

Sparkling curiosity for student learning and engagement

Insights from cognitive neuroscience

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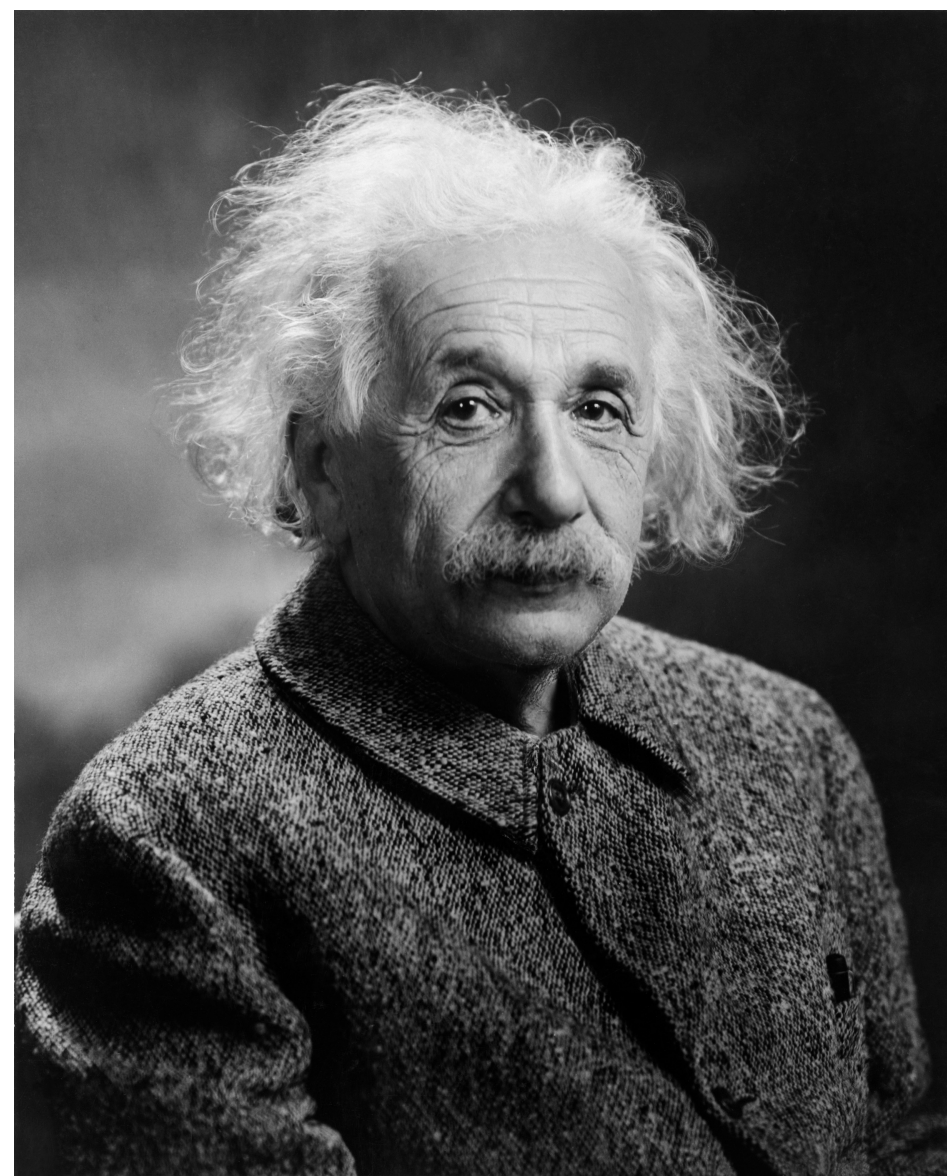
Working Together: Research and Practice 2026 | 3rd July 2026

**Which is the only bird that can fly
backwards?**

So, what is curiosity?

Curiosity = it's like a “psychological itch” to close a gap in what we know

What curiosity does for us...

