Understanding the power of immersive technologies for enhanced student engagement and learning

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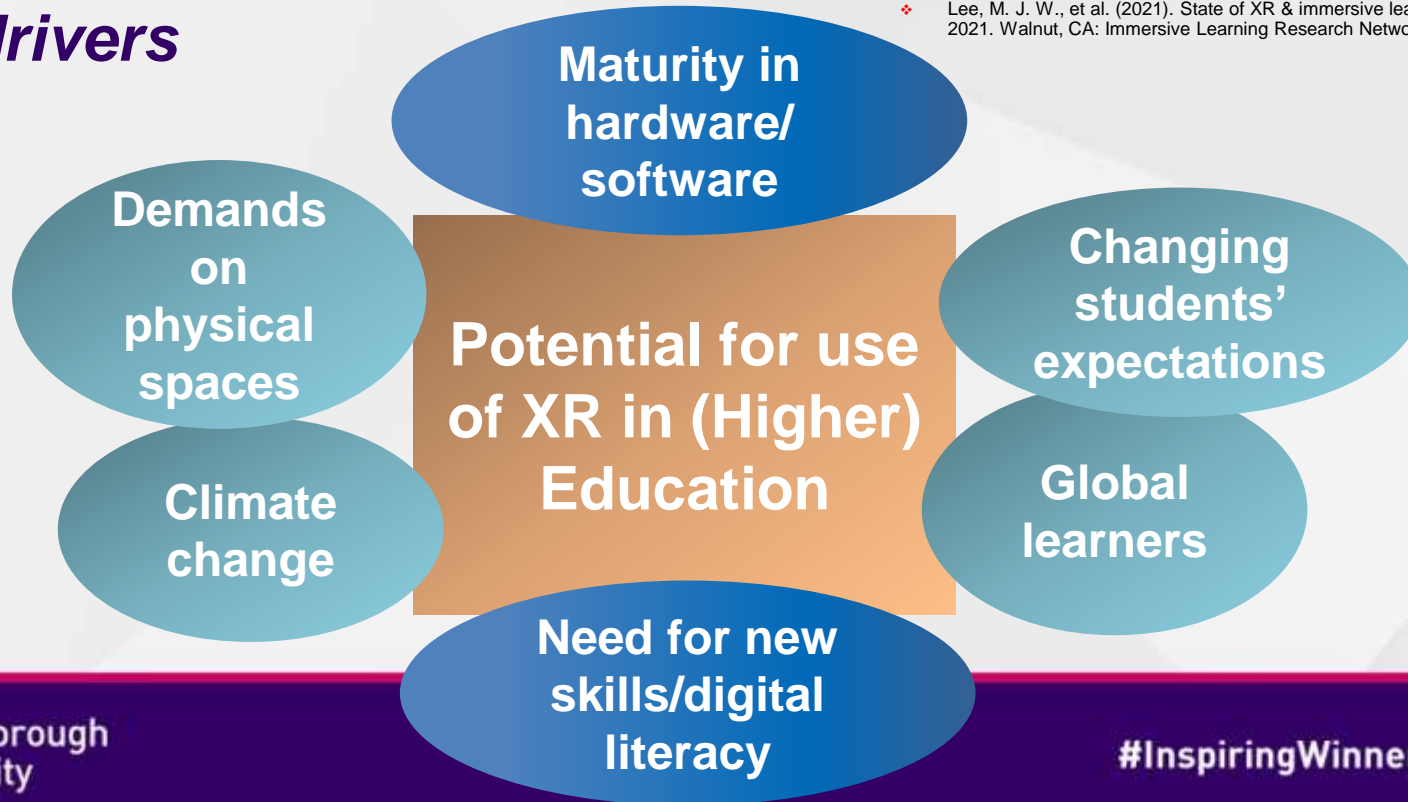School of Design and Creative Arts

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"*Roads? Where we're going, we don't need roads*"

"*I guess you guys aren't ready for that yet. But your kids are gonna love it*"

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Extended Reality (XR)/ Immersive technology in (Higher) Education:
Some drivers

- Some key reports/papers:
  - ❖ Dwivedi, (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy, International Journal of Information Management, 66
  - ❖ Soroushian, J., Neschke, S., Jackson, B. (2022, April). Thinking ahead about XR: Charting a course for virtual, augmented and mixed reality, Bipartisan Policy Center,
  - ❖ Lee, M. J. W., et al. (2021). State of XR & immersive learning Outlook Report 2021. Walnut, CA: Immersive Learning Research Network.

