Research Investigation of Social Presence in Online Learning Technology

Perhaps the most globally impactful event of the 21st century, the COVID-19 pandemic has had a vast effect in the approach education is delivered to students. Online learning technologies have played a noticeable role in enabling education to continue throughout the pandemic; removing physical interaction from the learning process. In education, society on large values continued learning, teacher clarity, and student engagement. A core aspect in all forms of education delivery is 'social presence'.

Broadly defined, social presence is the level of social linkage a contributor experiences in a given social setting. In an online learning context, the social presence is the degree of social engagement felt between teacher and student. Social presence is facilitated through immediacy (gestures and facial expressions), intimacy (behaviour interpretations to maintain a behavioural norm), and shared attention (focused on the same resource or task).

There is correlation between an increase of social presence and an increase is education delivery quality. Social or mobile technology focused on online learning delivery should aim to maximise the social presence of the platform.

This identified domain will be refined to distributed as online learning will be considered as occurring externally, and not co-located. Online learning technology can encompass both mobile and non-mobile technologies, and the domain such reflects this.

The learning delivery technologies identified in the research process include audio-based social presence, video-based social presence, and robotic-based social presence. Peer-reviewed journal papers encompassing social presence have been critiqued to identify how these social & mobile technologies have been applied to facilitate different, effective, and meaningful learning in an online setting.

Rettie, R. (2003). Connectedness, awareness and social presence. 6Th Annual International Workshop On Presence.

Abstract: "This paper discusses the concept of 'connectedness', exploring its relationship with the concepts of 'social presence' and 'awareness', and arguing that although 'social presence' and 'awareness' have received most focus in previous research, 'connectedness' is, in fact, a more fundamental concept. 'Connectedness' is potentially a key concept in the analysis of communication and the development of communication technology."

Critique: In her paper 'Connectedness, awareness and social presence', Rettie studies the origins of 'social presence' research and attempts to define this term among similar studied concepts. The paper explores how 'social presence' is unique from the concepts of 'awareness' and 'connectedness'.

Awareness is described by Rettie as comprehending what actions other people are making, which is interpreted as context for personal actions. In an online learning environment, the 'awareness' the user can experience is significantly impacted; designers working in this space must utilise the limited design opportunities to maximise the awareness experience by users of the platform.

Rettie explains 'connectedness' encompasses the emotional impact felt by participants in a social setting (physical or online social setting). While online education delivery is not aimed at providing an emotional impact, the 'connectedness' between student users is important in replicating a physical educational experience with an online platform. It was further identified that when selecting a form of communication, the 'connectedness' felt was the most deciding factor. This is imperative for designers in the online learning space to establish a user base efficiently and effectively.

Rettie clarifies that social presence arises when every person involved is aware of the social interaction; participants try to gauge the perception of others in a social setting. It is concluded that social presence is controlled by the social setting. Designers in the online learning space can use Rettie's description of 'social presence' to understand the importance of the concept in their platform design.

It has been shown this paper is very important for designers in the online learning space; understanding of the nuanced differences between these concepts will assist in optimising the platform design.

.

Lee, K., & Nass, C. (2003). Designing social presence of social actors in human computer interaction. Proceedings Of The Conference On Human Factors In Computing Systems - CHI '03. https://doi.org/10.1145/642611.642662

Abstract: "This study examines the interaction effect between user factors and media factors on feelings of social presence which are critical in the design of virtual reality systems and human computer interfaces. Both Experiment 1 and Experiment 2 show that matching synthesized voice personality to user personality positively affects users' (especially extrovert users') feelings of social presence. Experiment 2 also reveals that users feel a stronger sense of social presence when the personality of synthesized voice matches the personality of textual content than when those two are mismatched. In both experiments, extrovert voice induces a stronger sense of presence than introvert voice. These results provide strong evidence for human's automatic social responses to artificial representations possessing humanistic properties such as language and personality. Finally, we discuss various applications of these findings in the design of human computer interfaces, as well as in the study of presence."

Critique: In their paper 'Designing social presence of social actors in human computer interaction', Lee and Nass experimentally investigate how social presence is affected by deliberate changes in "paralinguistic cues of synthesised speech." Synthesised speech (computer generated text-to-speech) is already prevalent in online language learning platforms; an immense amount of learning material in general is presented to students in a textual format. Optimising synthesised speech technologies will significantly increase the social presence experienced by students when accessing these learning resources.

