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'Desirable Difficulty' in the YL classroom – What, Why and How

Laura Jane McWilliams, IATEFL YLTSIG

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Today's session…

- … aims to help participants understand the concept of desirable difficulty and why it can be of benefit.
- …aims to help participants consider their classroom culture around mistakes and risk-taking.
- …aims to help participants be more creative in embedding challenge that leads to long-term success for learners.

What is ‘desirable difficulty’?

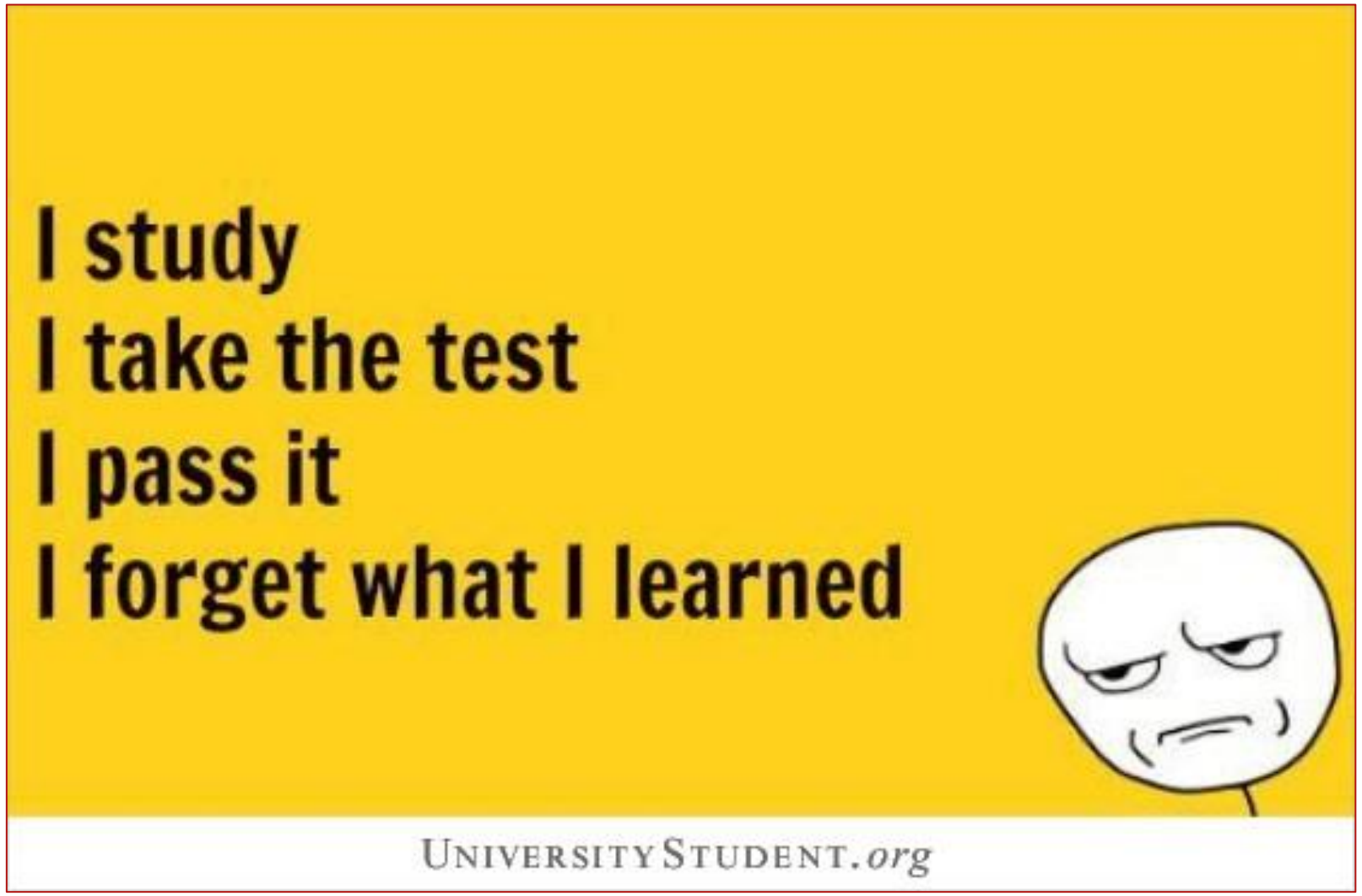
What is ‘learning’?

Learning is…

…a change in our long-term memory (Kirschner et al., 2006)
…lasting and stable

Performance is…

…short-term
…fragile and often quickly forgotten


I study
I take the test
I pass it
I forget what I learned
UNIVERSITY STUDENT.org

Learning vs Performance: Retrieval strength vs Storage Strength

Storage strength

How embedded or interconnected a memory representation is with related knowledge and skills

Retrieval strength

How easily a memory representation can be activated or accessed when needed.

Bjork and Bjork (2011)

So what are ‘desirable difficulties’?

