Shared Nods, Shared Presence: Enhancing Engagement in VR On-Demand Lectures

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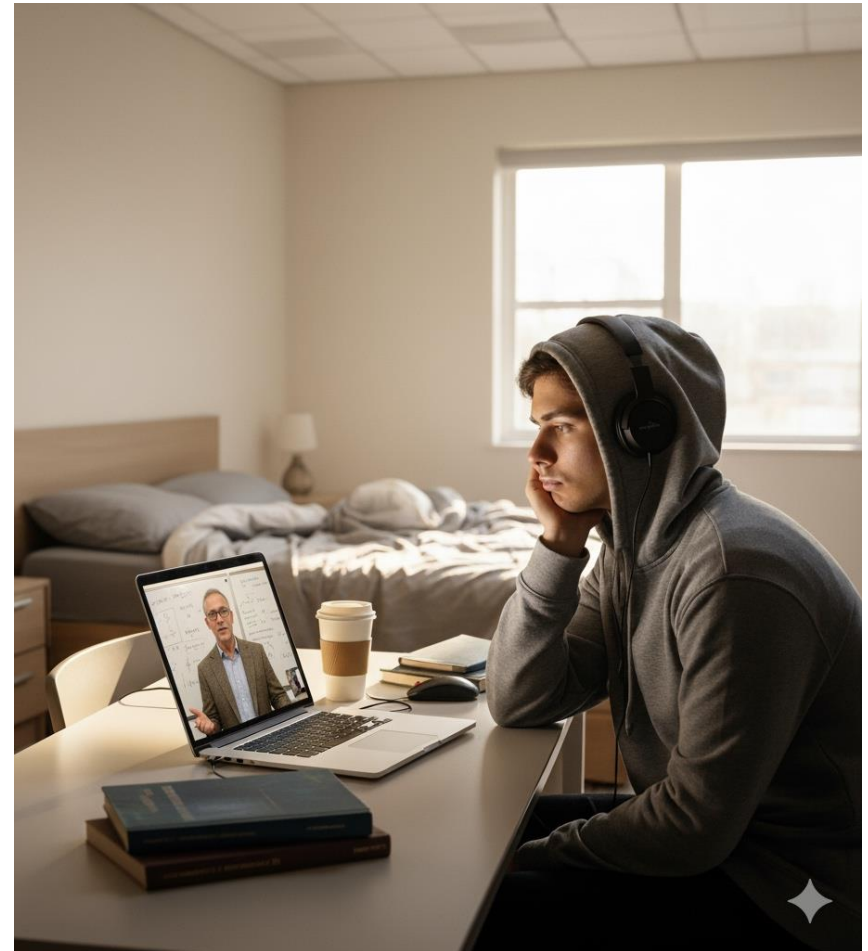
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Background & Problem

- On-demand lectures increased during COVID-19
  - Lack of nonverbal communication compared to face-to-face classes
  - Students often feel isolated and less engaged
- Social presence is important for learners
  - the degree of salience of the other person

How can we improve social presence?

# Main idea: VR x LA

- Share non-verbal social cues from others
  - We focus on nodding because:
    - non-verbal communication
      - interest, agreement, etc.
    - Low privacy risk
    - Easy to measure
    - Voluntary participation

RQ: Can sharing other students' nods in a VR lecture improve engagement and social presence?
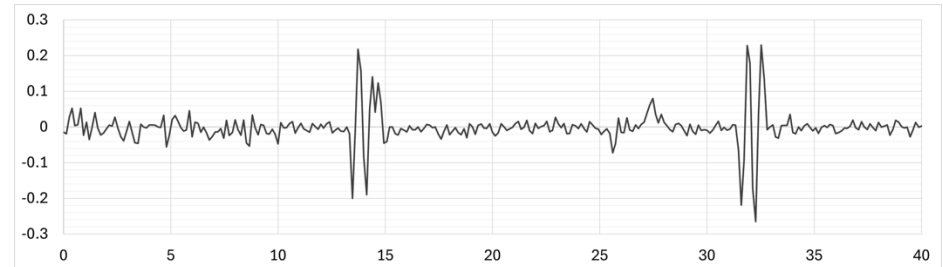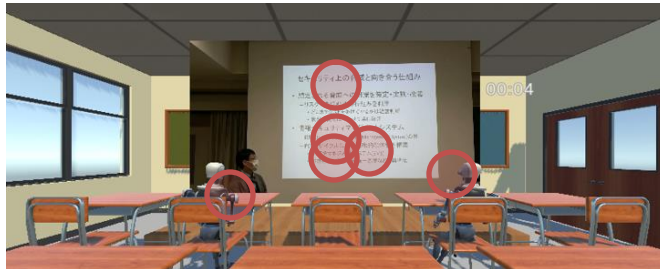
Proposed Method: "Shared Nods"