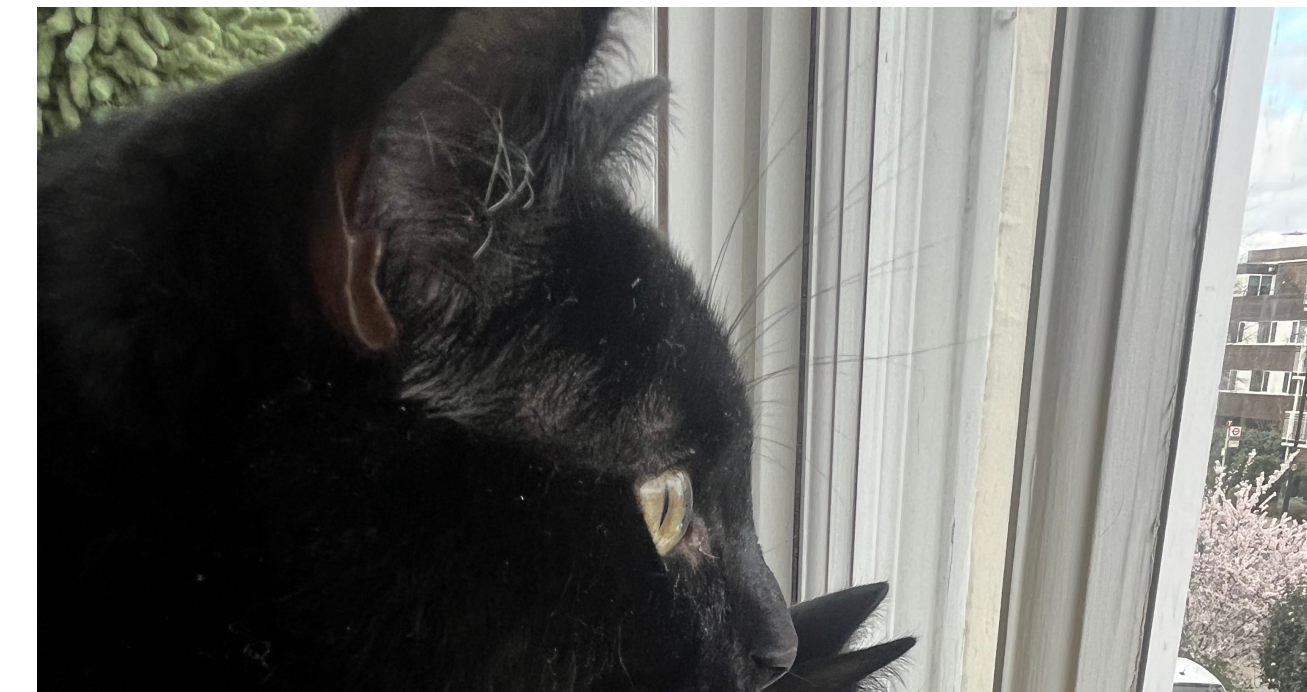


What do psychologists think about curiosity?

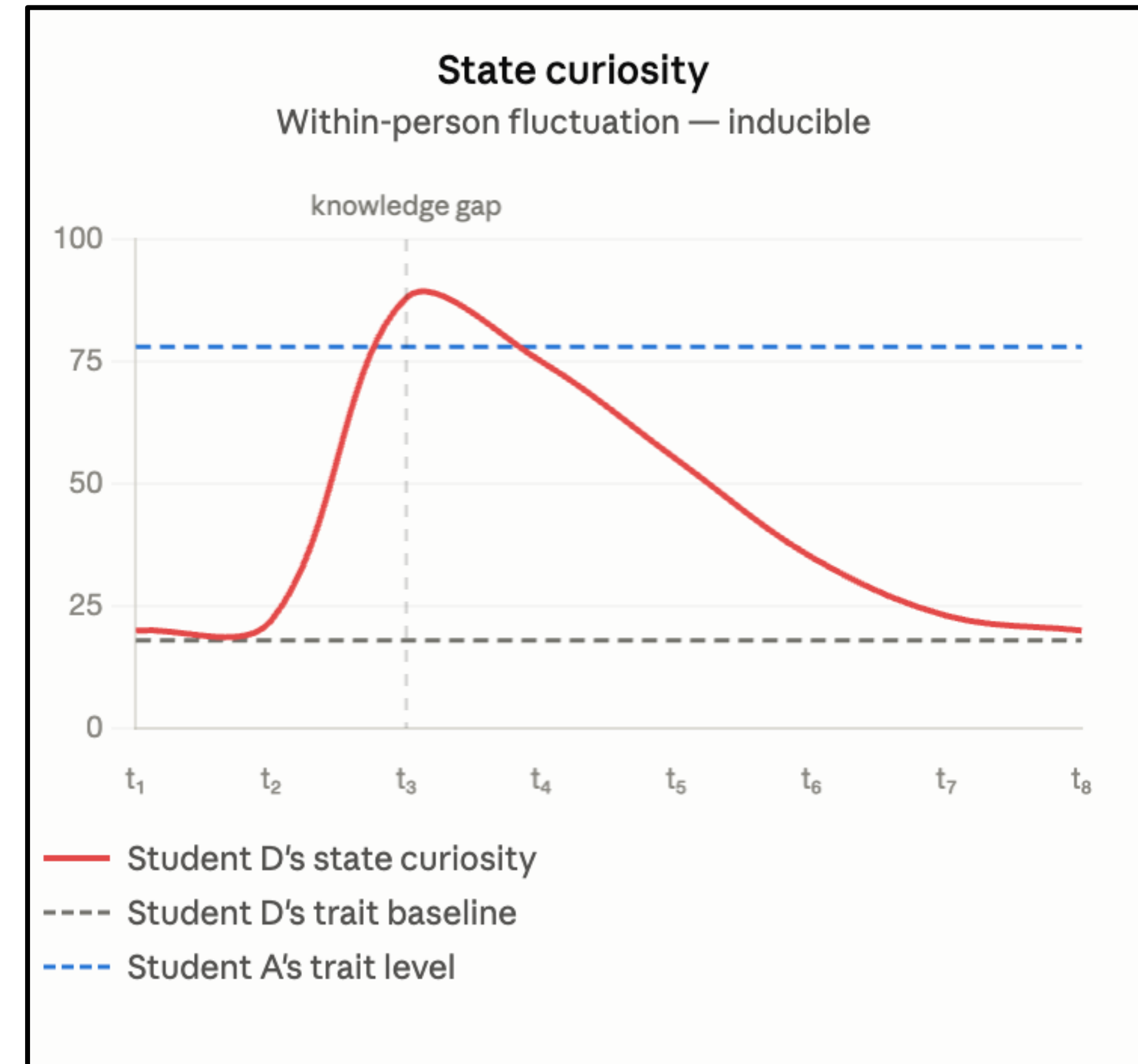
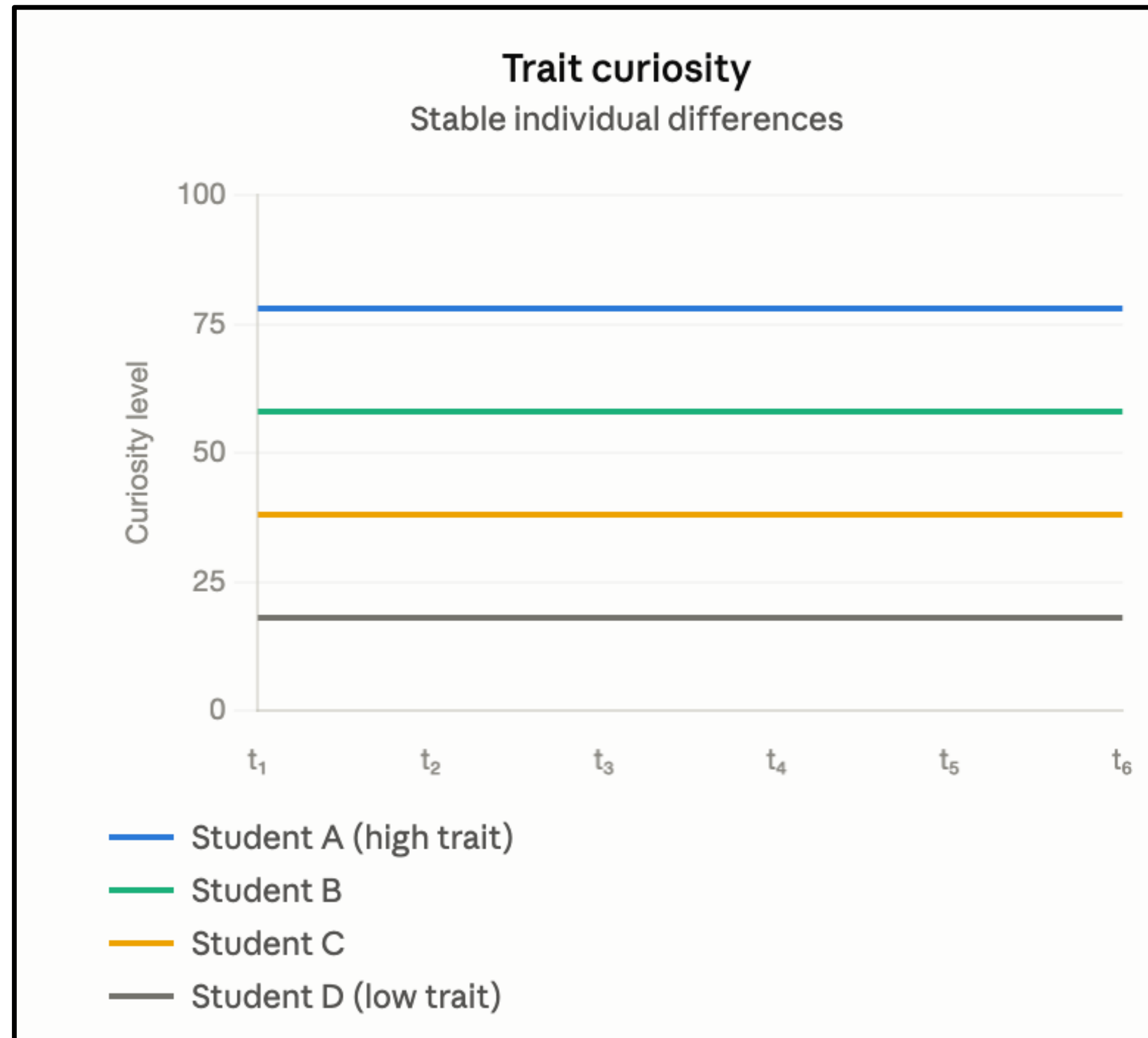
Perceptual curiosity: emerges from (novel) sensory input and drives exploration

