

ChrisQuigley
Education

Making It Stick

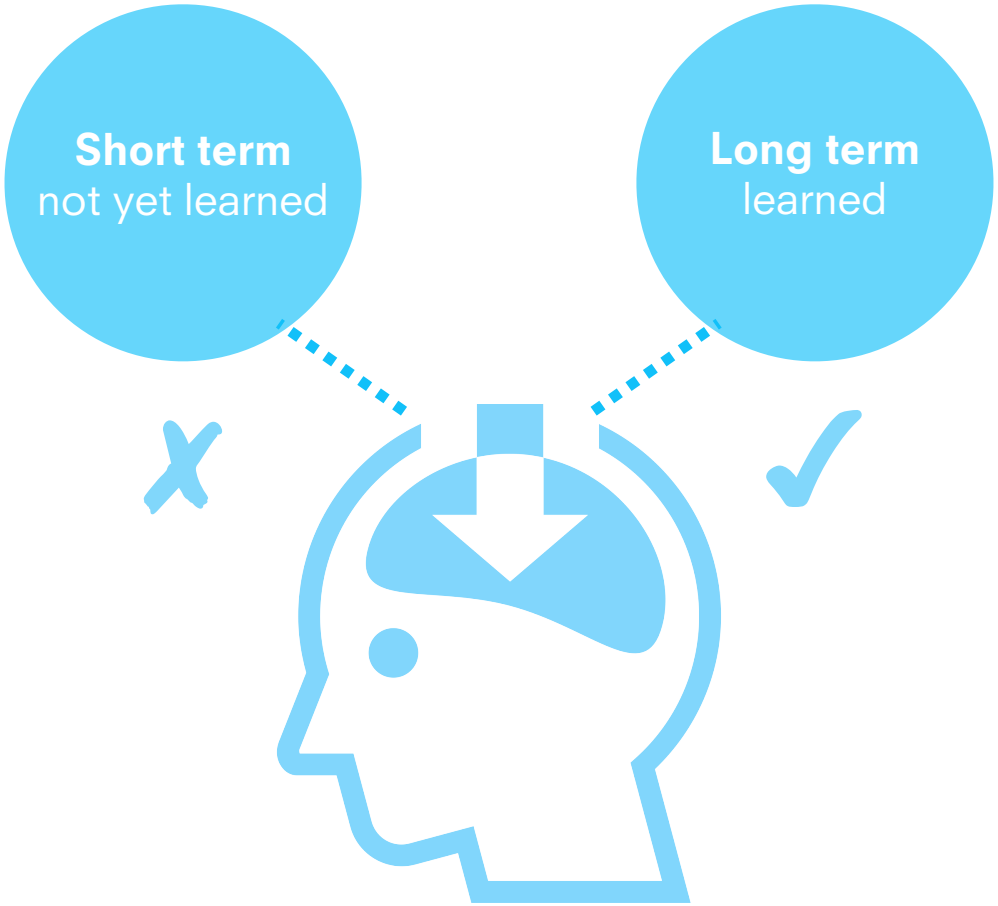
The science of successful learning

Why doesn’t learning stick?



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Learning is a change in long-term memory



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Long term memory



Non - declarative

Procedural

37 x 16

Declarative

Episodic

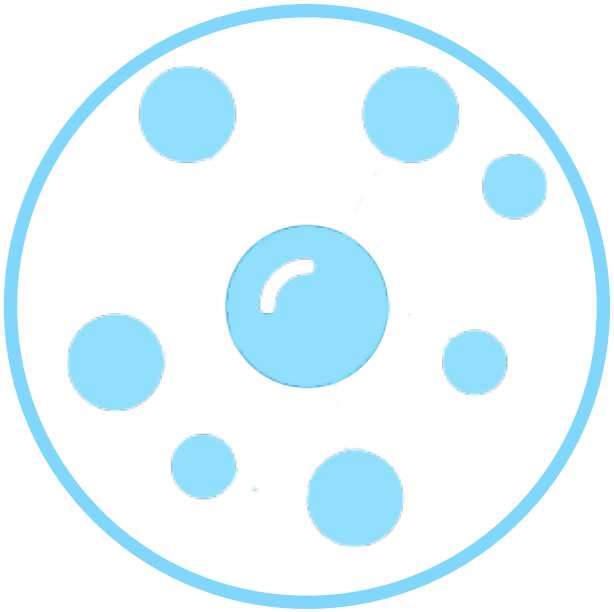
Experiences

Semantic

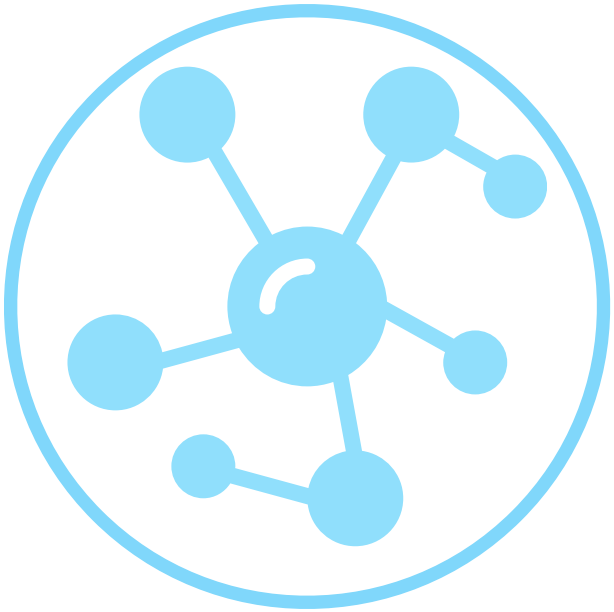
5 + 5 = 10

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What is knowledge?



Information

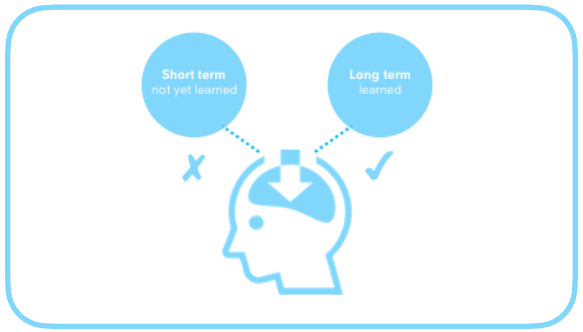


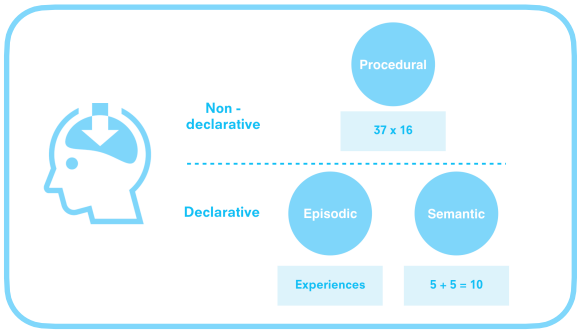
Knowledge

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Summary







Why doesn't learning stick?

Not in long-term memory

Episodic - once
Procedural & semantic - repetition

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Make it stick by…

1. Understanding how memory works.

1

Categorise

When planning ask: is this a procedure, fact or episode ?

2

Repetition

Repeat procedures and semantics over and over.

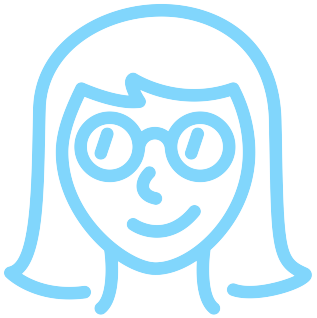
3

Episodes

Dress up if you like… but don't expect too much from it.

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When is Cheryl's birthday?

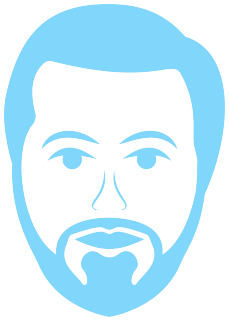


Albert and Bernard have just become friends with Cheryl, and they want to know when her birthday is. Cheryl gives them a list of 10 possible dates:

May		15	16			19
June				17	18	
July	14		16			
August	14	15		17		

Cheryl then tells Albert and Bernard separately the month and the day of her birthday respectively.

Later, Albert and Bernard are talking:



Albert:
I don't know when Cheryl's birthday is, but I also know that you don't know either.



Bernard:
At first I didn't know when Cheryl's birthday is, but now I know.

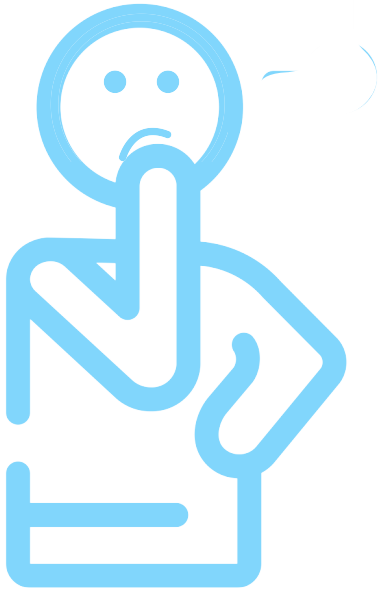
Albert:
Then I also know when Cheryl's birthday is.

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Cognitive principle #1



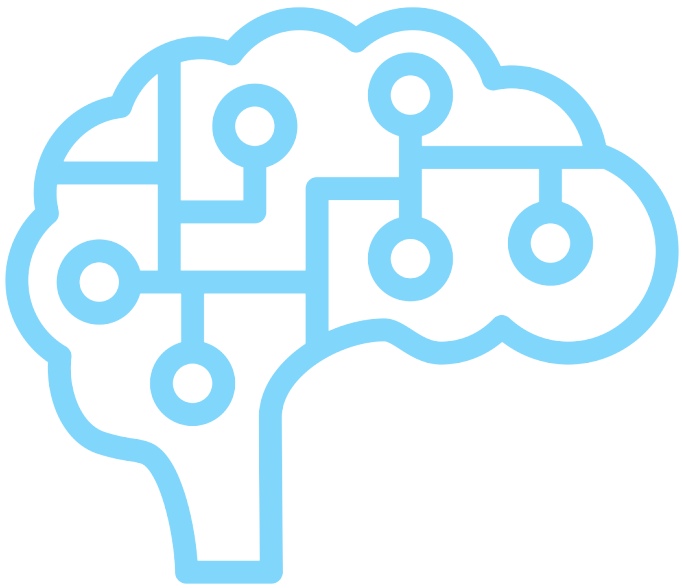
Naturally curious

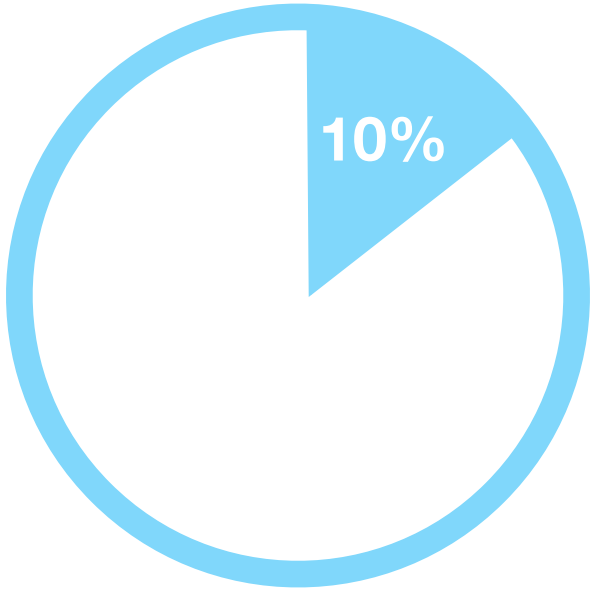


Poor thinkers

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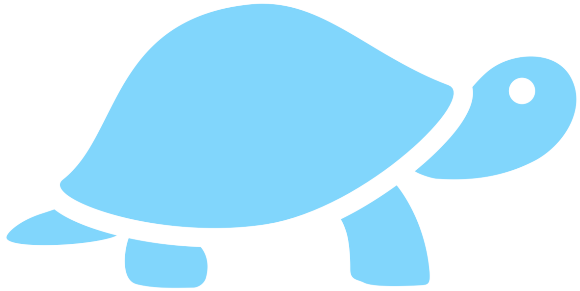
True or false?



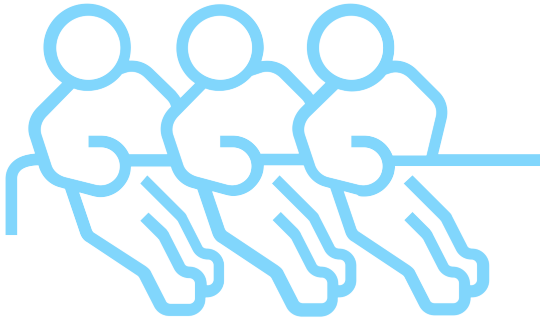


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Thinking



Slow



Effortful



Uncertain

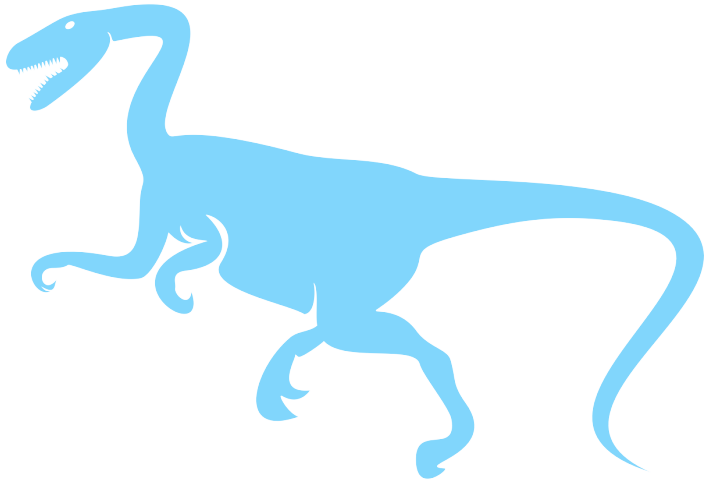
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A puzzle



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Follow students' interests?



