Effects of a holographic teacher projection on the engagement with the learning materials

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Background

- **Engagement:** "Active involvement of the student for learning activities" [1]
- **Hologram:** Person that looks like part of your environment
- **HoloLearn:** TU Delft group working on online education using holograms [2]
- **Distance learning:** Teacher is not in the same place as the students

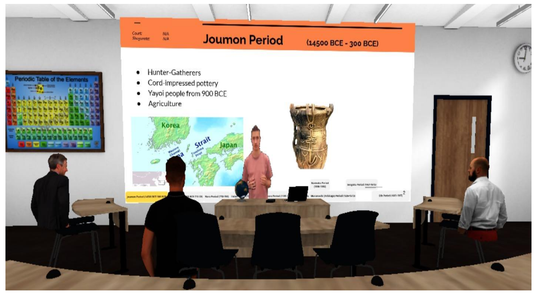


Figure 1 VR classroom

Research question

How does a holographic teacher projection affect engagement of the students with the learning material?

Methodology

Participants:
- 22 participants, mostly TU Delft students, speaking fluent English

Apparatus:

Figure 2: Zoom

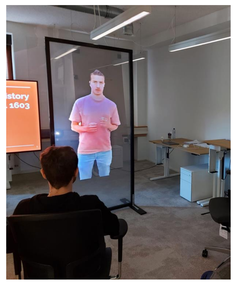


Figure 3: HoloDisplay

Figure 4: VR

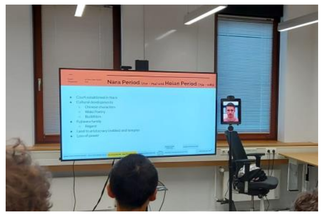


Figure 5: Robot

Measurement: user engagement questionnaire of O'Brien et al. [3] Questions like: "I was absorbed in this experience", The experience was demanding" and "The lecture was attractive"

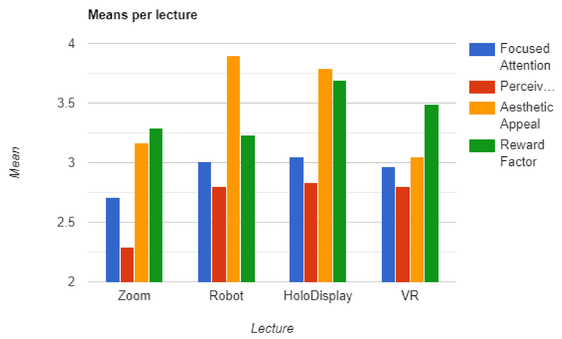
Design:
- **Independent variable**: representation teacher
- **Dependent variable**: engagement of students
- **Control group**: Zoom lecture
- **Treatment group**: HoloDisplay, Robot and VR lecture

Procedure:

Pre-exam → Lecture → Post-exam → Survey

Participants were randomly divided over one of the 4 lectures. Before the lecture started they had to fill in an informed-consent form and make a pre-exam. After the lecture they made a post-exam and they filled in the questionnaires.

Results



- Zoom low perceived usability
- Aesthetic appeal high for Robot and Holodisplay
- Holographic lectures doing better than the zoom lecture
- Sign test: all 3 holographic lectures do significantly better than zoom
- Mann-Whitney test: HoloDisplay and Robot lecture do significantly better than zoom
- No real statistical "winner" between the 3 holographic lectures

Conclusion

- Holodisplay and Robot lecture do significantly better than Zoom lecture
- VR lecture can probably do better if the environment is perfect
- Holographic lectures can really be the future of online learning
- More experiments need to be done: more participants, different measurements and more interactive lectures

References

[1] Skinner et al. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. Educational and Psychological Measurement, 69, 493–525.
[2] T. Quin et al. HoloLearn: Using holograms to support naturalistic interaction in virtual classrooms. In CEUR Workshop Proceedings, volume 2979, 2021.
[3] Heather L. O'Brien, Paul Cairns, and Mark Hall. A practical approach to measuring user engagement with the refined user engagement scale (UES) and new UES short form. International Journal of Human Computer Studies, 112, 2018.