Epistemic curiosity: an intrinsic motivation to acquire knowledge

Information-gap theory (Loewenstein, 1994): epistemic curiosity arises from an aversive state of uncertainty – “scratching the itch” is intrinsically rewarding



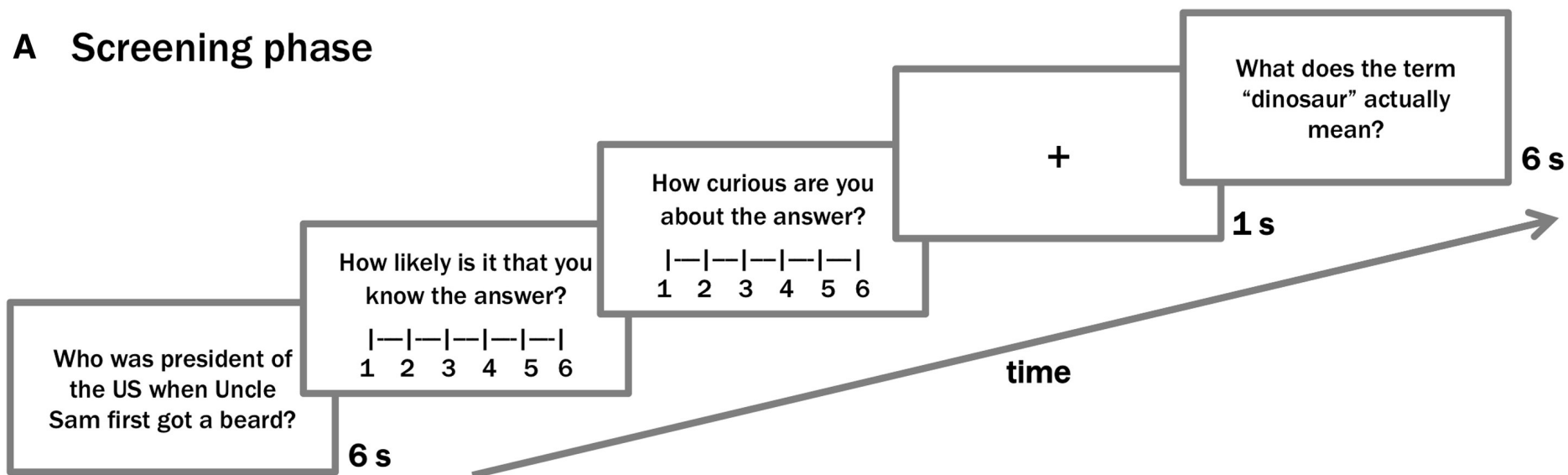
From traits to states...



