Team Katsura

Wind-driven thermal comfort

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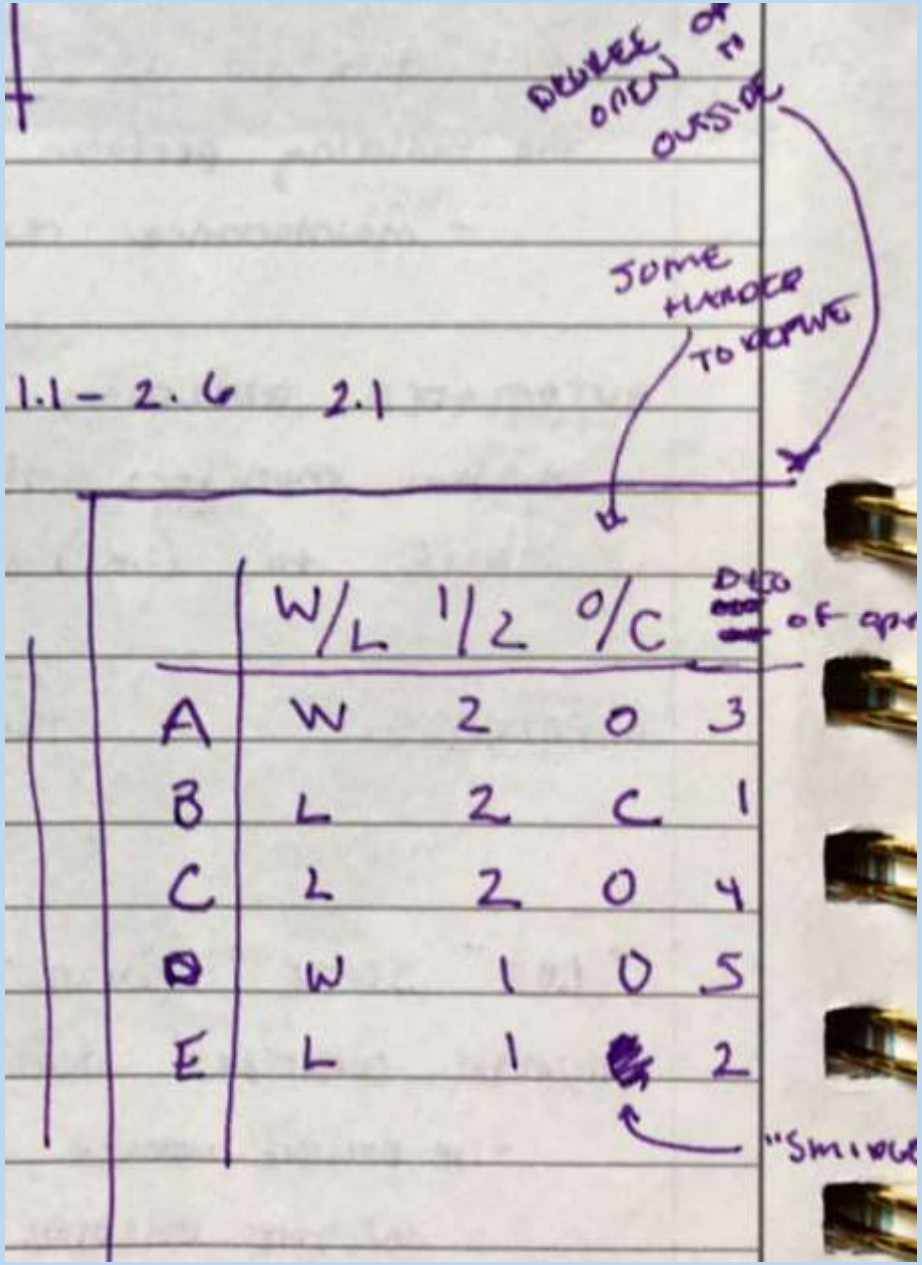
Hypothesis

- Comfort is better in rooms:
  - with openings
  - on the upper floor
  - on the windward side

- How do we define Comfort?
  - Subjective surveys of the 5 team members
  - ASHRAE Thermal Sensation scale
  - Assume -1 to +1 = comfort

Methods – Rooms

- Characterize rooms based on:
  - Windward vs. leeward side of building
  - 1st vs. 2nd floor
  - Openings (windows/doors)
  - Degree of openings (ranked)



