

Blended Learning Experiences in a Multimodal Setting: The Impact of Communication Channels and Learners' CMC Expertise on Perceived Social Presence and Motivation

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Abstract: Virtual learning environments are increasingly used to support online and blended learning settings. Yet, little is known about how different synchronous communication modalities influence students' perceptions of social presence in learning settings. Existing laboratory research indicates that social presence is negatively affected when communication cues are reduced to text. Using a within-subject design, we investigated whether differences in communication modality (1. chat, 2. audio, and 3. audio-video) affect social presence and motivation in a blended learning seminar. Results show in contrast to laboratory findings that communication modality did not directly affect students' perceptions of social presence. Instead, expertise in computer-mediated communication (CMC) appeared as important moderating variable that facilitated the perception of social presence as well as motivation in the chat modality more strongly than in audio or audio-video. Current results provide new insights and practical implications for online learning settings that use synchronous CMC.

Introduction

Virtual learning environments (VLE) as communication platforms constitute the surrounding for social interactions and perceptions through which collaborative online learning takes place. In VLE "the technological mediation of interaction and communication creates an additional layer of mediation with and through which learners must interact" (Hillman et al., 1994 cited in Johnson, Gueutal, & Falbe, 2009, p. 547). This layer affects the mode of communication, perception of physically separated individuals as well as the learning experience as a whole. Social presence, defined by Short, William and Christie (1976) as the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (p. 65), was recognized as a fundamental factor to enhance social interaction, which is the major vehicle of social learning in VLE (Tu, 2000). It was found to be positively related to the socio-emotional climate, especially to social dynamic and motivation (Gunawardena & McIsaac, 2004). Nonetheless only a few studies in the context of learning investigate social presence in synchronous CMC, especially in terms of comparing different communication modalities. By varying synchronous conversation modes (chat, audio, audio-video) in avatar related laboratory studies (Bente, Rüggenberg, Krämer, & Eschenburg, 2008; Sallnäs, 2002) less social presence was perceived in conversations via chat in comparison to CMC via audio or audio-video. The goal of the current study was to test if prior laboratory findings for synchronous CMC modalities (chat, audio, audio-video) can be replicated in a field experiment within a VLE used for a blended learning seminar. We explored whether communication modalities affect the perception of social presence and took particularly the factor of expertise with regard to CMC into account, as it was found to facilitate the reception of social presence in text-based CMC (Mykota & Duncan, 2007; Wrench & Punyanunt-Carter, 2007). Furthermore, we analyzed the impact of communication modalities on students' motivation to gain new insights for the improvement of CMC learning settings.

Theoretical Background

Short et al. (1976) stated in their original work that the capabilities of media to transfer nonverbal social cues determine the degree of social presence. From this line of argumentation, one can infer that communication modalities that convey more cues lead to a higher degree of perceived social presence. This perspective is in line with the reduced social cues approach (Kiesler, Siegel & McGuire, 1984) and takes into account that channel restrictions (e.g. text only) affect the degree of delivered social cues (e.g. via facial expressions, gestures, intonation of voice) and consequently the amount of perceivable social presence. Researchers questioned the idea that properties of media are the most salient determining factor for establishing social presence (Garrison, Anderson, & Archer, 2000; Gunawardena, 1995; Walther, 1992). Others have argued that the perception of social presence is interindividually different and varies greatly, even for the same communication medium (Johansen, Vallee, & Spangler, 1988; Lombard & Ditton, 1997). In line with evidence for both perspectives (see e.g. Lee & Nass, 2005 for a review), Tu (2002) points out: "Social presence is a dynamic variable based upon the user's perception and the characteristics of the medium." (p. 3) The current study therefore investigated synchronous CMC modalities as independent variable, and learners' expertise with regard to CMC as moderating factor in relation to social presence.

Social Presence and Learners' CMC Expertise

As proposed by Short et al. (1976) it can be expected that the less social cues are conveyed via synchronous communication modalities, the less social presence is perceived. Subsequent studies (Bente et al., 2008; Sallnäs, 2002) affirmed that social presence is perceived to a lower degree in synchronous communication via chat in comparison to audio or audio-video, but also showed that audio did not differ from audio-video with regard to social presence. Therefore we propose:

H1: The amount of perceived social presence is lower in text-based CMC in comparison to audio or audio-video CMC.

