The Social Presence Benefits of Synchronous, Interactive Video in Online Classes

Miguel Ramlatchan, Ph.D.
Office of Distance Learning
Old Dominion University
Gornto Hall, room 304
Norfolk, VA 23529
mramlatc@odu.edu

Candace Whitehurst, MA
Office of Distance Learning
Old Dominion University
Gornto Hall, room 305
Norfolk, VA 23529
clwhiteh@odu.edu

Descriptors: Social presence, online learning

Abstract

What are the benefits of interactive, two-way video and web conferencing in online classes in terms of social presence? This study compared four presentations, two were synchronous and were delivered in real-time and two were pre-recorded and delivered asynchronously. Student volunteers (n = 162) were organized into four treatment groups. The first treatment group participated from an immersive telepresence, video conferencing system, the second group participated via online web conferencing, the third group viewed a recording of the telepresence group's meeting, and the fourth group viewed a recording of the web conferencing group's meeting. The use of the telepresence system improved participants' sense of instructor immediacy and social presence, followed by the perception of the web conferencing group, while the asynchronous viewers reported a lower sense of connectiveness. The data analysis also indicated no significant difference among the treatment groups in terms of extraneous cognitive load. The results indicate the social presence benefits of real-time engagement, active learning, and suggests that instructors and instructional designers should consider the integration of synchronous activities in their online classes.

Introduction

We know that maintaining retention and ensuring learning effectiveness in online environments is a challenge for distance learning and distributed education programs. One means to support both motivation and learning effectiveness is to create learning environments that foster and enhance social presence. Social presence in the context of education is the student's perception that they are communicating and engaging with an authentic instructor (Short, Williams, & Christie, 1976). Social presence in this study was explored in terms of instructor immediacy, or the verbal and nonverbal communication effectiveness of the instructor from the perspective of online students (McCroskey & Teven, 1999; Violanti, Kelley, Garland, & Christen, 2018). The social presence implications of instructor immediacy has been explored in a number of other multimedia studies, however, these studies focused on pre-recorded, scripted instructor presentations (Jayasinghe, Morrison, & Ross, 1997; Ramlatchan & Watson, 2019). The present study has a similar research design, though instead now includes two treatments with a live, real-time instructor that encourages student interactivity and asking questions.

Instructional message design is the purposeful, thoughtful, and evidence-based development of instructional material, content, or other vehicle of instruction and can influence motivation, learning effectiveness, and retention (Fleming & Levie, 1993; Ramlatchan, 2019). The ideas of social presence and message design can be combined with the heuristics of multimedia learning to further improve overall learning effectiveness. Multimedia learning theory suggests using words and pictures, reducing extraneous information, and connecting new concepts to

previously learned concepts in instructional designs (Clark & Mayer, 2016; Mayer, 2009). Multimedia learning theory builds upon cognitive load theory, which suggest that extraneous cognitive load should be removed or reduced as much as possible from message designs to improve learning efficiency and effectiveness (Paas & Sweller, 2014).

In the context of this study, the multiple media used in the instructional message design includes synchronous or asynchronous online visuals of both the instructor and the instructor's presentation as well as the narrative voice of the instructor. While there is an established body of knowledge on the use of multimedia learning theory, there has not been significant research into the area of live, interactive, synchronous video. This study sought to explore the connection between multimedia design, social presence, and interactive video. Specifically, when the instructor and the subject matter are kept constant, how does the inclusion of live engagement in the multimedia design impact social presence in terms of student perceptions of instructor immediacy? This research project also gauged the impact of each presentation on student perceptions of extraneous cognitive load.

Research Questions

The problem this research sought to address was the lack of quantitative experimental results when comparing a student's ability to interact with an instructor and the impact on social presence in terms of instructor immediacy and the impact in terms of any added extraneous cognitive load:

Research Question 1: What impact will variations of synchronous and asynchronous online multimedia presentations have on student perceptions of instructor immediacy?

Research Question 2: What impact will variations of synchronous and asynchronous online multimedia presentations have on student perceptions of extraneous cognitive load?