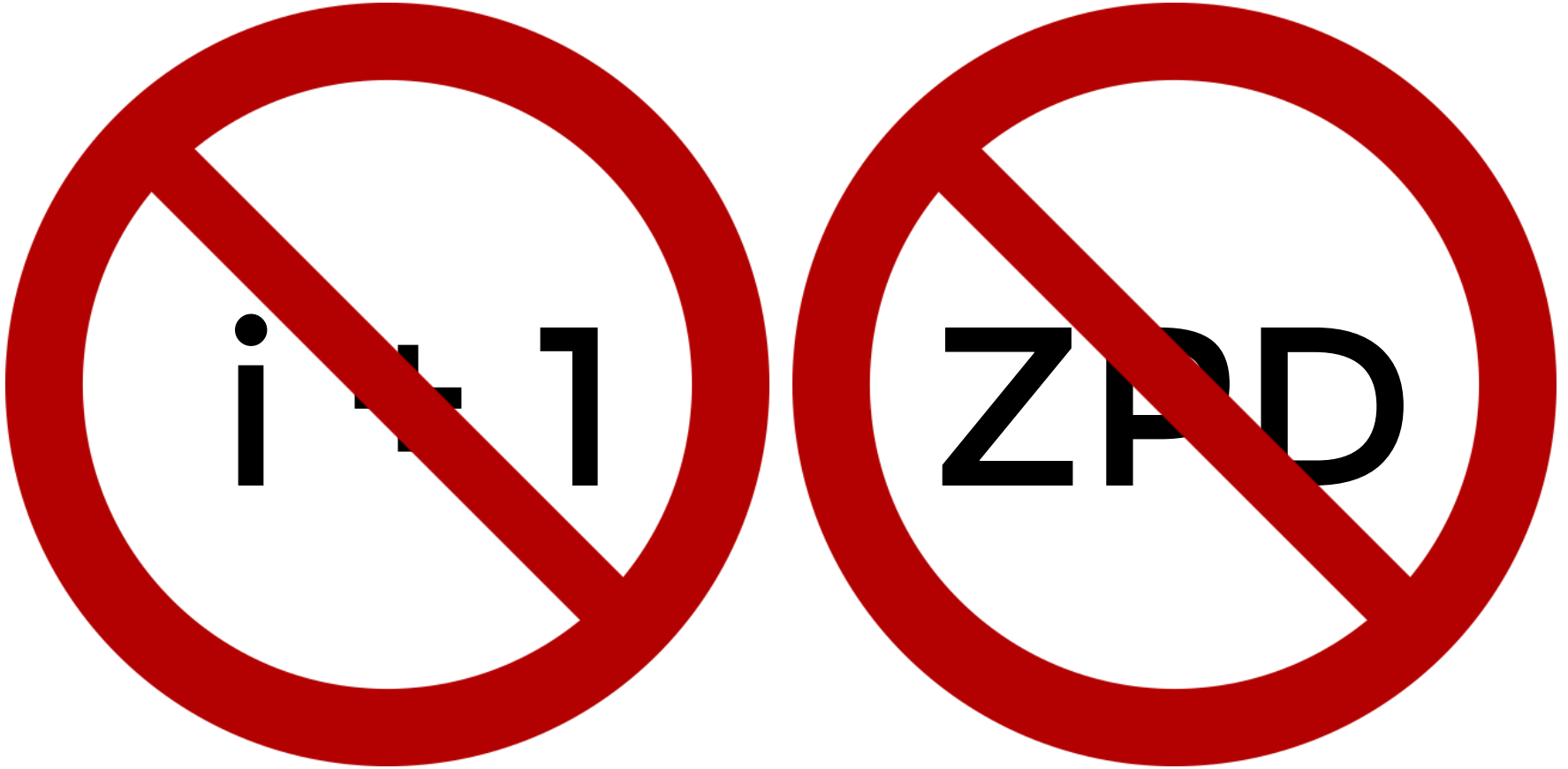
Conditions that create certain types of challenges, focused on slowing the rate of **apparent learning** so that long-term retention and transfer are optimised.

Bjork and Bjork (2020)

So what are ‘desirable difficulties’? (the original list)

1. Interleaving/Variable practice
2. Spaced practice
3. Contextual interference
4. Retrieval practice/Practice testing
5. (Reduced feedback)

So what aren't 'desirable difficulties'? (technically speaking)