Following Walthers' (1992) social information processing perspective, individuals are able to compensate missing cues in CMC situations – e.g. in text-based communication by using and interpreting creative constructions like acronyms or emoticons to communicate nonverbal information (Walther & Tidwell, 1995) – and can perceive text based CMC situations even as rich as face-to-face communication. The degree to which users are able to intensify CMC socio-emotionally thereby depends on the acquired experiences and competences over time with certain communication media (Walther, 1996). Research has shown that CMC skills have a positive impact on the perception of social presence in text-based communication (Mykota & Duncan, 2007; Wrench & Punyanunt-Carter, 2007). This indicates that familiarity with CMC modes affects social information processing and thereby the level of social presence that is perceived in a VLE. As more naturally produced social cues that can be interpreted automatically are transmitted in CMC via audio (e.g. sound, intonation of voice) or added video (e.g. facial expressions, gestures) in comparison to text-based communication, an interaction effect of learners' CMC expertise and communication modality is expected:

H2: CMC expertise has a more positive impact on the perception of social presence in text-based CMC than in audio or audio-video based CMC.

Moreover, the current study exploratorily assessed if communication modalities influence students' motivation towards learning via VLE as a major factor with regard to learning. As social presence was found to be positively related to motivation (Gunawardena & McIsaac, 2004) and research is needed to determine the extent (Richardson & Swan, 2003), this issue was additionally addressed.

Method

Altogether, 17 students from two German universities took part in a blended learning seminar using Adobe Connect as VLE. The seminar consisted of 3 face-to-face meetings as well as 9 online sessions, while the latter were divided in 3 units, each containing three 90 minutes long interactive online sessions that were held in the VLE. With the units, predefined synchronous communication modalities (1. chat, 2. audio, 3. audio-video) were varied over time (within-subject) with a stepwise conjunction of modalities.

Before the first unit (chat), a pre-questionnaire was administered to measure learners' CMC expertise. The scale consisted of 4 items that measured the frequency of using online communication tools (e.g. Blogs) from *never* (1) to *very often* (5). After each unit, social presence and motivation tailored towards the perception of online sessions within the unit were measured as dependent variables on 5-point Likert scales ranging from *completely disagree* (1) to *completely agree* (5). Social presence was measured with the two subscales *co-presence* (8 items) and *perceived attentional engagement* (6 items) adapted from Biocca and Harms (2003) that were selected because of their perfect applicability in the seminar context. Co-presence is related to the degree to which one feels that others are together in the same space. Perceived attentional engagement measures the degree to which one pays attention/is distracted as a basal, primitive factor for feeling social presence. Motivation was assessed via 7 items adopted from the Intrinsic Motivation Questionnaire (Deci, & Ryan, 1985), measuring enjoyment and perceived value.

Results

Reliability tests for all scales revealed satisfactory to high internal consistencies (Cronbach's $\alpha > .72$). A repeated measures ANOVA was calculated to test effects of communication modalities on *social presence*. H1 was not supported as no significant main effect was found, that is, audio or audio-video did not outperform chat with regard to social presence (Table 1).

Table 1: Means (*M*) and Standard Deviations (*SD*) for social presence and motivation in different communication modalities.

	Social Presence		Motivation	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Chat	3.45	.52	3.28	.79
Audio	3.58	.38	3.43	.58
Audio-Video	3.38	.52	3.02	.91

Regression techniques were applied to test effects of person characteristics on the influence of within-subject factors (Judd, Kenny, & McClelland, 2001) to analyze the effect of CMC expertise on the perception of social presence in relationship to different communication modalities. First, it was examined if CMC expertise moderated the perception of social presence in the chat modality stronger in comparison to audio and audio-video modalities with more social cues. To test H2, a weighted difference score for social presence (audio + audio-video - 2*chat) was regressed on CMC expertise, which emerged as a predictor on the 10% level of significance ($\beta = -.598$, $t = -2.237$, $p = .052$, $R^2 = .283$). In line with H2, CMC expertise related more strongly to the perception of social presence (learners with more CMC expertise felt more social presence) in the chat modality than in the audio or audio-video modalities. When comparing single conditions with each other, CMC expertise did not emerge as a significant predictor for the difference scores audio-video minus audio as well as audio minus chat, but for the difference score audio-video minus chat ($\beta = -.603$, $t = -2.27$, $p = .050$, $R^2 = .292$) with a similar interaction: CMC expertise moderated social presence in the chat modality more strongly than in the audio-video modality whereby learners with more CMC expertise perceived more social presence than learners with less CMC expertise.