Maturity in hardware/ software

Demands on physical spaces

Changing students' expectations

Potential for use of XR in (Higher) Education

Climate change

Global learners

Need for new skills/digital literacy

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The Positives: Key benefits of XR for *Educators/ Students?*

Engagement
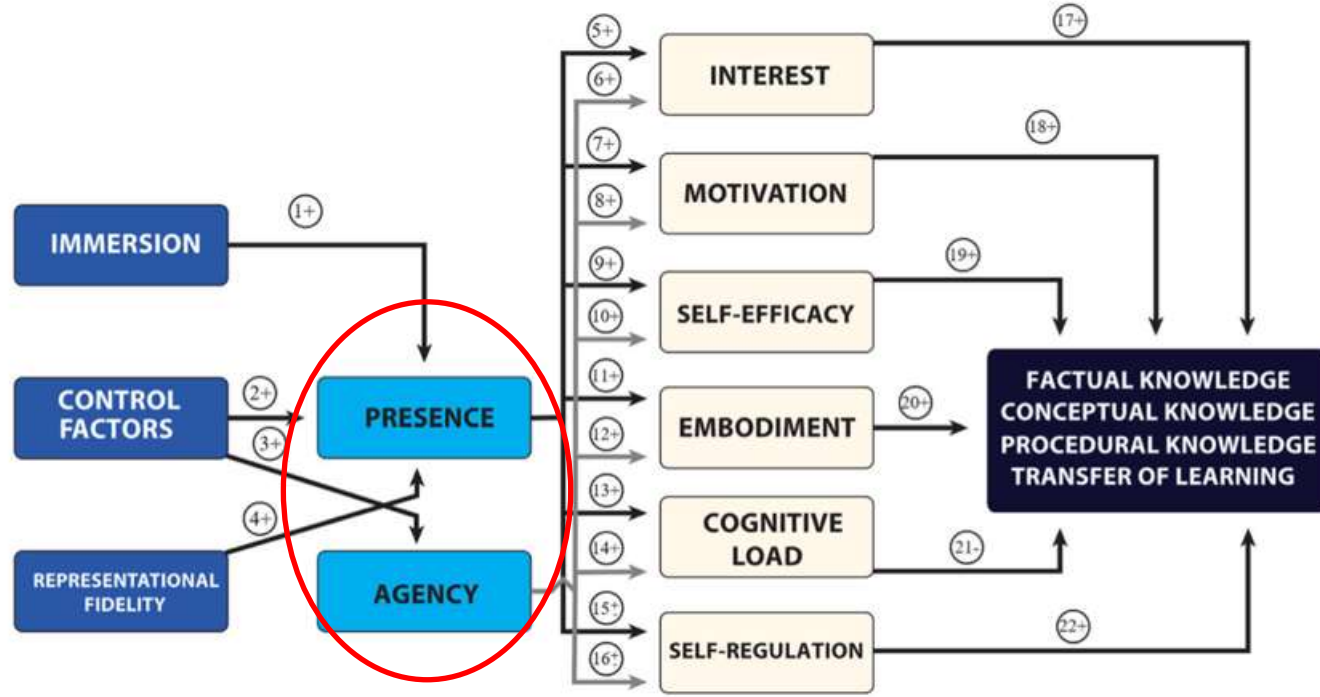
Access to learning

Flexibility in learning

Experientialism

Socialisation

Contextualisation

What's different about immersive technology?