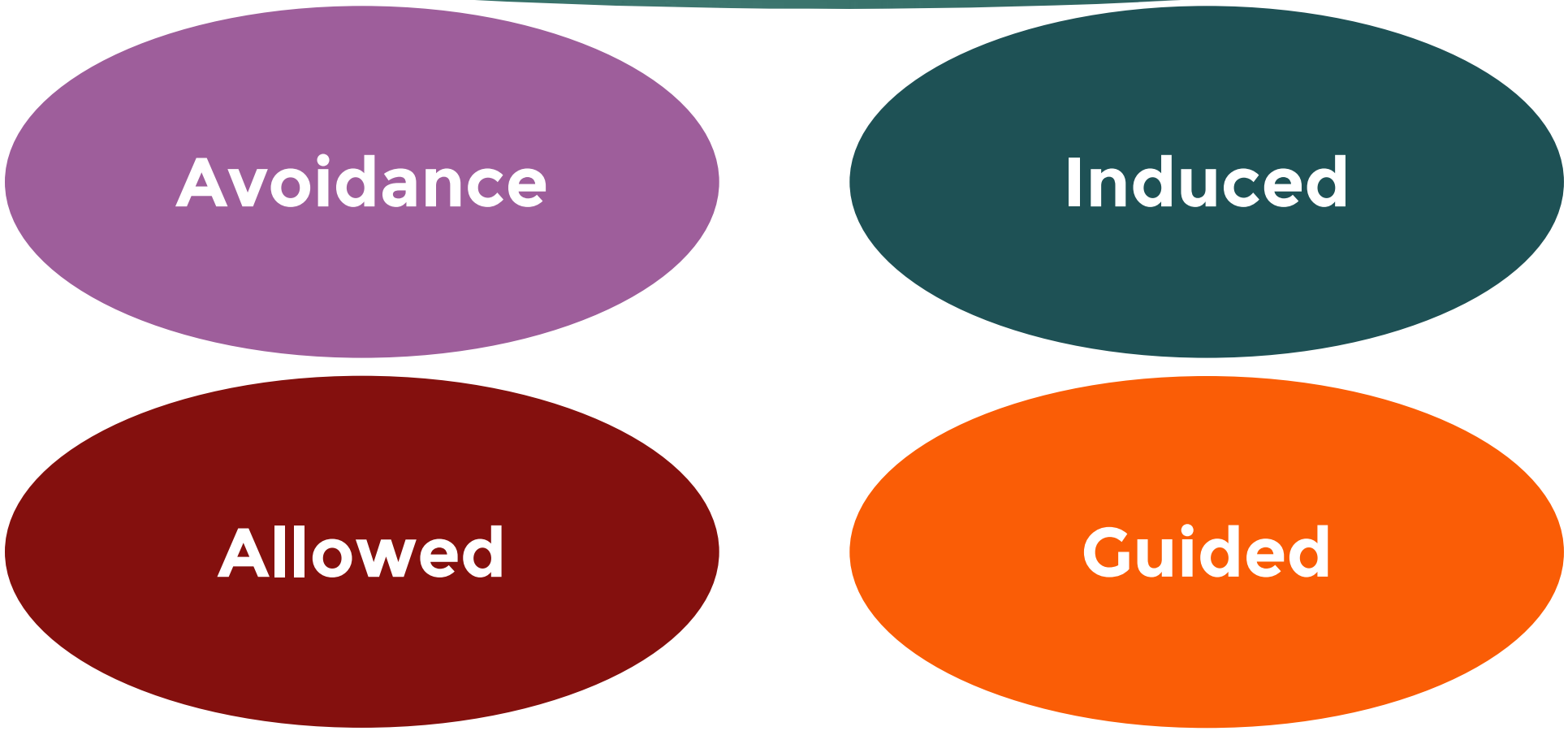


Maybe we need an example…

So what aren't 'desirable difficulties'? (technically speaking)

'DESIRABLE DIFFICULTIES' ARE NOT ABOUT TEACHING OR DESIGNING IN A WAY THAT ENCOURAGES THE LEARNER TO MAKE ERRORS OR 'FAIL' TO COMPLETE A TASK SUCCESSFULLY

Design approaches for errors:



Lorenzet, Salas, and Tannenbaum (2005)

1. Interleaving &
2. Spaced Practice

Interleaving vs Spacing

The **spacing effect** is about time gap (hours, days, weeks) between revisiting material

Interleaving is switching between (usually related) topics within a single learning session

