

Managing cognitive load

Cognitive load theory
and its application
to learning design

Introducing
'cognitive load'

Cognitive load theory:
what is it, and why
is it relevant?

How our brain works:
key assumptions

Types of load

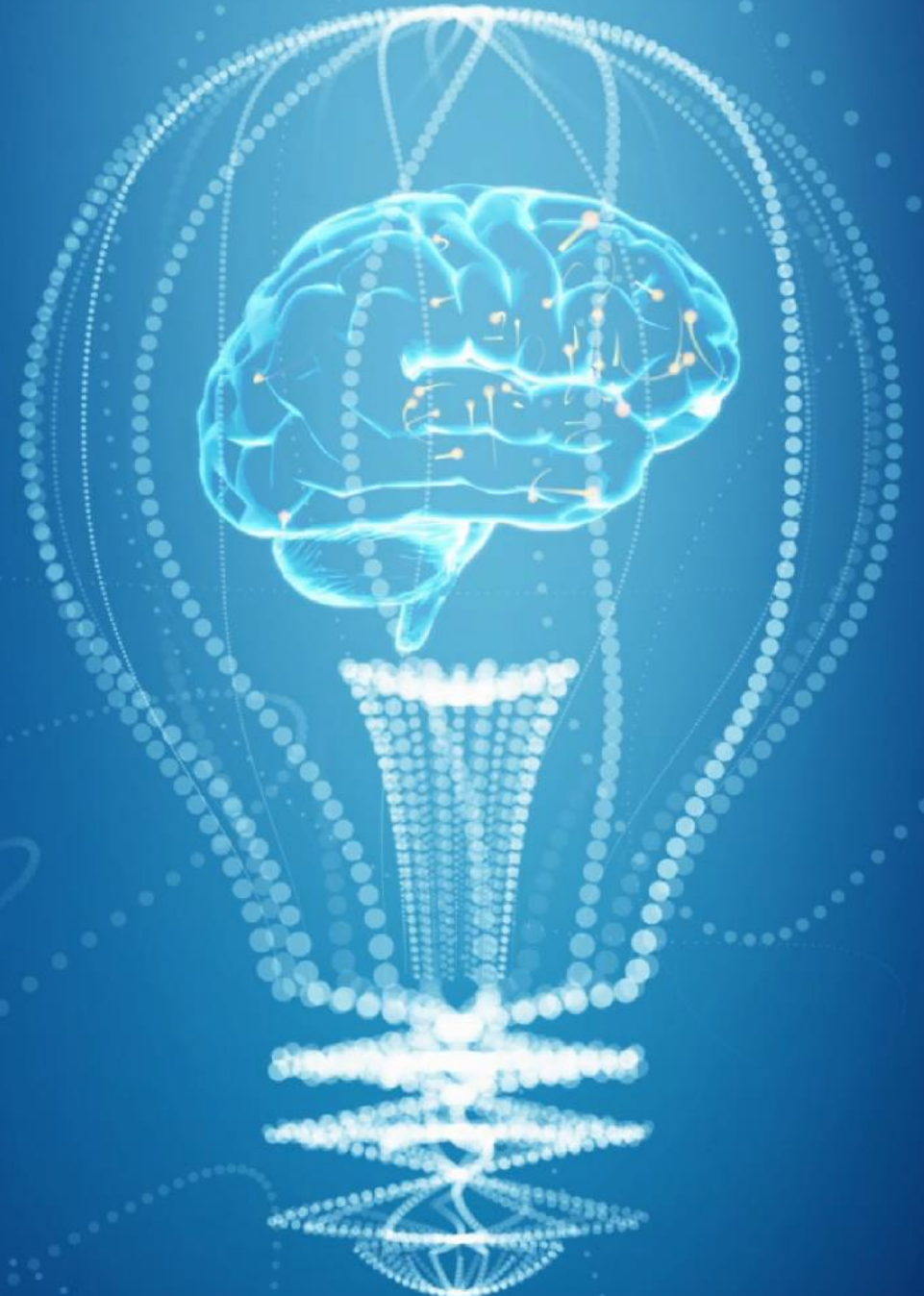
Cognitive overload,
cognitive underload

Managing the load

Summary

Questions

Poll feedback



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- We can recall a lot of existing knowledge at once
- We struggle to process more than 7 new pieces of information at a time
 - George Miller, 1956, '7 plus or minus 2'
- Cognitive load: the burden of information/task processing on our working memory
- Too much load means low or no retention – what about too little load?

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- CLT is an evidence-based theory in educational & cognitive psychology that looks at information processing
- Originally intended to help teach complex mathematical/scientific topics
 - John Sweller, 1980s
- CLT is practical as well as theoretical – propositions on how to reduce cognitive load
- Influential in instructional design & technology enhanced learning – you'll come across it

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- Working memory – limited when dealing with new information, but not with schemas
- Long-term memory – almost indefinite and unlimited information storage
- Schemas – mental constructs that help us understand and categorise information quickly and effectively
- Schemas help us process new information and store in long term memory without limiting mental processing of working memory.

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- Intrinsic load is cognitive load that is inherent in the content or task to be learned i.e. its difficulty
- Extraneous load is cognitive load that has been introduced by instructional techniques but which could have been avoided by alternative presentation
- Germane load is that which is used to construct schemas and is therefore essential to CLT
- $\text{Intrinsic} + \text{extraneous} + \text{germane} = \text{total cognitive load}$
- Must not exceed working memory processing capacity!

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- If there's too much information, working memory processing reaches its limits - learning is diminished
- Intuitively, learning would be increased the less information that's given...
- ... but studies show cognitive UNDERLOAD is just as bad
- In the worst cases, learners undergo expertise reversal... and lose existing knowledge and skills
- This has critical implications for learning designers!

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- Every topic and process has an intrinsic load – difficult materials have a higher intrinsic load, which you can't change
- Extraneous load is what we add on through our instructional methods
- Germane load is important because it enables us to create schemas, which we can use in the longer term – novices don't have schemas so need to build them
- We need to control the extraneous load to create optimum learning gain

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What increases extrinsic load?

- Wordiness – complex language, long sentences, blocks of text
- Too much going on – distracting elements on a page or in audio
- Problem solving introduced too early – before novices have schemas to use
- Repeated information in similar processing formats (text on screen & identical audio)
- Poor presentation
- Clear presentation, simple language and worked examples or case studies reduce extrinsic load.

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Expertise reversal: know your audience

- Experts should not be asked to complete basic level training – however, this may not always be possible, eg. compliance training
- Start with a diagnostic assessment – don't make learners study topics they already know, but find out what they don't know
- Include profiling for learners according to role or expertise – not a 'one size fits all' solution

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- Cognitive load is the burden of information/task processing on our working memory
- Cognitive overload causes learning gain to drop significantly... and so does cognitive underload
- We need to manage extraneous load to make sure learners have an optimal gain
- Know your learners – what's their expertise level?
- Avoid one size fits all solutions – tailor training when you can