily increase social presence, suggesting a threshold of diminishing returns [OBW18, p. 20].

Depending on the social orientation of the participants, visual interaction via video may or may not be preferable for online interaction [OBW18, p. 25]. Regarding the benefits of video on social presence, Yoo and Alavi [YA01] found that the media condition (audio vs. video conferencing) had a significantly smaller effect on social presence than group cohesion in established groups. Also, in cooperative digital games, Gajadhar [Ga12] found that communicating with other players via audio works better than via video because the player’s visual channel is already heavily taxed by the game.

Finally, it should be mentioned that social presence is not only influenced by technology, but is also highly dependent on other factors, such as course design, participation, and instructors [Ar03].

3 Study design and procedure

We explored the research question by observing three courses in our MSc program in Information Systems in the fall semester of 2021/2022 for all classes.² All courses were rewarded with three credit points (ECTS) and spanned over 14 weeks (with a corresponding number of attendance units, 90 min each). Attendance was voluntary for all courses. The detailed course characteristics are shown in Tab. 1.

² Our business school groups students into classes of about 50, so the courses were evaluated by two classes.

	Enterprise Architecture (EPA_online)	IT Security (ITS_hybrid)	Project and Change Management (PCM_online)
Syllabus	Practical modeling of enterprise architectures.	Technical foundations of IT security with hands-on lab experience.	Basic Leadership, business transformation, and multi-project management.
Teaching concept	Flipped classroom: self-learning with videos and literature, discussion of exercises in units.	Synchronous lectures and hands-on lab homework.	Synchronous lectures, case analysis, and exercises (including group exercises).
Teaching mode	Online only (Microsoft Teams).	Hybrid: students were free to participate online (Cisco Webex) or in person.	Online only (Zoom).
Course assessment	Written final exam.	Written final exam.	Two graded group assignments and three online tests (pass/fail).
Recording	All attendance units were video recorded.	All attendance units were video recorded.	No attendance units were video recorded (with one exception for organizational reasons).

Tab. 1: Course characteristics

Students were surveyed at the end of the semester using an online questionnaire distributed through the central learning management system.

The online questionnaire consisted of a general section to collect participant information (class affiliation, academic background, employment status). In addition, specific questions per course were asked (i.e., three times total; one block of questions per course to avoid relative ratings of the courses).³

For our research question regarding camera usage, we collected the following information from the participants:

- *Number of synchronous units* attended (in steps of two from zero to 14)

³ Quantitative results of the course evaluation regarding social presence are presented in [MLH23].

- *Usage of a video camera* when participating online (“mostly yes” or “mostly no”)
- *Rationale* for video camera use (free text)

We analyzed participants’ responses descriptively as to whether they activated their cameras during their online participation. Survey participants were able to give multiple reasons and to give different reasons for different courses. All students in the two classes of the semester (97 participants in total) were invited to participate in the survey. 30 students completed the survey (30.93% response rate), of which 25 students responded to the open-ended question (25.77% response rate).

Following Saldaña [Sa15], the first cycle of analysis focused on participants’ rationales for using the camera, employing attribute coding (i.e., extracting meta-information for data management) and initial descriptive coding (i.e., coding the free text responses with their dominant themes). We inductively defined codes for and against camera use, resulting in an initial exploratory set of categories. We then applied code mapping [Sa15] to further categorize the emerging codes and categories (see Tab. 2). The coding process was performed sequentially by the first and second authors, and disagreements were resolved. All authors reviewed the results.

4 Results

Almost half of the participants came from class A ($n = 13$) and half from class B ($n = 17$). Exactly half of the respondents indicated a technical background and the other half reported none. Most participants reported working part-time (80%, $n = 24$), few worked full-time (13.33%, $n = 4$), and two participants did not provide any information.

Most of the participants attended classes regularly, apart from *PCM_online*. Unlike the other two courses, where end-of-semester exams had to be taken, *PCM_online* grading was administered during the semester – students were thus often present only at those units that were relevant to them.

Across all courses, participants consistently reported that they had not activated their cameras most of the time when participating online (Fig. 1). Participants gave various reasons why they did (not) activate the camera. In general, fewer reasons were given for the *ITS_hybrid* course, as only online participants answered the questions about camera usage for this course.

