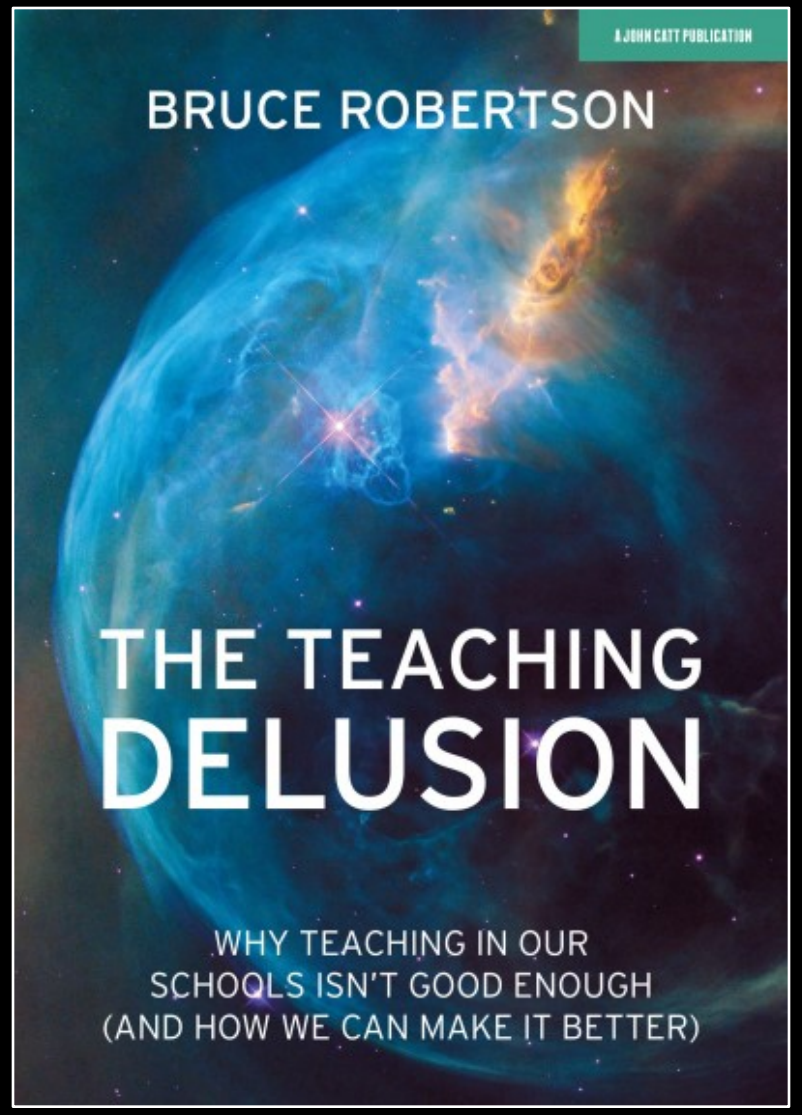
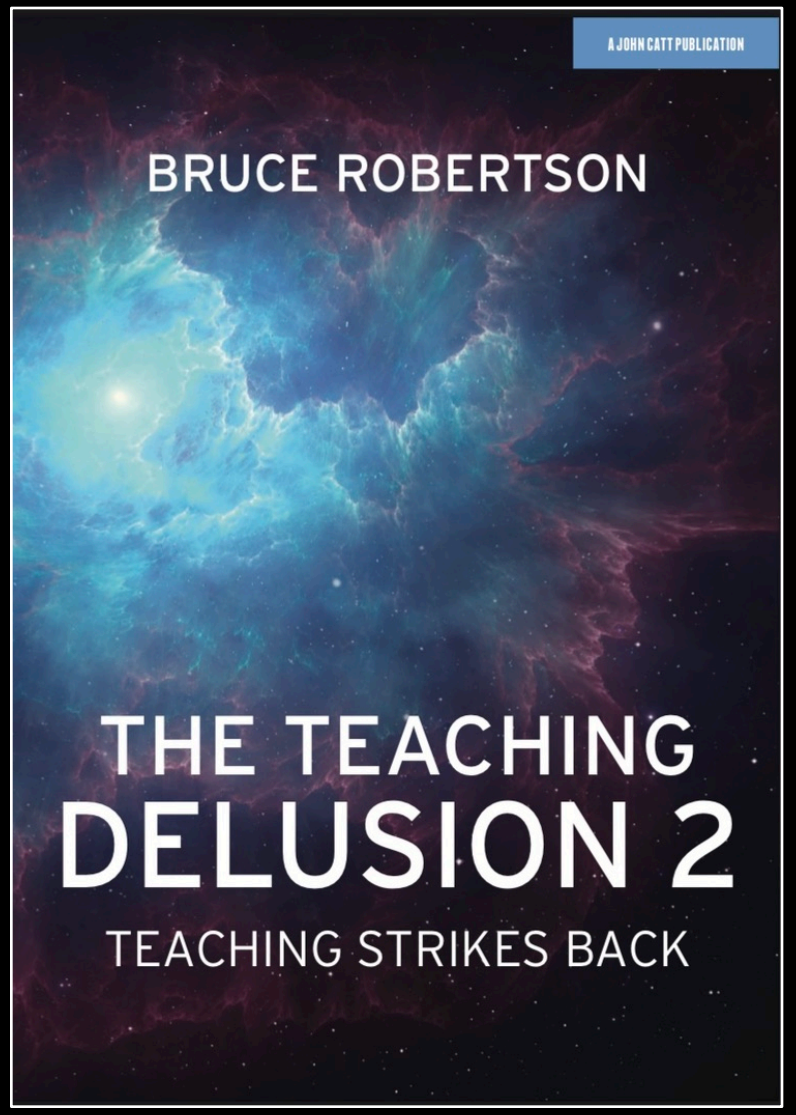