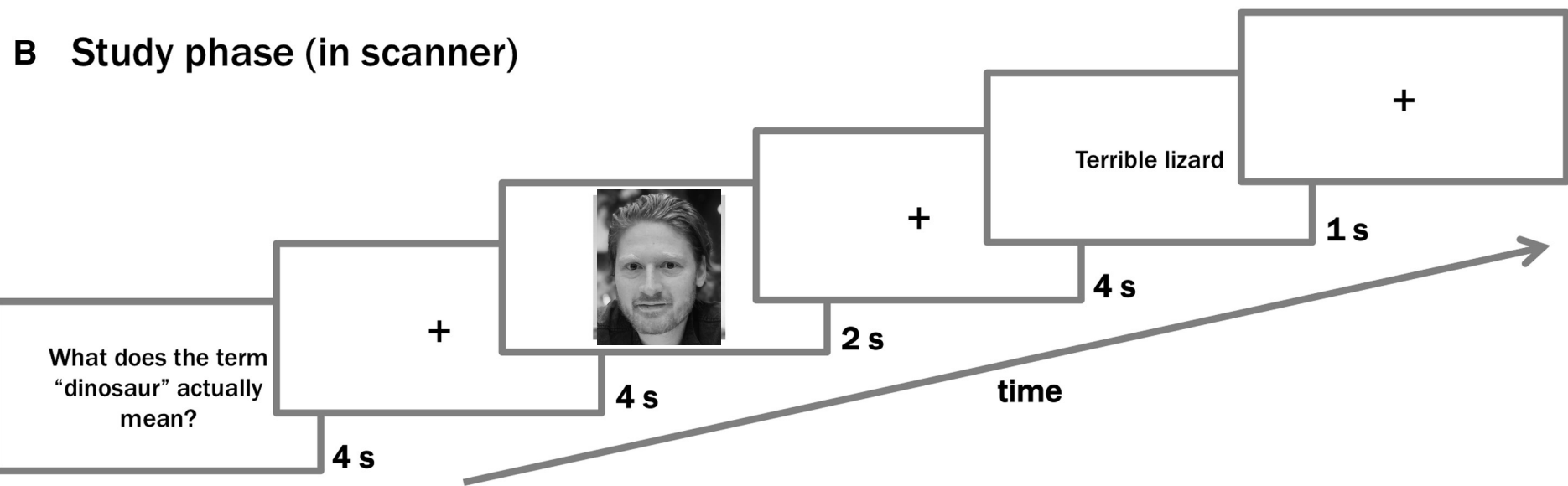
Curiosity in the brain



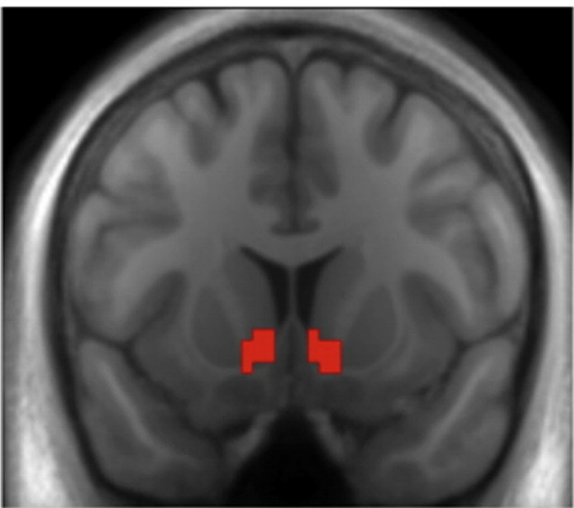
A Screening phase



B Study phase (in scanner)