Makransky, G. & Peterson, G.B. (2021) The Cognitive Affective Model of Immersive Learning (CAMIL): a Theoretical Research-based Model of Learning in Immersive Virtual Reality, *Educational Psychology Review*, 33, 937-958

DICE framework for when to use XR*

- When activity in real-world would be **dangerous**
- When it would be **impossible** to do activity in real-world
- When real-world activity would be **counter-productive**
- When activity done in real-world would be **expensive or rare**
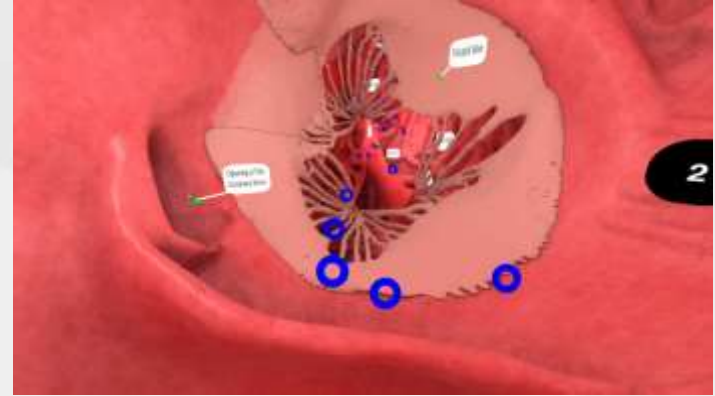
* Bailenson, J. (2018) *Experience on Demand: What Virtual Reality is, how it works, and what it can do*, WW. Norton and Co: London/NY

The Negatives: *Key concerns/limitations/challenges/ barriers* for XR

Validity/Proven impacts on learning

Equity in access

Health and Safety

Societal impact

Usability

Ethics

Privacy/Security

Acceptance/ Resistance to change

Examples of my teaching/research with XR

Immersive learning with holographic technology*

- Use-cases:
  - **Remote teaching…**
  - Live innovation teaching
  - Student generated content
  - AI avatar interaction
- Many research questions for use of this technology

* https://www.timeshighereducation.com/campus/youre-my-only-hope-embedding-holographic-learning-experiences-teaching

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Hologram displays – Exploratory work

- Test mini-lectures took place Friday 7th June
- 2x15mins lectures of general interest
  - Planning for agility
  - Occupant packaging in vehicles
- Lecturers in different room on campus
- Invited students from across the University
- Ethics approval granted to survey/ video students

Survey results – Social/Co-Presence

3. To what extent do you agree/disagree with the following statements

Strongly disagree   Disagree   Neither agree not disagree   Agree   Strongly Agree

The hologram speaker was in the room with me

The hologram speaker was watching me and was aware of my presence

The thought that the hologram speaker was not a real person crossed my mind often

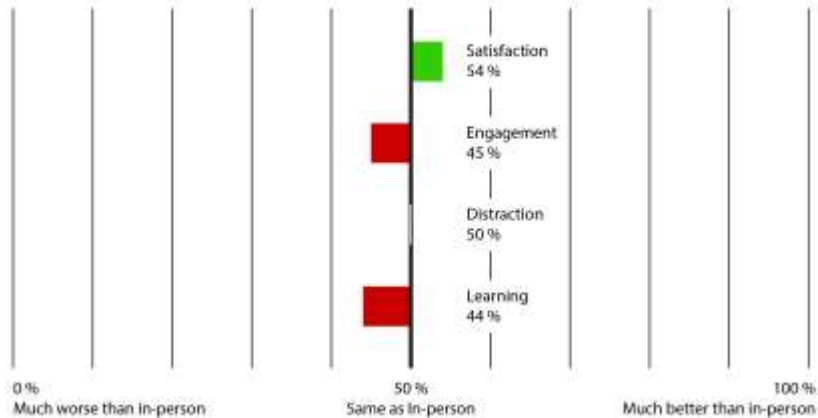The hologram speaker appeared to be sentient, conscious, and alive to me