Research Design

This study employed four treatment groups to explore interactive multimedia and instructor immediacy (see Figure 1). The same instructor presented the same subject matter with the same PowerPoint presentation in each group. The slides were designed to present the content in a clear, concise manner, with a concerted focus to avoid extraneous distractions. The instructor presented a 20-minute module on "Transcendentalism, Romanticism, and Regionalism" from her online American Literature course. There were four specific times in the mini-lecture where the presenter specifically asks a question to engage and solicit thoughts and feedback from participants. The first treatment, the telepresence group, employed two telepresence equipped classrooms. Telepresence in the context of this study is the practical application of immersive video conferencing, such as using a Cisco IX-5200 or similar immersive system which includes high resolution video, multiple large, high-definition displays, and high-fidelity audio. The instructor presented from one classroom, volunteers participated from another classroom. The students and the instructor could see and hear each other in real-time in each classroom and the students could also see the PowerPoint slides. Students in the second treatment, the web conferencing group, participated online via web conferencing, with the instructor still in the same telepresence classroom as the first treatment group. Each student could see the instructor and see the PowerPoint slides. The third treatment group viewed a recording of the telepresence group's meeting. The fourth treatment group viewed a recording of the web conferencing group's meeting. These two groups could also see the instructor and the slides.

Volunteers for this study were students enrolled at a mid-size, metropolitan, public university. A link to participate in the study was included in a university events and announcements email sent daily to all students; the only requirement to participate was the ability to attend the presentation in the telepresence classroom or have a reliable Internet connection. The study continued until at least 30 students had participated in each treatment group. The social presence component of instructor immediacy was measured using the McCroskey's Source Credibility Measure (McCroskey & Teven, 1999). Cognitive load was measured using the NASA Task Load Index (Hart, 2008; Hart & Staveland, 1988). These two survey instruments, and an additional item asking them to enter in any additional comments, were accessible to participants as a survey after they viewed the presentation. Each student only participated in one treatment group and each were given a free t-shirt for their time and feedback.

Figure 1a. Participants in the synchronous telepresence video conference treatment group viewed the instructor in the classroom's center display and the PowerPoint slides on the two outer displays.

Figure 1b. Participants in the synchronous web conference treatment group viewed the instructor on the right and viewed the PowerPoint slides on the left, both of these windows could be resized or made full-screen based on the preferences of the viewer.
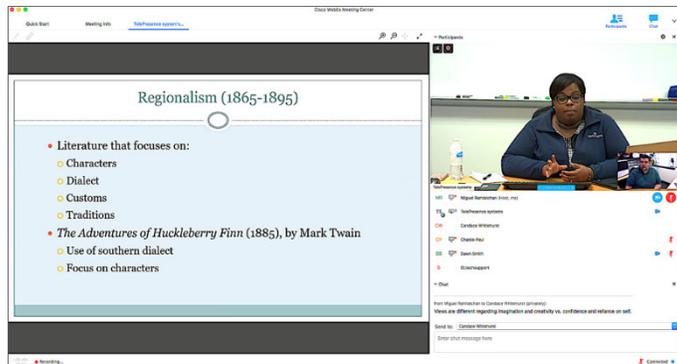
Figure 1c. Participants in the asynchronously viewed telepresence video conference recording treatment group viewed the instructor on the left and viewed the PowerPoint slides on the right.

Figure 1d. Participants in the asynchronously viewed web conference recording treatment group also viewed the instructor on the left and viewed the PowerPoint slides on the right.

Figure 1. Volunteers in this study participated in one of four different treatment groups, two were delivered live and allowed for real-time interaction with the instructor and two were pre-recorded (modified from Ramlatchan & Whitehurst, 2019).

Results

A one-way univariate Analysis of Variance (ANOVA) was conducted to determine the effect of the four presentation methods on the mean score of participants on the Nonverbal Immediacy Behaviors Index section of the survey. The ANOVA indicated a significant difference between treatment groups, $F(3,156) = 5.8$, $p < .01$ (see Table 1). A follow-up Tukey HSD test was conducted to determine the distinction among the groups, which showed a statistically significant difference between the telepresence group and the three other treatments (see Figure 2).