Image from https://examstudyexpert.com/interleaving/

Blocking vs interleaving

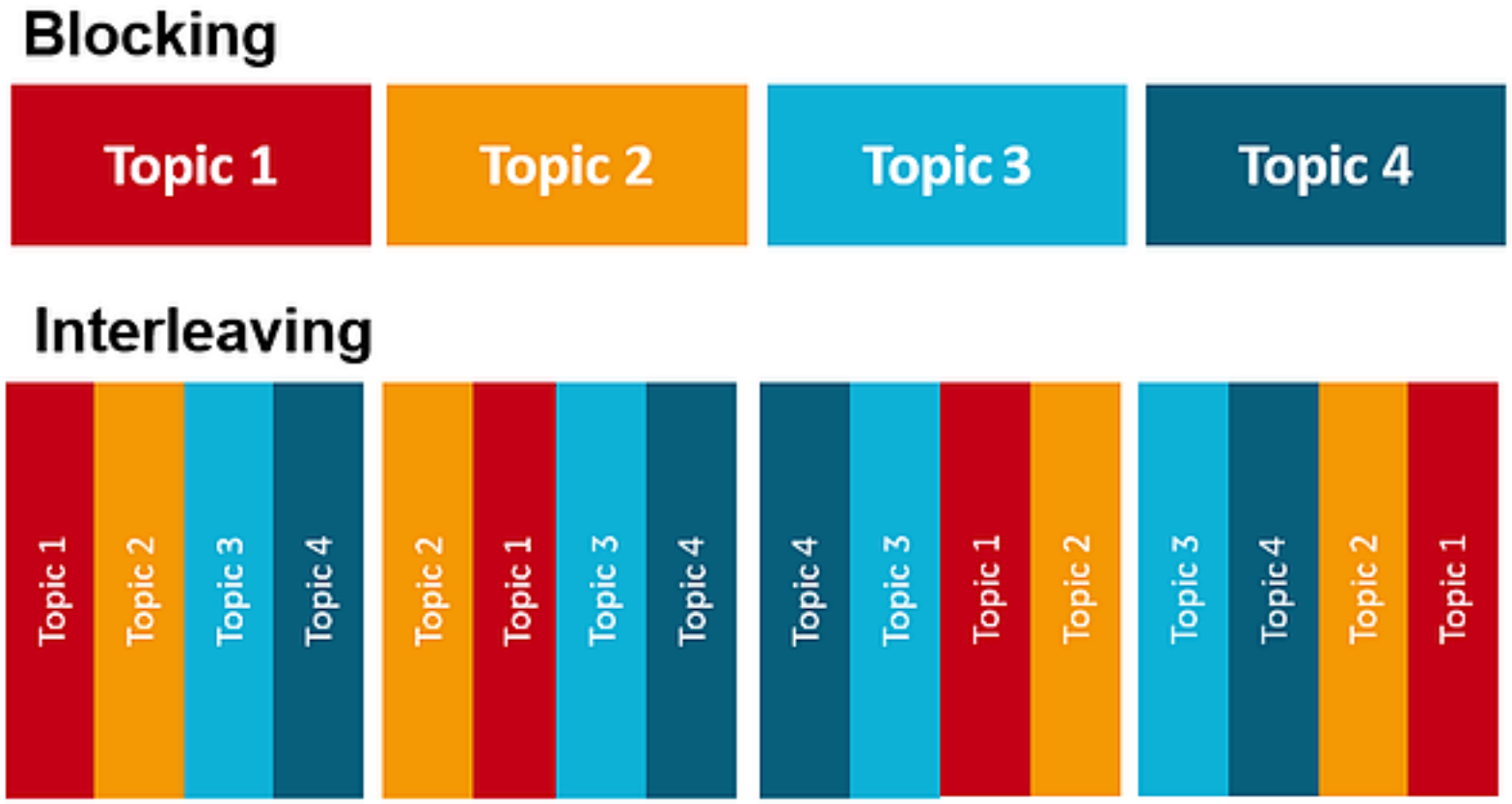


Image from https://blog.innerdrive.co.uk/why-interleaving-works

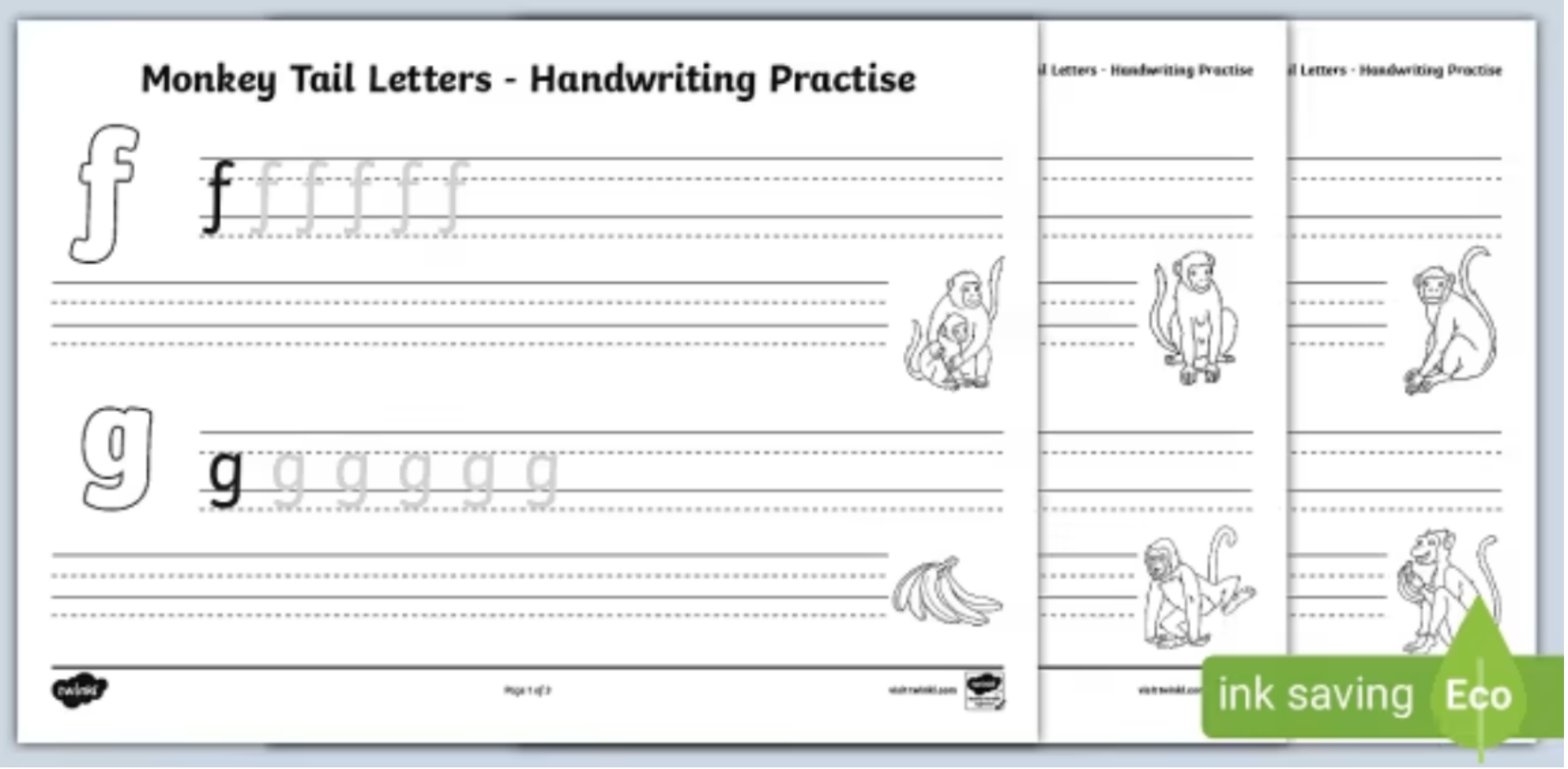
Why interleaving works

1. **Discrimination Learning**
   novelty of information – reduces 'thinking on autopilot' – difference between similar things