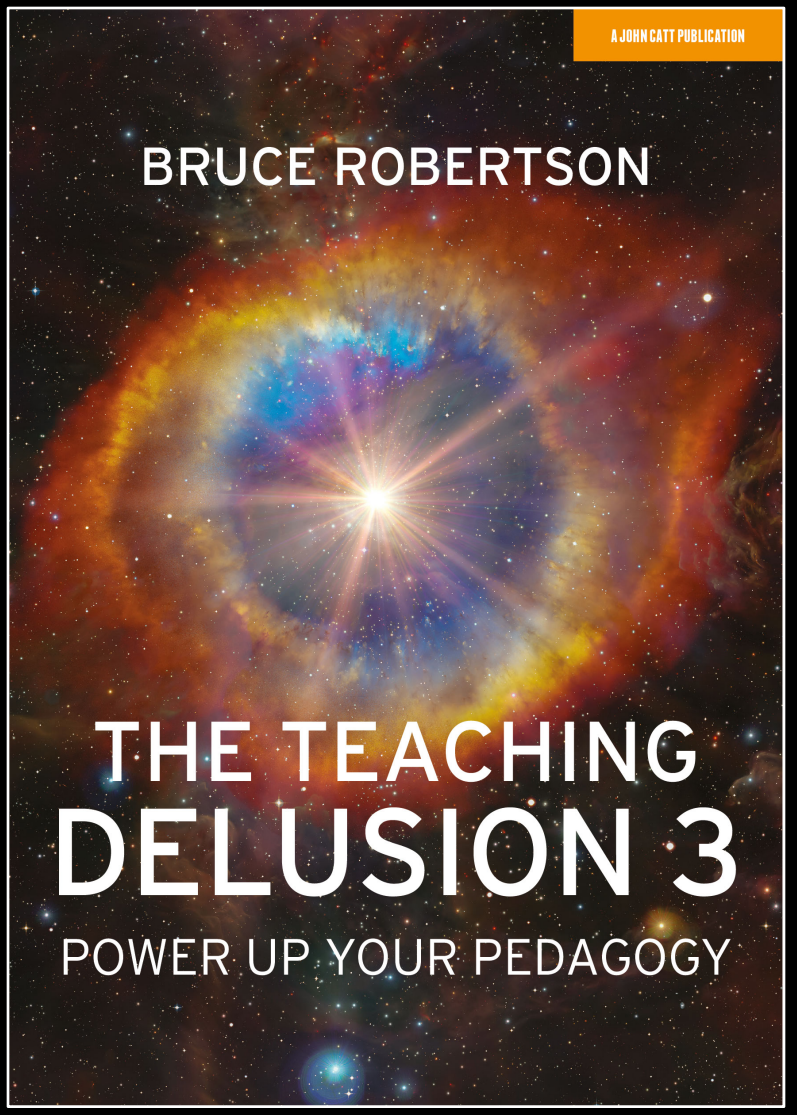
Power Up Your Pedagogy

