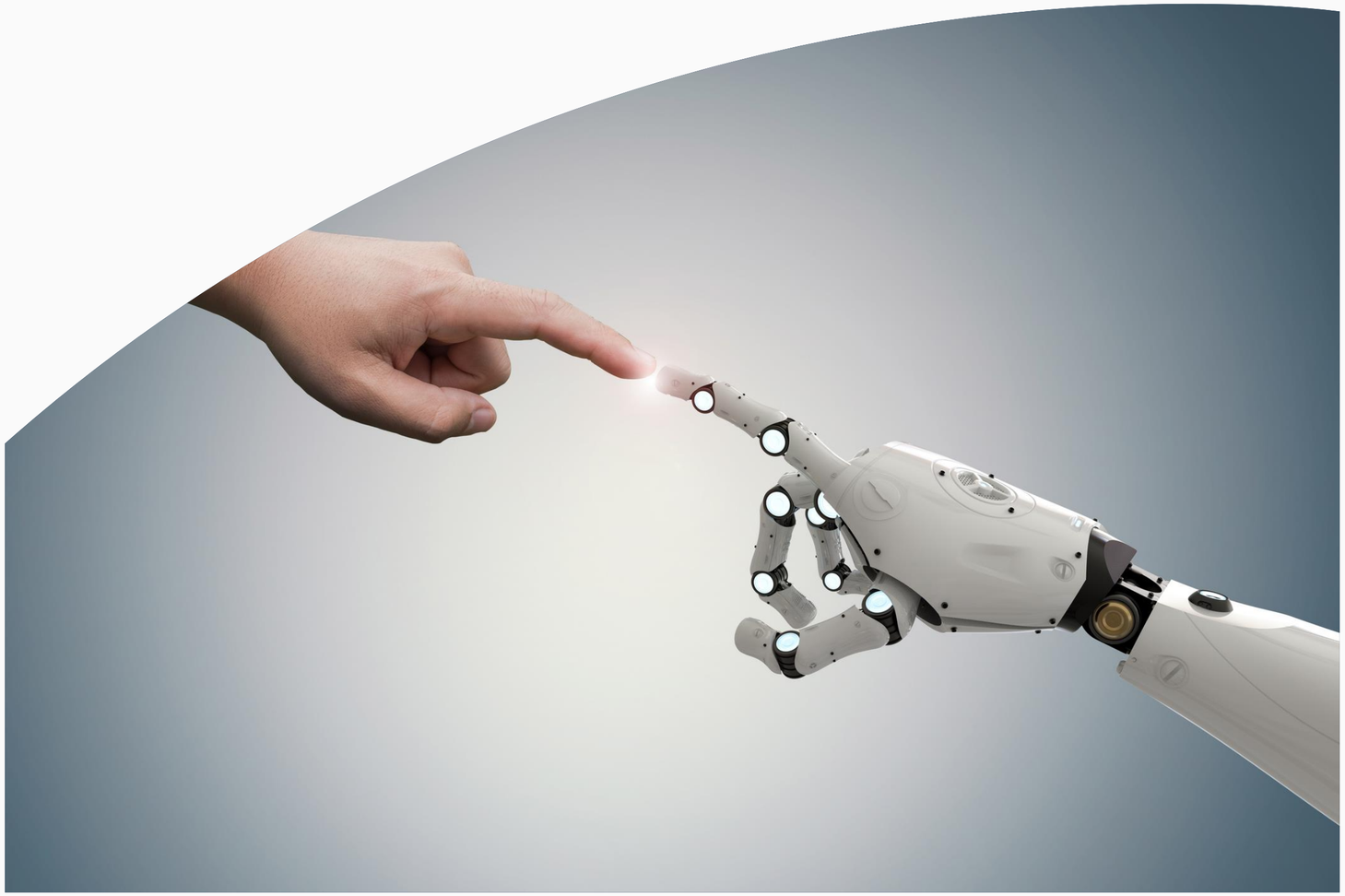
University College Dublin
An Coláiste Ollscoile,
Baile Átha Cliath

Why we need to think metacognitively in the Age of AI

Prof Emma J O'Neill



What do you think the purpose of Higher Education is in the Age of Generative AI?



How do we all learn most effectively?



What has changed?

No longer about availability of information



Information overload



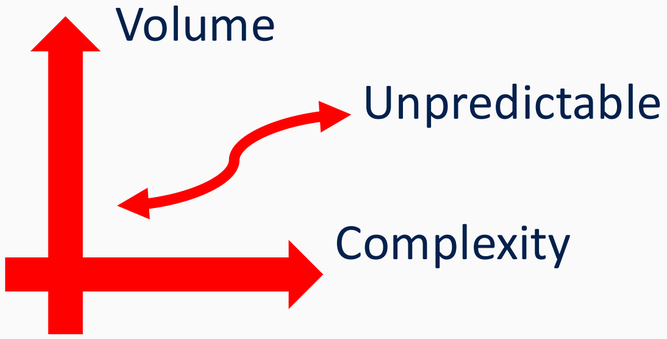
Speed of change



‘Wicked’ challenges



Generative AI

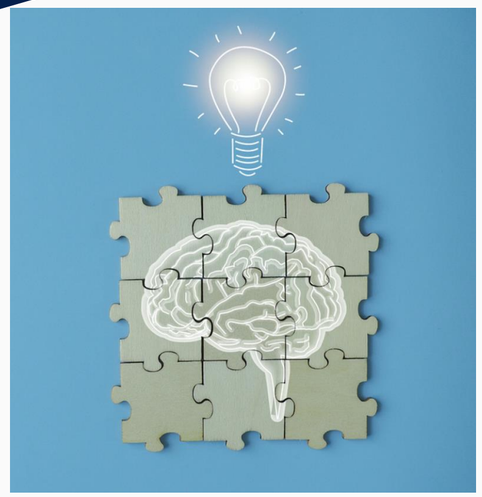


How do we need to respond?

Focus on how we manage and interpret information

Competencies - knowledge, skills, abilities, behaviours, and experiences that enable an individual to perform a specific job or task effectively









How do we support competency development?