- We developed a VR lecture system that visualizes the nods of past learners.
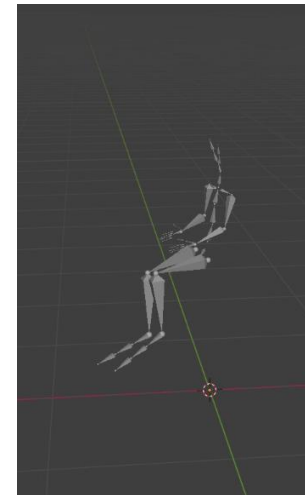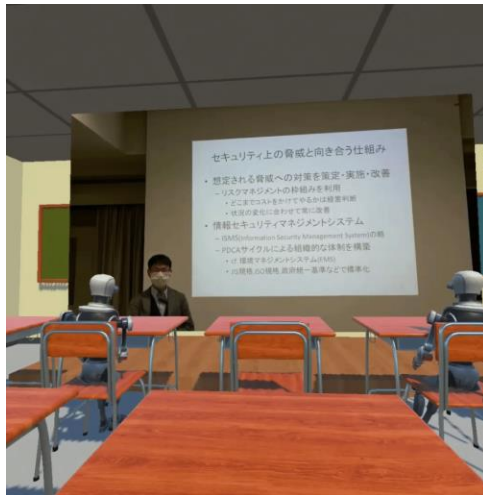
  - pre-captured nodding is replayed by virtual classmates
    - we can specify different timings for each classmate

System Overview

- VR device: Meta Quest Pro
  - display: 1800x1920
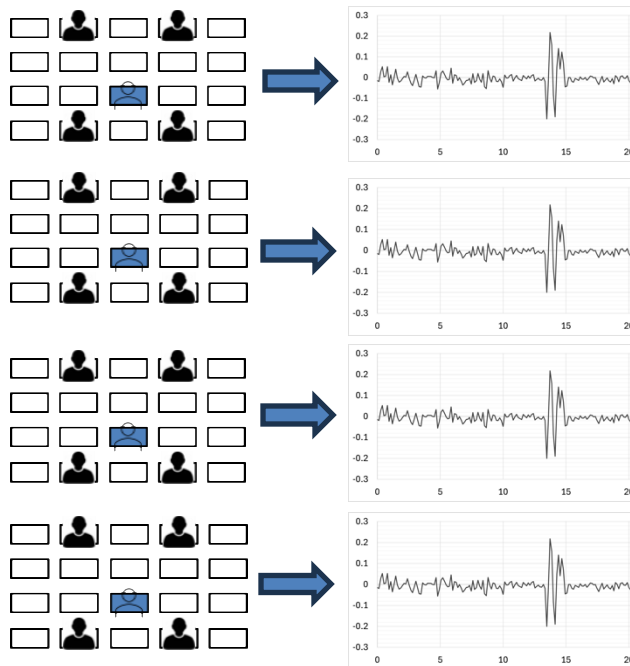 - sensors: eye tracker, angular velocity

angular velocity (vertical)

  - Records gaze and ang. vel. every 0.133 seconds
  - gaze time = # of gaze event x 0.133 sec
- Virtual classmates are placed in the seats.
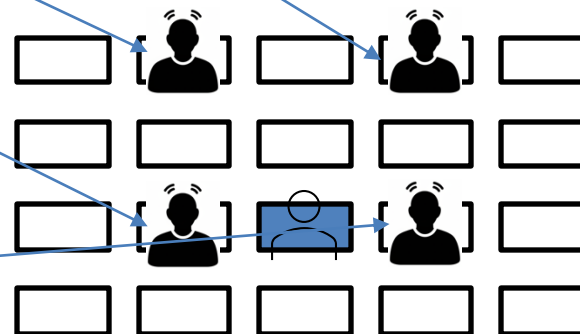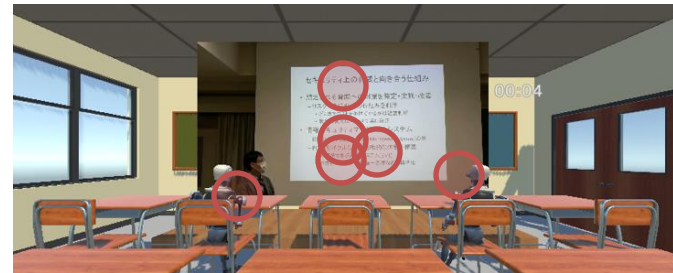
Experimental lecture setting