Lee's and Nass's experimental data supported their similarity-attraction hypothesis, that users will experience a higher social presence from synthesized speech that displays a similar personality to the user. For designers creating online learning resources utilising synthesised speech technology, it has become clear that one synthesised voice for every user is disadvantageous to maximise social presence felt by all users. A brief personality survey could provide users with a synthesised speech option most optimal for that user, without affecting any other user's social presence.

The experimental data corroborated Lee's and Nass's consistency-attraction hypothesis, that users will experience greater social presence when the synthesised speech is consistent with the content being delivered. This conclusion is important in designing for an online educational space. It is clear to maximise social presence for student users, efforts should be made to align the paralinguistic cues of the synthesised speech options with the educational content delivered.

Finally, the experimental data supported Lee's and Nass's extroversion hypothesis; an extroverted synthesised voice will create more social presence than an introverted synthesised voice. Designers should thus ensure the synthesised voices used on online learning platforms displays only extroverted personality characteristics.

This paper is very useful for designers. Several design constraints and recommendations are made to maximise the social presence felt by student users when utilising synthesized speech technologies in an online learning space.

Hung, W. (2003). Building learning communities by enhancing social presence. ACM SIGGROUP Bulletin, 24(3), 79-84. https://doi.org/10.1145/1052829.1052847

Abstract: "Lewis, Snow, Farris, et al. stated in the National Center for Education Statistics that "distance education appears to have become a common feature of many postsecondary education institutions and...it will become only more common in the future" [3]. In the wave of migration to new instructional delivery modes, it is necessary for us to critically examine some issues that have arisen, in order to reach an optimal solution for both the students and the instructors. One of the inevitable tradeoffs in an online learning environment is a decrease in the quality of social interaction. Social interaction is innate in traditional face-to-face classrooms. It is not only a critical element in helping the learners to develop a sense of belongingness within a learning community, but also determines the dynamics of the learning community, which greatly influence the students' learning outcomes. Among the essential components of a community, interaction between the members is deemed to be the one crucial factor that makes a community alive. Researchers agree that helping students develop a sense of community is an important aspect in promoting positive learning experiences and better learning outcomes in distance learning environments [7]."

Critique: In his paper 'Building learning communities by enhancing social presence', Hung investigates the short-fallings of video conference technologies in an online learning context. Video conferencing is prevailing as the current distributed technology in replicating synchronous co-located educational interactions. Investigating how video conferencing technologies detract from the online educational experience is crucially important for designers working in an online education space.

Hung discusses that social presence is innately minimal in online learning settings. Through his observations from online learning environments, he noted after less than a month of online platform use students would voluntarily switch off their video cameras. This paper has thus highlighted a significant issue that video conferencing technology has had in a previous attempt at implementation in the online learning design space. A possible cause is proposed in this useful paper; video transmission is not always perfect due to hardware and software limitations. Hung concludes until these limitations are completely eliminated, video conference technology will continue to be rejected by student users in online learning environments.

Hung further identifies in his paper, although video conference technology delivers "face-to-face intimacy and immediacy", students require a high level of "ambient environmental information" to replicate the social presence of co-located synchronous learning. By increasing the ambient environmental information, a stronger learning community is created for students and instructors. This is important for online education platform designers to incorporate when utilising video conferencing technology.

Hung's paper has successfully provided insight into specific issues and considerations in maximising social presence of online learning environment, through exploring previous attempts at incorporating design technology into the online learning space.

Lord, W. (2021). Designing for Social Connectivity (Not Everyone Likes Webcams). Elearn, 2021(4). https://doi.org/10.1145/3462445.3457174

Abstract: "COVID-19 has forced vast numbers of educational institutions to shift their operations from being delivered face-to-face to being delivered online. As a result, academic institutions have had to scramble to find complex solutions that meet systems-wide online teaching and learning needs. The quality of interaction that occurs between the educator and the student is crucial to the success of delivering education via online technologies, and it is incumbent on the host institution to provide a usable, effective, and satisfying form of communication all participants may communicate with while maintaining a sense of social presence. It requires little effort to compile a list of potential benefits of using webcams in educational settings. It is more challenging to come up with a list of conditions as to when you may not require all learners to communicate using webcams. This paper explores the benefits and challenges of incorporating webcams in teaching and learning in the online learning environment."

Critique: In his paper 'Designing for Social Connectivity (Not Everyone Likes Webcams)', Lord approaches the subject of delivering education online due to the Covid-19 pandemic. Lord focuses on previous attempts at utilising webcam technology in the online learning space, and explores the issues and considerations identified.