The hologram speaker was only a computerised image, not a real person

Holograms represent the future of Higher Education

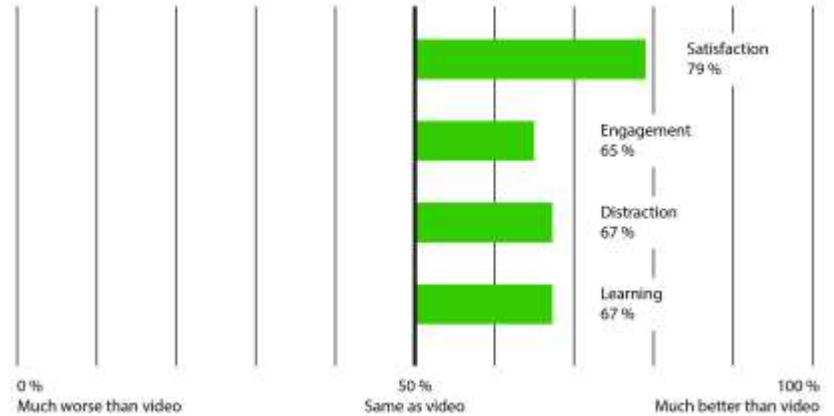100%   0%   100%

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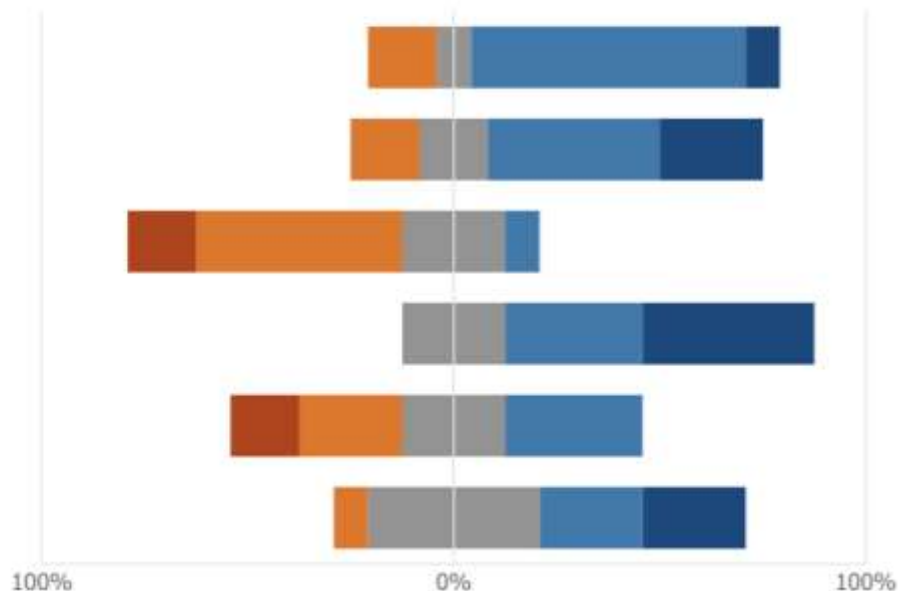
Survey results – Satisfaction, Engagement, Distraction and Learning

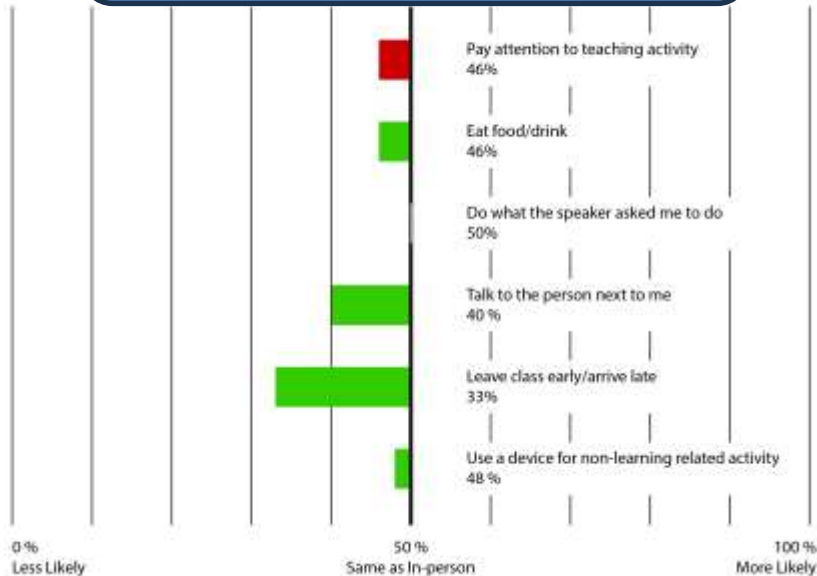Comparison of holograms to in-person teaching