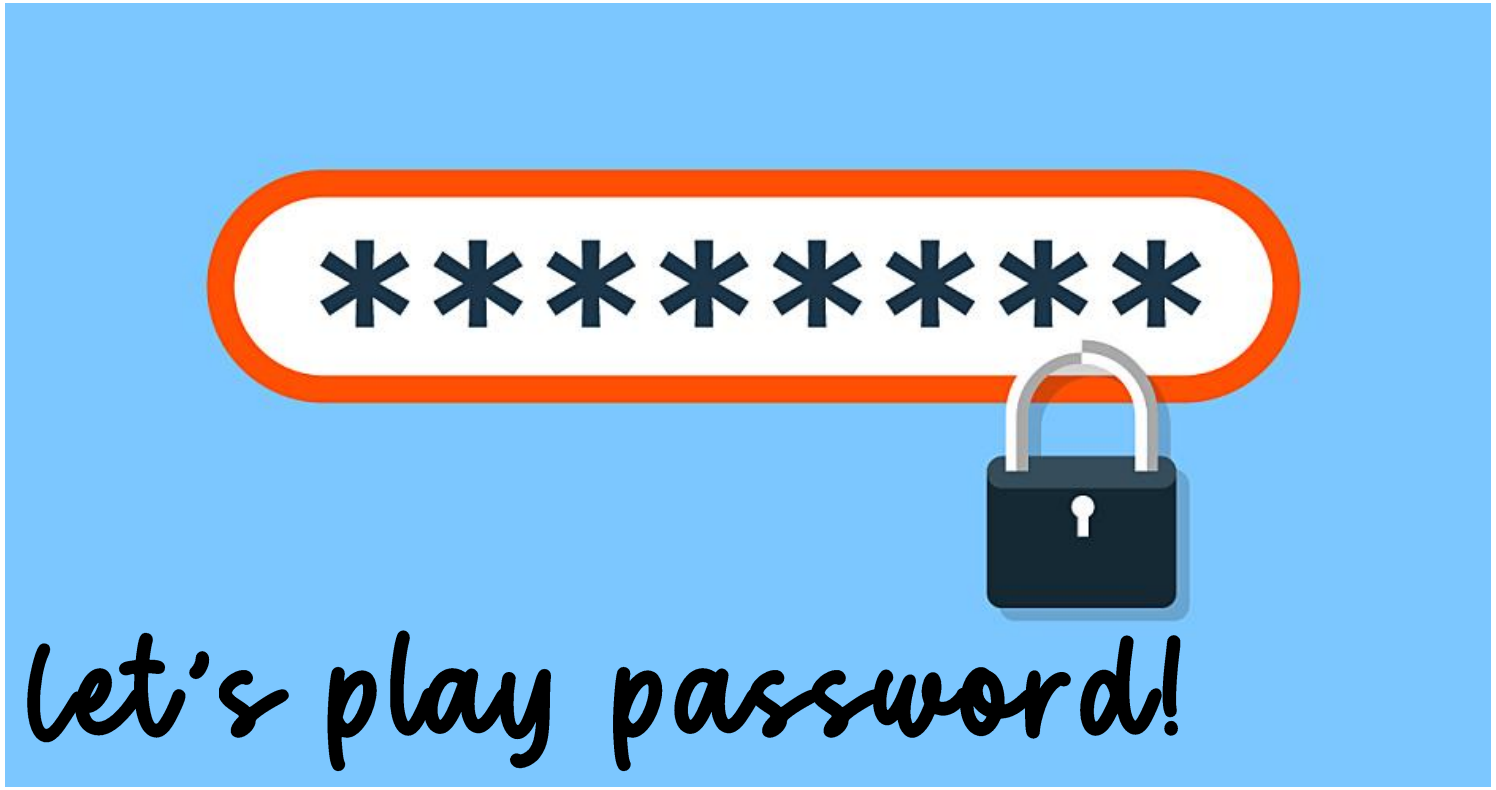
2. **Spot the similarities**
   make connections between topics and material – refine and develop schema – creates multiple 'anchor points'

3. **Exploits the benefits of spacing**
   spread out learning over time – relearning each time they revisit – cements in long-term memory