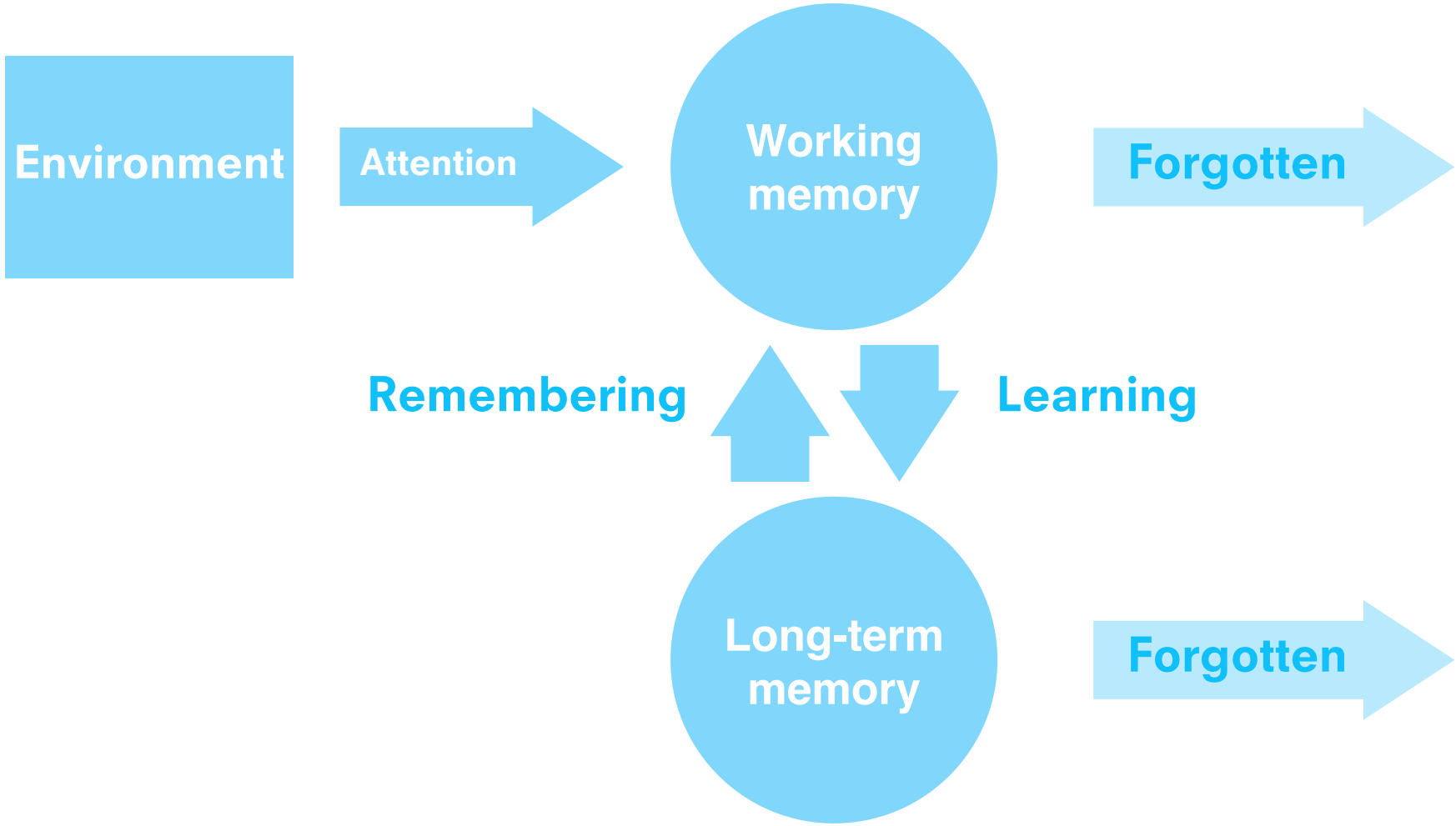
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Desirable difficulty



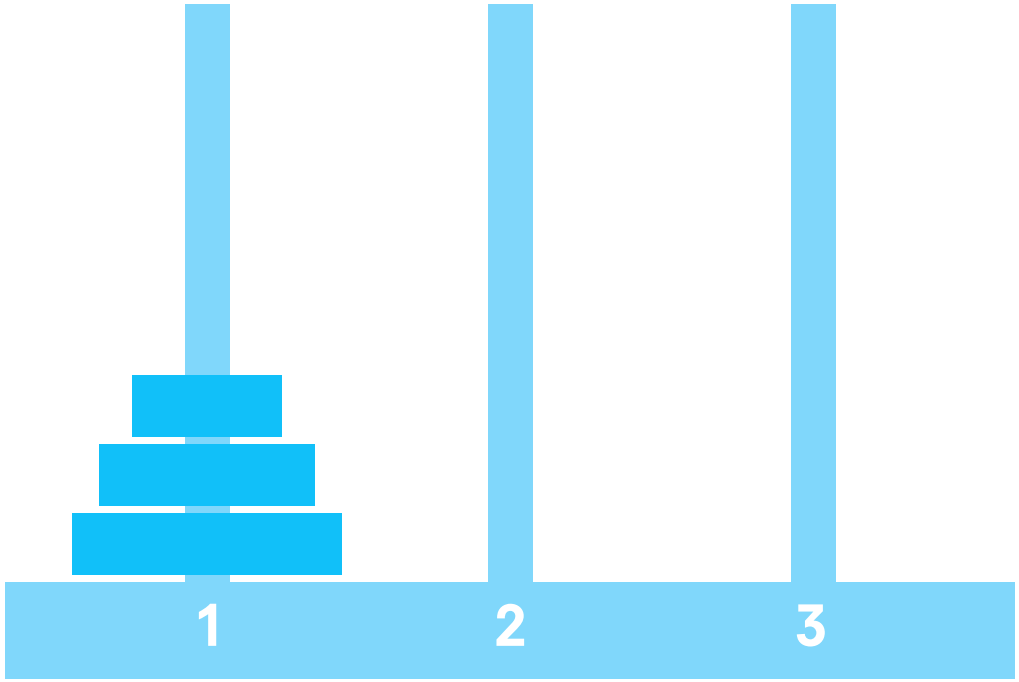
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How thinking works



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Another puzzle



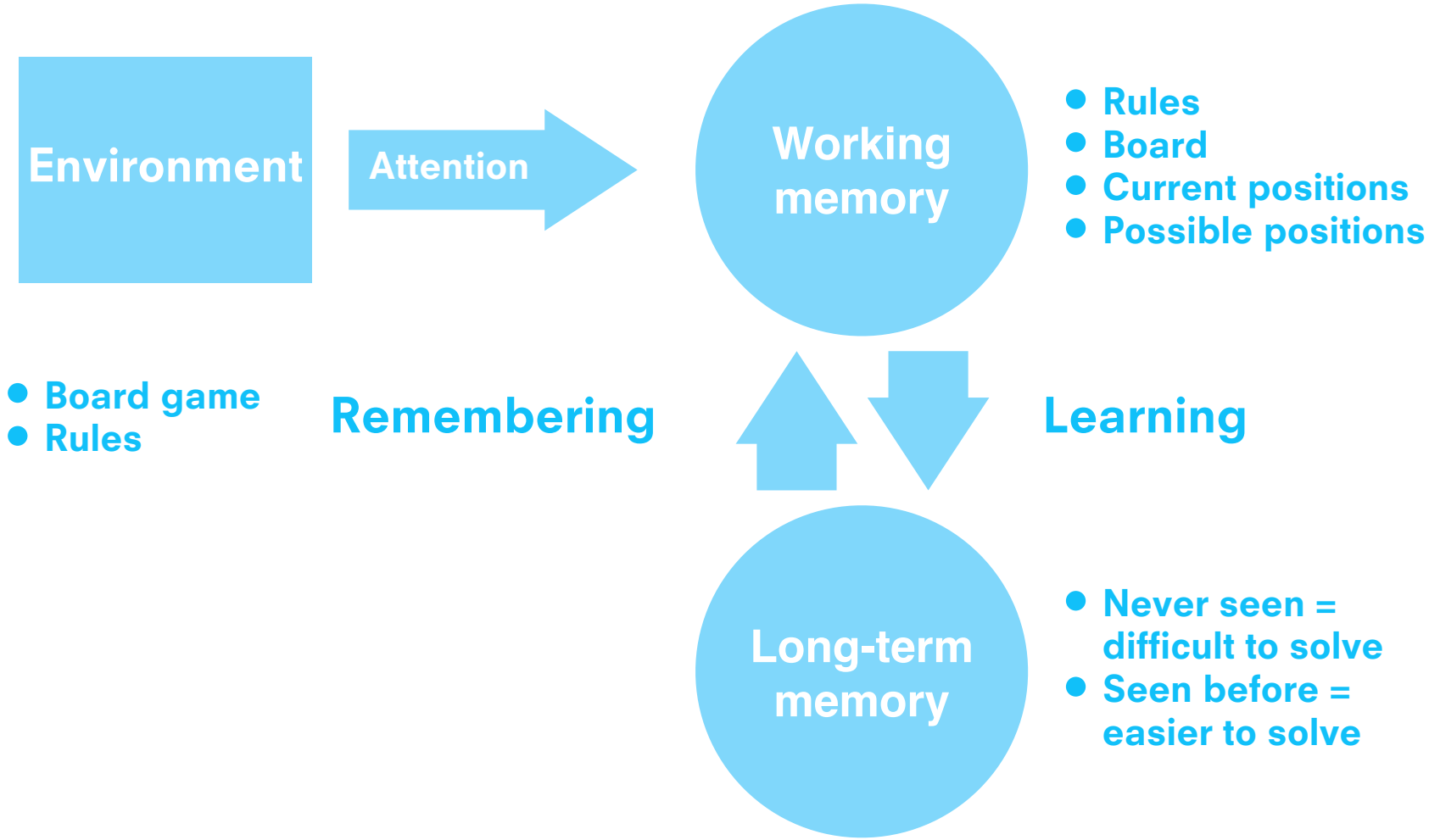
Move all the rings from peg 1 to peg 3.

Rules:

- **Move only 1 ring at a time.**
- **Do not place a larger ring on a smaller ring.**

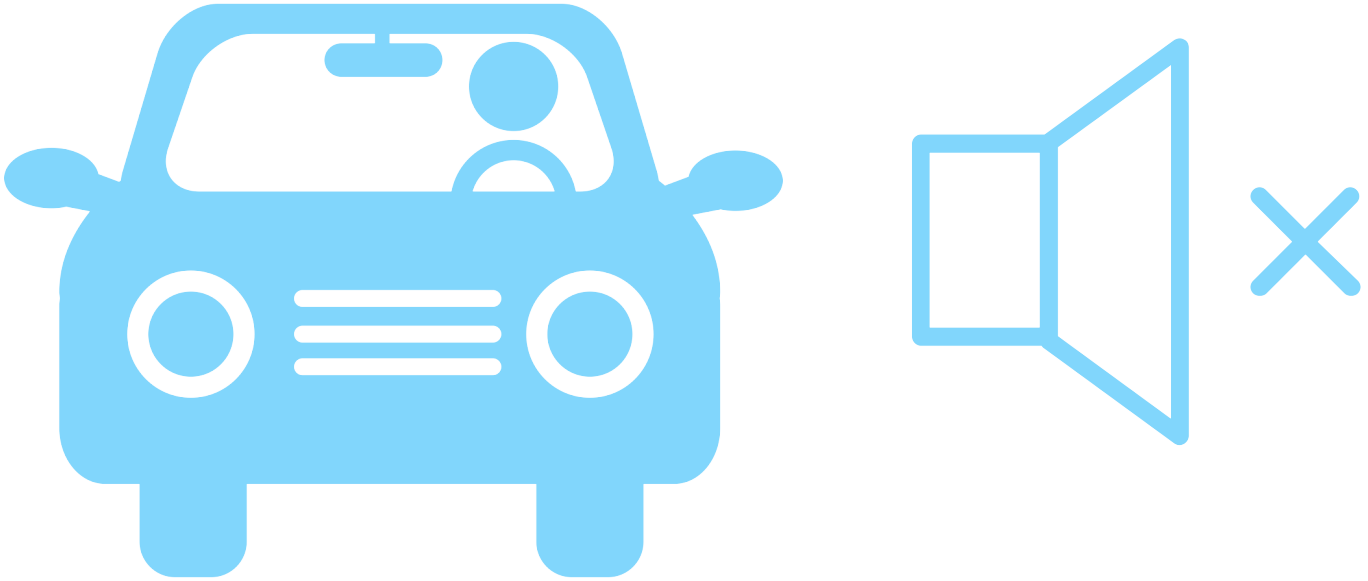
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The importance of long-term memory



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The limitations of working memory

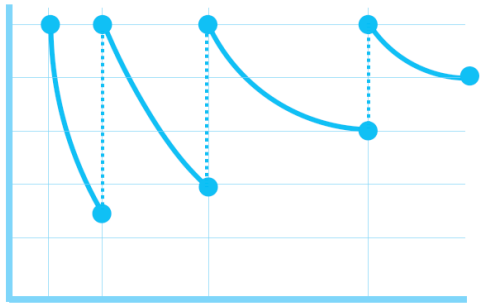


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Cognitive load theory

Intrinsic

Extraneous



Germaine

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New material…

“The process involves sorting items into groups and then, given that different items may also need particular treatments, creating batches that will take a period of time to be processed. In between batches, another process can be taking place which will then prepare the items for another process involving special equipment. The final stage prepares the items for their next use.”

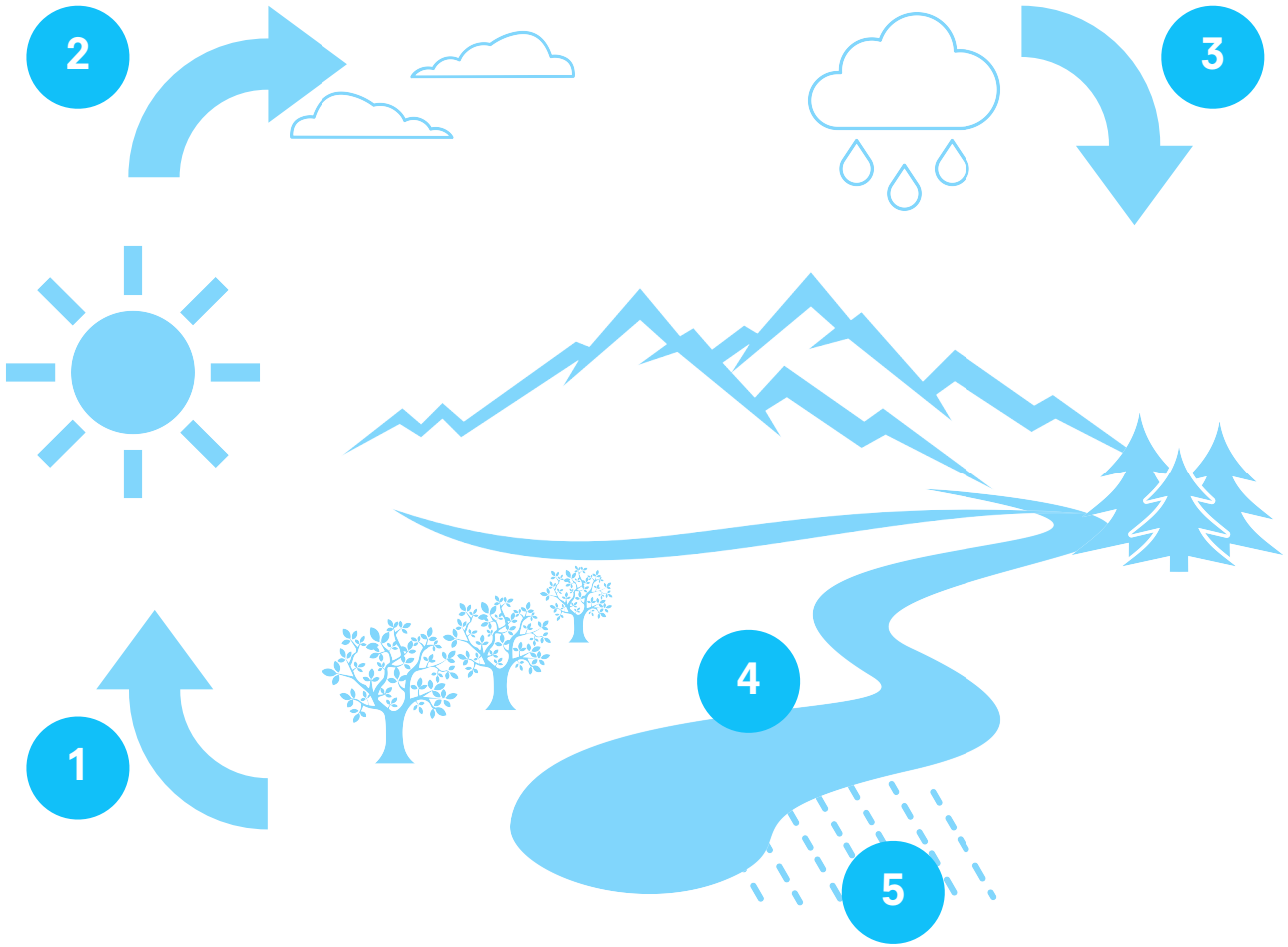
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Areas of working memory



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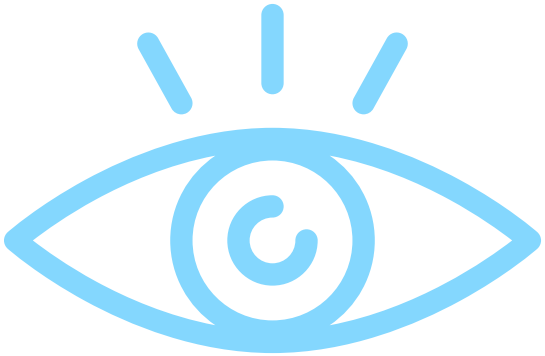
Overloading the phonological loop



1. The sun's heat causes water from rivers and the sea to evaporate. The water turns from a liquid to a gas called water vapour.
2. The water vapour rises and cools. As it cools it condenses and forms clouds.
3. The water falls to the ground as precipitation (rain or snow)
4. The water runs off high land as rivers and forms lakes and the oceans.
5. Some of the water percolates into the ground.