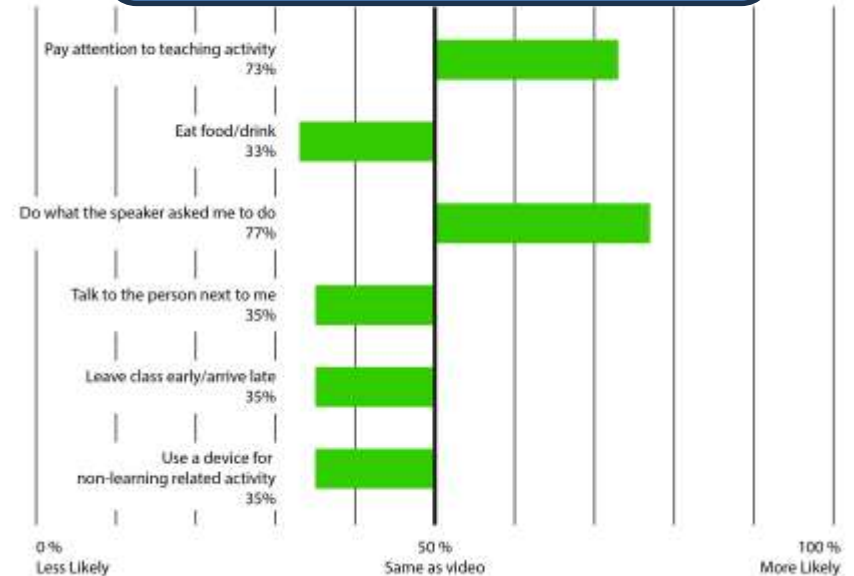Comparison of holograms to video-conferencing teaching

Survey results – Likelihood of Behaviours

Comparison of holograms to in-person teaching

Pay attention to teaching activity
46%

Eat food/drink
46%

Do what the speaker asked me to do
50%

Talk to the person next to me
40%

Leave class early/arrive late
33%

Use a device for non-learning related activity
48%

0% Less Likely — 50% Same as In-person — 100% More Likely

Comparison of holograms to video-conferencing teaching

Pay attention to teaching activity
73%

Eat food/drink
33%

Do what the speaker asked me to do
77%

Talk to the person next to me
35%

Leave class early/arrive late
35%

Use a device for non-learning related activity
35%

0% Less Likely — 50% Same as video — 100% More Likely

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Comments (Positive)

"I feel more focused because .... the hologram caught my eyes"

"Felt like they were in the room and was just like a lecture"

"I felt very excited about it .... and I had more focus on what the speaker said!"

"It was interesting how the image of the person seemed to be in the room and how engaged they were e.g. aware of me/eye contact"

'…it felt refreshing, exciting and new"

"A new experience"

"I enjoyed the novelty of it and trying to work it out"

"The sound was great"

"Can see the speaker vividly and without any internet problems"

"I could hear them very clearly, their voice was loud and clear"

"The speaker looks more active in hologram than in video speech. And there is no lag"

Comments (Negative)

"…it felt there could be a barrier between lecturer and the students since I could feel mind wondering at some points"

"I kept looking at the hologram…so I couldn't really focus on the lecture."

"Still feel like it's a technology interacting with me"

"I was looking from the screen to the holograph a lot whereas in-person lectures often have the lecturer standing closer to the screen.."

"..because ..they're 2 screens to focus at .. made me confused about where should I look at."