Active exploration, problem-solving and sensemaking





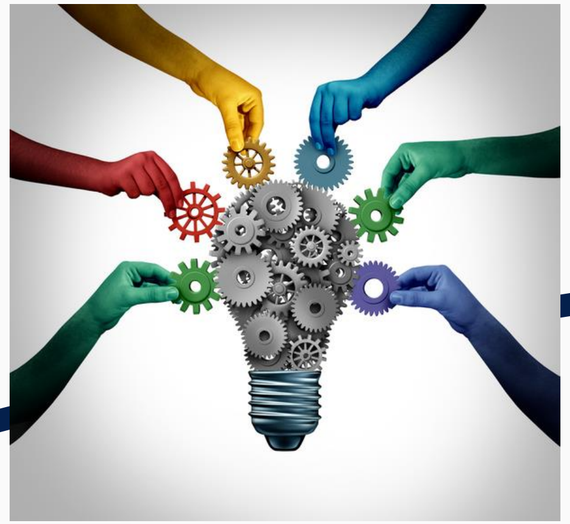




This is a dynamic process



Learn



Unlearn



Re-learn

Alvin Toffler: “The illiterate of the 21st century are not those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

Metacognition

Awareness and understanding of one's own thought processes

Flavell 1979



Metacognition

Affective and social components



Knowledge of cognition
Recognition of approaches and strategies



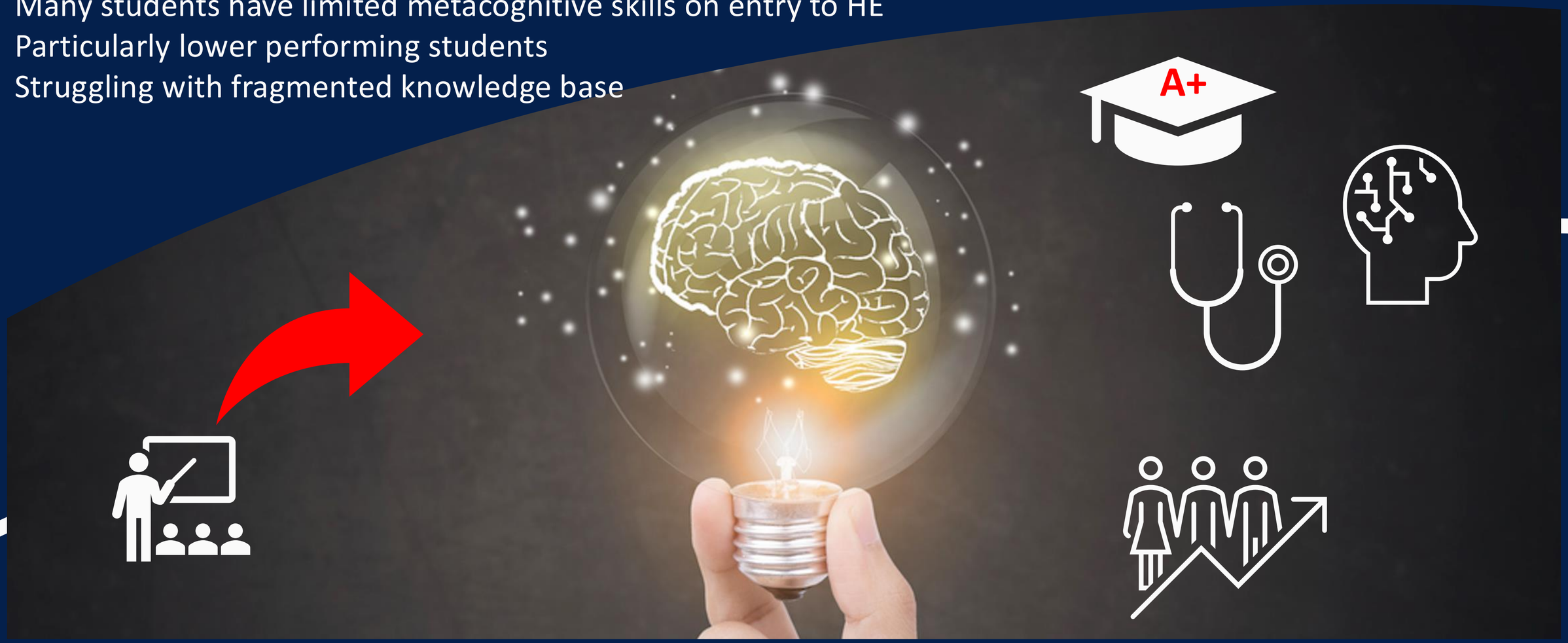
Regulation of cognition
Skills that help control learning