A repeated measures ANOVA was calculated to test effects of communication modalities on students' *motivation*. No significant main effect occurred. Additionally the same regression techniques as above were applied to investigate a possible interaction effect between CMC expertise and communication modalities with regard to motivation. First, a weighted difference score for motivation (audio + video - 2*chat) was regressed over CMC expertise that predicted the difference score ($\beta = -.604$, $t = -2.397$, $p = .038$, $R^2 = .301$) with a similar pattern as with regard to social presence. CMC expertise moderated motivation more strongly in the chat modality (learners with more CMC expertise perceived more motivation) than in audio or audio-video. By comparing single conditions with each other, the same interaction occurred for motivation difference scores between video and chat ($\beta = -.591$, $t = -2.32$, $p = .043$, $R^2 = .284$) as well as audio and chat ($\beta = -.568$, $t = -2.67$, $p = .017$, $R^2 = .277$), whereas CMC expertise was no significant predictor for the motivation difference score between audio and audio-video. Thus, in contrast to social presence, CMC expertise moderated the treatment difference with regard to motivation between audio and chat.

Correlation analyses, investigating preferences for learning in specific modalities, showed in line with previous findings that learners who were motivated with audio as communication modality did also like audio-video ($r = .90$, $p < .001$), whereas the motivation values for chat did not correlate significantly with audio or audio-video. With regard to the relationship between social presence and motivation, analyses revealed significant correlations in the chat ($r = .55$, $p = .026$) and audio-video modality ($r = .60$, $p = .048$), whereas not in the audio modality.

Discussion

The goal of the present study was to test if prior laboratory findings for social presence can be replicated in a field experiment within a VLE, and to additionally investigate motivation as well as learners' CMC expertise as moderating factor. According to our findings, it is unclear how reduced communication cues affect the perception of social presence in VLE. Present results indicate that CMC expertise is an intervening factor that supports the perception of social presence and becomes more important if communication occurs via chat in comparison to audio/video, whereas communication modalities did not directly affect the perception of social presence. The latter fact stands in contrast to Short et al.'s (1976) expositions and previous results from laboratory studies (Bente et al., 2008; Sallnäs, 2002), what can be explained by the small sample size, differing operationalizations of social presence or a sequence effect regarding modalities that was caused by the study design; but might also be due to the fact that interactions via VLE took place for a longer period of time and under different circumstances (e.g. to acquire knowledge) compared to the prior results from the laboratory. It is important to note that results need to be treated with caution, because sequence effects could not be ruled out as there was no possibility to rotate CMC modalities in a university course setting due to practical didactic constraints. Therefore field and laboratory studies have to be conducted, that control additional factors (e.g. sequence, interaction time, involvement) which may interfere. However, current findings support in line with empirical results (Mykota & Duncan, 2007; Wrench & Punyanunt-Carter, 2007) and Walther (1996) that expertise with regard to CMC intervenes in the processing of social information delivered by CMC. In the current study, learners' CMC expertise had a more positive influence on the perception of social presence if communication cues appeared on a text-chat basis in comparison to auditory or audio-visual cues. Even though the difference in social presence between chat and audio was not predicted by CMC expertise, CMC expertise seems to become more important if acronyms and emoticons replace naturally produced social cues. The less social cues are transmitted by communication modalities that can be interpreted instinctively, the more CMC expertise seems to be needed to perceive others as socially present. Further studies need to investigate which specific CMC skills and competences are required to perceive a high degree of social presence in a social cue reduced environment. With regard to motivation the current study gives insights, that it is interconnected to CMC expertise in a similar way as social presence. Interestingly, students who were motivated in auditory

sessions were also motivated in audio-visual sessions, whereas no connections with regard to motivation in chat sessions were found. This indicates that preferences for communication modalities may differ depending on CMC expertise, with learners with less CMC expertise preferring communication modalities with many social cues. However, as CMC expertise did not just impact the degree to which social presence was perceived but also the motivation to participate in online sessions, learners' CMC expertise can be stated as an important prerequisite for successful interactive online seminars on a text basis. Consequently prior trainings for learners with low CMC expertise to learn to adapt to text-based CMC should be able to support rich text-based learning experiences that involve social presence as well as motivation.

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