preliminary experiment

- classmates *without* nods

- nods were detected

main experiment

- nods are shared
    - gaze, ang. accel. are recorded

virtual classmate
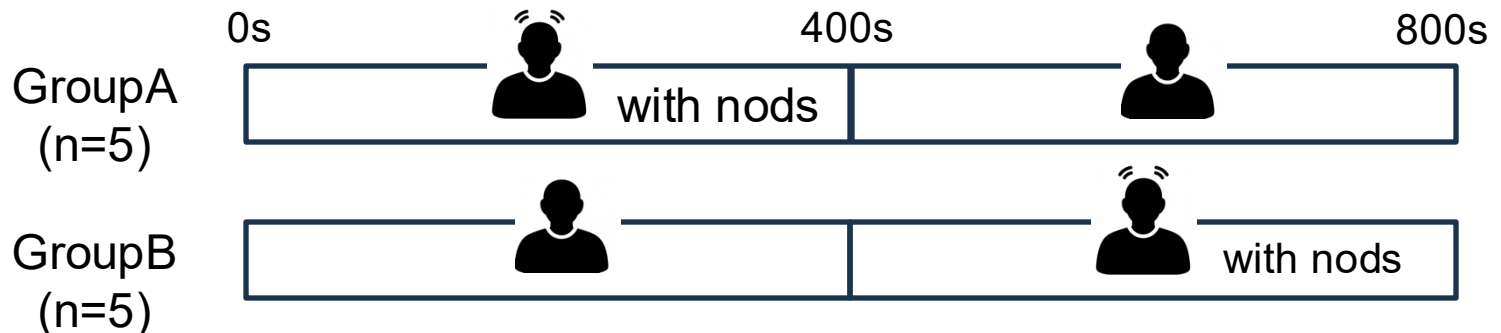
participant

Experiment Design

- We use a simple Difference-in-Differences design to control for lecture-content effects.

- Participants: 10 students
  - 800-sec video is divided in half
    - watch lecture video with/without nods