Planning
Information management
Monitoring
Debugging
Evaluation

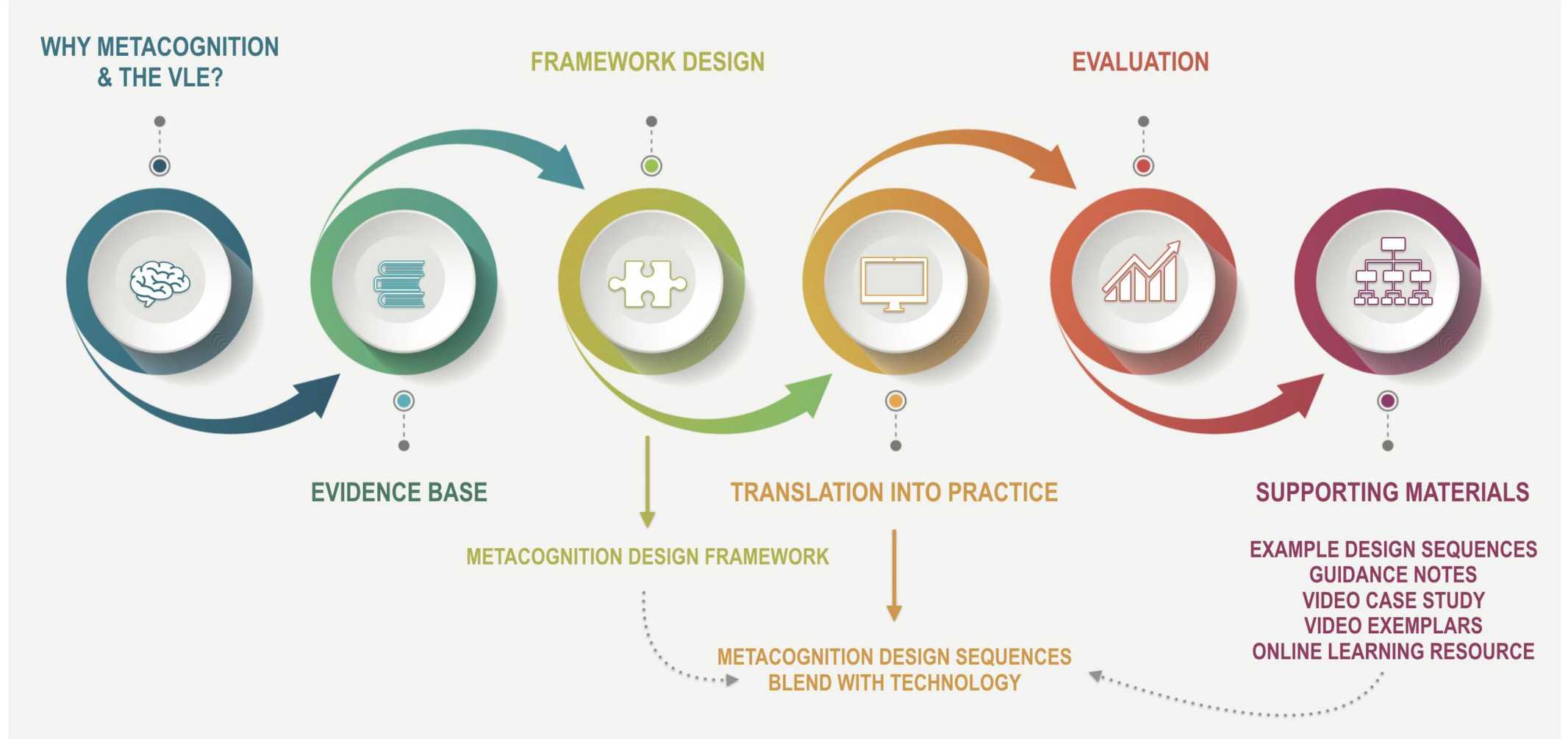


Metacognition

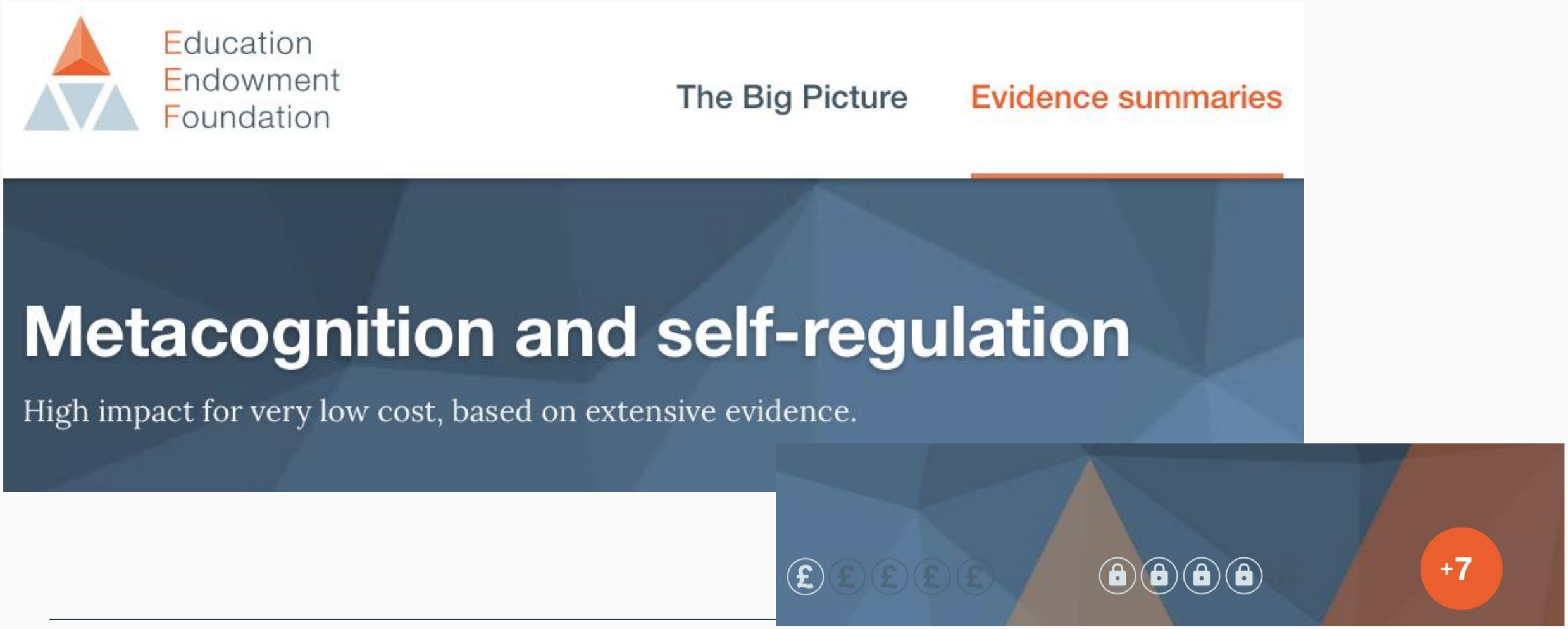
Many students have limited metacognitive skills on entry to HE
Particularly lower performing students
Struggling with fragmented knowledge base



Fellowship research study



Where to start….?



Metacognition ….developing a framework

EEF detailed **seven actionable recommendations** to support the teaching of metacognitive skills in secondary education.
However, this framework **aligns closely with models of metacognition** and self-regulated learning used in **tertiary environments** (Nicole &McFarlane-Dick 2006, Winne, 2011; Pandero, 2017)