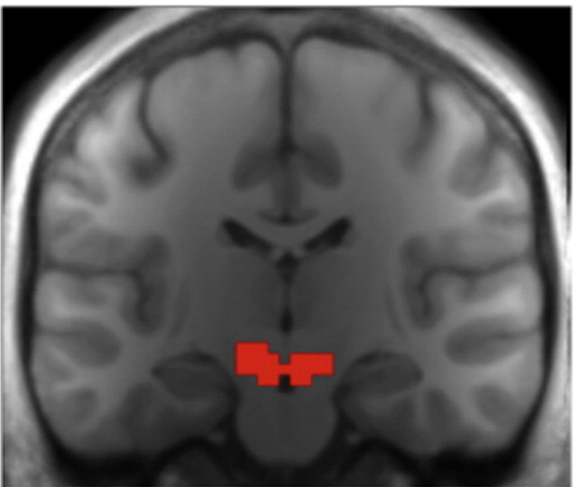


A

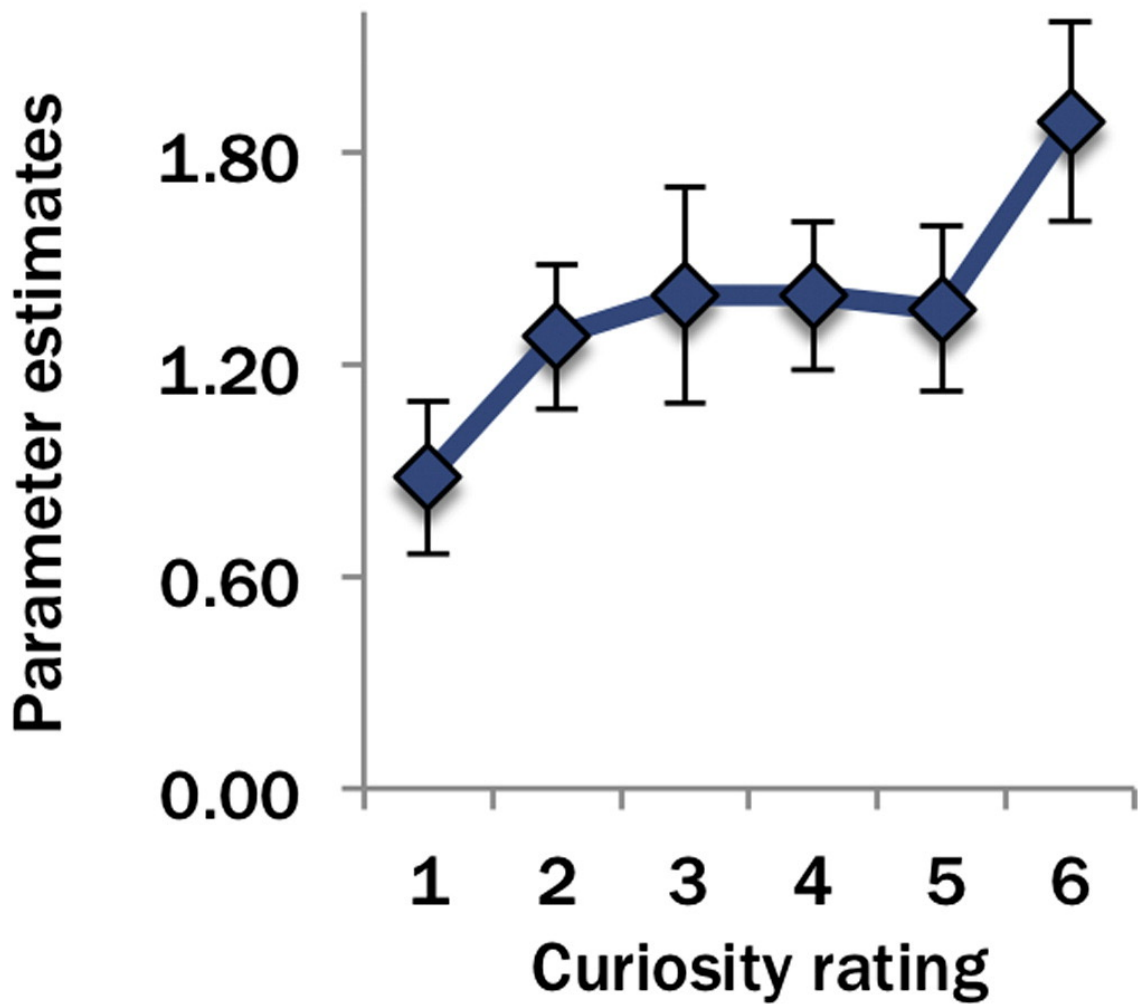
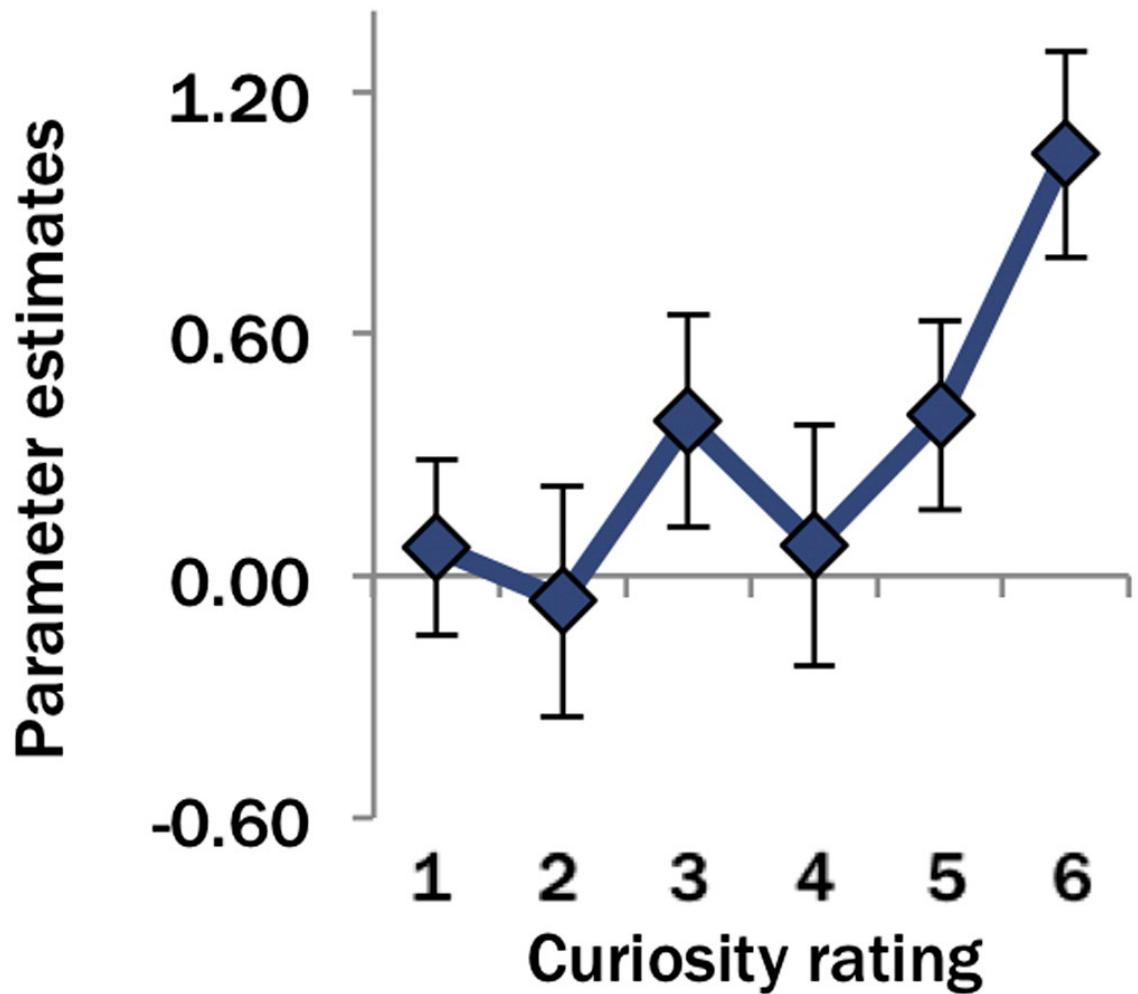