GroupA (n=5): 0s — with nods — 400s — 800s

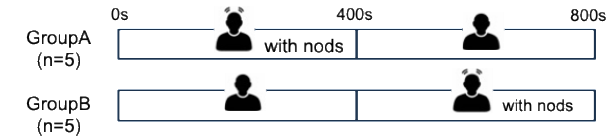GroupB (n=5): with nods
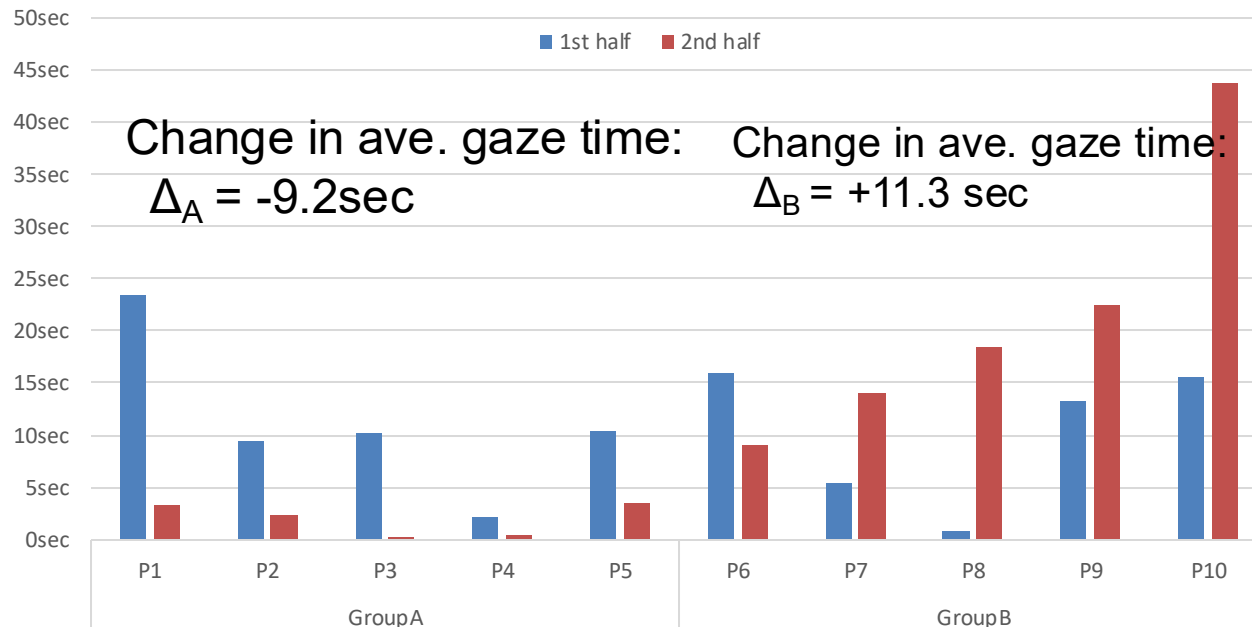
  - *"watch the lecture in a relaxed manner"*
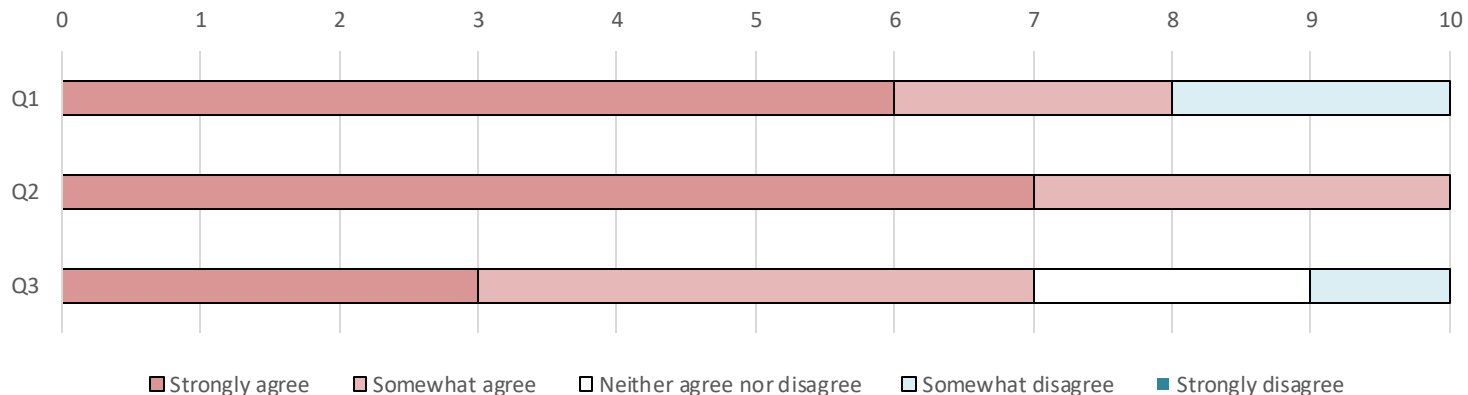   - *we did not mention classmates' nods*

Results: Gaze

- Gaze time increased with nodding classmates
  - Welch's t-test: t=3.15, p<.05
  - Effect size: Cohen's d=1.99 (large effect)

Change in ave. gaze time:
Δ_A = -9.2sec

Change in ave. gaze time:
Δ_B = +11.3 sec

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Survey Results

- *Q1: Did you feel VR environment made it easier to concentrate?*

- *Q2: Did virtual classmates reduce feelings of loneliness ?*

- *Q3: Are you willing to share nodding data ?*

Legend: Strongly agree | Somewhat agree | Neither agree nor disagree | Somewhat disagree | Strongly disagree

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Discussion

- Seeing others' nods made students feel like part of a group.
  - This feeling of 'shared experience' seems to improve engagement.
- Even simple, non-verbal cues can have a powerful impact in a virtual environment.
- This method can help overcome the isolation of on-demand learning.

Conclusion & Future Work

- We proposed a 'Shared Nods' system to enhance engagement and social presence in VR on-demand lectures.

  – Small pilot study with 10 participants

  – No direct measure of learning outcomes yet

- Future Work:

  – Larger studies, learning outcomes

  – Explore other non-verbal cues

    • gestures, note taking, etc.