Table 1. Nonverbal Immediacy Behaviors Index Measure of each Treatment Group

Treatment	n	Mean (SD)	95% Confidence Interval
Synchronous telepresence video conference	**33**	**5.03 (.53)***	**[4.85, 5.21]**
Synchronous web conference	38	4.54 (.72)	[4.31, 4.77]
Asynchronously viewed telepresence video conference	51	4.51 (.67)	[4.33, 4.69]
Asynchronously viewed web conference	37	4.42 (.73)	[4.18, 4.66]

Note. Nonverbal Immediacy measured on a 1 to 6 scale, with 6 being the most immediate.
* A significant difference was found between this treatment and the three other treatments, $p < .05$
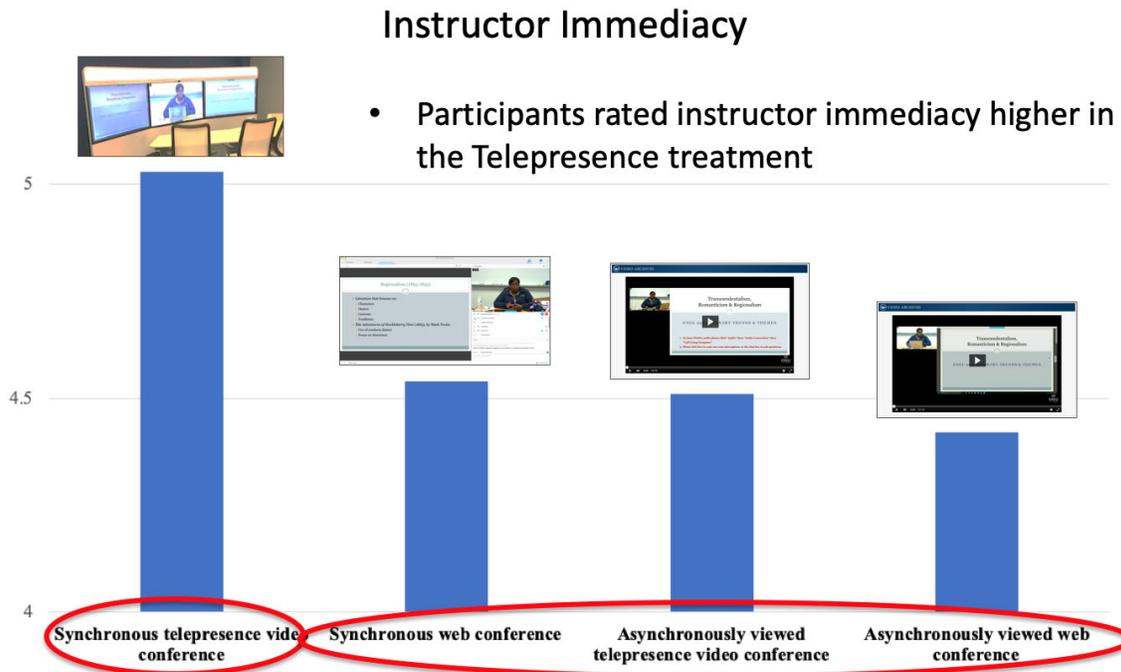

Figure 2. A one-way ANOVA and Tukey HSD post-hoc analysis indicated a significant difference in participant perception of immediacy, or the communication effectiveness of the online instructor. Participants in the live telepresence classroom treatment felt a high degree of social presence.

A one-way univariate Analysis of Variance (ANOVA) was also conducted to determine the effect of the four presentation methods on the mean score of participants on the NASA Task Load Index section of the survey

(see Table 2). While a pattern may appear to forming, the ANOVA indicated no significant difference between treatment groups in terms of participant perception of extraneous load, $F(3,158) = .32$, $p = .81$ (see Figure 3).

Table 2

NASA Task Load Index (TLX) Measure of each Treatment Group

Treatment	n	Mean (SD)	95% Confidence Interval
Synchronous telepresence video conference	33	2.35 (1.62)	[1.83 to 2.87]
Synchronous web conference	39	2.45 (1.56)	[1.96 to 2.94]
Asynchronously viewed web conference	39	2.45 (1.97)	[1.83 to 3.07]
Asynchronously viewed telepresence video conference	51	2.72 (1.69)	[2.26 to 3.18]