nucleus accumbens

B



SN/VTA



Curiosity as a memory vacuum

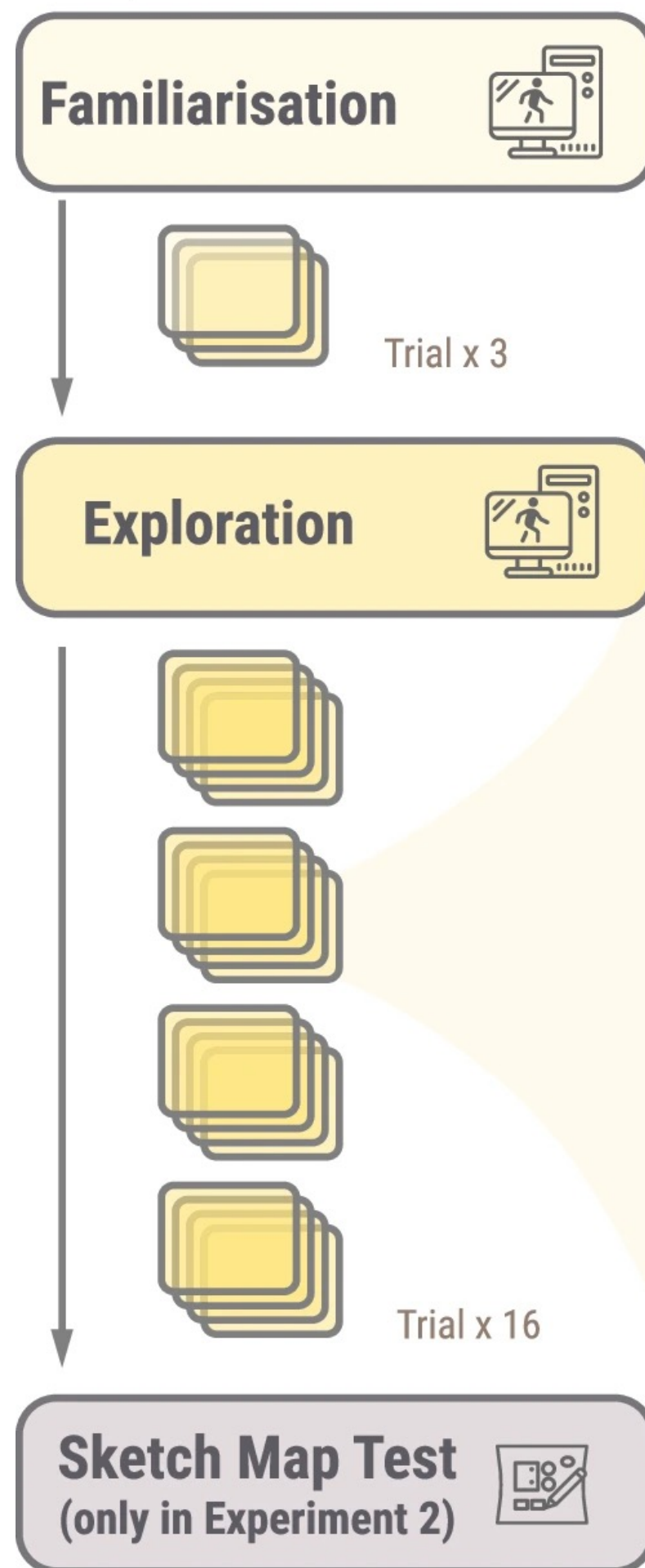
Curiosity doesn't just boost memory for the answer