Bruce Robertson

November 2021







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Aims

- To develop your understanding of key messages from **cognitive science** and **educational research** about high-quality teaching and learning.
    - Make you think.
    - Challenge and consolidate.
    - Whet your appetite.
    - Influence your classroom practice, making it *even better* than it is already.

8 Pedagogical Principles

THE most important consideration is the extent to which *all* students are *learning* what we *plan* for them to learn

PRINCIPLE 1

Content

Key focus

Checking

Subject: History

Topic: The Ancient Roman Civilization

Experiences & Outcomes

I can use my knowledge of a historical period to interpret the evidence and present an informed view.

By studying groups in past societies who experienced inequality, I can explain the reasons for the inequality and evaluate how groups or individuals addressed it.

Subject: History

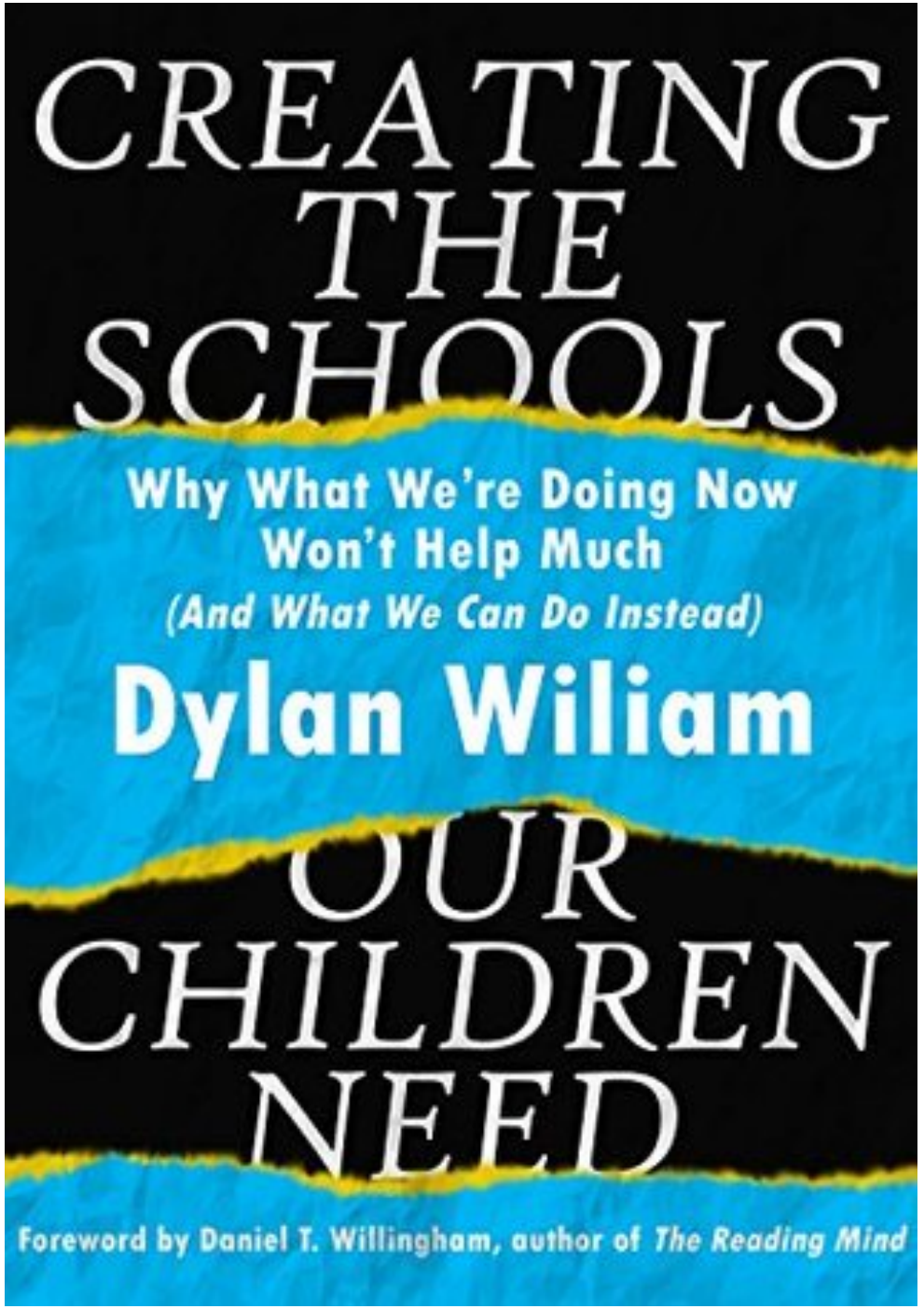
Topic: The Ancient Roman Civilization

Content

THE EMPIRE

- Julius Caesar
  - Defeats Pompey in civil war, becomes dictator "Veni, vidi, vici" ("I came, I saw, I conquered")
  - Cleopatra of Egypt
  - Caesar assassinated in the Senate, Brutus
- Augustus Caesar
- Life in the Roman Empire
  - The Forum: temples, marketplaces, etc.
  - The Colosseum: circuses, gladiator combat, chariot races Roads, bridges, and aqueducts
- Eruption of Mt. Vesuvius, destruction of Pompeii
- Persecution of Christians


Great Teaching Toolkit
Evidence Review
June 2020
REVIEW
Rob Coe
C.J. Rauch
Stuart Kime
Dan Singleton
In partnership with
Cambridge Assessment International Education
greatteaching.com


CREATING THE SCHOOLS
Why What We're Doing Now Won't Help Much
(And What We Can Do Instead)
Dylan Wiliam
OUR CHILDREN NEED
Foreword by Daniel T. Willingham, author of The Reading Mind

Knowledge-based; skills-orientated

- The learning intention to produce a tourist information leaflet about attractions along the Nile.

- Students given:
  - an information sheet
  - examples of starter sentences

- 30 minutes to make the leaflet.

- What happens?

- Most students just copy the starter sentences and facts.

- Exit Ticket:
  - ‘The river Nile looks like a tree’.