"There was a bit of a lag in the comms and an echo"

"…I could see the wall behind the white backdrop in the left corner which was a little distracting"
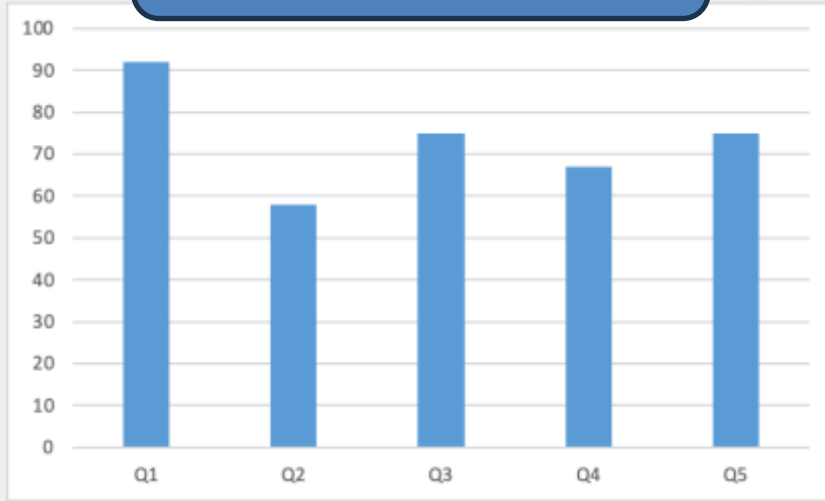
"Bright light from box"

"Sometimes it felt like a video playing back to me…"

"Can't interact with the lecturer"

"I am not sure the speaker can see me or not. I cannot feel any interaction of students and speakers.

Did they learn anything?!
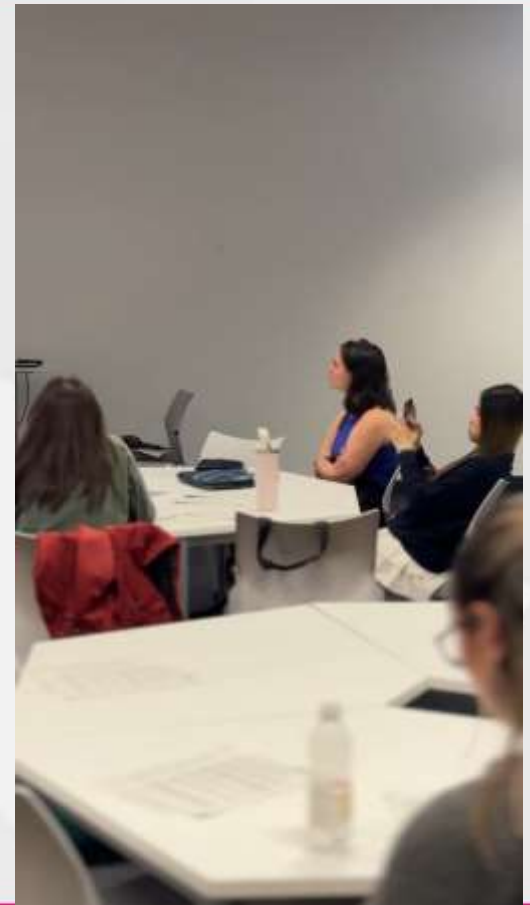

% correct answers

Post-lecture questions

Number of correct answers

Student number

Issues from teacher's perspective

- Didn't feel co-located with students
  - Difficulty in 'reading' the room
- Lack of agency to:
  - Move around room
  - Point to specific content on slides/ annotate slides
- Very useful to magically 'bring' in props from out of student's field of view

Conclusions (so far)

1. Students can be very engaged in hologram lectures and, most importantly, they appear to be learning!
   - ❖ Although distraction is still a possibility for such technology (at least initially)
2. The experience is much closer to an in-person lecture than a video conference session:
   - ❖ General perception that lecturer is co-present with them
3. Interactivity is hard:
   - ❖ We need appropriate technology in place to enable the teacher to also feel 'present'
4. The lecturer can still have authority over the class
   - ❖ Although a moderator in the room is still needed
5. Need to consider more carefully where box is located in relation to:
   - ❖ Students
   - ❖ Slides/content

Future work

- Further analysis – especially of videos
- Additional test trials:
  - With wider range of students in a 'better' lecturing location
  - Set up to enable improved 2-way interactions
- Also need to explore how to enhance teaching sessions with this novel technology through:
  - Recorded scenario content
  - 'Magical' mix of real and digital content
  - AI avatars

Thanks for listening!

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