It boosts memory for whatever else is happening nearby - even if unrelated

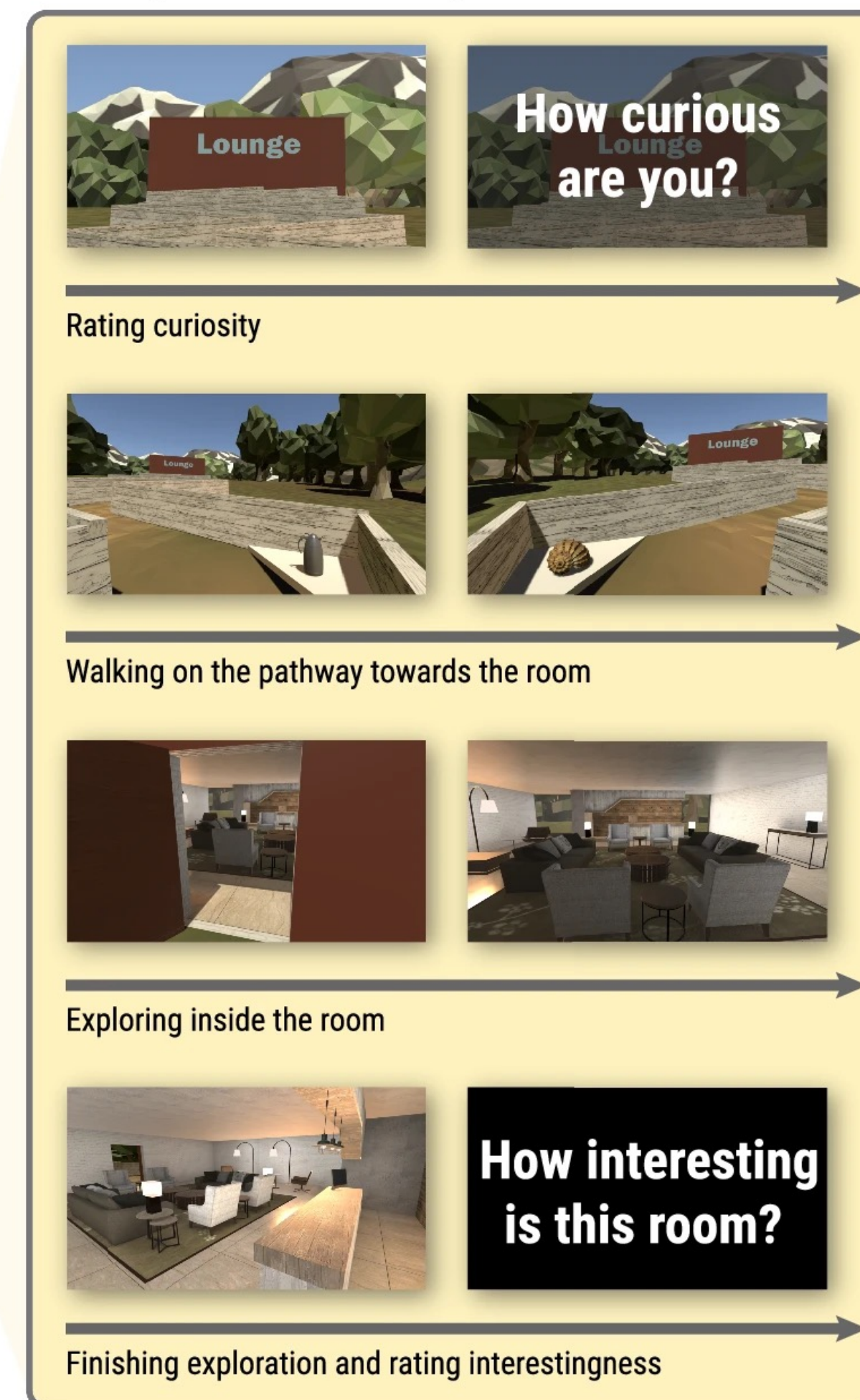
Curiosity is like *vacuum* drawing information into memory