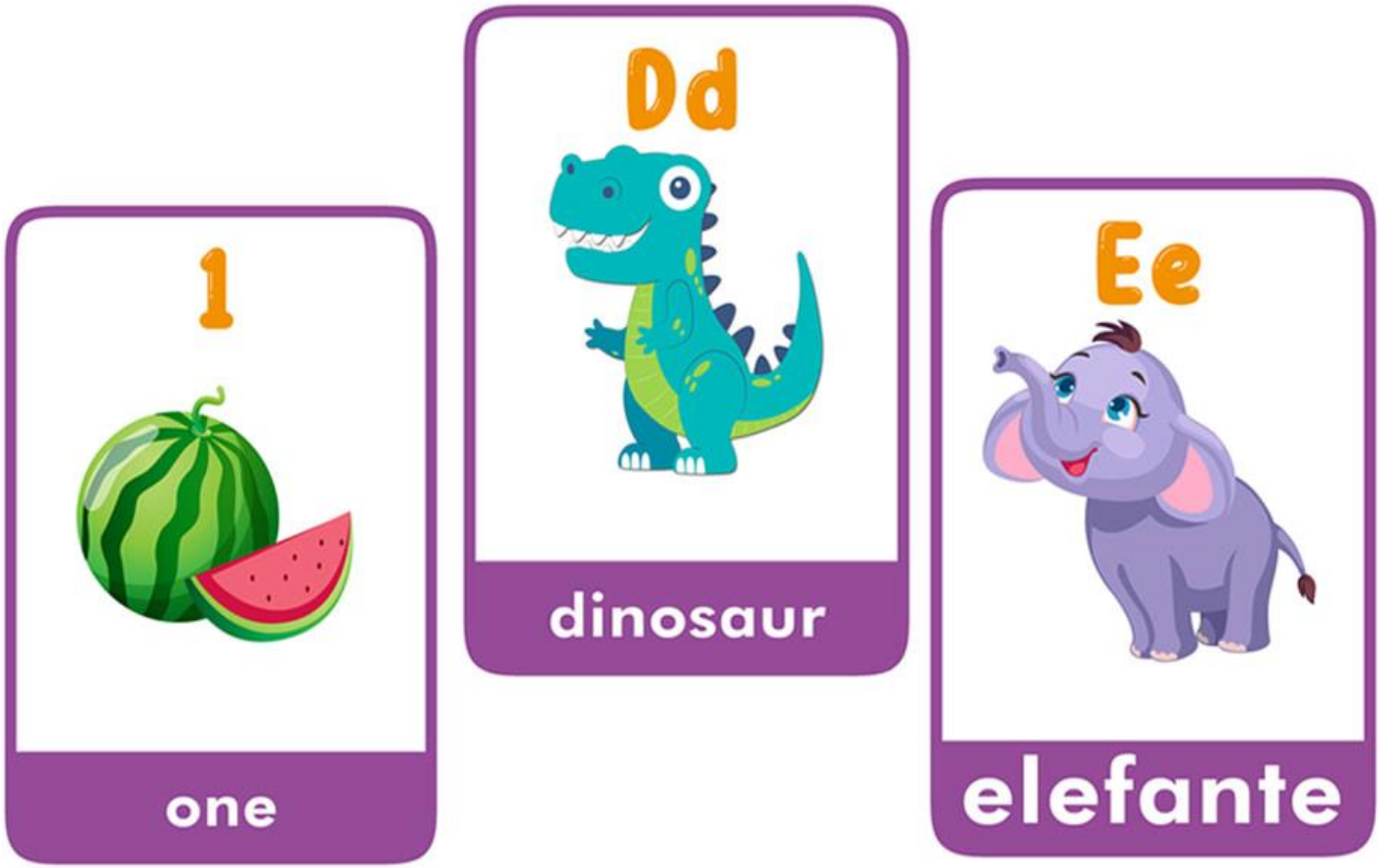
Even for physical skills…



A simple idea…



A simple idea…



As a differentiation strategy…

Blocking vs spacing

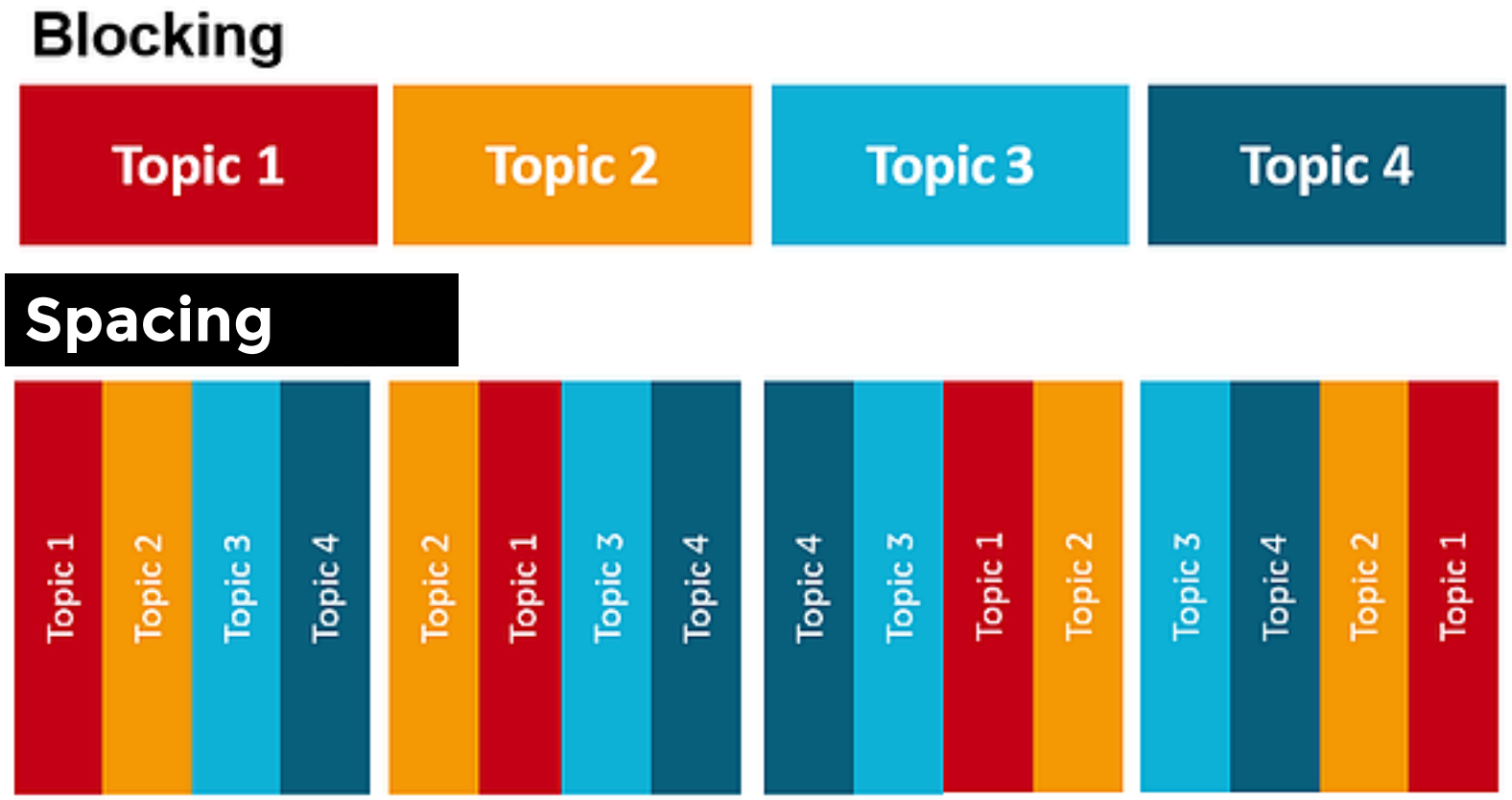
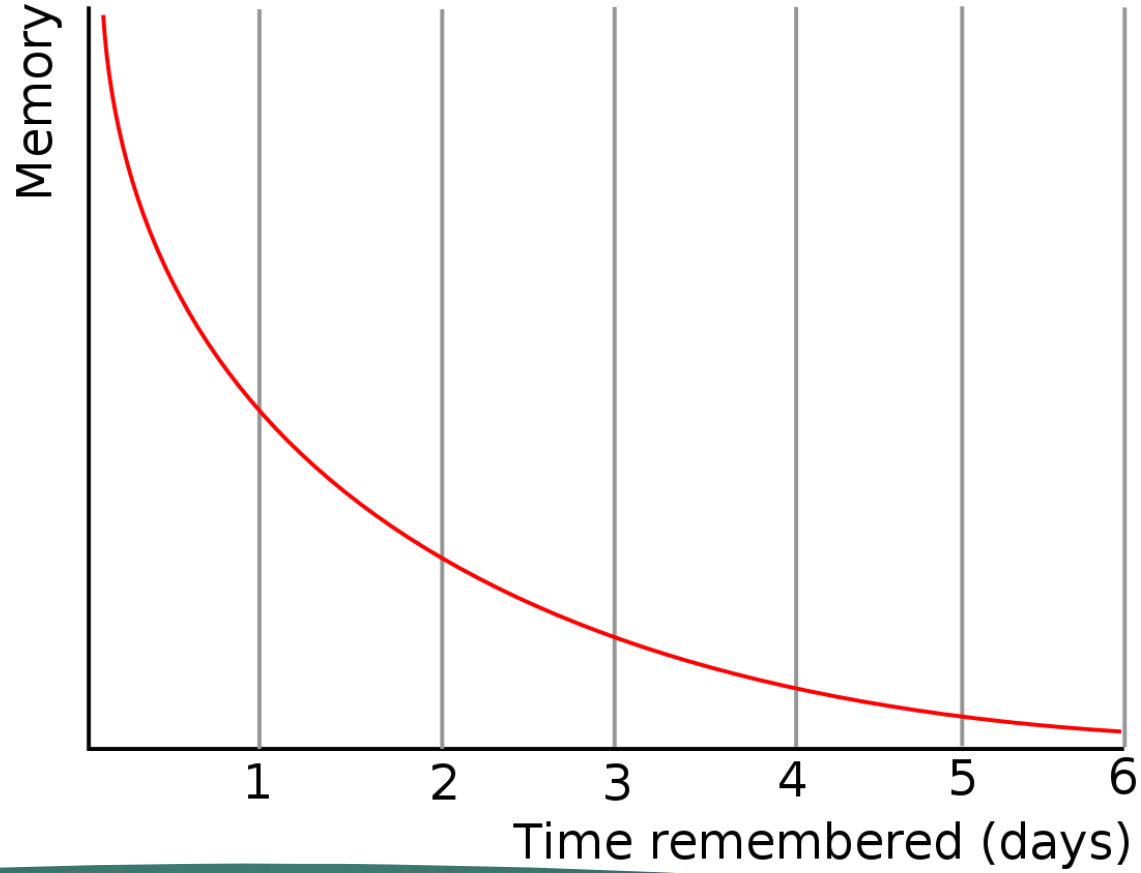