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Dual coding



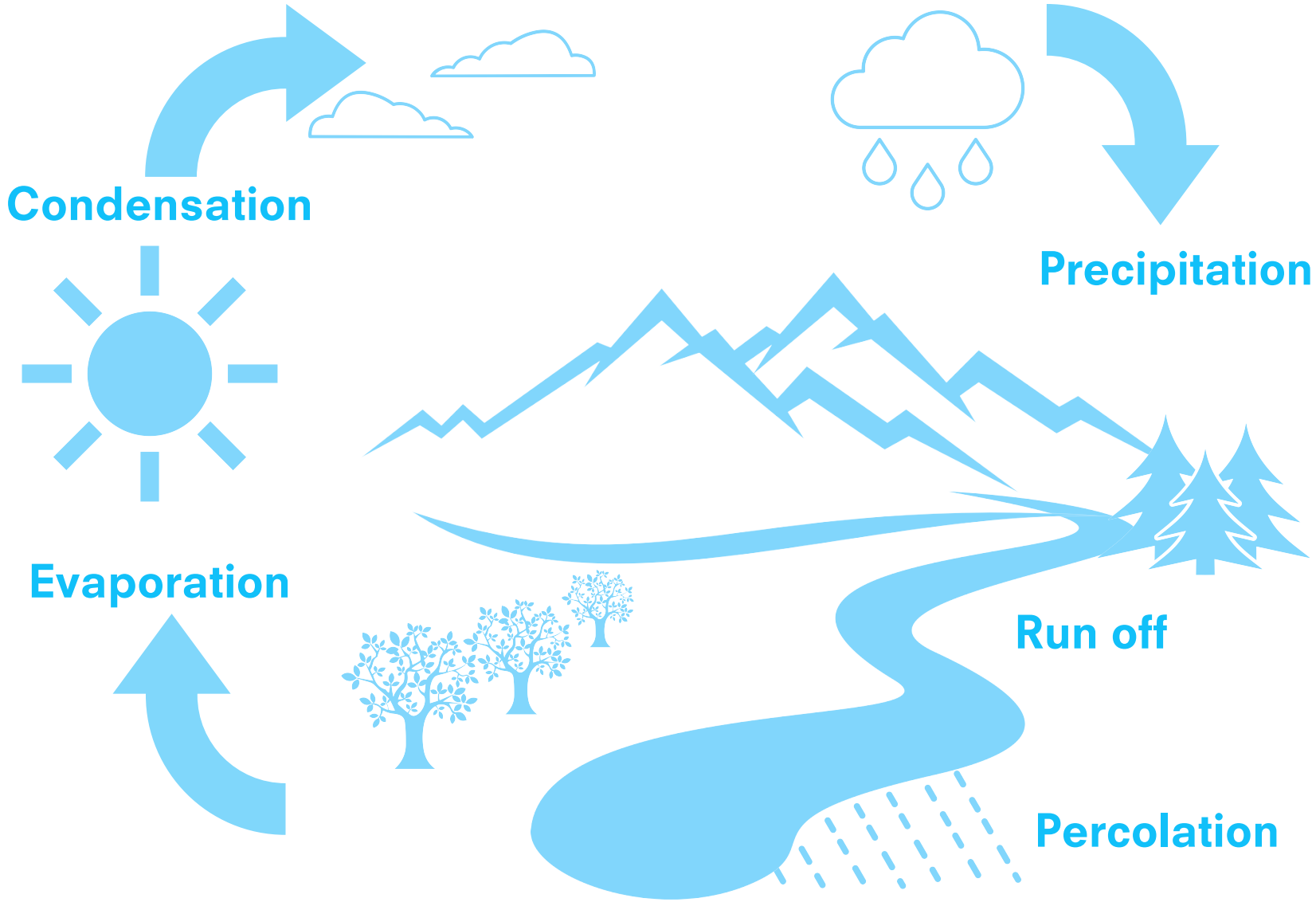
Visual



Verbal

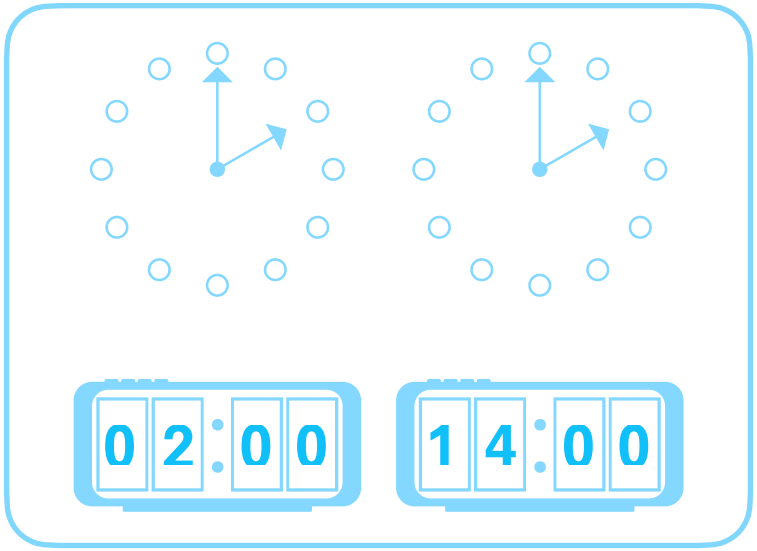
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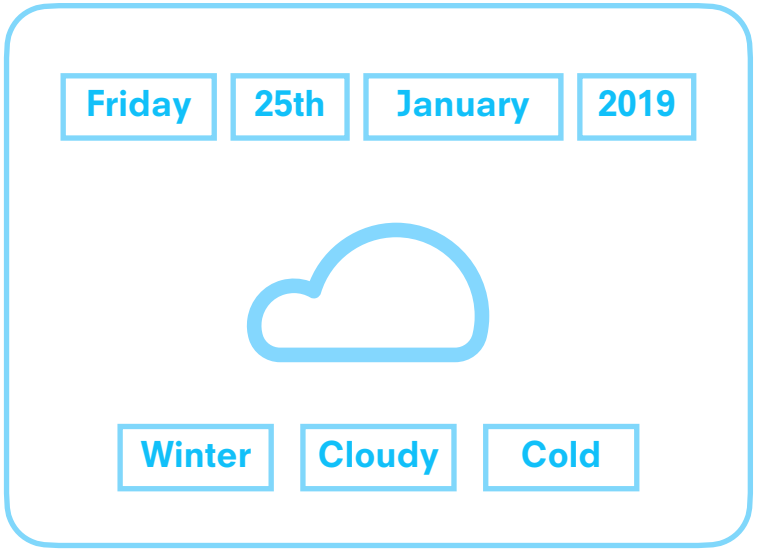
The water cycle

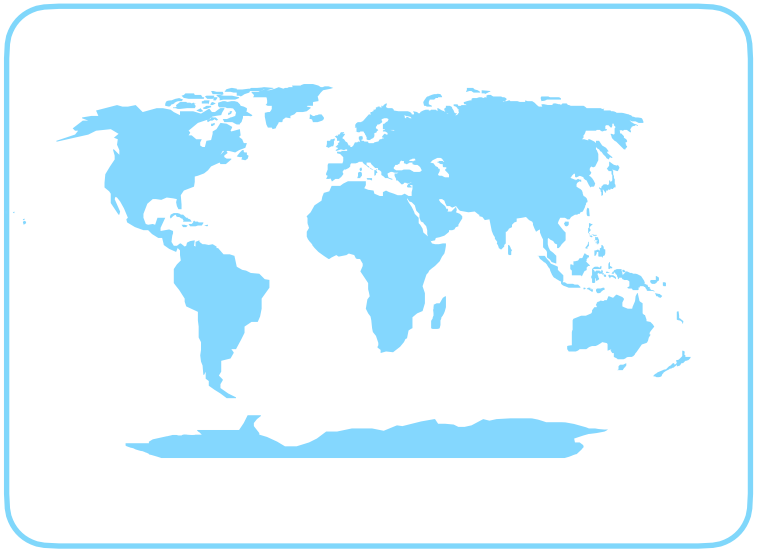


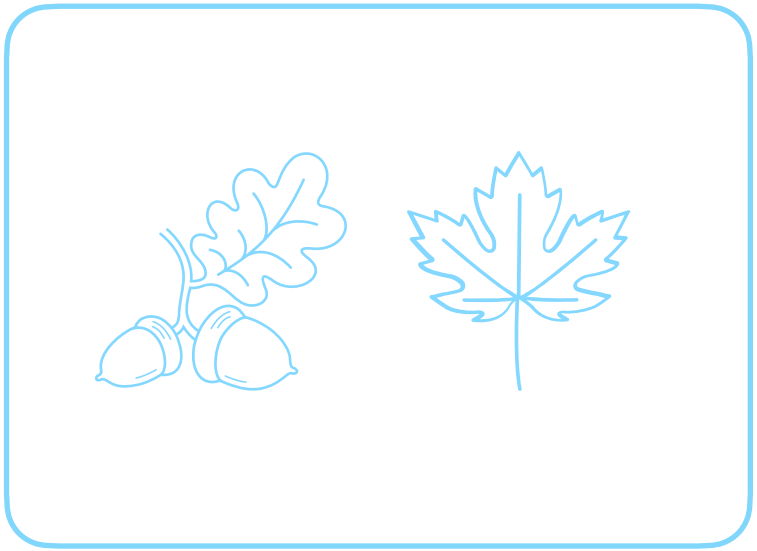
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Daily routines to reduce cognitive load





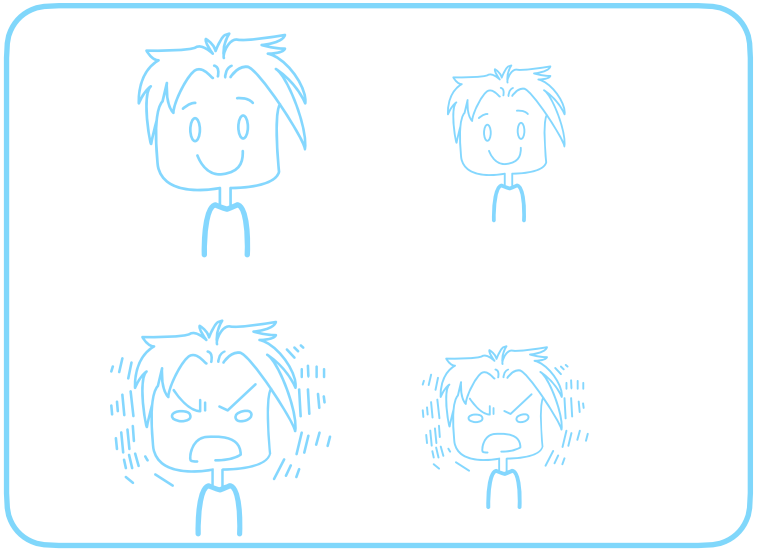


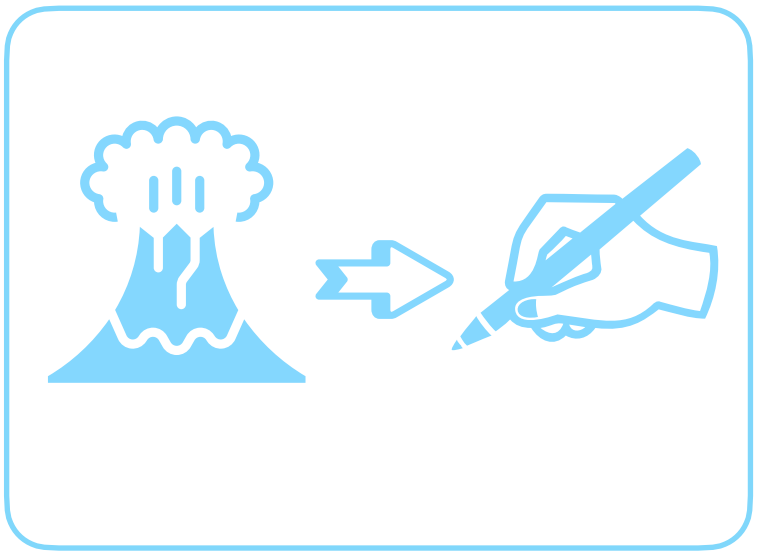


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Curriculum ideas to reduce cognitive load

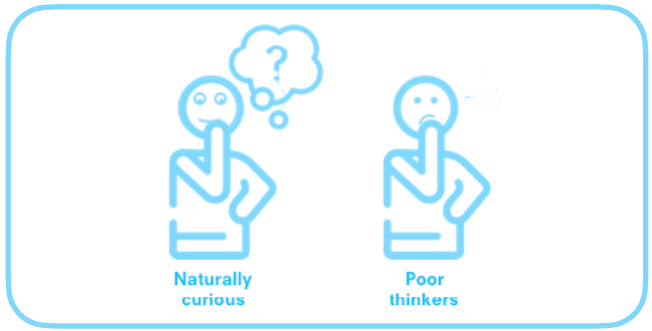


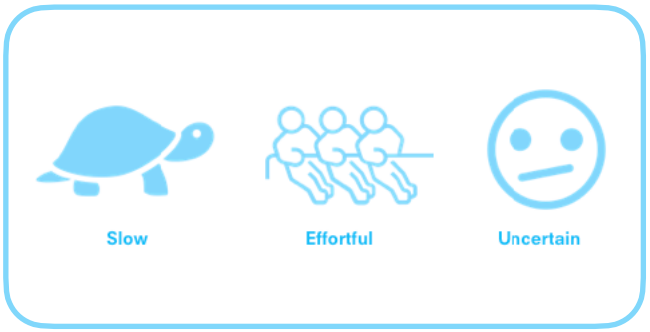




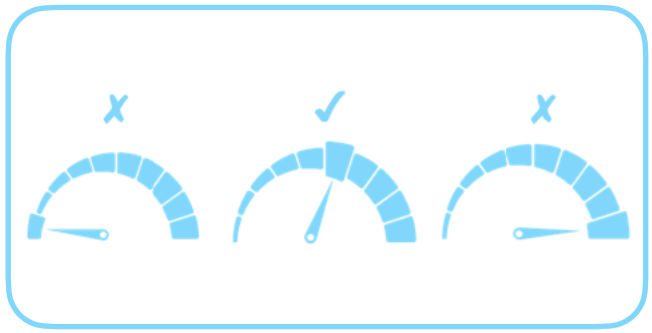
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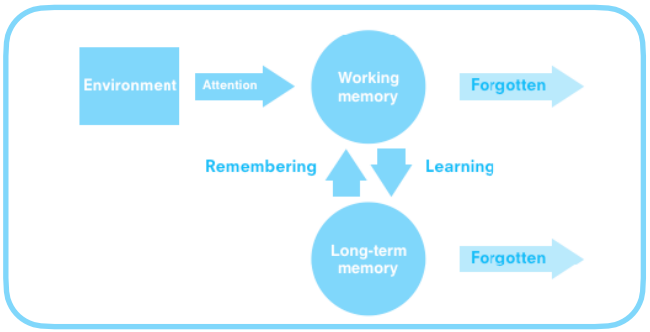
Summary

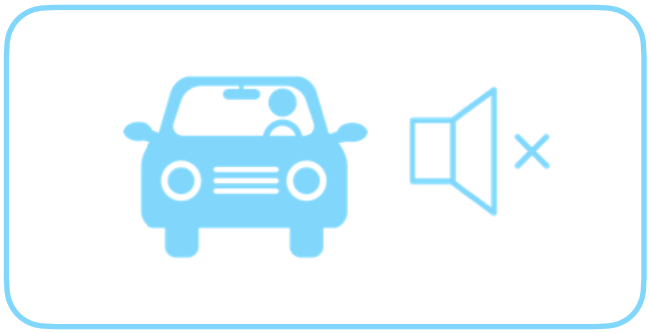












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Make it stick by…

2. Engaging students in thinking

4



Don’t follow

Don’t follow students’ interests.