Methods – data collection

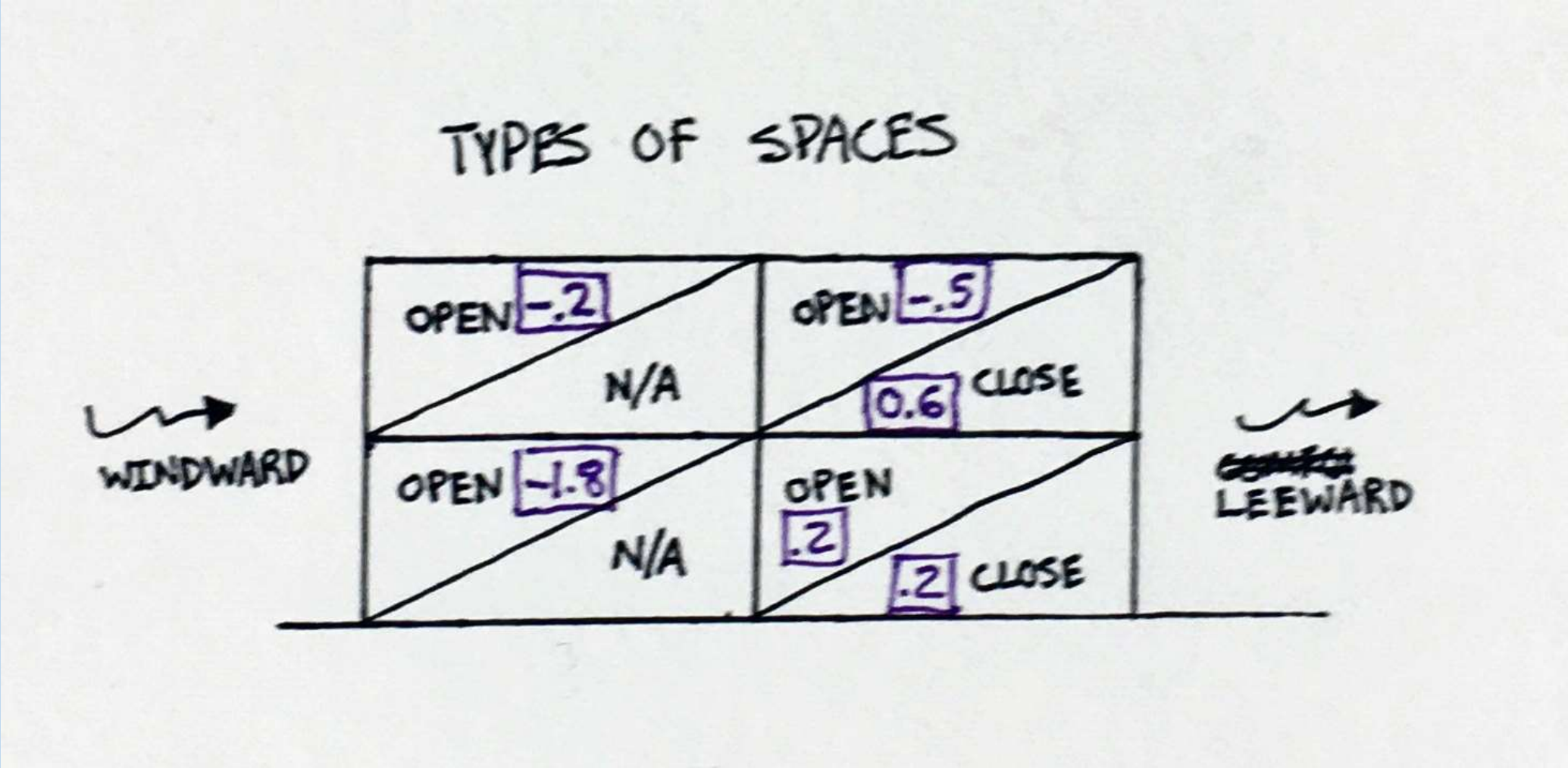
Physical

- Exterior:
  - Wind direction, windward vs. leeward → observation of trees blowing
- Interior
  - Temperature → measurement, Kestrel
  - Air Velocity → observation (consensus)
    - Scale 1-5 (still to breezy)
  - Thermal Sensation → observation (individual)
    - Scale -3 to +3 (cold-neutral-not)
  - Comfort → assume TS of -1 to +1 = comfortable

Personal

- Clothing value
  - Estimated (individual) → 0.4 to 0.8 clo

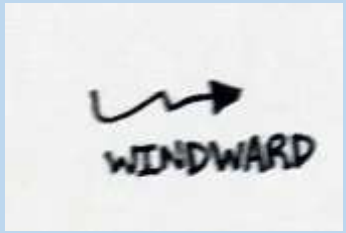
Results– Rooms & Average Thermal Sensation