MEDITERRANEAN SEA
WEST BANK
GAZA
ISRAEL
Marsa
Alexandria
Tanta
Port Said
Al Arish
Al Ismailiyyah
Giza
CAIRO
Suez
wah
Sinai Peninsula
Al Fayyum
Bani Suwayf
Nile
Gulf of Suez
Gulf of Aden
At Tur
Al Minya
Sharm el-Sheikh
Asyut
Hurghada
Suhaj

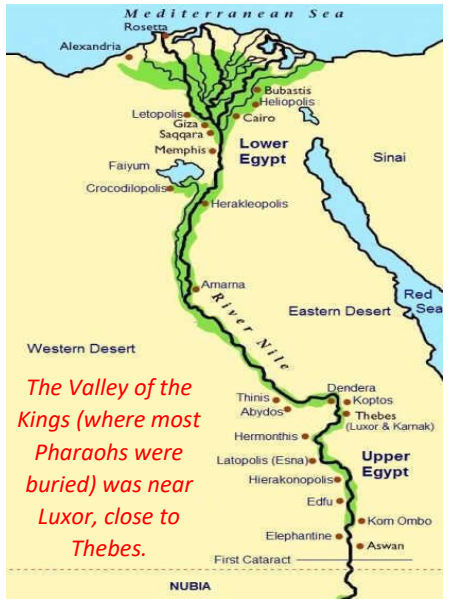
- Common issue of teachers not being clear about what, *specifically*, students should be learning.
  - Learning intention
  - Success criteria
- Developing Knowledge Organisers can help.

Ancient Egyptians — Year 3

	Term	Definition
1	*Afterlife*	*The place where Egyptians believed they would go after they died.*
2	*Akhet*	*The season of the year when the Nile river flooded. A very important time of year in the desert!*
3	*Canopic jars*	*Special jars that held the organs of a mummy including the lungs, intestines, liver and stomach (Right).*
4	*Dynasty*	*A period of rule when a series of Pharaohs all came from the same family.*
5	*Egyptologist*	*An archaeologist who focusses Ancient Egypt. Howard Carter discovered Tutankhamun's tomb.*
6	*Hieroglyphics*	*A type of writing that used a combination of pictures and symbols (Right).*
7	*Mummification*	*The process of preserving a body after death in preparation for the afterlife.*
8	*Papyrus*	*A plant that grew on the banks of the Nile. It was used as an early version of paper.*
9	*Pharaoh*	*The supreme ruler of all of Ancient Egypt.*
10	*Sarcophagus*	*A large stone box that held a mummy's coffin. Often richly decorated for Pharaohs.*

Area near the River Nile that flooded was known as the **Black Land**. Areas further away were known as the **Red Land**. They relied on the Nile's flood to grow crops and farm.

Famous & important Pharaohs		
1	***Narmer***	*Said to be the first Pharaoh of all Egypt, around 3150 BCE. Also known as Warrior Menes.*
2	***Khufu***	*Pharaoh responsible for the building of the Great Pyramid at Giza.*
3	***Hatshepsut***	*First and longest-reigning female Pharaoh.*
4	***Tutankhamun***	*Youngest Pharaoh, famed for his burial tomb in the Valley of the Kings (mask, left).*
5	***Ramses II***	*Often known as Ramses the Great, his mummy still rests in Cairo's Egyptian Museum. Built more statues and temples than any other!*
6	***Cleopatra VII***	*Often considered the last Pharaoh of Egypt. Kept power by making alliances with famous Romans such as Mark Antony & Julius Caesar.*



The Valley of the Kings (where most Pharaohs were buried) was near Luxor, close to Thebes.

Amun
King of the Gods

Ra
God of the Sun

Anubis
God of Mummification

Horus
God of the Sky

Thoth
God of Knowledge

Isis
Mother Goddess, Goddess of Protection and Healing

Key Gods (but there were MANY more)

Osiris
God of Death and the Afterlife

Timeline of Key Events:

All dates below are approximate

Old Kingdom: 2600 BCE - 2100 BCE
Middle Kingdom: 2000 BCE - 1650 BCE
New Kingdom: 1540 BCE - 1075 BCE

7500 BCE	First settlers in Nile valley
3500 BCE	First use of hieroglyphic symbols
3100 BCE	Narmer unites regions of Lower and Upper Egypt.
2650 BCE	First step pyramid built
2550 BCE	Pyramids at Giza built
2335 BCE	Pyramid texts written (magical spells to protect pharaohs)
1472 BCE	Hatshepsut becomes caretaker ruler. (Later declares herself pharaoh)
1336 BCE	Tutankhamen becomes pharaoh
1279 BCE	Ramses II becomes pharaoh
1100 BCE	Upper & Lower Egypt split
332 BCE	Alexander the Great conquers Egypt
196 BCE	Rosetta stone carved
1279 BCE	Ramses II becomes pharaoh
30 BCE	Egypt becomes a Roman Province
1922 CE	Carter discovers Tutankhamen's tomb

https://www.tes.com/teaching-resource/ancient-egyptians-knowledge-organiser-12044279