5

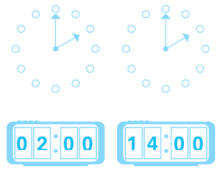


Challenge

Provide moderate challenge.

3. Reducing intrinsic cognitive load

6



Routines

Daily routines slowly build prior knowledge.

7



Story settings

Learn two settings: rural and urban and use in every story.

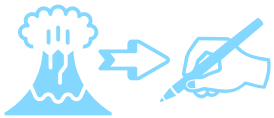
8



Characters

Develop 4 characters and use them every time.

9



Curriculum

Bring curriculum knowledge to writing.

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Make it stick by…

4. Reducing extraneous cognitive load

10

One Focus

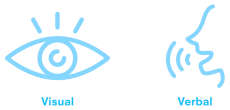
Avoid splitting attention. Think about slide layouts.

11

K.I.S

Avoid redundant information that adds nothing to learning.

12

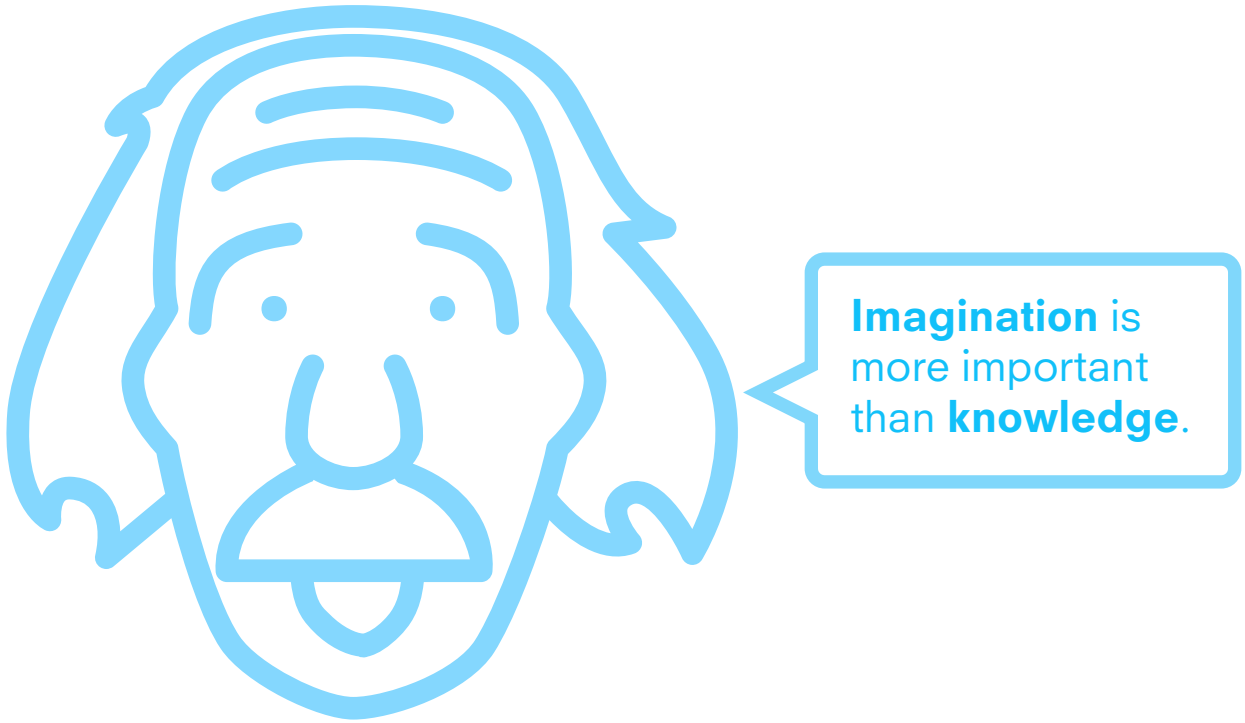


Dual coding

Make teaching visual and verbal.

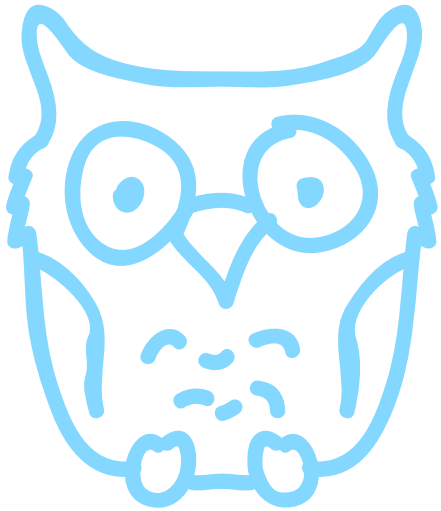
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Creativity



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Cognitive principle #2

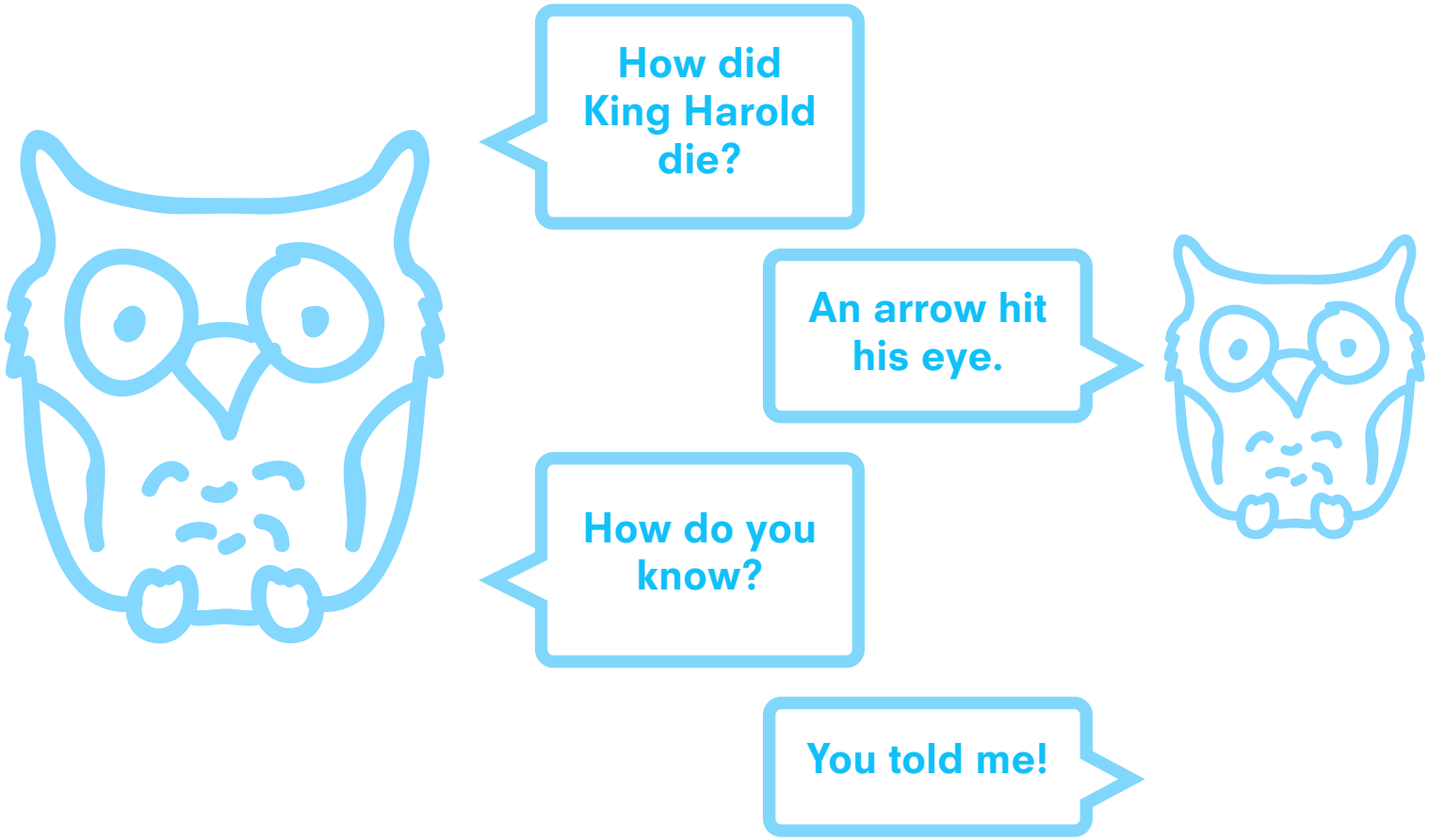




Knowledge **Precedes** **Creativity**

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Knowledge?



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Knowledge improves...



Reading comprehension



Creativity

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Reading comprehension

“Jenna is keen to get back out on the water and, hopefully, this time she wont catch a crab!”

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Build knowledge with vocabulary

Tier 1 words

Everyday words

Most often found in everyday talk.
e.g. the 20 most common words: the, be, to, of, and, a, in, that, have, I, it, for, not, on, with, he, as, you, do, at.

Tier 2 words

General academic and literary words

Most often found in academic speech and texts.
e.g. relative, vary, formulate, specificity, accumulate, calibrate, itemise, misfortune, dignified, faltered, unabashedly, periphery.

Tier 3 words

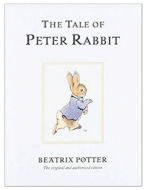
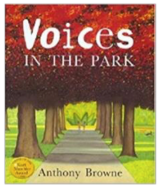
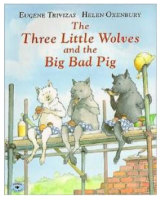
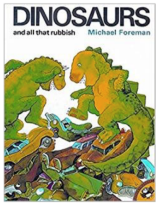
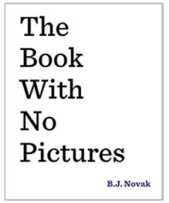
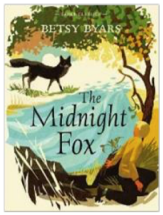
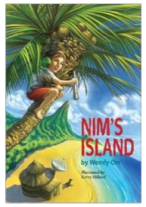
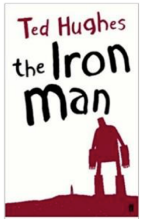
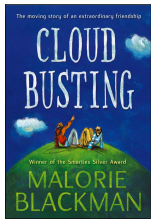
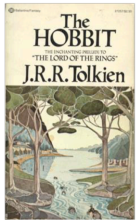
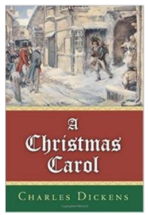
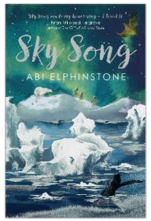
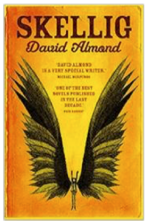
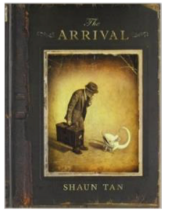
Subject specific words

Most often found in Information texts within a specific subject or field.
e.g. lava, missionary, timbre, circumference, deciduous.

Based on: Isabel L. Beck, Margaret G. McKeown, and Linda Kucan (2002, 2008) *Bringing Words To Life*

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Build knowledge through complex texts

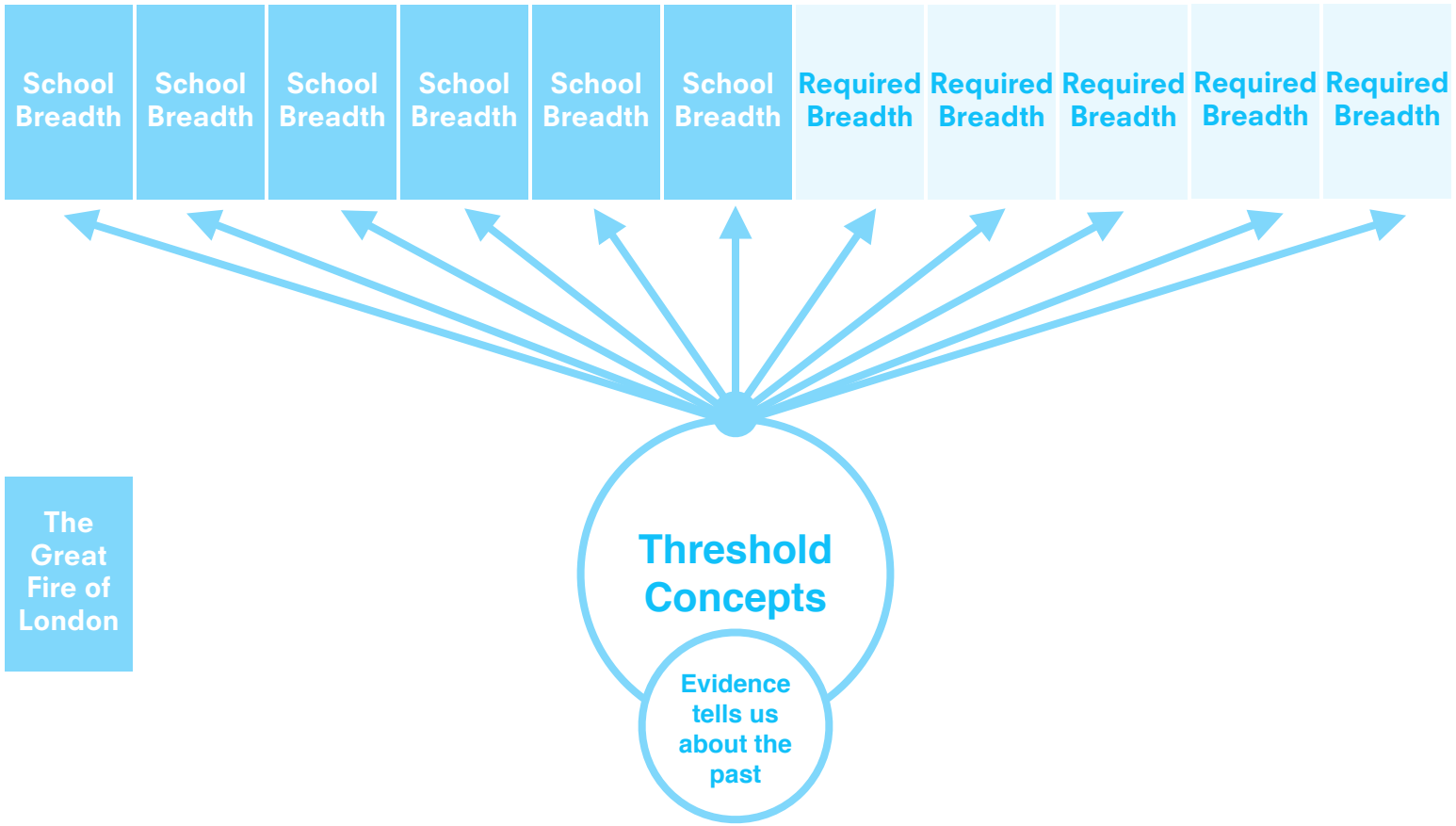
	Archaic text	Non-linear sequences	Narratively complex	Symbolic text	Resistant text
Years 1 and 2					
Years 3 and 4					
Years 5 and 6					

Adapted from D Lemov, 'Teach Like A Champion 2.0' (2015) accessed on 1.9.19 at http://teachlikeachampion.com/wp-content/uploads/5-Plagues-Reading-Spine.pdf