Education
Endowment
Foundation

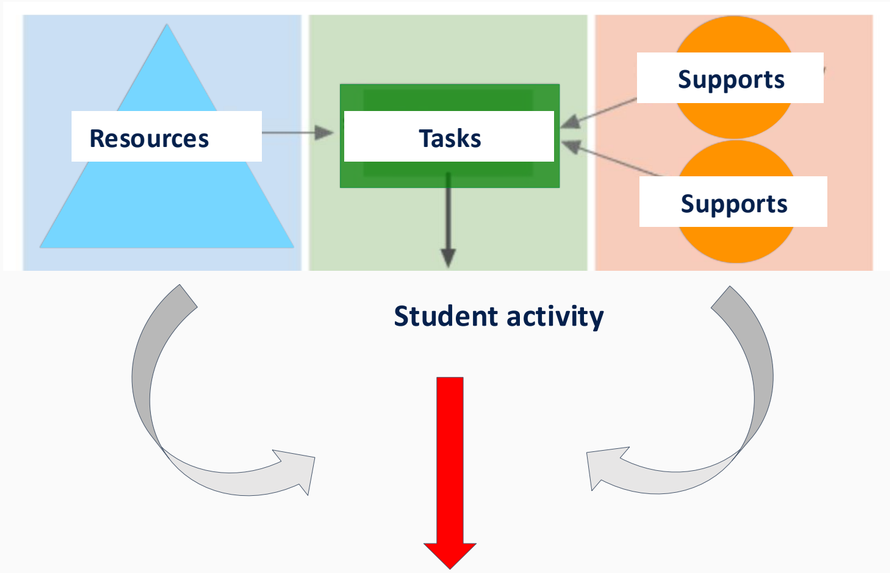
METACOGNITION AND SELF-REGULATED LEARNING

Summary of recommendations



Evidence-based theory into practice





Learning design sequences (Oliver 1999)

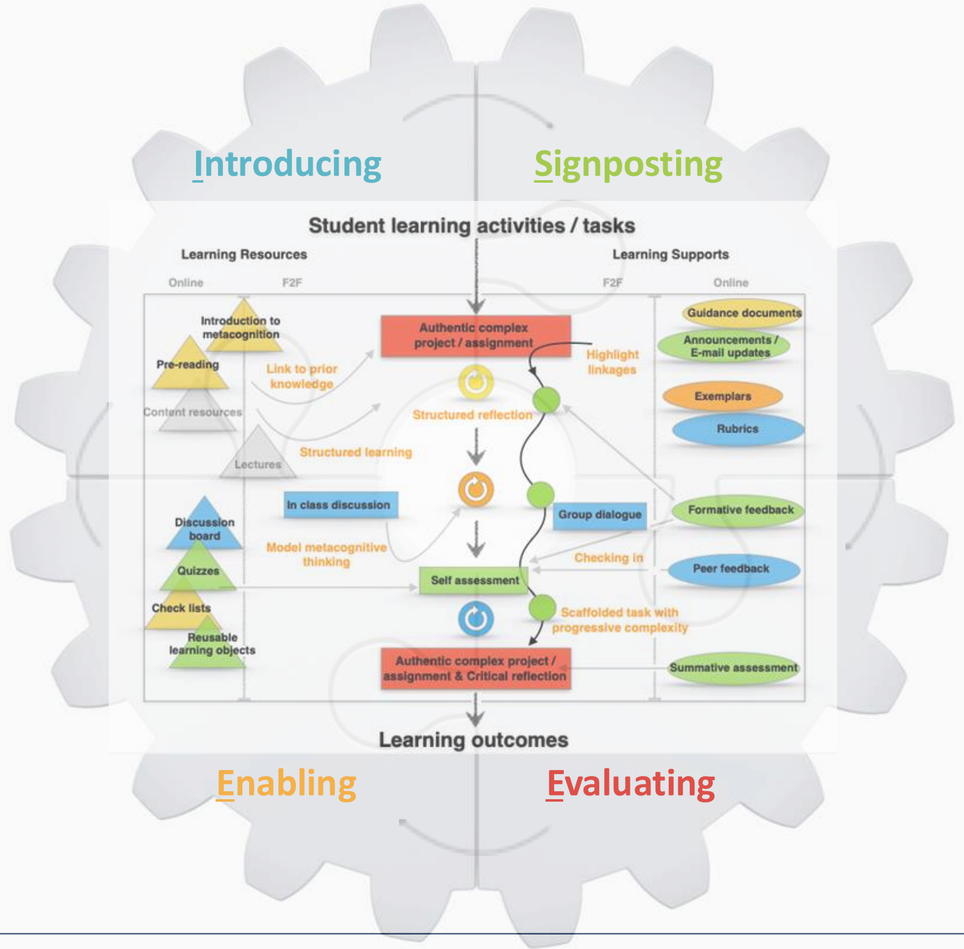
Metacognition Design Framework



Metacognition Design Framework

“I SEE” Strategies for learning: Introducing, Signposting, Enabling, Evaluating

‘I-SEE’