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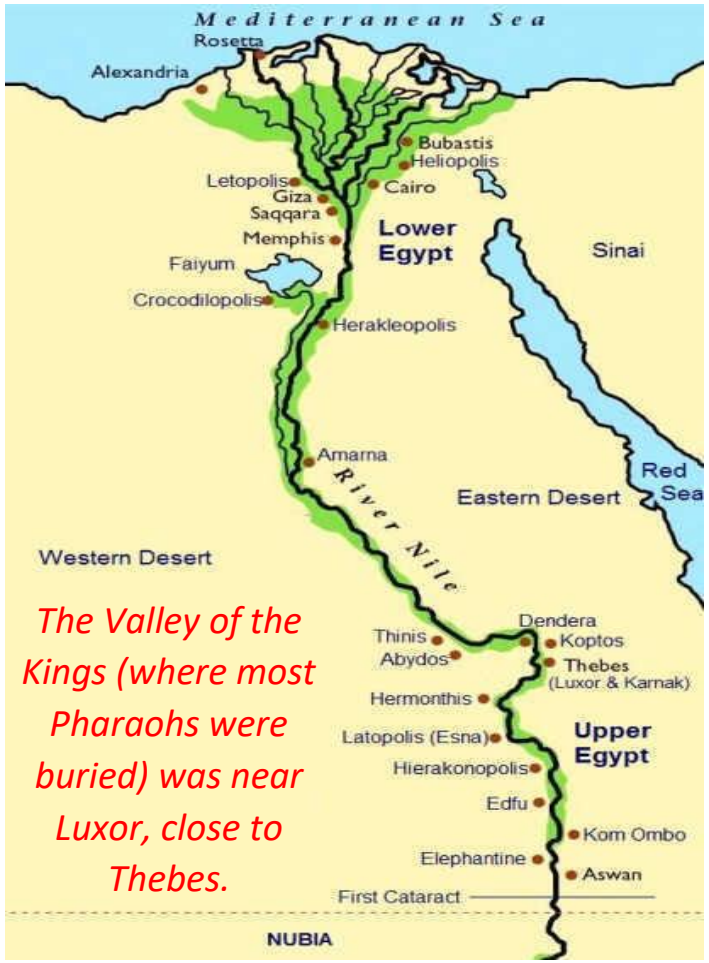

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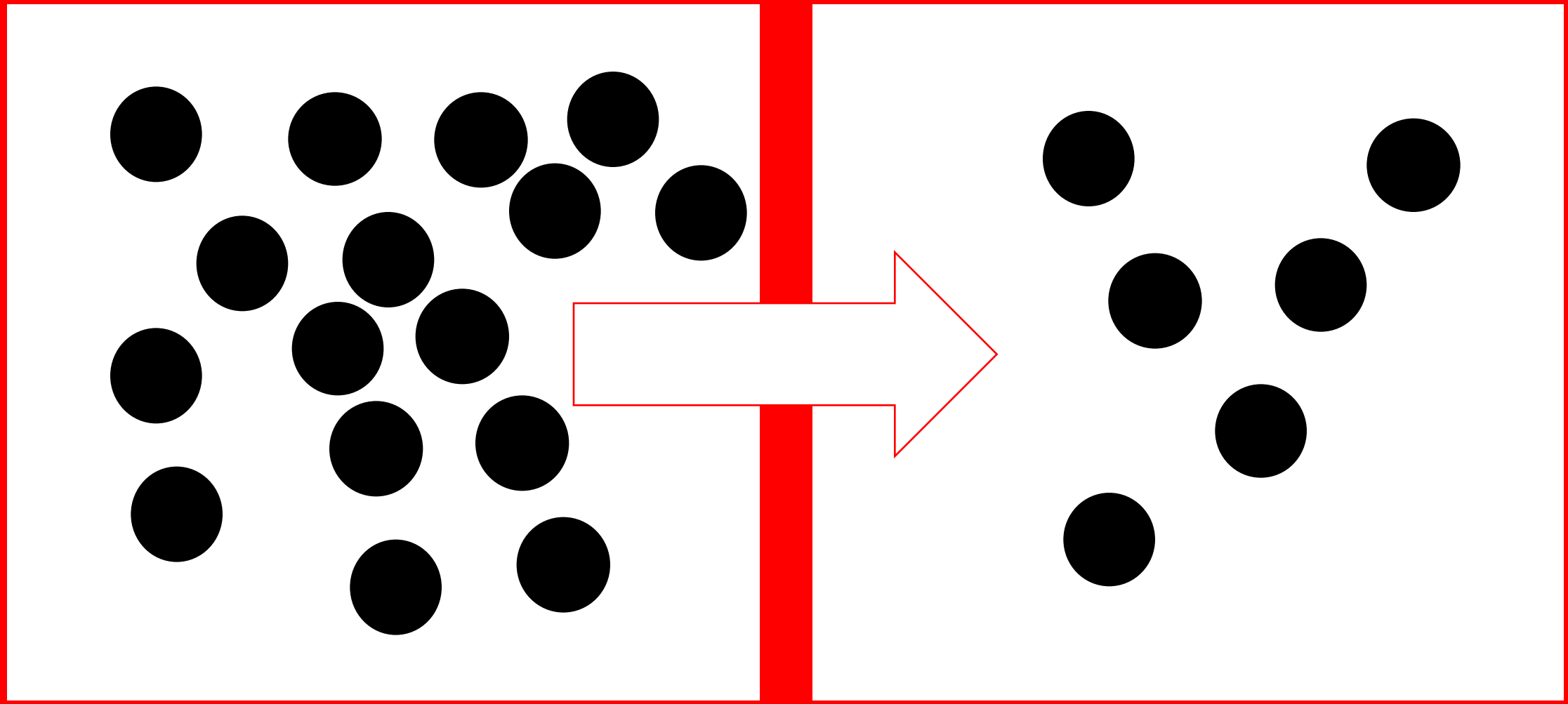
Learning usually requires *deliberate effort*