Adapted from: **Reading Reconsidered**, Lemov. D; Driggs.C; Woolway.E. 2016 published by Uncommon Schools and Jossey-Bass

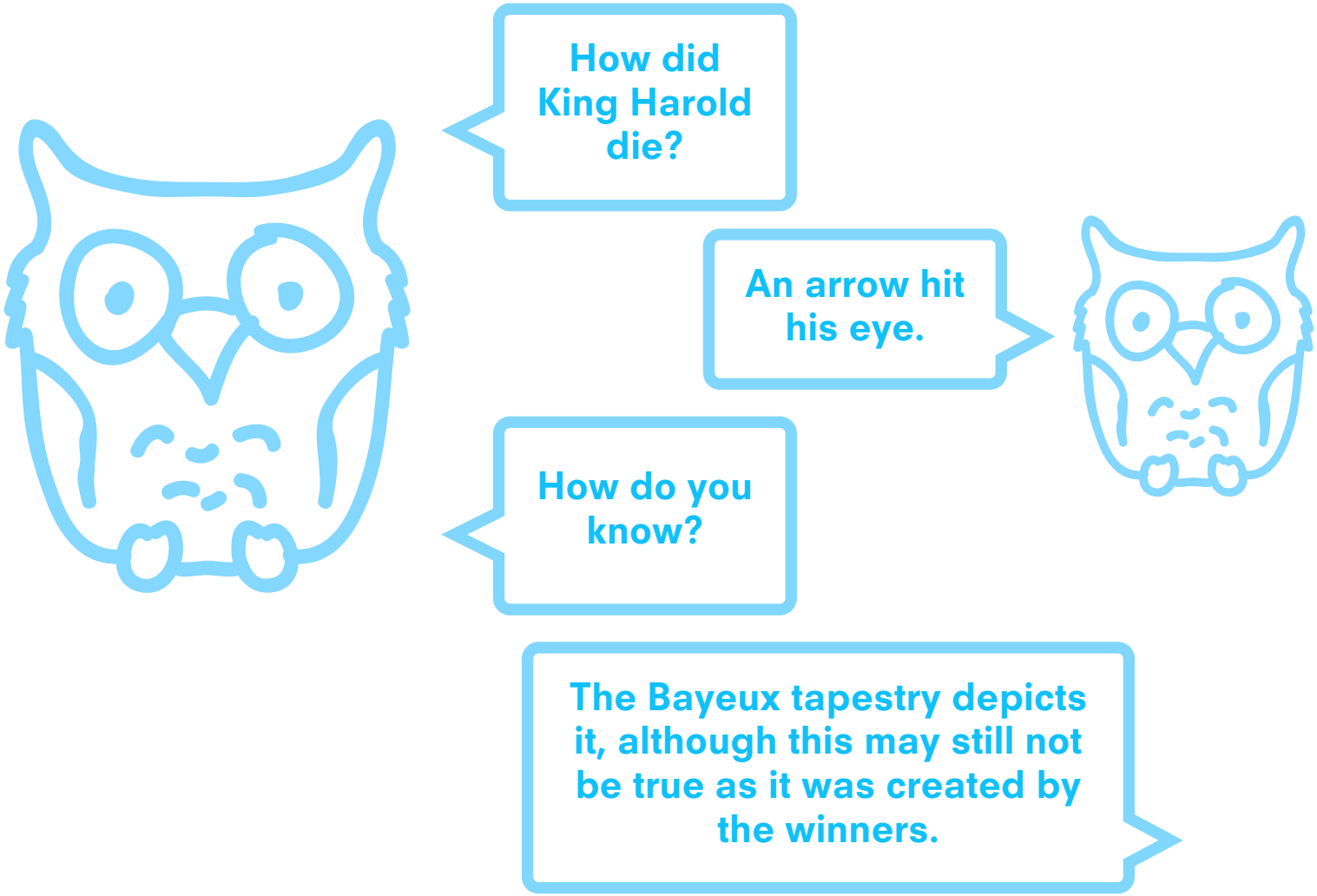
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Making knowledge meaningful



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More meaningful?



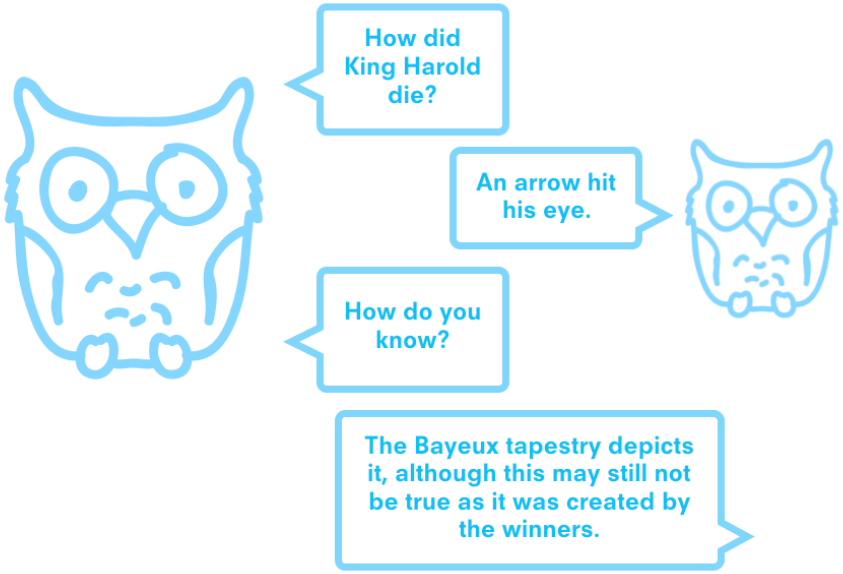
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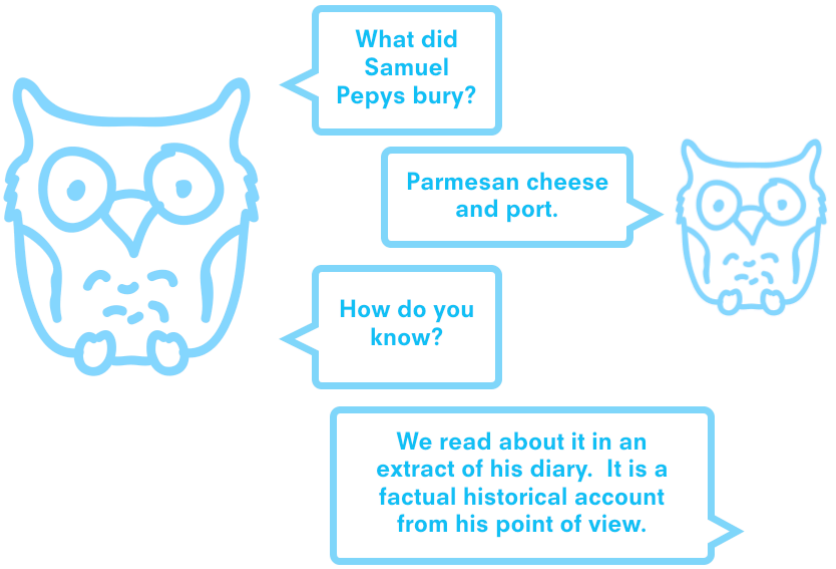
A quick problem:

“In the inns of certain Himalayan villages is practiced a refined tea ceremony. The ceremony involves a host and exactly two guests, neither more nor less. When his guests have arrived and seated themselves at his table, the host performs three services for them. These services are listed in the order of the nobility the Himalayans attribute to them: stoking the fire, fanning the flames, and pouring the tea. During the ceremony, any of those present may ask another, “Honoured Sir, may I perform this onerous task for you?” However, a person may request of another only the least noble of the tasks which the other is performing. Furthermore, if a person is performing any tasks, then he may not request a task that is nobler than the least noble task he is already performing. Custom requires that by the time the tea ceremony is over, all the tasks will have been transferred from the host to the most senior of the guests. How can this be accomplished?”

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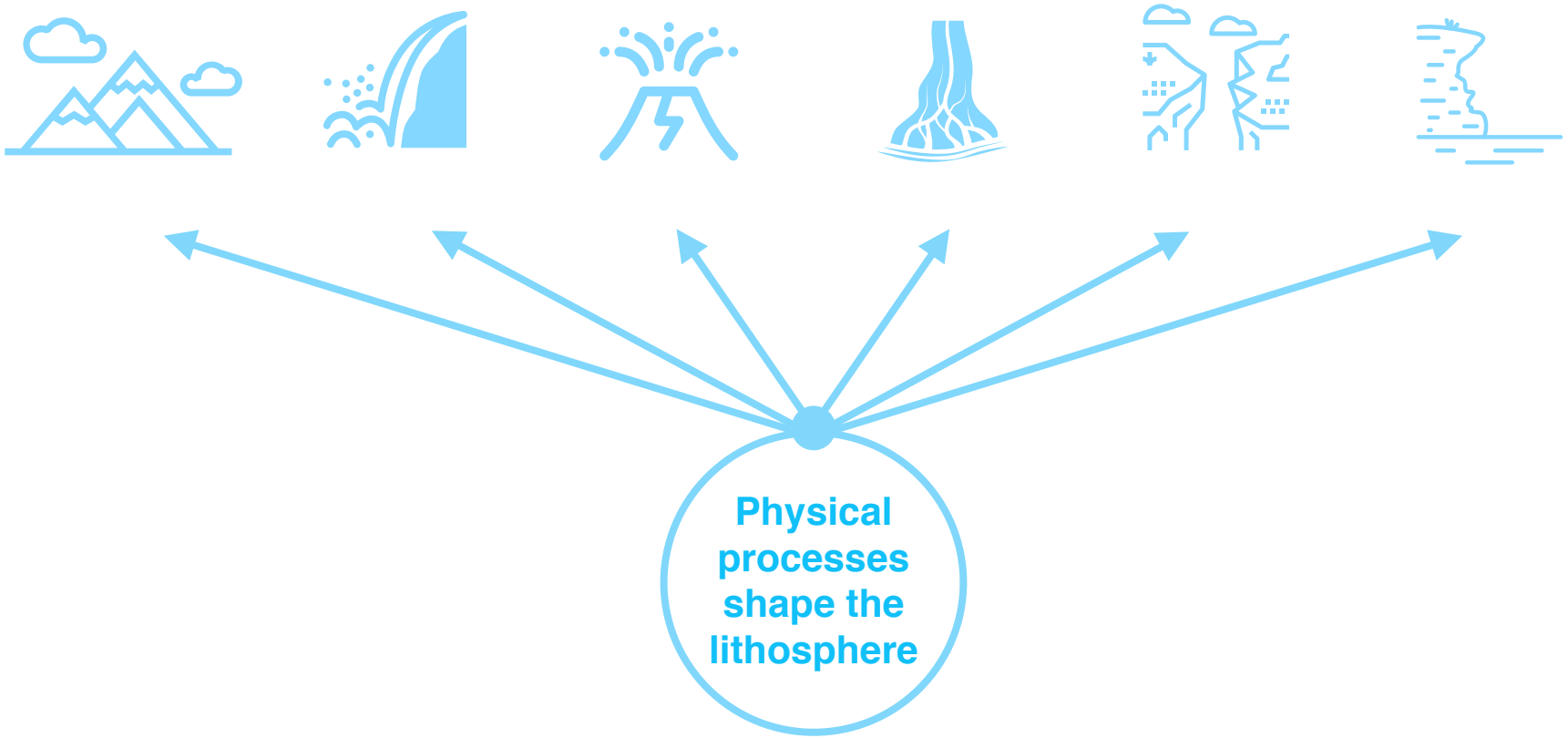
Transference





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Examples of threshold concepts



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Think like Leonardo?

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From novice to expert

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Cognitive skills, Year 2

Suggest a garden design for someone who likes privacy and bright Autumn colours



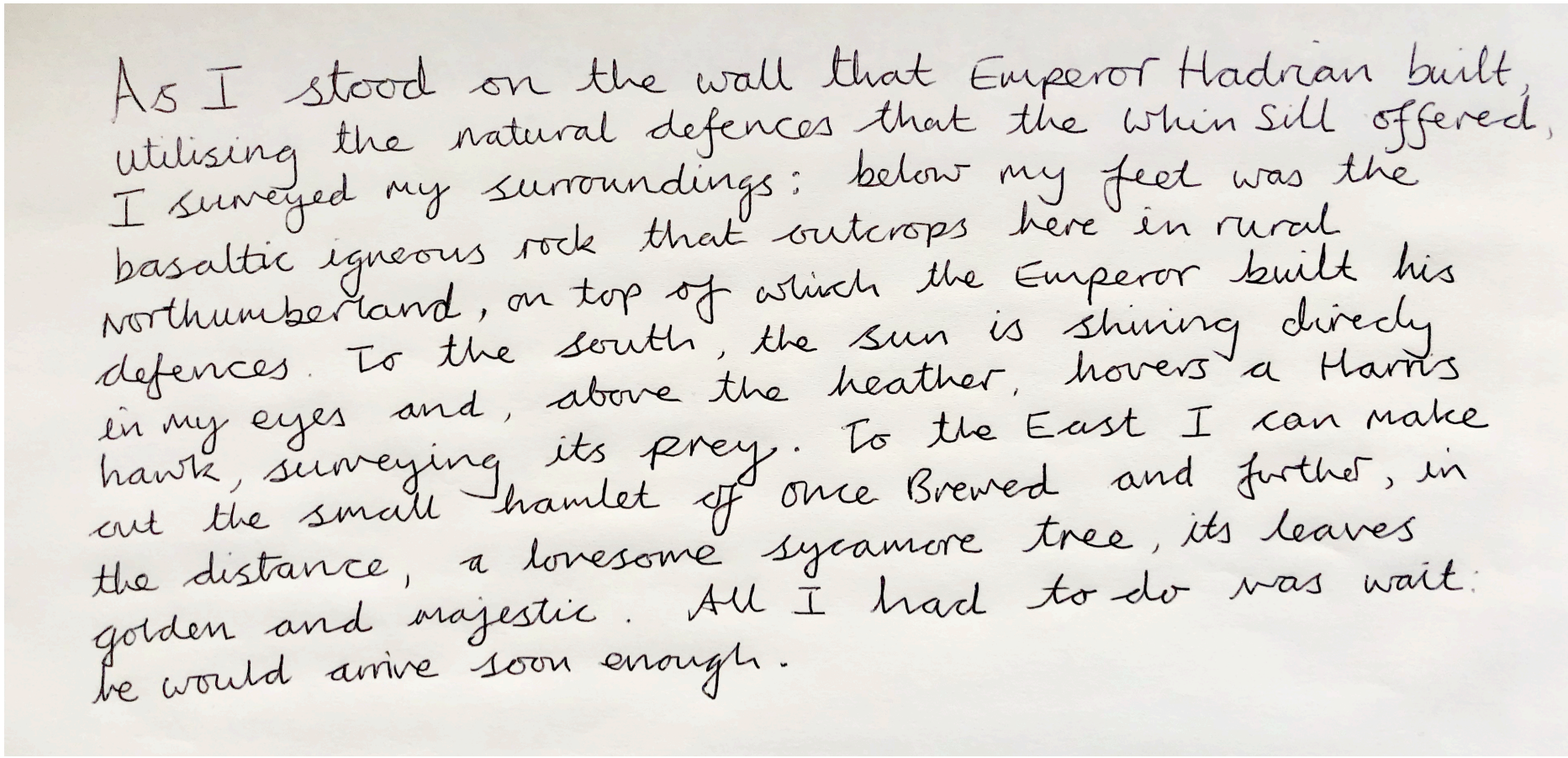
for my design I need privacy and bright autumn colours.

for the privacy I have chosen evergreen trees such as Scots pines. I have also put some deciduous trees such as Beech because it turns a bright orange colour in autumn but also keeps it leaves. I have put folowering plants at the bottom that have flowering in autumn. some are bulbs other are shrubs.

Examples taken from **Greater Depth in Science** Chris Quigley Education.
This shows the standard expected for Greater Depth in Year 2.