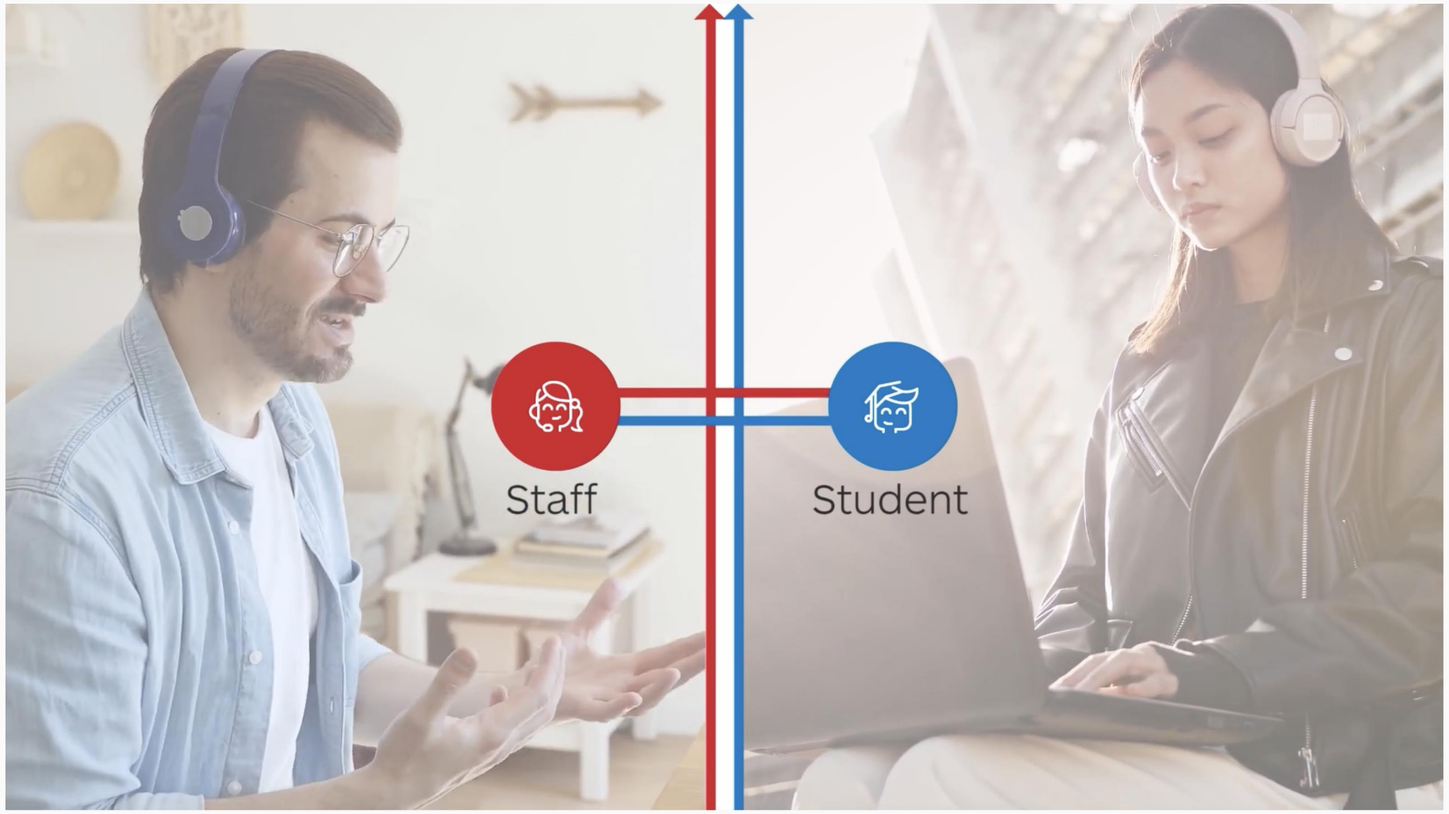
- Explicitly teach metacognitive strategies
- Model metacognitive thinking
- Set appropriate level of challenge
- Promote and develop metacognitive dialogue
- Explicitly teach students management / organisation of their own learning

Aligns with UDL Framework

‘I-SEE’

Strategies for supporting metacognitive learning





Introducing

Signposting

Enabling

Evaluating



Summary of three parallel case studies



VETERINARY CLINICAL NEUROLOGY



PSYCHOLOGY OF SPORT



SOCIAL SCIENCES

Quantitative evaluation: Metacognitive awareness inventory & Self-efficacy for learning, learning analytics

Qualitative evaluation: Open-ended questions, Staff and student focus groups, Stake-holder interviews, student reflections

Qualitative results: Students

'I-SEE' Strategies for Learning

Introducing clear structure, clear pathway, digestible chunks

Signposting kept on track + helped completing complex tasks

Enabling helped regulate learning, motivated, confidence

Evaluating low stakes check points, expectations



Qualitative results: Students

'I-SEE' Strategies for Learning

Introducing

Signposting

Enabling

Evaluating

"Quizzes were a really nice way of… testing your knowledge of the module without being worried about stressing out for tests and stuff. …. really helpful in terms of self-directing your learning."

[Reflection] was good for making you actually think about learning. It made you actually think about the points that I was thinking over, rather than just blindly going through points of the lecture.



Qualitative results: Stakeholders

Metacognition is important for student learning!

- Moves the conversation from assessment-driven to holistic learning
- Fosters critical thinking
- Creates student awareness of learning
- Helps students strategise to maximise learning
- Provides a foundation for programmatic learning - linkages



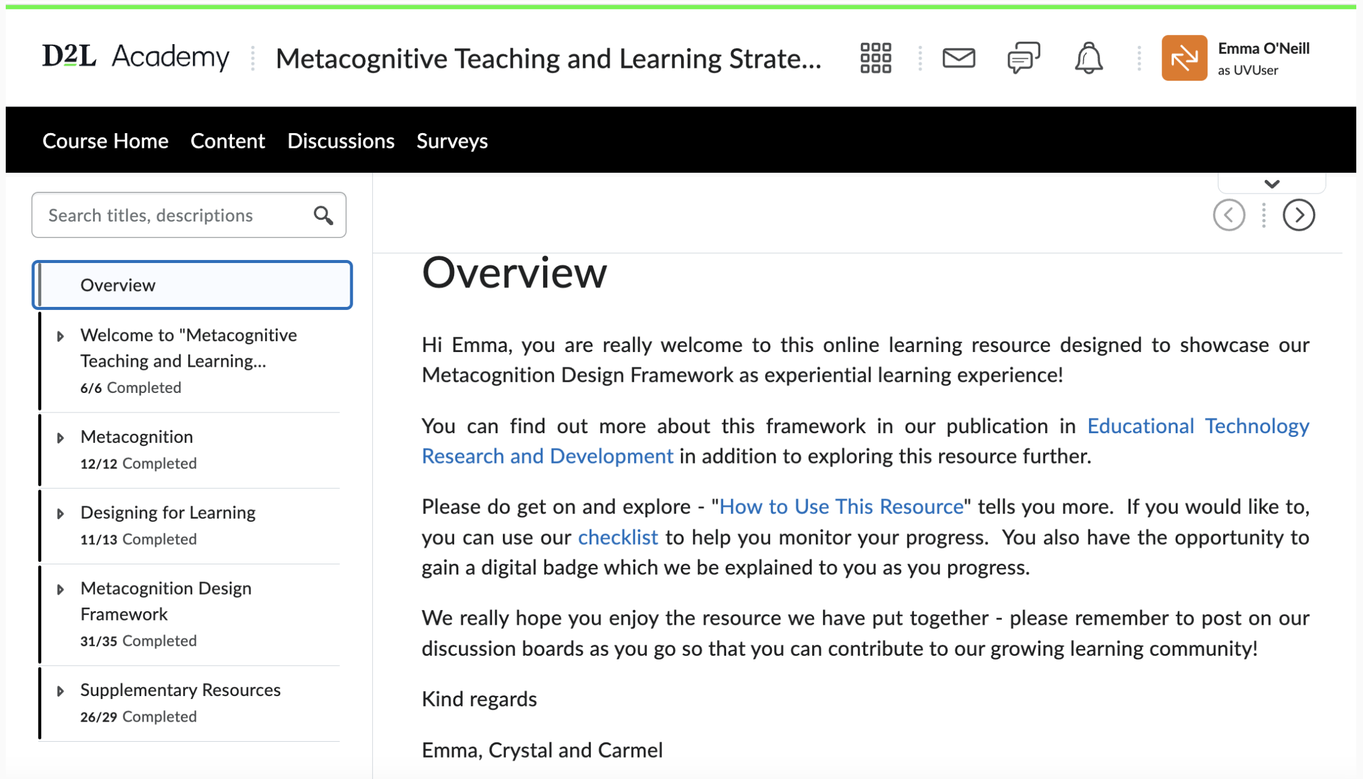
VPTL: ***"I do think it helps people develop good habits around what they do in terms of learning and to use that time well, if they understand what's actually happening during the process. …… I think it's fantastic if people can be much more aware and sort of know, "How can I drive my own learning and help myself get where I'm going?""***