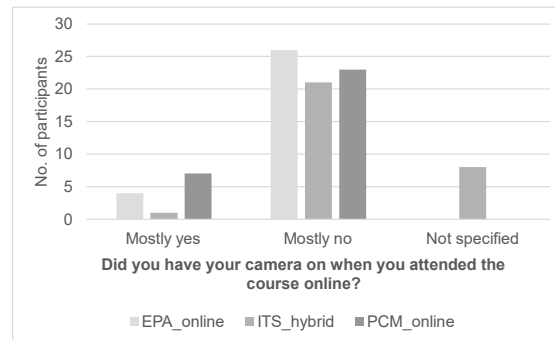


Fig. 1: Camera usage in online classes

Tab. 2 provides an overview of the reasons and the total number of participants who indicated these for at least one of the courses. Some reasons could be assigned to more than one category.

Category/reason	Camera	#
<i>Learning</i>		19
Group dynamics: “no one else turned on the camera”, undesired focus on the visible few	OFF	9
Better concentration without camera, less biased, more active listening	OFF	2
Better social interaction, more dynamics, and more engagement with activated camera	ON	3
Using the camera when actively involved, e.g., speaking or presenting	ON/OFF	3
Using the camera when collaborating in smaller working groups	ON/OFF	2
<i>Privacy</i>		14
Wish not to be seen or observed (also during unrelated activities like housework or eating)	OFF	8
Wish not to be recorded on video	OFF	4
Better concentration without camera, less biased, more active listening	OFF	2
<i>Lecturer</i>		12
Better social interaction, more dynamics, and more engagement with activated camera	ON	3
Out of respect for the lecturer	ON	3
Actively addressed, asked, or wished for and/or requested by the lecturer	ON	3
Lecturer did not care; annoyed by lecturer’s wish to turn the camera on	OFF	3
<i>Technology</i>		5
No camera, issues with internet connection, camera orientation, lighting	OFF	5

Tab. 2: Reasons for (not) using the camera

The most frequently mentioned reasons for not turning on the camera were related to the learning situation (19). The most common reason in this category was group dynamics (9). Participants mentioned that only a few other students turned on their cameras, making them the center of attention – students who found this uncomfortable thus refrained from using the camera. Another reason for turning off the camera was concentration, with participants finding that it allowed them to focus better on the content of the course or to listen with less distraction from appearances (2). Reasons for participating with an activated camera included better social interaction and dynamics, and that students were more engaged and involved (3).

Other participants indicated that they used the camera selectively or contextually, seeking a better interaction experience in certain situations. They activated the camera only when they were actively participating in class, such as speaking or presenting (3), or when they were working in small group exercises (2).

The second most common reasons were related to privacy (14). Some participants indicated that they did not want to be seen or observed, especially during activities unrelated to the course, such as housework or eating (8). Others specifically did not want to be recorded on video (4). To some extent, these privacy concerns overlap with reasons for better concentration and more active listening when the camera is turned off (2), as concerns about being observed are removed.

A comparison of the results between the courses shows that more participants mentioned privacy aspects in the *EPA_online* course. Although all attendance units were recorded in *ITS_hybrid* as well, in *EPA_online* the recordings invariably concerned all (online) participants, whereas in *ITS_hybrid* the in-person participants were not recorded.

Another category of frequently cited reasons for (not) using the camera concerns the lecturer (12). This is the only category that mainly provides reasons in favor of activating the camera. Reasons cited include better interaction, more dynamic and engaged participation (3), respect for the lecturer (3), and the lecturer actively asking to turn on the camera (3). Reasons for not using the camera included the impression that the lecturer was not interested or, on the contrary, was too demanding (3).

This last point is the biggest difference between the courses. The lecturer's active (and repeated) request in *PCM_online* to turn on the camera in class resulted in more cameras being turned on overall (as compared to the other courses). However, some students indicated that they felt compelled to do so. In one case, a student activated the camera despite feeling uncomfortable. In another case, a student felt the request was presumptuous, so he or she did not activate the camera at all.

Technical reasons for not using the camera were the least common (5). Some of the reasons were purely technical, such as no camera available or problems with the Internet connection. Others were related to unfavorable camera orientations and poor lighting conditions.

We did not find any significant effects of camera use on social presence in our study results. However, the test power was not sufficient to detect such effects with sufficient probability.⁴

5 Discussion

After three semesters of online instruction, we had ample evidence, albeit anecdotal, that students generally activated their cameras only when they needed to. Against this backdrop, the results of our survey were not surprising: as none of the courses had a requirement to activate the camera (mainly due to the recommendations from the school's legal department), the majority of participants reported not activating their cameras in online classes – but for very different reasons.