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Cognitive skills, Year 6

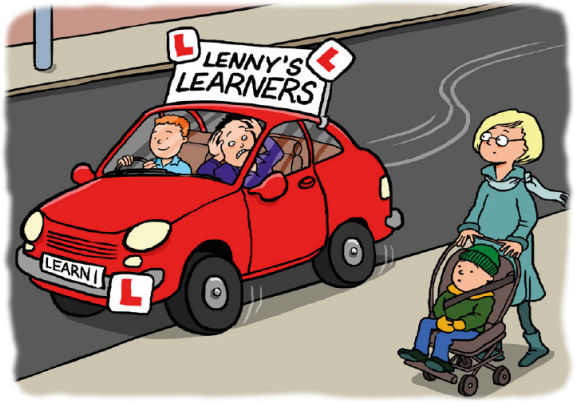
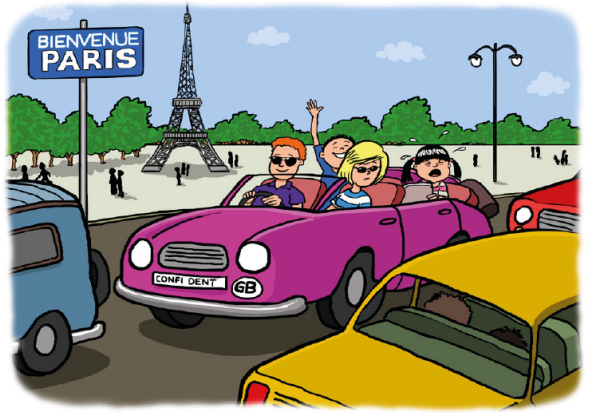


As I stood on the wall that Emperor Hadrian built, utilising the natural defences that the Whin Sill offered, I surveyed my surroundings: below my feet was the basaltic igneous rock that outcrops here in rural Northumberland, on top of which the Emperor built his defences. To the south, the sun is shining directly in my eyes and, above the heather, hovers a Harris hawk, surveying its prey. To the East I can make out the small hamlet of once Brewed and further, in the distance, a lonesome sycamore tree, its leaves golden and majestic. All I had to do was wait: he would arrive soon enough.

Examples taken from **Greater Depth in Science** Chris Quigley Education

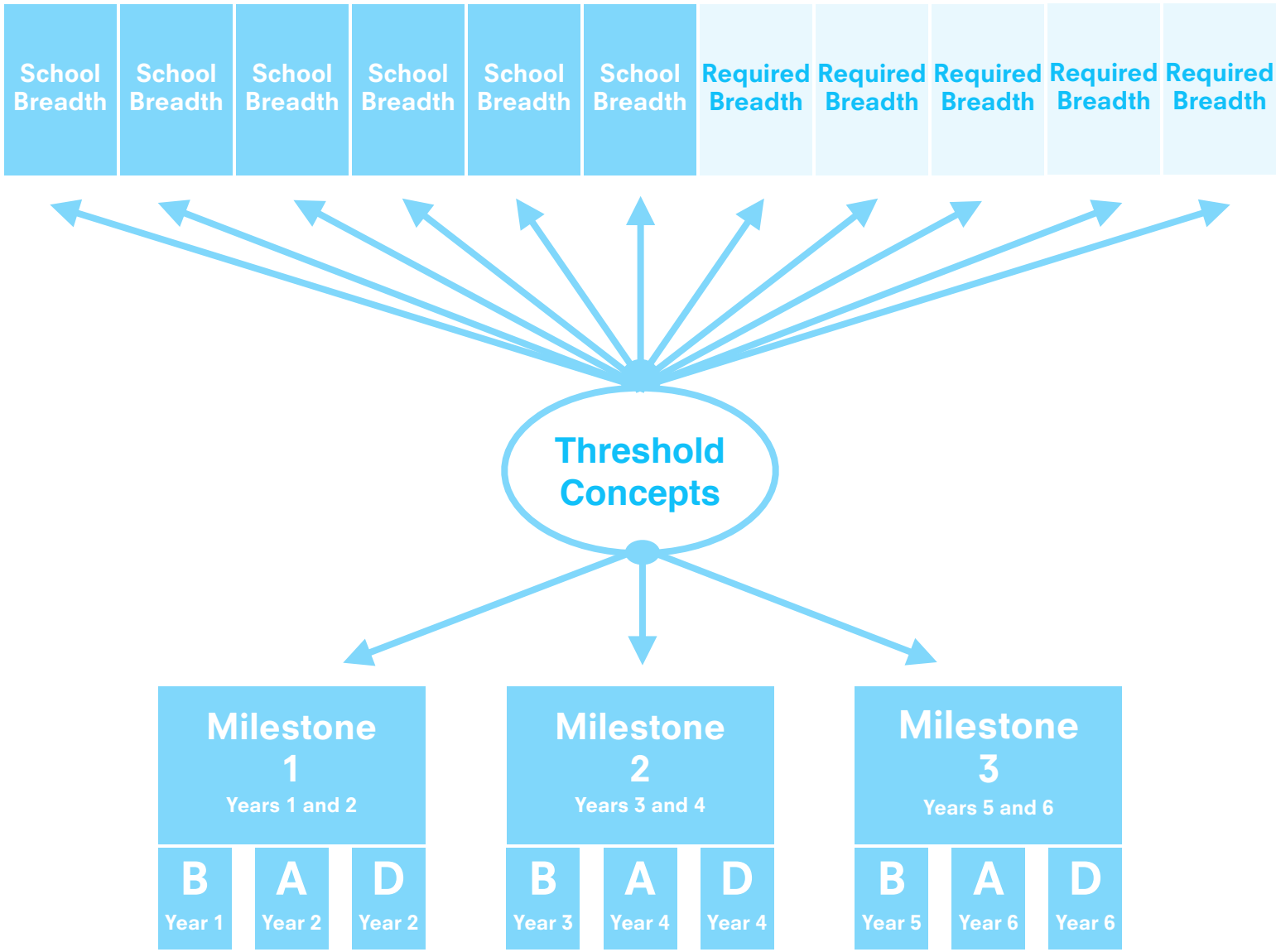
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Fundamental foundations first

Knowledge building to acquire fundamental foundations.	Decision making to apply fundamental foundations.	Non-routine thinking that requires inventive application of fundamental foundations.
		
Basic	**Advancing**	**Deep**

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B.A.D Teaching



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Some important differences

Basic	Advancing	Deep
Acquiring knowledge.	Applying knowledge.	Reasoning with knowledge.
Knowledge is explicit and unconnected.	Knowledge is explicit and connected.	Knowledge is connected and tacit.
Relying on working memory.	Drawing on long-term memory, freeing working memory to consider application.	Relies on long-term memory, freeing working memory to be inventive.
Procedures processed one at a time with conscious effort.	Procedures becoming automatic.	Automatic recall of procedures.
Understands only in the context in which the materials are presented.	Sees underlying concepts between familiar contexts.	Uses conceptual understanding in unfamiliar situations.
New information does not readily stick. Schemas are limited.	New information is linked to prior knowledge. Schemas are strong.	Readily assimilates new information into rapidly expanding schemas.
Struggles to search for problem solutions. Relies on means-end analysis.	Combines searching for problem solutions with means-end analysis.	Draws on a vast store of problem solutions.
Requires explicit instructions and models.	Uses models effectively.	Prefers discovery approaches to learning.

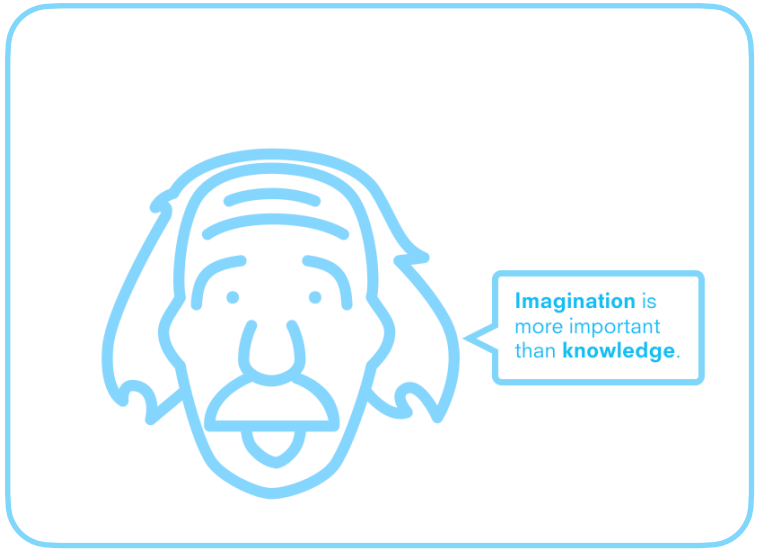
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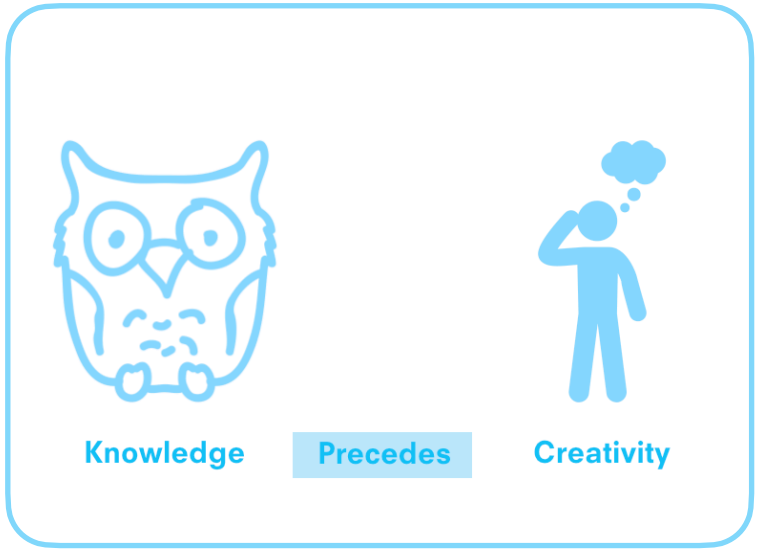
Changing pedagogical style

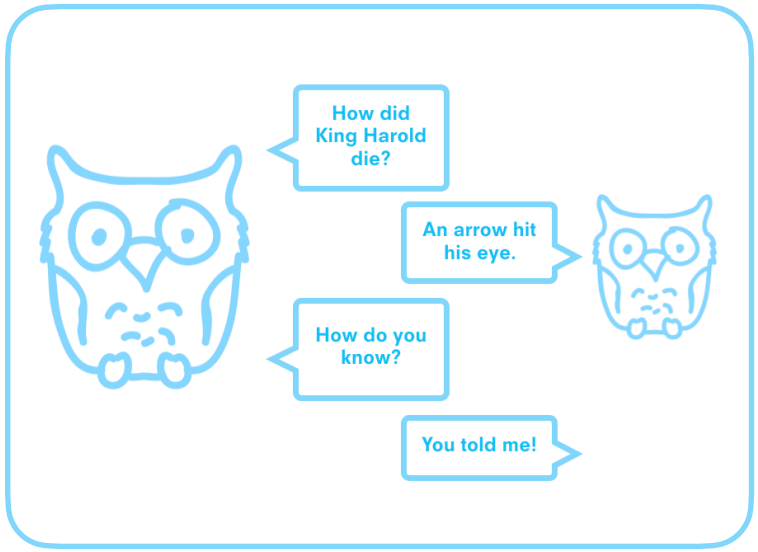
Basic	Advancing	Deep

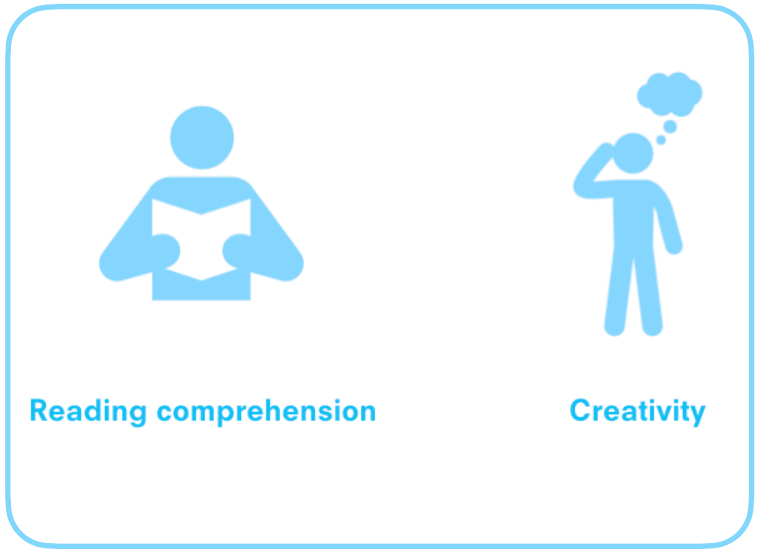
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Summary









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Make it stick by…

5. Planning for breadth of knowledge

13

Culture

Plan for a wide breadth of curriculum knowledge.

14

Vocabulary

Make knowledge visible with vocabulary.

15

Complexity

Plan for students to read complex texts to broaden their knowledge.

6. Optimising intrinsic cognitive load

16

Concepts

Make knowledge powerful by connecting it through concepts.

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Make it stick by…

7. Being B.A.D

17

Slow down

Take longer to make progress permanent.

18

Foundations

Focus on fundamental foundations first. Always return to them afterwards.

19

Novice first

Novices can't think like experts. First work on being a novice before trying to be an expert.

20

Pedagogy

Remember that novices need different approaches than experts.

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Making learning memorable?



1:1:1:1

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Cognitive principle #3



Memory:
the residue of thought

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Our model of memory



Non - declarative

Procedural

Mixing, measuring etc.