“Metacognitive Teaching and Learning Strategies”

Open access in the Brightspace Learning Centre

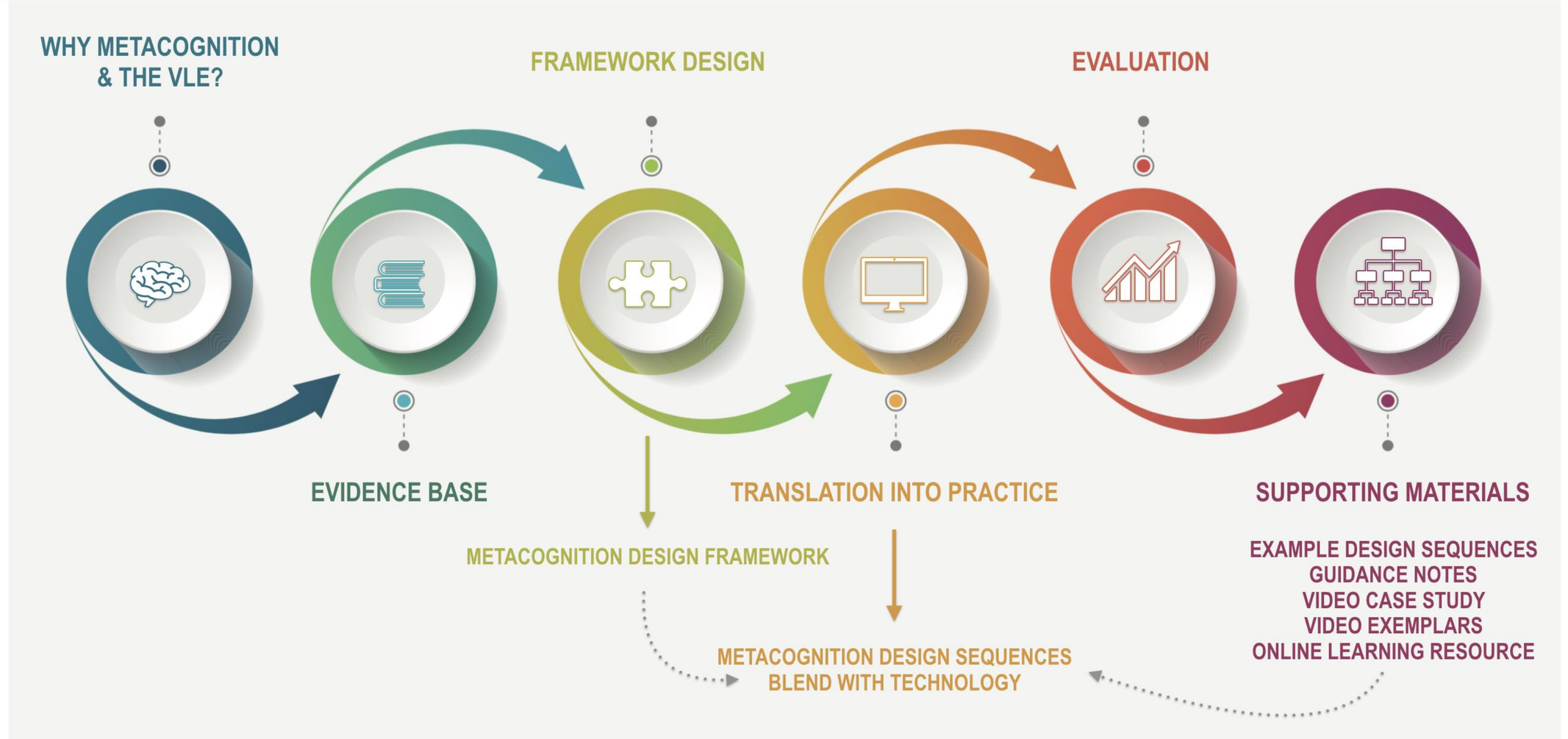
Huge thanks to **D2L** for their support

- Launched 2022
- Within 18 months: 322 users
- Across 12 countries & 5 continents
- Average time / person: 15.5 hr