Note: Extraneous load measured via the NASA TLX was measured on a 0 to 10 scale, with 10 being the most demanding, stressful, or cognitively distracting.
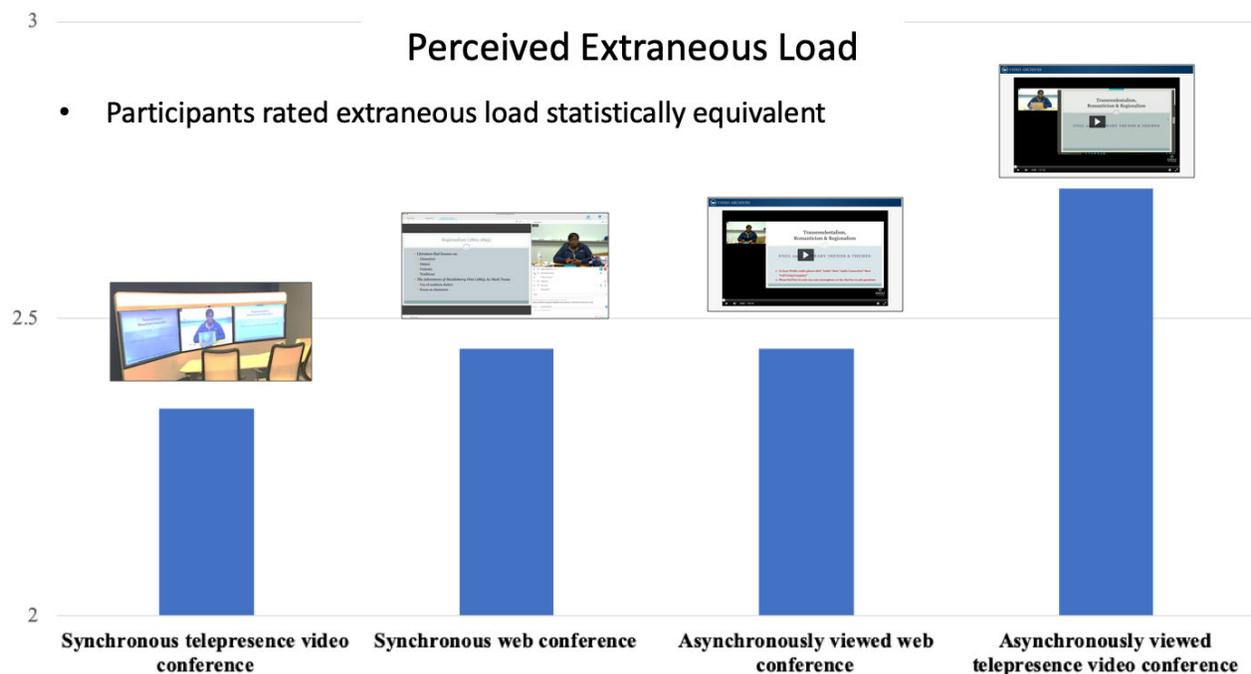No significant differences were found between these treatments, $p < .05$

Figure 3. A one-way ANOVA indicated a no significant difference in participant perception of extraneous load when measured with the NASA TLX (unweighted), although there does appear to be a pattern indicating the ease of use of the classroom environment.

The online survey used in this study included a write-in box for other participant comments. This qualitative data collection yielded several interesting responses. One participant during the synchronous web conferencing treatment reported:

I think the instructor in this case covered things very well and seemed, in hindsight, to give a lot of time to students for questions and comments. I can see classes like this feeling a lot more communal to distance learning students, giving students the opportunity to discuss and "be together" all in one place at the same time.

This statement appears to highlight the importance of keeping students engaged. Another participant during the synchronous telepresence treatment echoed this response:

The interaction with the instructor was super helpful due to the fact that we were actually able to engage in conversation and when any of us had questions, she'd be more than willing to answer and explain information further.

This feedback would tend to indicate some of the advantages of a synchronous online tool in terms of allowing the instructor to guide a discussion beyond a scripted presentation. However, even participants in the asynchronous treatment groups appeared to appreciate the instructor's desire to engage with students. For instance, one participant during the recorded asynchronous telepresence treatment commented:

The instructor was very well paced through the presentation; questions were asked throughout the presentation that were thought provoking and let the discussion evolve with the participants.