Declarative

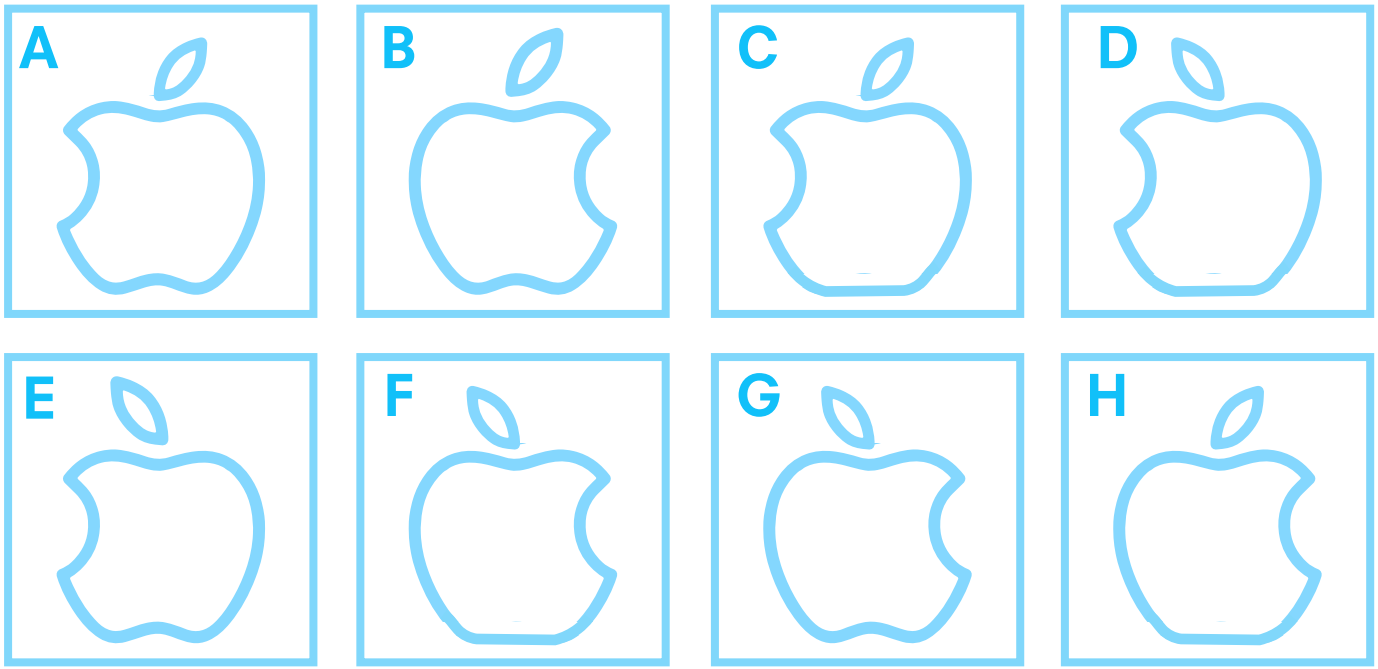
Episodic

Baking a cake

Semantic

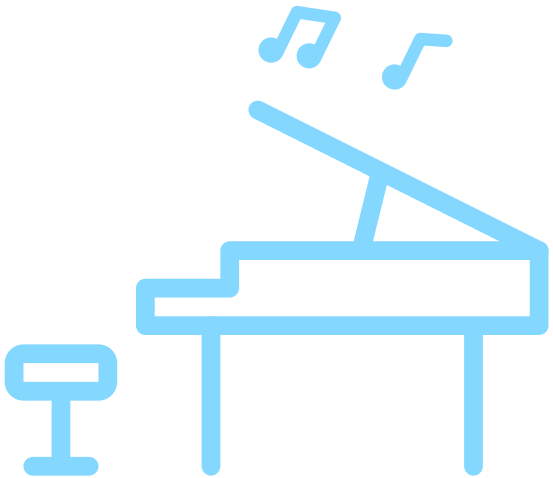
1:1:1:1

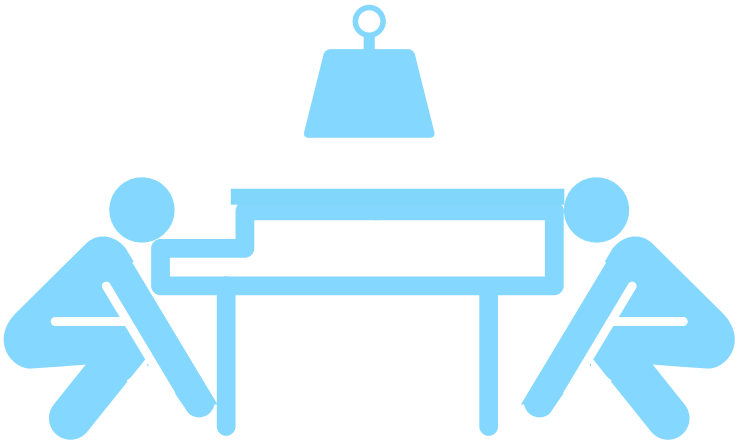
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Meaning depends on context





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Does ‘wanting’ to remember help?



Surprise test: same results



Forewarned: same results

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Stories



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Follow students interests?



What I want



Reality

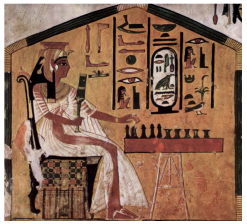
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Focus on concepts: KS1

Breadth	Threshold Concept	Milestone 1 Years 1 and 2	Example Activities
The Great Fire of London	Investigate and interpret evidence	• Observe or handle evidence to ask questions and find answers to questions about the past. • Ask questions such as: What was it like for people? What happened? How long ago? • Use artefacts, pictures, stories, online sources and databases to find out about the past. • Identify some of the different ways the past has been represented.	Look at the extract of Samuel Pepys' diary and answer the following questions: 1) When was the Great Fire of London? 2) Where did the fire start? 3) How many buildings were burned? 4) What are the main reasons the fire spread so fast? Look at pictures and newspaper cuttings from the time and answer the following questions: 1) How did people try to stop the fire? 2) How did buildings change when people re-built London?

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Focus on concepts: Lower KS2

Breadth	Threshold Concept	Milestone 2 Years 3 and 4	Example Activities
The Ancient Egyptians	Investigate and interpret evidence	• Use evidence to ask questions and find answers to questions about the past. • Suggest suitable sources of evidence for historical enquiries. • Use more than one source of evidence for historical enquiry in order to gain a more accurate understanding of history. • Describe different accounts of an historical event, explaining some of the reasons why the accounts may differ. • Suggest causes and consequences of some of the main events and changes in history.	What does the following evidence suggest about how Ancient Egyptians liked to spend their leisure time?     Find out more about these artefacts.

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Focus on concepts: Upper KS2

Breadth	Threshold Concept	Milestone 3 Years 5 and 6	Example Activities
The Ancient Egyptians	Investigate and interpret evidence	• Use sources of evidence to deduce information about the past. • Select suitable sources of evidence, giving reasons for choices. • Use sources of information to form testable hypotheses about the past. • Seek out and analyse a wide range of evidence in order to justify claims about the past. • Show an awareness of the concept of propaganda and how historians must understand the social context of evidence studied. • Understand that no single source of evidence gives the full answer to questions about the past. • Refine lines of enquiry as appropriate.	The picture from Medinat Habu temple in Luxor, Egypt shows carvings representing a scene where a god hands over a dagger to Ramses the Third, to tell him to mercilessly massacre foreign enemies. Could this be propaganda to show that it was alright to kill the people because a god said it must be done? 

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Style?



Comedian



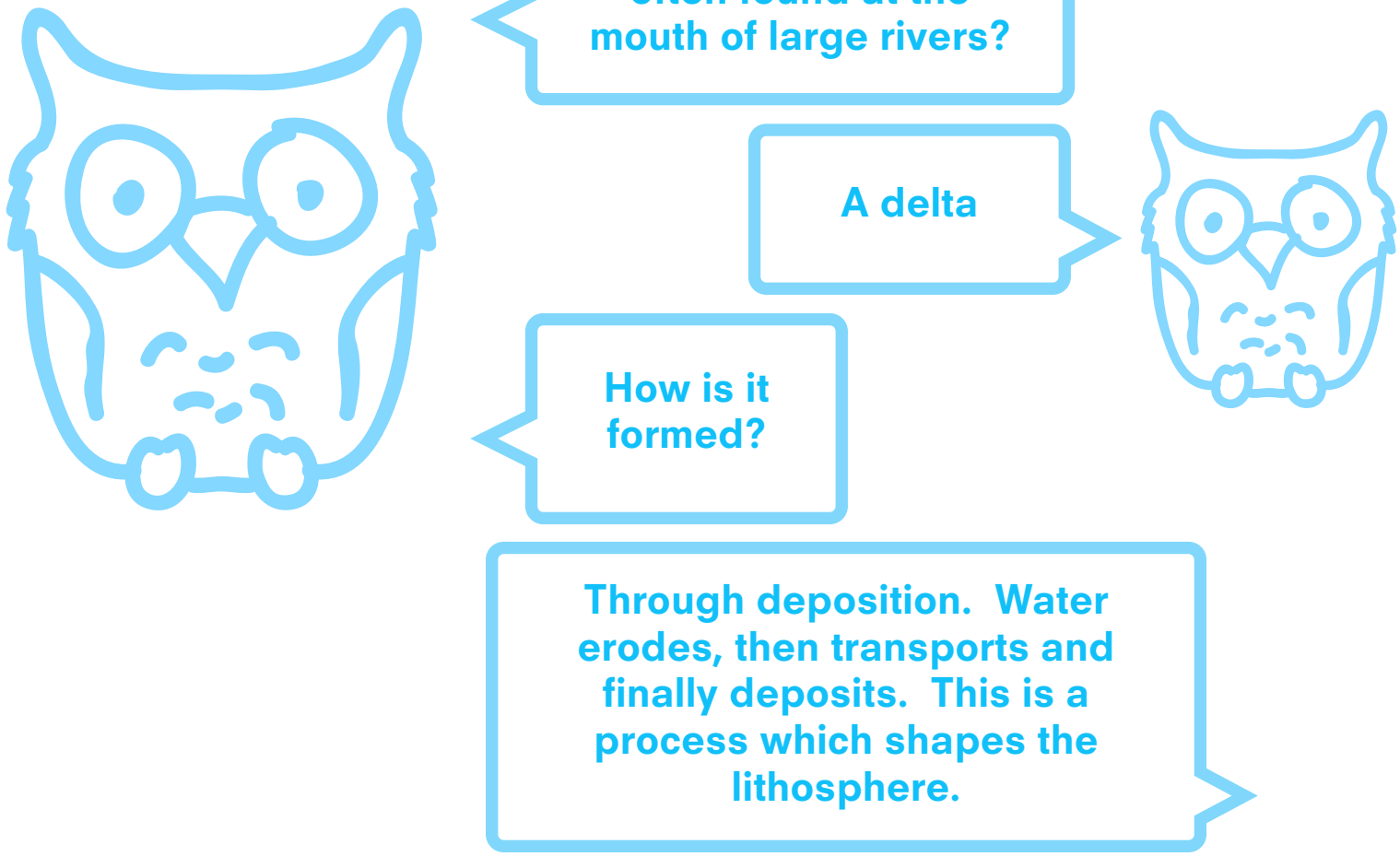
Caring



Entertainer

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Threshold concepts give meaning



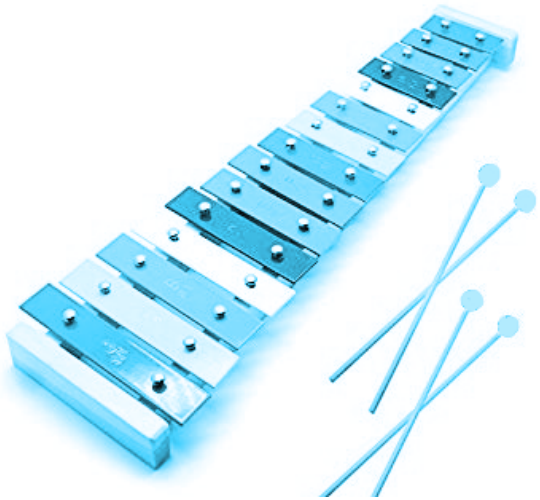
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What if there's, seemingly, no meaning?



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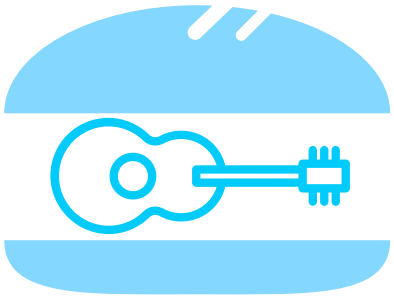
Xylophone?





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Mnemonics: peg method







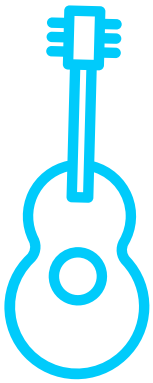
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Mnemonics: loci method



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Mnemonics: acronym method



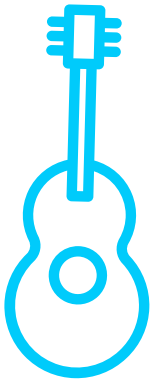




G r i **P** p e **D**

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Mnemonics: initialism method



Granny



Plays



Dodgeball

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Mnemonics: songs



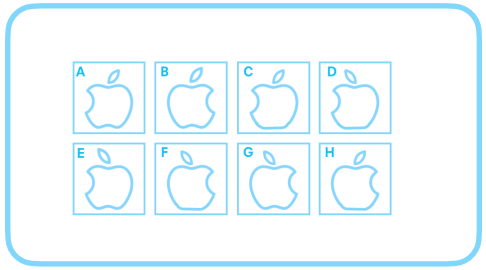
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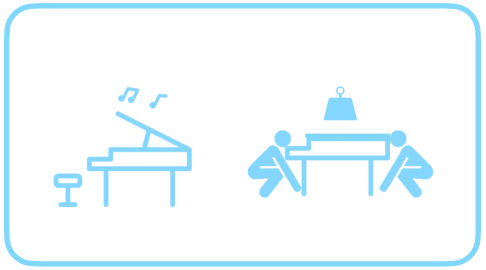
Students who struggle

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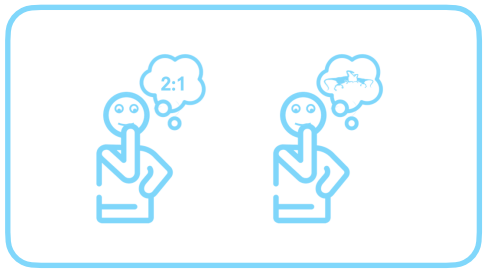
Summary



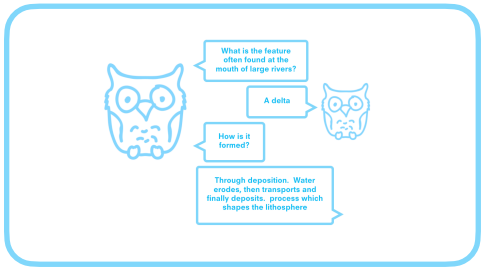


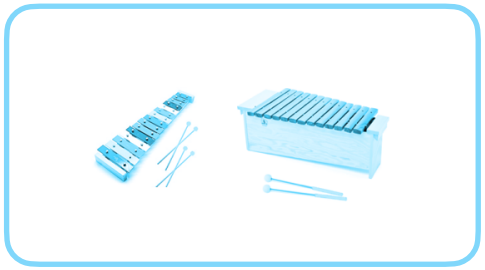


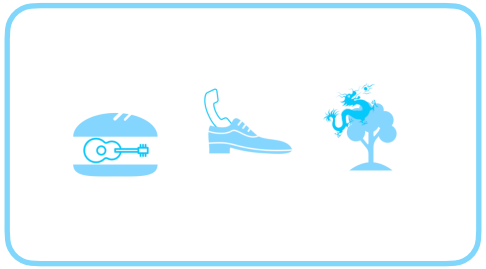












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Make it stick by…

8. Focusing on meaning

21

Thinking first

Instead of fun, put thinking first. We remember what we think about.

22

Vary contexts

How we present something affects its meaning. Vary contexts to give new meaning.

23

Concepts

Relate everything new to the Threshold Concepts.

9. Offering insight

24

Root words

Explore the Latin or Greek roots of vocabulary.

25

Etymology

Embed etymology across the curriculum.

26

Mnemonics

Using mnemonics as a tool to remember lists.

27



Stories

Exploit the privileged position of stories in our memory.

