



Studying the Effects of Educative Holographic Projections in VR Environment

1. Background

- **HoloLearn** is a project at TU Delft that aims to improve online education using holograms.
- **Virtual Reality** environments can be highly motivating for students, leading them to spend more time on the learning task (Winn et al., 2002).

2. Definitions

- **Hologram:** a representation of a human in an environment that the human will be part of.
- **Social Presence:** "the degree of illusion that others appear to be a "real" physical persons" (Kreijns et al., 2011).
- **Zoom fatigue:** a new term that is not as much about physical irritation, but limitations in social interactions (Nadler, 2020).

3. Research Question

How do holograms placed in Virtual Reality affect the perception of teachers' social presence?

4. Methods

Design: Independent measures experiment

- **Independent variable:** representation of the teacher
- **Dependent variable:** Social Presence (SP), Zoom Exhaustion & Fatigue (ZEF), etc
- **Confounding variable:** a pre-recorded lecture, a 15 min lecture on Japanese history before the year 1603.

Participants:

- (Mostly) Computer Science students
- Fluent in English
- 22 students randomized into groups of 5 or 6

Procedure: showing a pre-recorded lecture in 4 setups

- Zoom (control group)
- Telepresence robot
- VR holograms
- Screen holograms

Apparatus:

- Double 2 (Double Robotics)
- HoloDisplay & Projector
- 5x Oculus GOs + Headphones
- Kinect camera (for HoloDisplay & VR)

Materials & Measures:

- Social Presence measure (Kreijns et al., 2018).
- Zoom Exhaustion & Fatigue scale (Fauville et al., 2021)

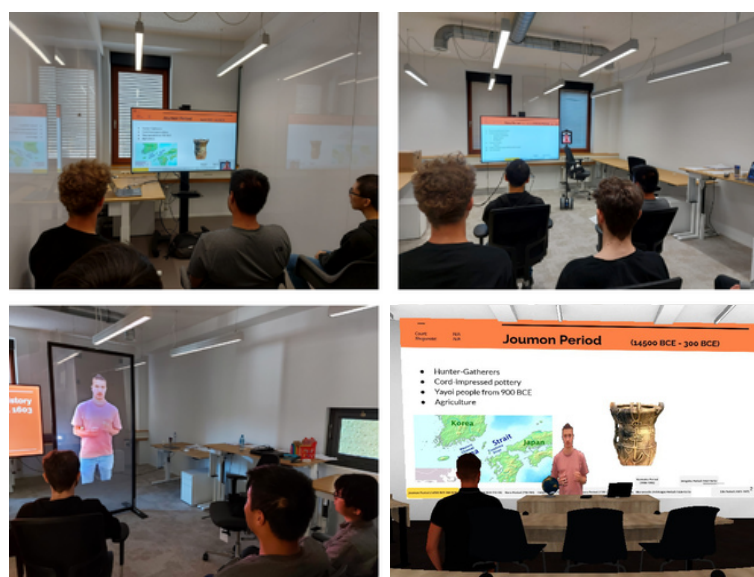


Figure 1: The setups arrangement: Zoom, robot, HoloDisplay, HoloVR.

5. Results

Subject	H	p-value
SP	3.7773	0.1513
ZEF	1.4367	0.4876

Figure 2: Kruskal-Wallis test on Likert scale sums.

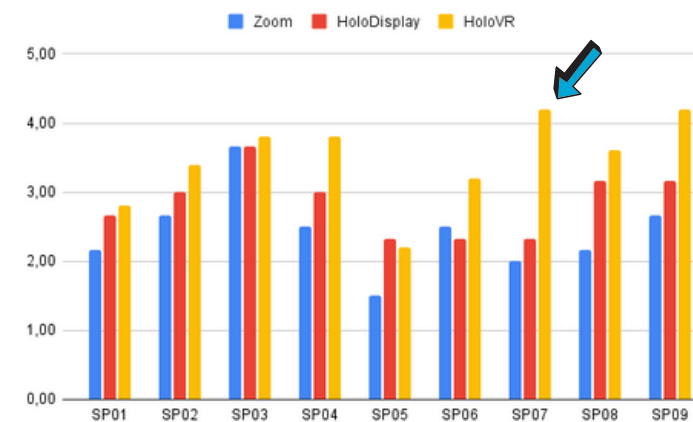


Figure 3: The average Likert score in SP per group.

SP07: In this learning environment it feels as the lecturer and I are in the same room.

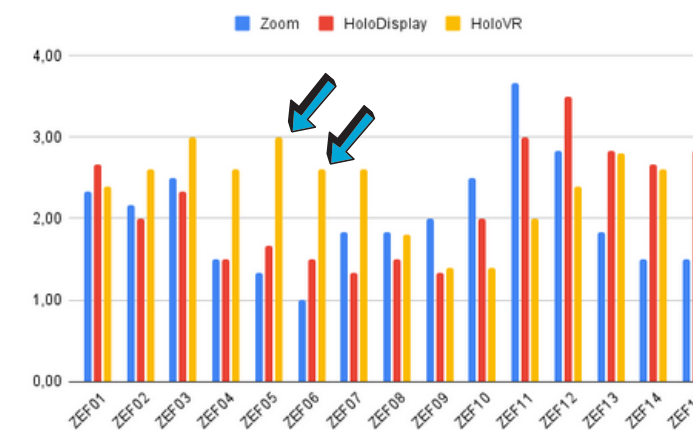


Figure 4: The average Likert score in ZEF per group.

ZEF05: How irritated do your eyes feel after video conferencing?
ZEF06: How much do your eyes hurt after video conferencing?

6. Conclusion

- No statistically significant difference.
- Except for individual items: SP07, ZEF05, ZEF06.
- Future work: larger sample, higher quality hardware & software.

7. Contacts



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8. References

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