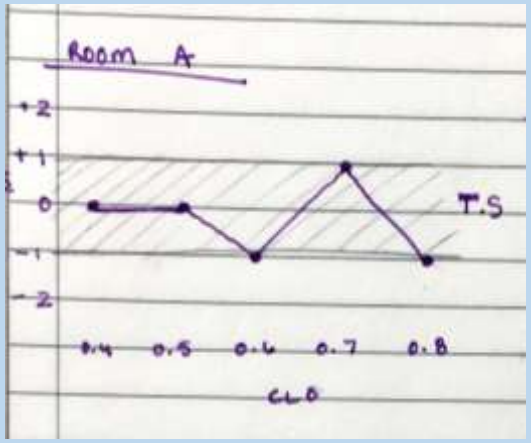
Results

2nd floor

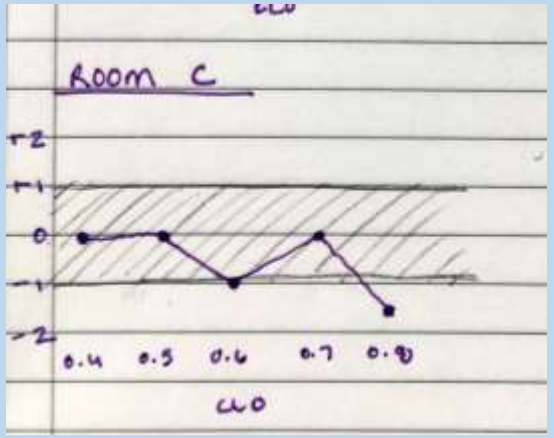
1st floor



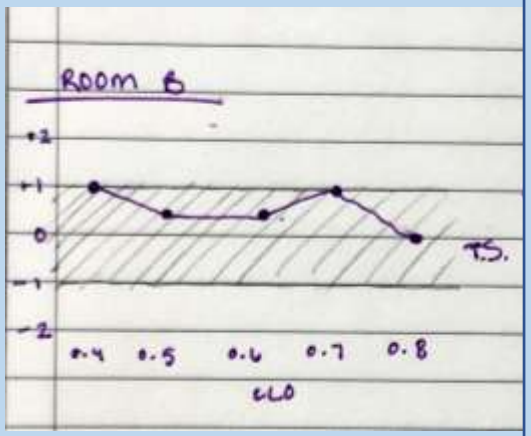
Open



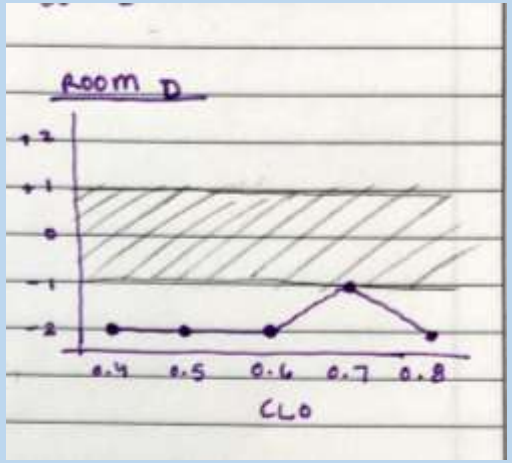
Open



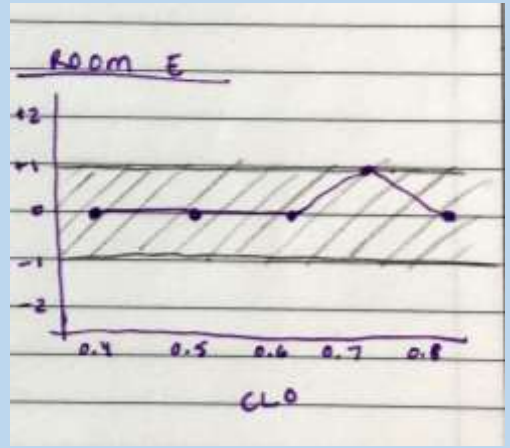
Closed



Open



Partially open / closed



Conclusions

- Comfort was affected less by orientation (windward vs. leeward)
- Comfort was more affected by degree of openness (windows vs. doors, extent open, etc.)
- Windward ventilation was more readily accessible (but on this cold day, there was a little too much)
- Clo value had less of an impact because individual differences and thermal sensitivities were more significant