Open access via D2L Academy

Fellowship research study

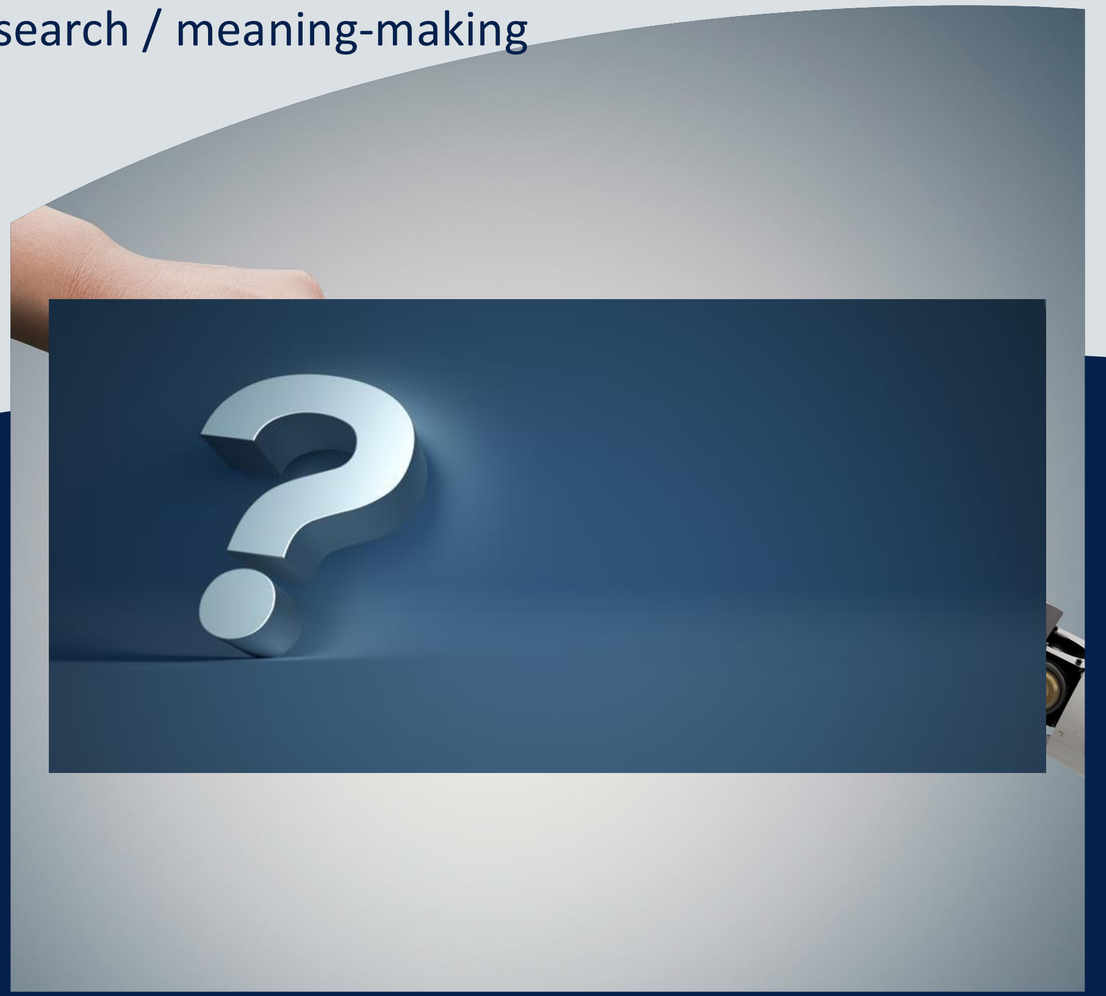


Where does AI fit in?

Generate information / answers – threaten to shift student role

Summaries of vast amounts of information – bypass student research / meaning-making

Efficiency and speed – clear, well-presented outputs effortlessly



Where does Generative AI fit in

Not just another digital tool – shifted abundance of information & actively participates in knowledge creation

Probabilistic rather than deterministic – dynamic, interactive and context-sensitive

Opaque system – increasingly complex systems have emergent properties

Necessitates new ways of learning – competency to engage critically and productively



Where does generative AI fit in - risks

Risk of cognitive offloading – erosion of capacity

Erosion of metacognitive accuracy – performance-confidence disconnect, fluency illusion

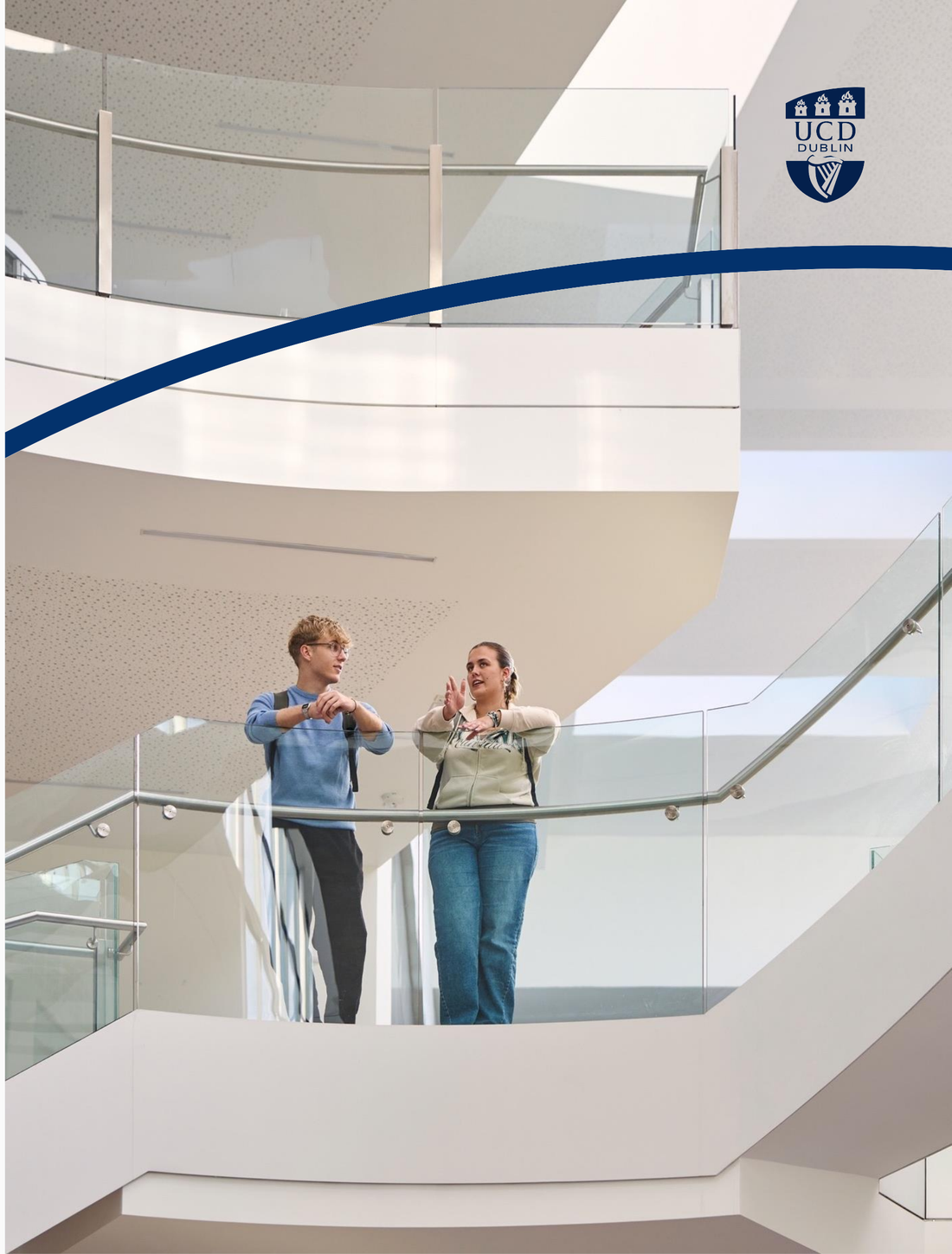
Metacognitive ‘laziness’, Paradox of AI literacy



Not ‘one size fits all’

Prior knowledge and competence important

- Novice versus expert – different approach
- Metacognitive capacity
    - Focus of monitoring –steps cf. understanding
    - Calibration and accuracy –Dunning-Kruger
    - Error detection speed – often slow and late
    - Resource allocation – cognitive load
    - Response to friction – double down / give up



Considerations for learning

What are we trying to achieve?