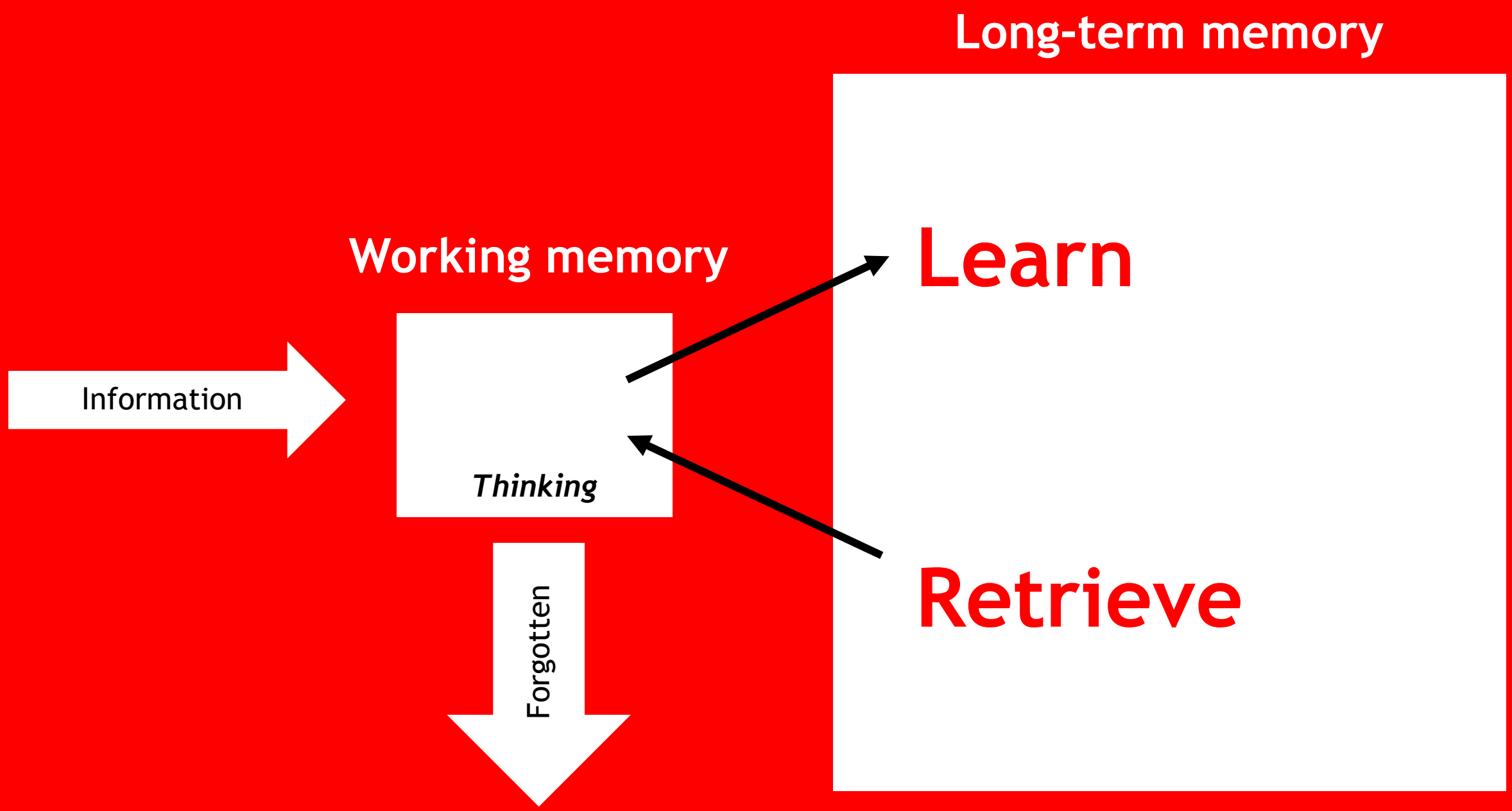
PRINCIPLE 2



- Paying attention is a pre-requisite to learning
- But there has to be more

We need to plan with *working memory* and *long-term memory* in mind

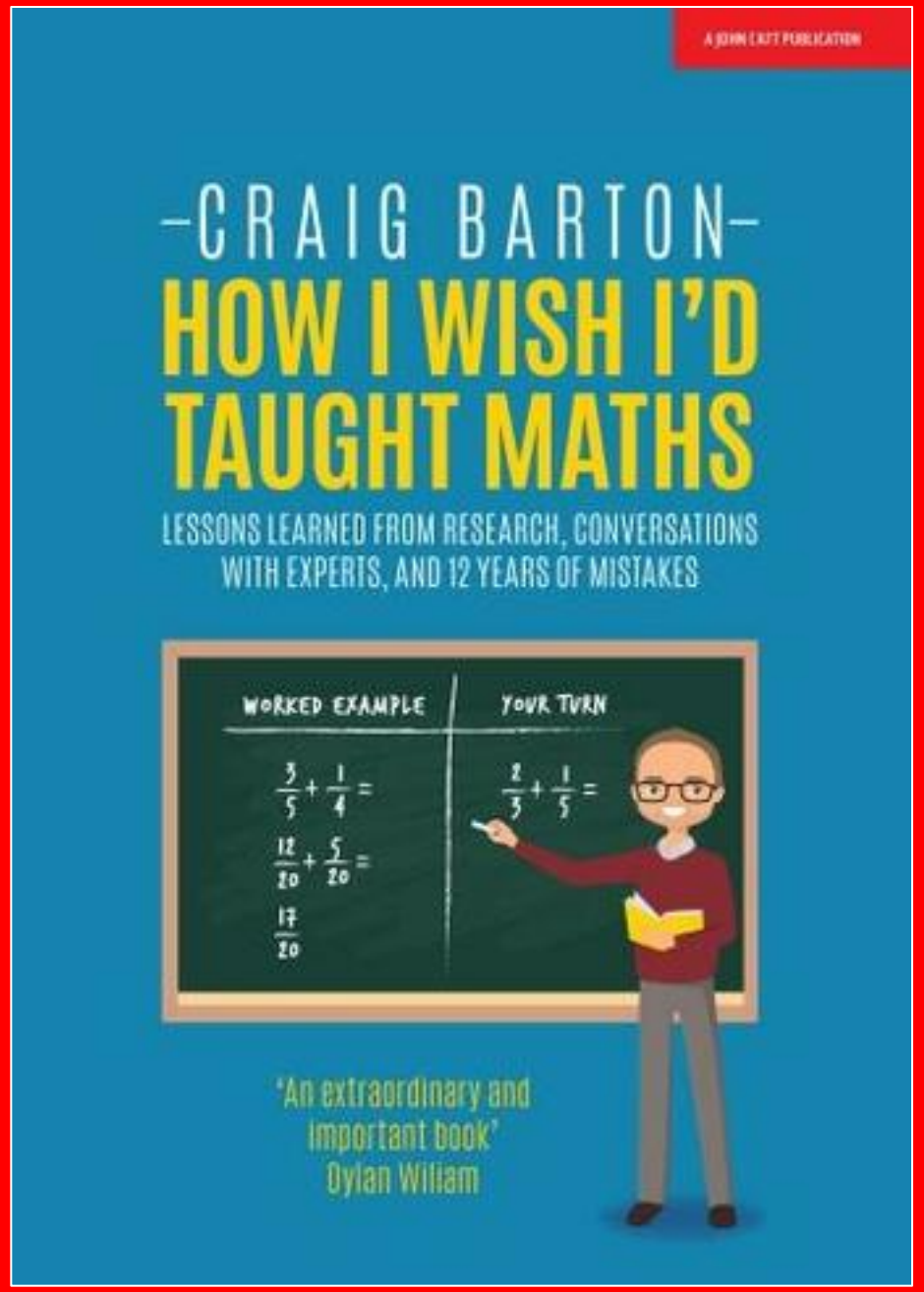
PRINCIPLE 3


Long-term memory
Working memory
Learn
Information
Thinking
Retrieve
Forgotten

Learning is the development of **long-term memory**

All subjects

All stages

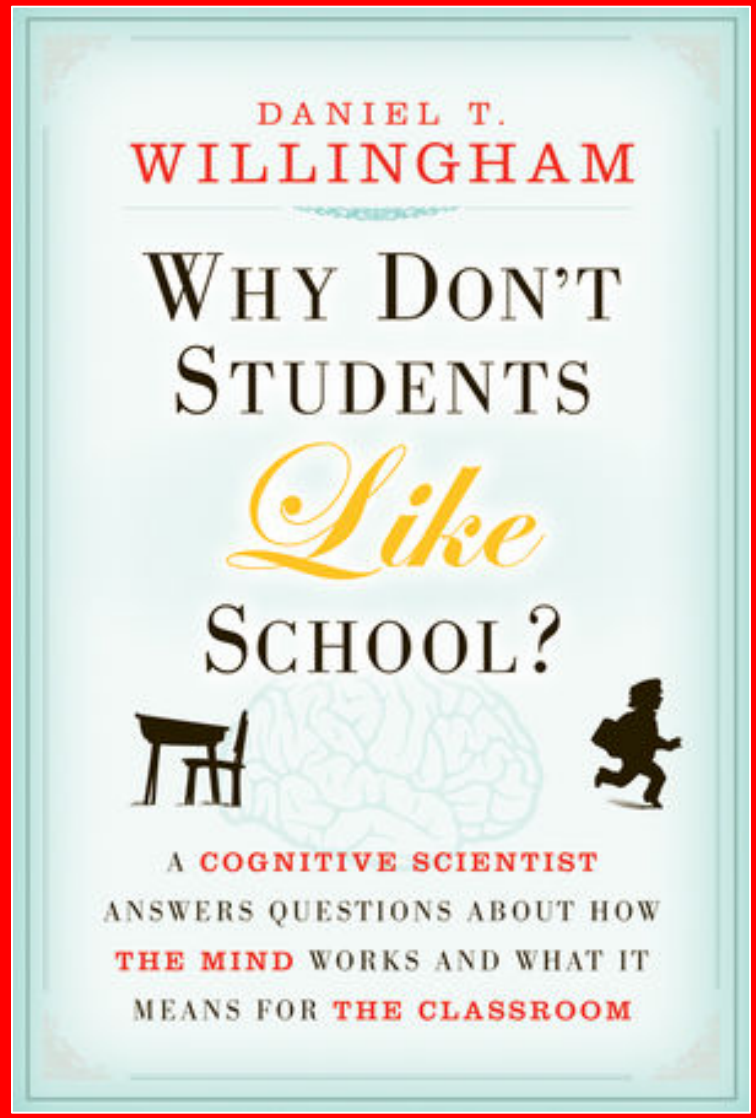


"A teacher not considering how their students think and learn is kind of like a doctor not being overly concerned about the workings of the body, or a baker taking only a casual interest in the best conditions for bread to rise."

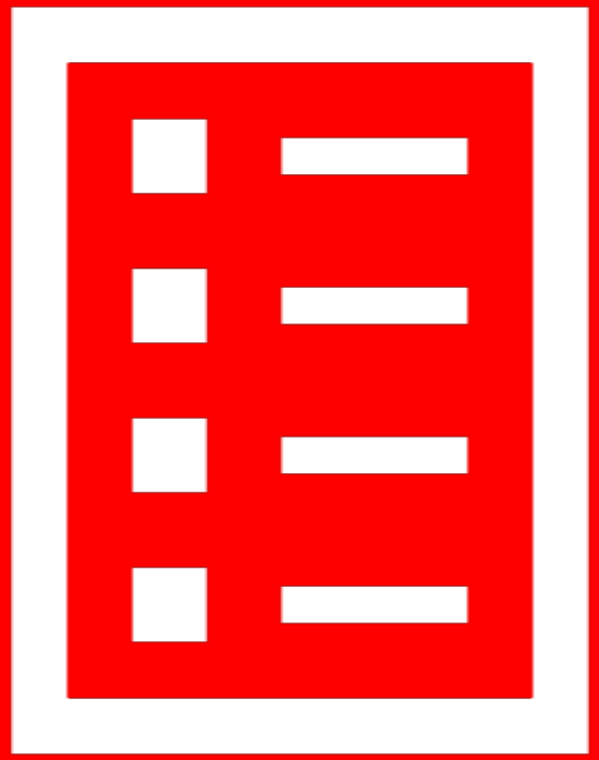