Curiosity, exploration, and complex memory

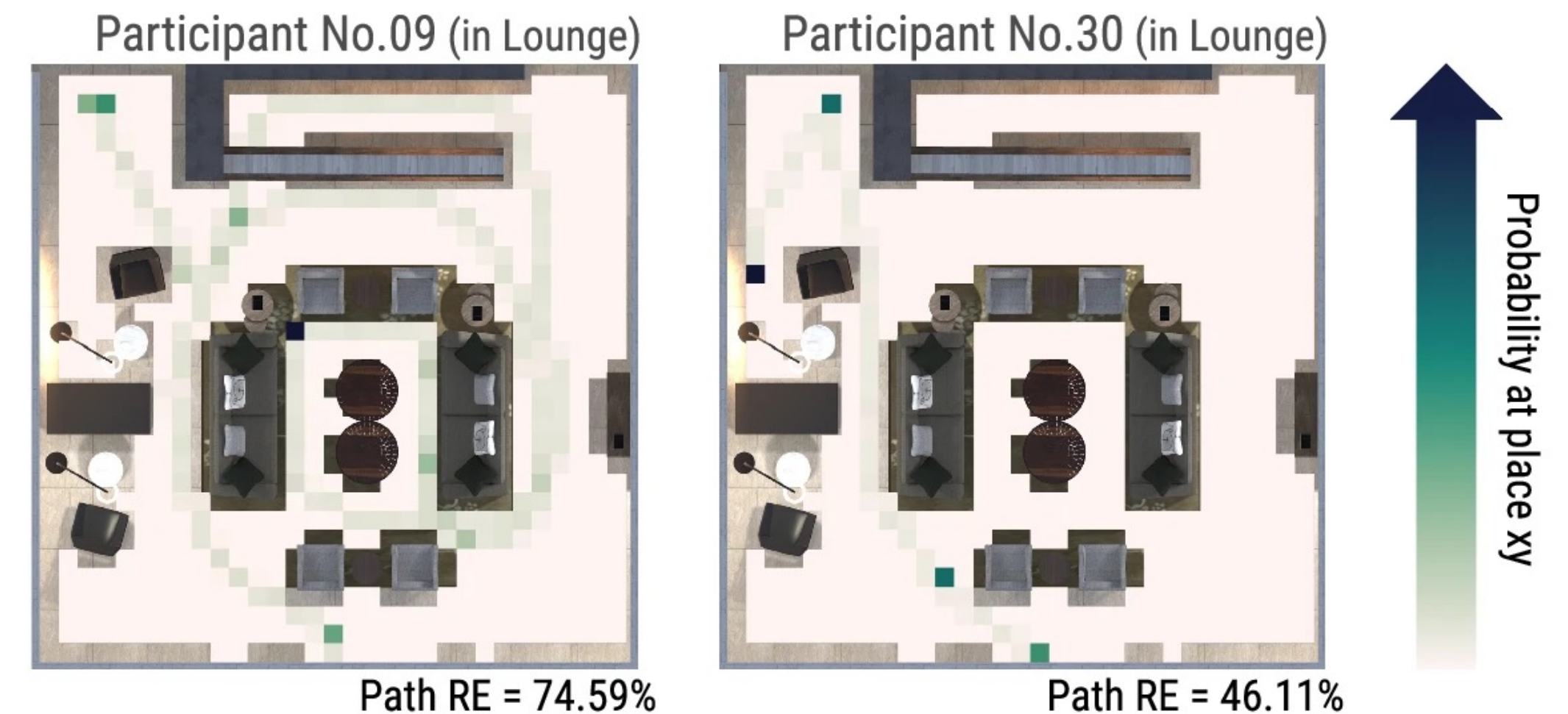
A. Experiment flow chart



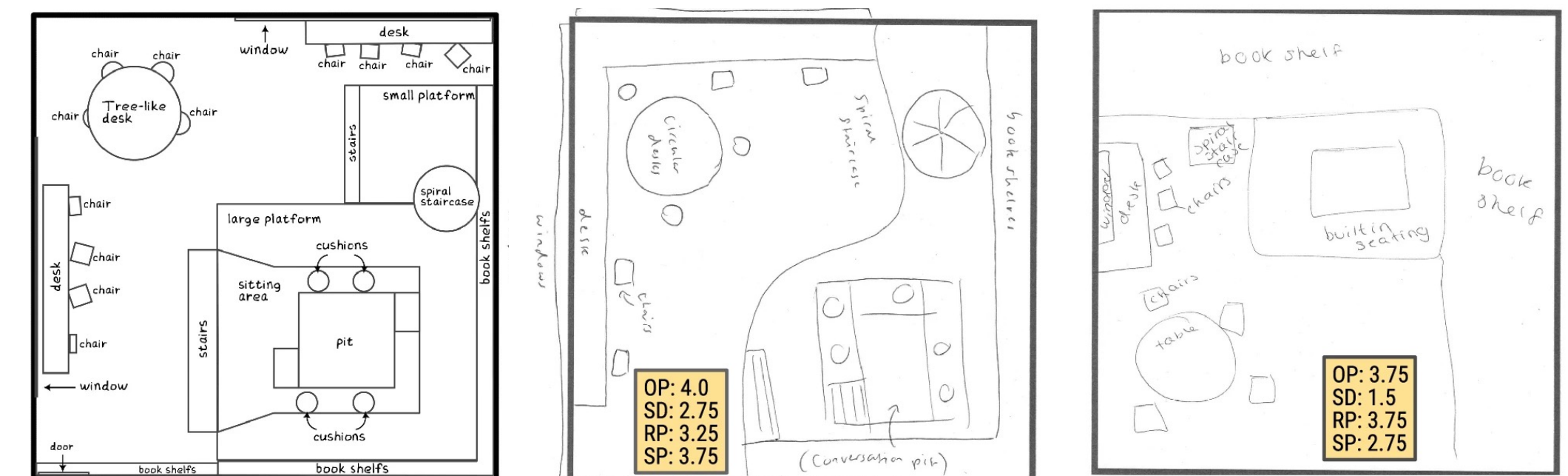
B. Sample trial in the Exploration session



Participants explored more widely in high curiosity states – no effect of *trait curiosity*



High curiosity states help us remember detailed “maps” of the environment



What does this mean for teaching?

What we have learnt so far...

- Curiosity is a powerful motivating force and can be sparked in the moment – it's not a fixed trait of individuals
- Has meaningful and potentially long-lasting effects on learning and memory

What levers can we pull when teaching?

1. Start the lesson with a surprising fact or open question - not just a topic title or description
2. Don't resolve it too fast - let the not-knowing sit and teach through the gap
3. Don't be afraid to model your own curiosity/uncertainty out loud

Instructional behaviours to model uncertainty

1. Providing more opportunities to think, question, participate and respond
2. Prompting students to generate questions as well as answers
3. Encouraging the generation of alternative explanations
4. Providing opportunities to explore their own interests or questions.



Key takeaways

Curiosity is an important driver of behaviour and shapes learning

Curiosity is not just a stable characteristic – it's a state that can be harnessed to empower learning

Satisfying curiosity states is a “cognitive reward” that engages the brain's reward system

Curiosity helps memory capture more information from the world and motivates us to explore

Neuroscience and psychology may inform practices in how we structure lessons/lectures, frame information, and model our own behaviour

**So...which is the only bird that
can fly backwards?**



Hummingbird!

Thank you – any questions?

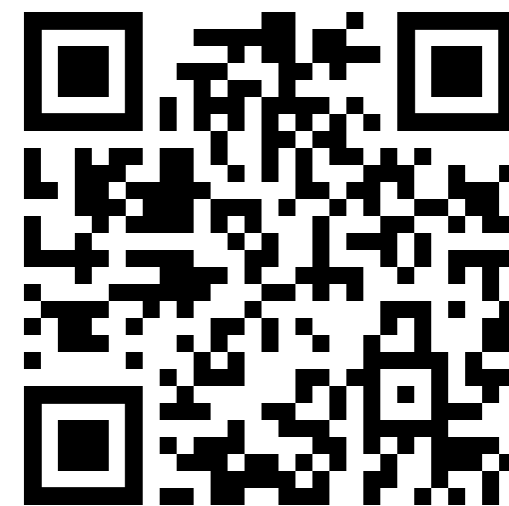
Harnessing curiosity to enhance learning and memory in higher education

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communications psychology

Article



<https://doi.org/10.1038/s44271-024-00174-6>

Curiosity shapes spatial exploration and cognitive map formation in humans



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To think about...

1. How can we resolve the tension between curiosity-based teaching and standardised curricula and assessment?
2. How does state and trait curiosity interact – what about student's with a low baseline?
3. What are the other benefits of curiosity in schools (e.g., reducing anxiety, enjoyment, attainment gaps)?
4. How do peer interactions influence curiosity, particularly between students with different levels of trait curiosity?