Image from https://blog.innerdrive.co.uk/why-interleaving-works

In the late 1890s, the German experimental psychologist Herman Ebbinghaus reported the ‘spacing effect’. He was the first person to describe the forgetting curve, which shows how quickly memories fade after learning.



The origins of spaced practice…

Why spacing works

1. **Networks take time**
   consolidation of memories requires time – resting and sleeping helps

2. **Memory decay**
   relearning is active, effortful reconstruction – links to retrieval practice

3. **Changes the context**
   different cues or triggers – different environment – different routes to the same destination

In the classroom…

- **Build systematic reviews of previously learned information** into your planning.
- **Build spaced practice into classroom routines.**
- Explicitly **explain to students why they are doing it**.
- **Support the review process** by adjusting it to where each student is in their learning.
- **Differentiate the practice phase** from the initial learning process.

Contextual Interference

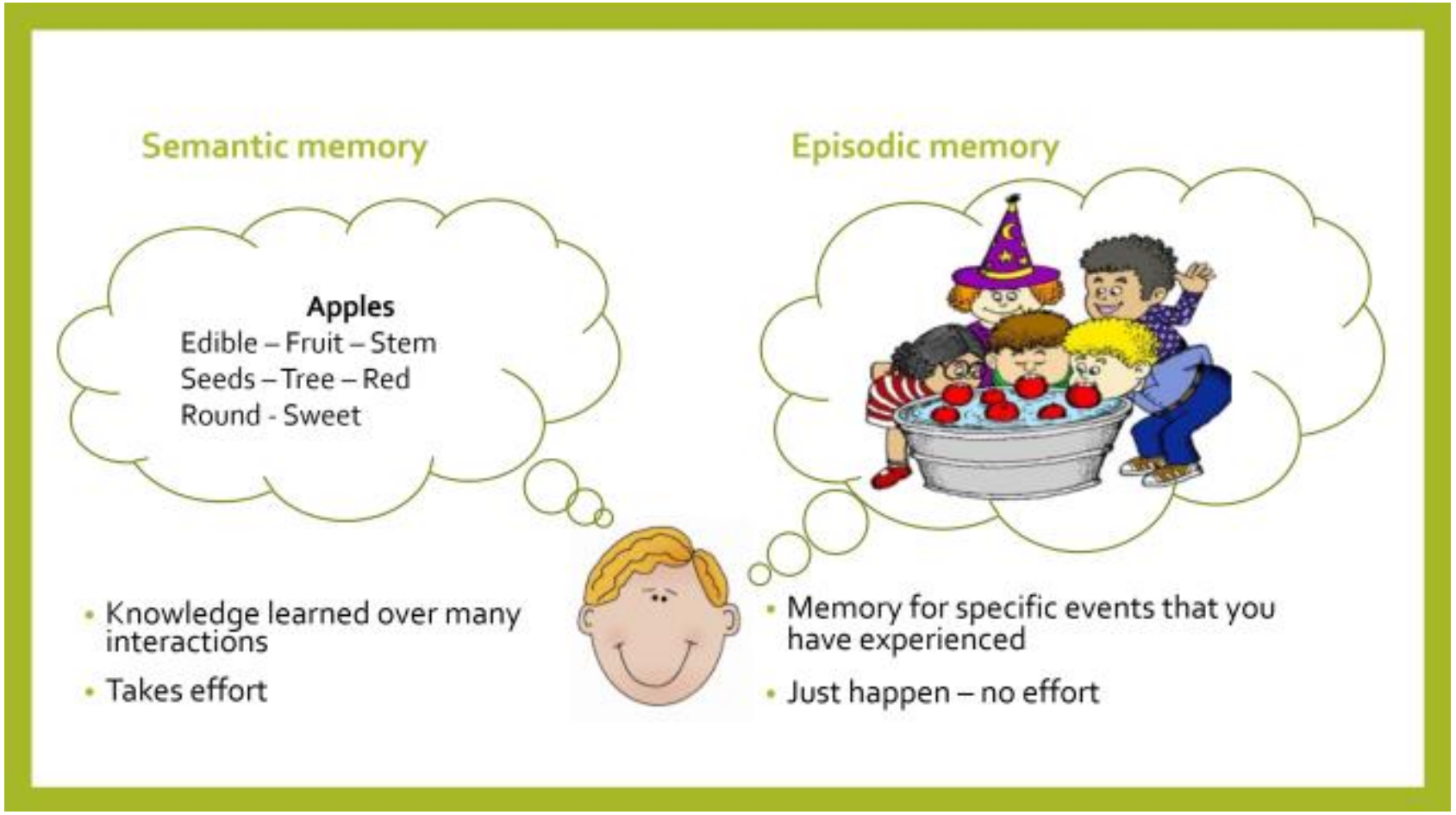
"make the task environment – not the task itself – more variable or unpredictable"