We found that camera use had little to do with technological conditions – very few participants reported that they did not have a camera, for example, or that the quality of their camera or Internet connection was inadequate. On the contrary, the motivation for and against camera use seemed to be strongly influenced by the learning context.

First and foremost, group dynamics seem to play an important role: students will not turn on their cameras if the others do not either. This can be explained from several perspectives: On the one hand, the principle of reciprocity may apply [WA99], i.e., participants will only show themselves if others do the same. On the other hand, and at the same time, network effects [SV99] may contribute to this behavior, i.e., activating the camera will only be helpful (e.g., to create increased social presence and interaction) if a certain minimum number of participants do so. Otherwise, there may even be negative effects of unwanted “more attention”, as one participant pointed out.

Furthermore, the activation of the camera seems to be very task-dependent. In lectures, the focus of the participants is typically on the lecturer and his or her slides, so transmitting one's image or seeing other participants provides little additional benefit – thus, participants actively “filter out” the respective social cues [WP02]. This task dependency mirrors findings in cooperative digital games: video communication can increase the cognitive load of users who are already visually engaged with primary information [Ga12, p. 145]. In contrast, collaboration and discussion in groups seem to strongly promote camera activation: here, participants prefer increased interactivity, for which sharing facial expressions and gestures is seen as beneficial.

We suggest that the observed camera usage behavior could also be related to territorial habits known from environmental psychology [MU03, p. 9]: it is assumed that individuals exhibit different perceptions, attitudes, and behaviors depending on their social or physical context, e.g., private spaces, semi-public environments, and public environments. Coincidentally, cameras seem to contradict these habits by directly and immediately

⁴ Quantitative results regarding social presence are presented in [MLH23].

linking private and (semi-) public environments. Since private spaces allow one to isolate or protect oneself from the intrusion of others [MU03, p. 9], it seems reasonable that participants would be wary of being seen or recorded in their private spaces; turning off the camera could be a coping strategy to regain control and overcome uncomfortable feelings.

Currently, online collaboration tools offer few options for limiting the association of private and public environments (e.g., selecting an image or blurring the video background). Future research could address this issue by providing better (technical) control over what is revealed from the private space, and in what context.

The observation that some students do not activate their cameras during online classes for fear of being seen doing household chores or eating raises the possibility that the phenomenon of fear of missing out (FOMO) may extend to class participation. While previous research has primarily examined FOMO in the context of social media use [GS21] and its effects on student performance [QA19], little attention has been paid to its relevance to online course participation. Some students who participate in an online course may do so in search of a sense of connection with others rather than learning, leading them to engage in parallel activities while turning off their cameras. Further investigation of the intersection of FOMO, camera use, and student engagement in online courses is warranted to gain a deeper understanding of these dynamics.

Finally, while students may have good reasons to be “invisible,” there appear to be legitimate reasons for lecturers to activate cameras. For example, there is a basic need for them to be aware of their audience and to acknowledge their reactions (e.g., frowning, laughing), preferably in real-time. Future research should explore ways to obtain such feedback during lectures without the need for cameras (e.g., through digital “mood boards” that display feelings and feedback in an abstract form).

6 Conclusion

After several semesters of educational change forced by COVID-19, universities are struggling to establish a new “normal”. The literature suggests that online environments can lead to similar learning outcomes as in-person classes, but that they also affect social presence.

In this exploratory study, we contribute to the understanding of the role of video in moderating social presence in the online classroom. The one-size-fits-all approach of current collaboration tools only partially meets the diverse needs of students and instructors. Particularly in lectures, this often leads to students turning off their cameras, suggesting interesting research opportunities for a more nuanced design of such tools, e.g., in terms of territorial habits.

As with any study, there are limitations to this research. Further research, such as the use of multiple case studies and interview techniques, could be considered to provide better validation. In addition, further quantitative research approaches may be helpful. It is important to acknowledge that our study was conducted during a period heavily influenced by the COVID-19 pandemic. Thus, our findings may have been subject to the unique circumstances associated with distance learning during the pandemic. It would be useful to gain further insight from future studies to understand the complex factors influencing camera use in online and hybrid courses in a post-pandemic context.

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