Output

No longer valid measure of learning

Process

Important to understand and guide

Competency

Key ‘product’ desired from learning – what does this mean in relation to AI use?

Future

Resilient
Agile
Adaptable
Human!

Considerations for learning

Ho do we learn?

Fast

System 1
Fast, intuitive, and affective processing

Slow

System 2
Slow, deliberate, and analytical reasoning

Judgement

Affected by familiarity, ease of gaining the answer, knowledge and familiarity with AI

Friction

Productive struggle
Cognitive offloading

Kahneman’s Dual Process Framework

Our response

Risk of cognitive offloading – need to keep learning active

Important how tools are used– influenced by how human-AI collaboration is structured

Avoid transactional use – ask question get a reply

Flip the approach to prompting – think first then ask for feedback

Re-frame – engage with knowledge as emergent and co-constructed rather than static

Opportunity!



Metacognition

Affective and social components

Knowledge of cognition
Recognition of approaches and strategies





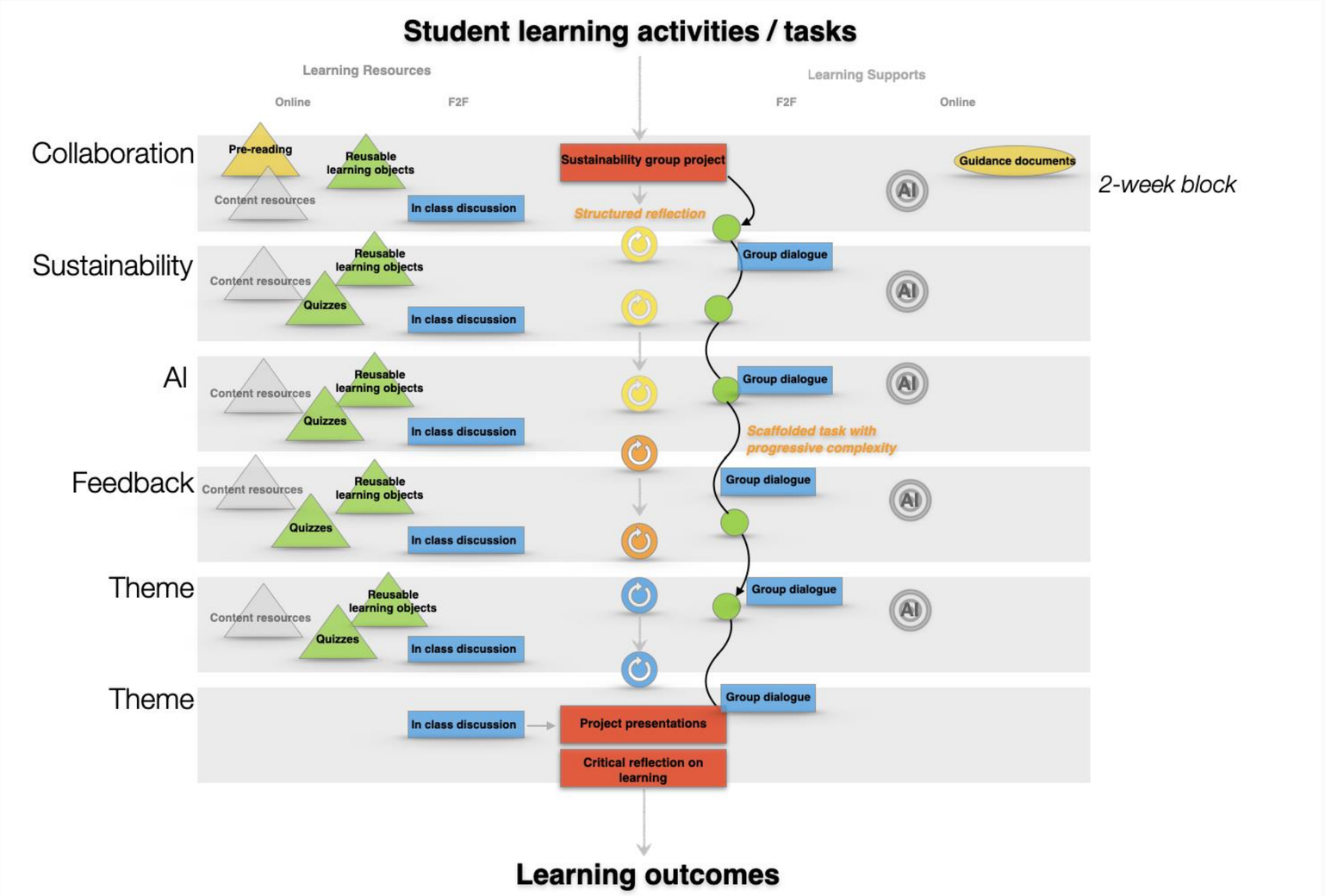
Regulation of cognition
Skills that help control learning

Planning
Information management
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Thinking Well in a Changing World

- Explicitly teach metacognitive strategies
- Model metacognitive thinking
- Set appropriate level of challenge
- Promote and develop metacognitive dialogue
- Explicitly teach students management / organisation of their own learning



So, what now……?

Great opportunity for transforming learning

- Don’t forget about metacognition!
- Opportunities for shaping use to enhance learning
- Higher metacognitive ability – more likely to use AI deliberately rather than passively



Any questions?





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More information: https://www.ucd.ie/cshe/metacognitivelearning/