Kirschner et al., (2022)

Is it like riding a bike?

Image from https://primarytimery.com/2017/09/16/memory-not-memories-teaching-for-long-term-learning/

Episodic vs semantic memory



O Captain My Captain

Memory is the residue of thought

- Connected to cognitive load theory: what students do in their working memory determines what they will remember and recall later.
- Too much ‘fun’ and the fun feeling is all they remember.
- However, there is an overlap between the two memory types; neither is ‘good’ or ‘bad’ inherently.
- Make them think about the story – make time for the thinking.

Variety is the spice of life

Interaction patterns

Routines

Cross-curricular elements

Physical space

Task types

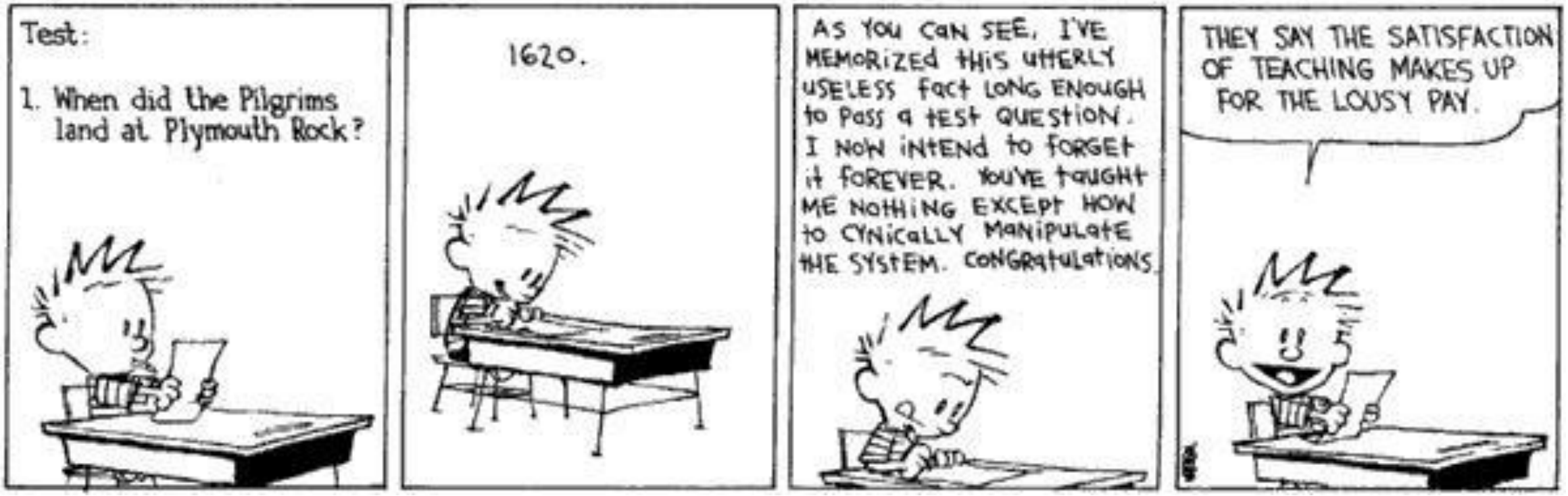
Input format

Retrieval Practice

"varying the conditions of practice"

Bjork (1994)

Is ‘test’ a dirty word?



Key Principles

1. Involve everyone:
2. Make checking accurate and easy:
3. Specify the knowledge:
4. Keep it generative:
5. Make it time efficient:
6. Make it workload efficient

Any questions?

Some simple ideas

Quick-fire Quiz

Silent Self-quiz

Self-explanation

Paper Quiz

Paired Quiz

Tell the story

Recommended Reading and Resources

(in no particular order!)

- Bjork, R. A., & Bjork, E. L. (2020). Desirable difficulties in theory and practice. Journal of Applied Research in Memory and Cognition, 9(4), 475-479.
- Bjork, E. L., & Bjork, R. A. (2011). Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. Psychology and the real world: Essays illustrating fundamental contributions to society, 2, 59-68.
- Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). Make it stick: The science of successful learning. Harvard University Press.
- Lorenzet, S. J., Salas, E., & Tannenbaum, S. I. (2005). Benefiting from mistakes: The impact of guided errors on learning, performance, and self-efficacy. Human Resource Development Quarterly, 16(3), 301-322.
- Ebbinghaus, H. E. (1964). Memory: A contribution to experimental psychology. New York, NY: Dover

thank you

https://www.linkedin.com/in/laura-jane-mcwilliams/

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YLT SIG Teaching for Tomorrow Today