From Lord's experience with utilising web cam hardware and video conference software like Skype, he highlights an important issue for designers to address in online learning platforms. It is revealed that students became psychologically uncomfortable from the continual personal live stream of themselves. Lord hypothesises this is because students are unhappy with their personal appearance and feel embarrassed, and because information about the student's "private space" is revealed in video stream backgrounds. Designers in the online learning space must incorporate solutions for these issues into their platforms (e.g. facial filters, background modifiers).

In the paper Lord further considers how online learning platform designers can encourage "webcam-averse" students to embrace the technology. The platform must facilitate building user faith in the technology; it is suggested the platform allows the user to first become comfortable with audio & avatar based communication, before utilising full video conference capabilities.

Finally, Lord assists online learning space designers by emphasising the benefits of webcam technology, assisting designers in the online learning space to ensure these benefits aren't lost on their platform. Among these benefits, it was identified that webcams provide the greatest quantity and highest quality of 'social cues'; this is important for maximising the social presence experienced by users, and thus optimising the interaction quality.

This paper will greatly assist designers in the online learning space by making conclusions and recommendations based of previous experiences utilising webcam technology.

Howley, I., Kanda, T., Hayashi, K., & Rosé, C. (2014). Effects of social presence and social role on help-seeking and learning. Proceedings Of The 2014 ACM/IEEE International Conference On Human-Robot Interaction. https://doi.org/10.1145/2559636.2559667

Abstract: "The unique social presence of robots can be leveraged in learning situations to reduce student evaluation anxiety, while still providing instructional guidance on multiple levels of communication. Furthermore, social role of the instructor can also impact the prevalence of evaluation apprehension. In this study, we examine how human and robot social role affects help-seeking behaviors and learning outcomes in a one-on-one tutoring setting. Our results show that help-seeking is a moderator of the significant relationship between condition and learning, with the "human teacher" condition resulting in significantly less learning (and marginally less help-seeking) than the "human assistant" and both robot conditions."

Critique: In their paper 'Effects of Social Presence and Social Role on Help-Seeking and Learning', Howley et al. investigate utilising humanoid robots to increase help-seeking behaviour in online learning. Help-seeking behaviours are crucial for students to achieve valuable self-learning outcomes; designers in the online educational space should be prioritising access to student users seeking help. The experimental results of the investigation performed by Howley et al. reveals while a robot teacher only slightly increase help-seeking behaviours, students learn significantly more from robotic teachers than human teachers. A probable reason for these results is suggested; students perceive less judgement from robotic agents opposed to human. This paper is clearly very useful for designers to understand a previous attempt at incorporating robotic technology into the online leaning design space.

Howley et al. also provides insights into the specific issues and considerations surrounding the implementation of robotic technology in the online learning space. It was concluded in the experimental results that robots carry larger social presence than virtual agents. This comparison of technologies confirms to designers that the effect 'social presence' has in online learning environment has been careful considered in this paper.

Howley et al. further highlights the increase in student engagement, motivation, and communication that was observed when utilising virtual tutor technology, opposed to utilising only textual based technology. Designers can use this study to make informed decisions on the instructional delivery technology. Robotics is a social and mobile technology that when applied can effectively and meaningfully improve the methods used in the online education space.

This collection of five peer-reviewed journal papers covering social presence have been critiqued, which has determined how social & mobile technologies have been applied to facilitate different, effective, and meaningful learning in an online setting. Social presence is defined in context with similar pre-existing social concepts. The majority of these papers explored previous design attempts at incorporating technologies into online learning environments. Hardware technologies such as webcam and robotic agents were explored in an education setting, in a similar manner to software technologies such as video conference software and synthesised voiced.

It was noticed that the asynchronous technologies, robotic tutors and synthesised voice, were deemed mostly successful in delivering online education content. This is in contrast to the synchronous technologies, webcam hardware and video conference software, which were deemed to have only mixed success in online educational environments. The most limiting factor was the technology not delivering a functional platform for synchronous learning with enough frequency to replicate the feeling of physical social interaction. A conclusion can be drawn from these previous attempts of technology incorporation; students prefer the convenience and low judgment of asynchronous learning technologies.

Other key considerations for online learning designers were identified from this review. While maximising ‘social presence’ is very important, designers must not sacrifice the ‘awareness’ and ‘connectedness’ experienced between student users. Balancing these will meet society’s values of continued learning, teacher clarity, and student engagement. Online learning technologies will continue to play an impactful role in enabling education to continue beyond the pandemic-mandated online learning environments.