Conclusions

The significant contribution to the existing body of knowledge on the subject of multimedia, social presence, and online learning was the use of interactive communication in two of the four treatment groups. This allowed for a comparison between live interactivity and pre-recorded, asynchronous multimedia presentations, using the same content and instructor. The results of this study indicate that participants rated the instructor highest in terms of immediacy during the live interactive telepresence treatment. A pattern in the data indicated that both live treatment groups outscored the two recorded video viewing groups in terms of perceived instructor immediacy. This finding suggests and helps confirm that students feel a high degree of social presence when they are able to engage in real time with their instructor. This study also indicated that while the peripheral distractions of the classroom environment was rated lower, neither of the presentation formats appeared to statistically significantly differ from each other in terms of cognitive load, especially extraneous cognitive load. These findings could indicate that the design of the classroom, the design of the web conferencing application, and the design of the video playback interface did not introduce a significant level of extraneous cognitive load. The instructional message design of these learning environments did not appear to negatively impact learning effectiveness from this perspective.

Feedback from participants who viewed the recordings and commented that they appreciated the instructor asking and answering questions and engaging with the live students were interesting given that they themselves were unable to ask questions and participate in that discussion. In effect, it appears that both synchronous and asynchronous students benefited from the instructor actively engaging with the live audience. While this finding makes intuitive sense in terms of social learning and social presence, a future study could remove the question and answer periods from the recording and try a new series of treatments to confirm this conclusion. Another avenue for future research could be the use of eye-tracking techniques to more directly measure extraneous cognitive load as compared to the indirect self-reporting used in this study. Yet another series of experiments could vary the instructor, subject matter, and include the use of whiteboards or writing on digital tablets to further explore how multimedia presentation design can impact social presence in our online learning environments.

To increase social presence in their online classes, and thus increase learning effectiveness and motivation, instructors and instructional designers should consider the use of synchronous tools in their online instructional designs. The ability for students to see and hear their instructor, live and in real time, and the ability to ask questions, have a discussion, and actively engage in learning can create and enhance positive environments for social presence in online classes and programs.

References

Clark, R. C., & Meyer, R. E. (2016). *e-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning.* Hoboken, NJ: John Wiley & Sons, Inc.

Fleming, M., & Levie, W. H. (1993). *Instructional message design: Principles from the behavioral and cognitive sciences.* Englewood Cliffs, NJ: Educational Technology Publications.

Hart, S. G. (2008). *NASA-Task Load Index (NASA-TLX): 20 Years Later.* Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting, (pp. 904-908). Santa Monica: Human Factors and Ergonomics Society.

Hart, S. G., & Staveland, L. E. (1988). Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research. In P. A. Hancock & N. Meshkati (Eds.), Human Mental Workload (pp. 239-250). Amsterdam: North Holland Press.

Jayasinghe, M. G., Morrison, G. R., & Ross, S. M. (1997). The effect of distance learning classroom design on student perceptions. *Educational Technology Research and Development, 45*(4), 5-19.

Mayer, R. E. (2009). *Multi-media learning* (2nd ed.). New York, NY: Cambridge University Press.

McCroskey, J. C., & Teven, J. J. (1999). Goodwill: A reexamination of the construct and its measurement. *Communication Monographs, 66*, 90-103.

Paas, F., & Sweller, J. (2014). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed.), The Cambridge Handbook of Multimedia Learning (pp. 27-42). New York, NY: Cambridge University Press.

Ramlatchan, M. (2019). Message design for instructional designers – An introduction. In M. Ramlatchan (Ed.), *Instructional Message Design: Theory, Research, and Practice* (Vol. 1). Norfolk, VA: Kindle Direct Publishing

Ramlatchan, M. & Watson, G.S. (2019). Enhancing instructor credibility and immediacy in online multimedia design. *Educational Technology Research and Development*, 1-18. https://doi.org/10.1007/s11423-019-09714-y

Ramlatchan, M. & Whitehurst, C. (2019). *The Impact of Immersive Telepresence Video Conferencing on Instructor Social Presence and Online Learning.* Manuscript submitted for publication.

Short, J., Williams, E., & Christie, B. (1976). The social psychology of telecommunications. London, UK: John Wiley & Sons.

Violanti, M. T., Kelly, S. E., Garland, M. E., & Christen, S. (2018) Instructor clarity, humor, immediacy, and student learning: replication and extension. *Communication Studies, 69*(3), 251-262.