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Cognitive principle #4

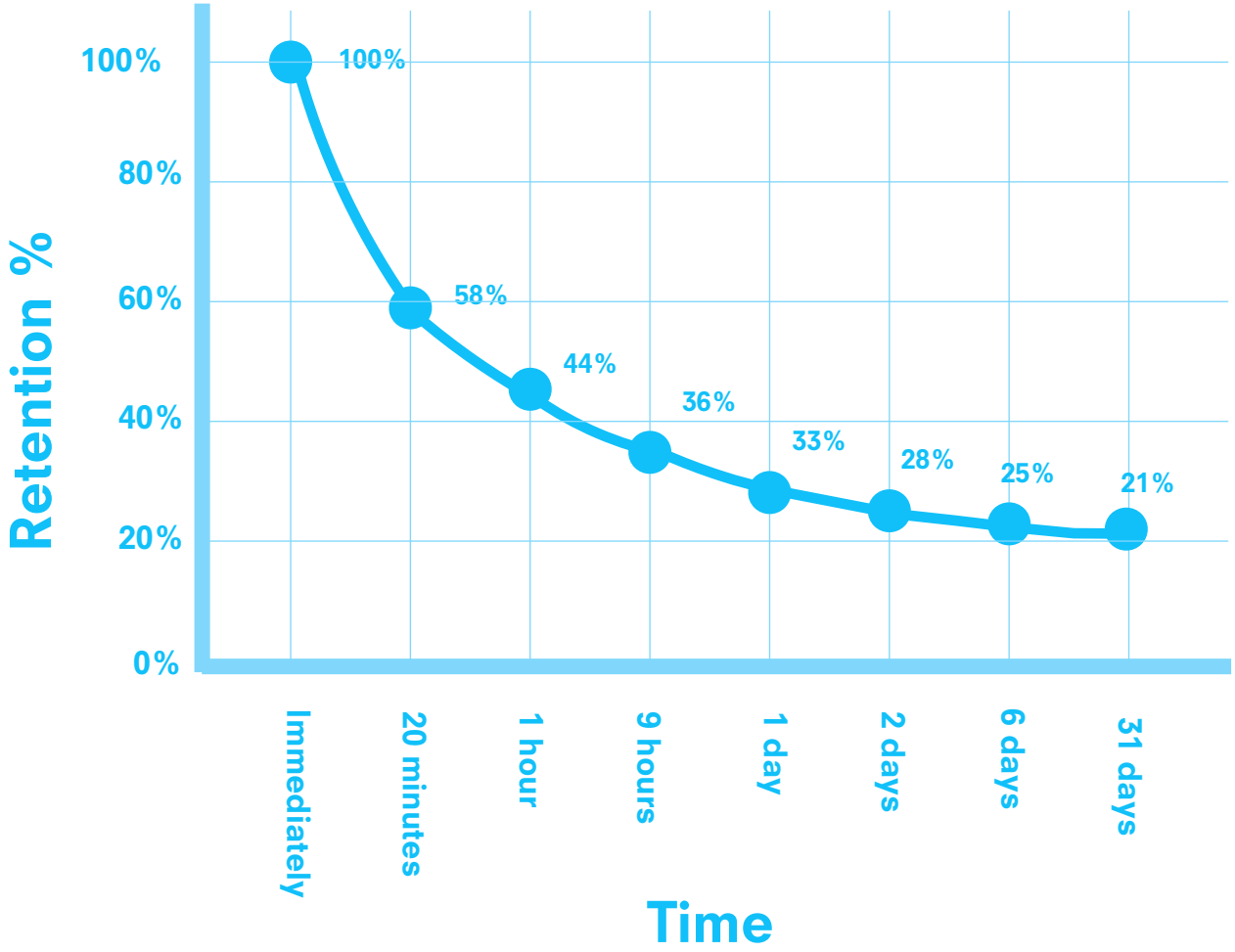
Proficiency takes practise

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The illusion of mastery

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Forgetting



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Working memory

Working memory

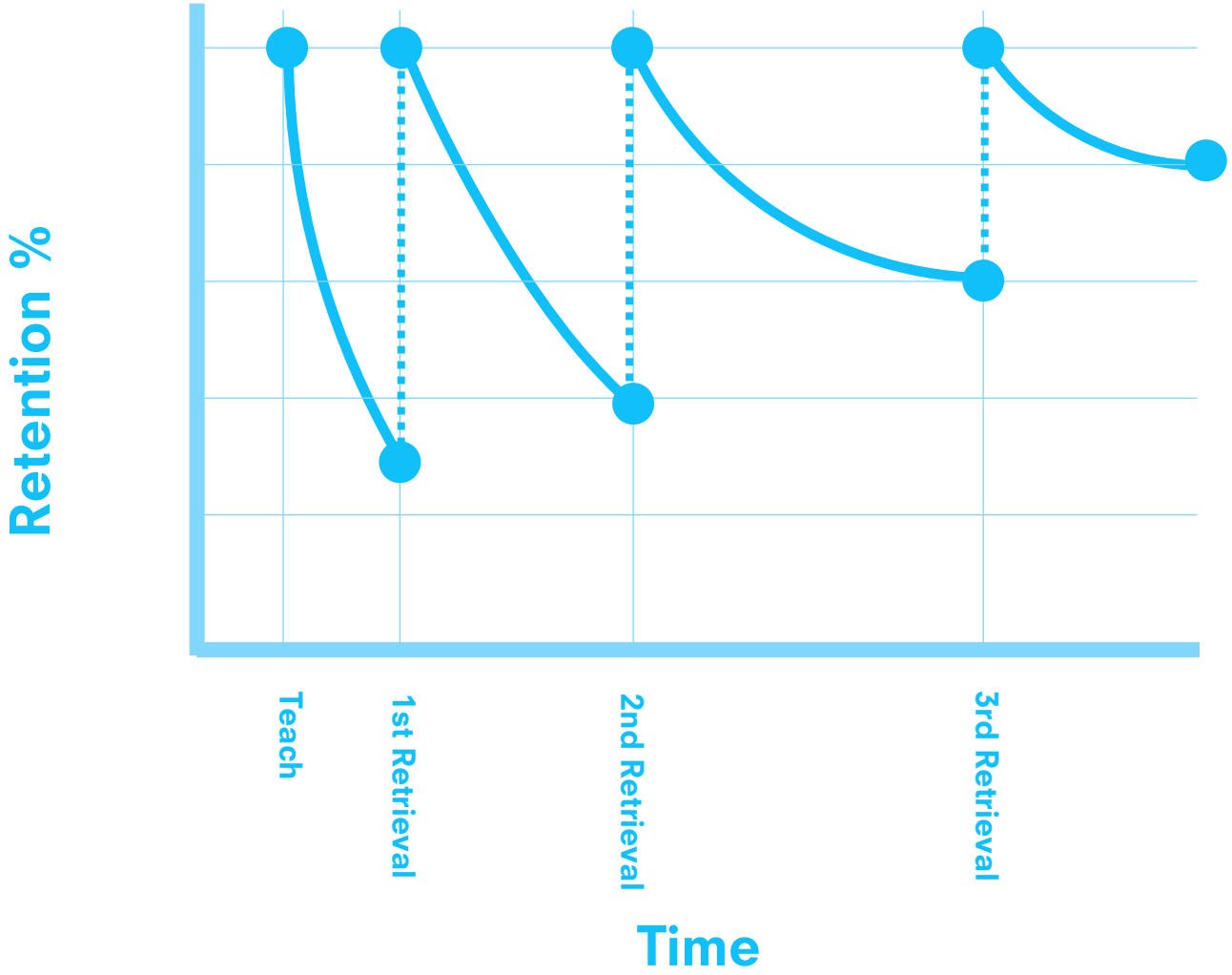
Long-term memory

Working memory

Long-term memory

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Spaced practise



Reference: ***The Roles of Discrimination and*** *retrieval, Memory and Cognition 41 (2012), Elizabeth and Robert Bjork*

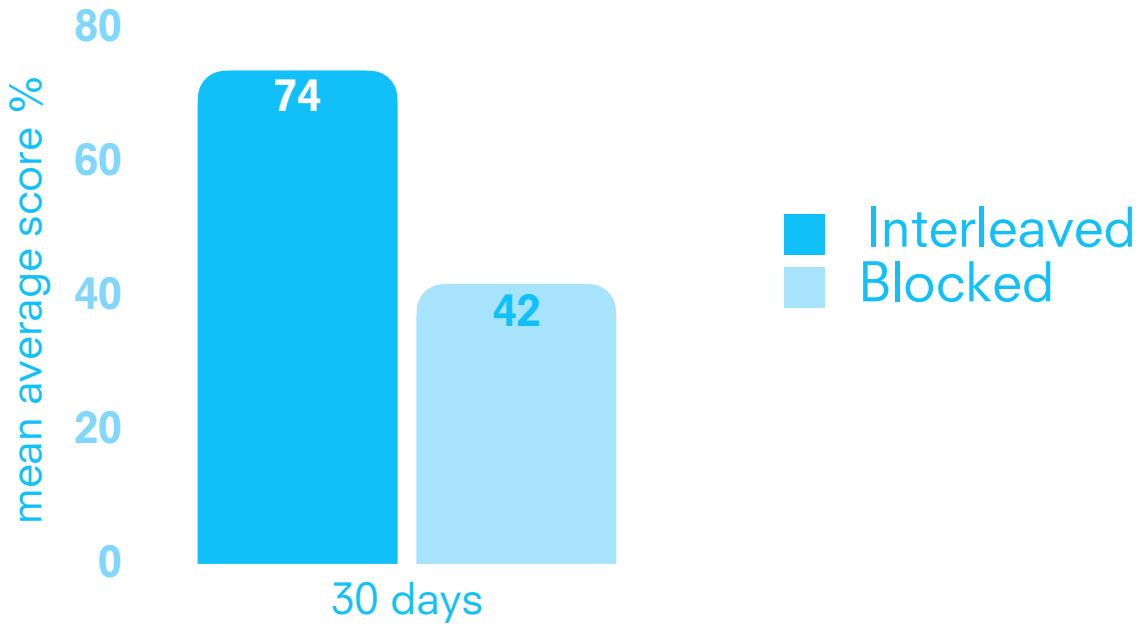
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Interleaved practise



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Interleaved practise results



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Retrieval practise



Learning



Retrieving

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Retrieval practise techniques

No-stakes quizzes

Show-me boards

Exit tickets

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Make it stick by…

10. Practising for permanence

28

Perfect

Practise doing it properly. Practise perfection.

29

Prioritise

Practise the things that are most important.

30

Automaticity

Practise until it becomes automatic.

31

Fundamentals

Return to the fundamentals even when they are automatic.

32

Precision

Show what perfection looks like.

33

Shine

Practise your greatest strengths as well as your weaknesses.

34

Simple first

Practise the simple things before the complex.

35

Correct

Don’t reflect, correct.

36

Isolate

Isolate aspects of a procedure.

37

Name

Name the procedure.

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Make it stick by…

11. Establishing Routines

38

Fallback

Have a fallback routine you can use at any time.

39

Team Huddle

Practise in a group rather than waiting for an individual turn.

40

Name time

Remember the procedures you named? Choose one.

41

Snap back

Expect students to ‘snap back’ to attention so you can carry on.

42

Do it!

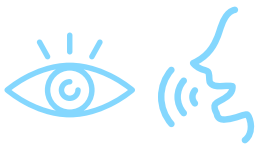
Spend more time practising than talking.

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Make it stick by…

12. Modelling

43



Dual code

Show and describe.

44

How and why

Explain how and why.

45

Realistic

Practise in a realistic, relevant situation.

46

Immerse

If possible, immerse in the subject. e.g. speak French all lesson.

47

Imitate

Me then you. Follow my lead.

48

Small steps

Introduce new material in small steps.

49

Product

Show the finished product, not just the steps.

50

Details

Pick out and examine small details.

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Make it stick by…

13. Scaffolding: temporary structures such as…

51

Organisers

Knowledge organisers may be useful in the short term for presenting information.

52

Vocab lists

Similar to knowledge organisers but for key vocabulary.

53

Frameworks

Writing frames and other frameworks give temporary structure as a starting point.

54

Examples

Worked examples provide an excellent scaffold in early stages of teaching a topic.

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Make it stick by…

14. Streamlining feedback

55

Use it

Don't 'accept' feedback, use it - soon after it's given.

56

Ping-Pong

Do, Give feedback. Do again. Give feedback etc.

57

Success

Success: Spot it, Swap it (into another situation)

58

1 big thing

Limit feedback to the one big thing that will make a difference.

59

Repeat

Repeat the one big thing over and over.

60

Solutions

Describe the solution not the problem.

61

Summarise

Ask the student to summarise his or her feedback.

62

Prioritise

Ask the student to identify and prioritise the most important part.

63

Next steps

Ask the student to say what the next steps are.

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Make it stick by…

15. Creating a culture of feedback

64

Delight

Delight in errors. They are common and we can learn from them.

65

Dive in

Get straight into practise. Procrastination is the thief of time.

66

Who's first?

Instead of asking 'Any volunteers?' try, "Who's first?'

67

Be me

Say to students:'What would I say about it?'

68

Praise effort

Make it clear that any success is down to effort.

69

Encourage

Instead of trying to motivate, show success and watch the student push a little harder.

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Make it stick by…

16. Utilising germaine cognitive load

70

Spacing

Spaced repetition improves long-term retention.

71

Interleaving

Interleaved practise improves storage and retrieval strength.

72



Retrieval

Try retrieval practise as often as possible.

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Learning styles?

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Cognitive principle #5

Students are more alike than different in the way they think and learn.

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Content differences

Diagram of the digestive system.

Listen to the sound of a bumble bee’s wings.

Move to learn a gymnastics routine.

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Change mode

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Make it stick by…

17. Using content to dictate approaches

73

No V.A.K

Until evidence shows this is effective, leave it to one side.

74

Look

Use a visual approach if the content is visual in nature.

75

Listen

Listen if the content is auditory in nature.

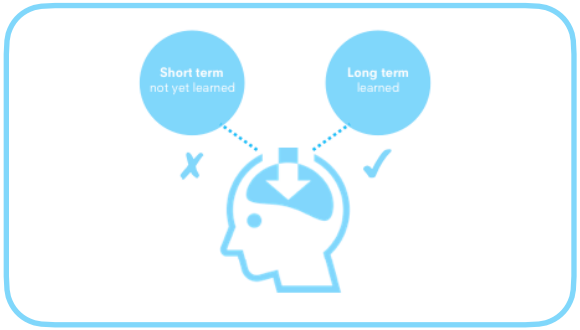
76

Move

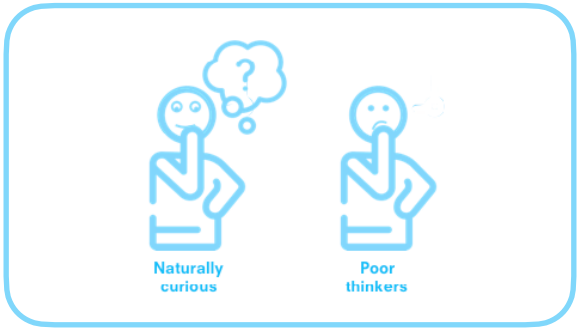
Move if the content calls for physical involvement.

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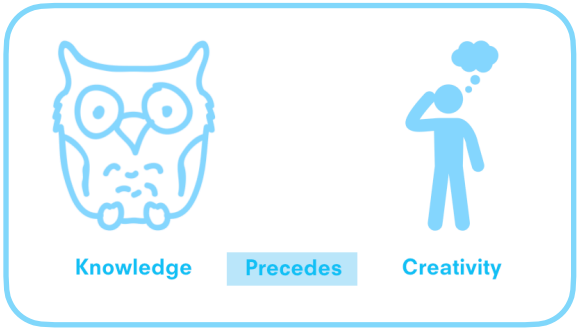
Making it stick: the principles



learning is a change to long-term memory.



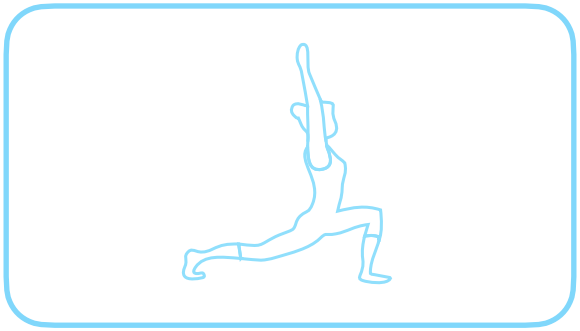
We are naturally curious but poor thinkers.



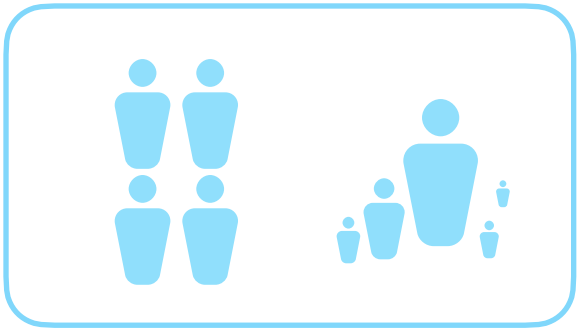
Knowledge precedes creativity



Memory is the residue of thought.



Proficiency takes practise.



Students are more alike than different in the way they think and learn.

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