Being busy and *learning* are not the same thing

PRINCIPLE 4

‘Learning happens when people *think hard*’



‘Memory is the *residue of thought*’



Plan for thinking

Enjoyment & ‘doing something’

Common ‘being busy’ activities

- Copying notes from the board or a book
- Transferring information from one place to another, without having to think about it
- Moving around the room for no apparent reason

Better Bets

- Whole-class interactive teaching
- Engagement with well-planned questions
- ‘Spotlight assessment activities’
  - Multiple-choice questions
  - True or false
  - Deliberate mistakes

Desirable difficulties propel learning forward

PRINCIPLE 5

Bjork and Bjork

Chapter 5

Learning

Elizabeth L. Bjork and Robert Bjork

Making Things Hard on Yourself, But in a Good Way: Creating Desirable Difficulties to Enhance Learning

True or false:

1. We are learning about ‘the Bluehouse Effect’.
2. Burning fossil fuels is a bad thing.
3. Burning forests is causing climate change.

Controlling the difficulty

- The size of the gap between what we are asking students to do and what they can already do
- How much we are expecting them to think about at one time
- The length of time that has passed since we last discussed a concept we are asking them to think about (the amount of ‘spacing’)
- The amount of support we let them access

“If you need to, you can look back at your notes”

A ‘teaching-learning gap’ is inevitable (but reducible)

PRINCIPLE 6

Paying attention

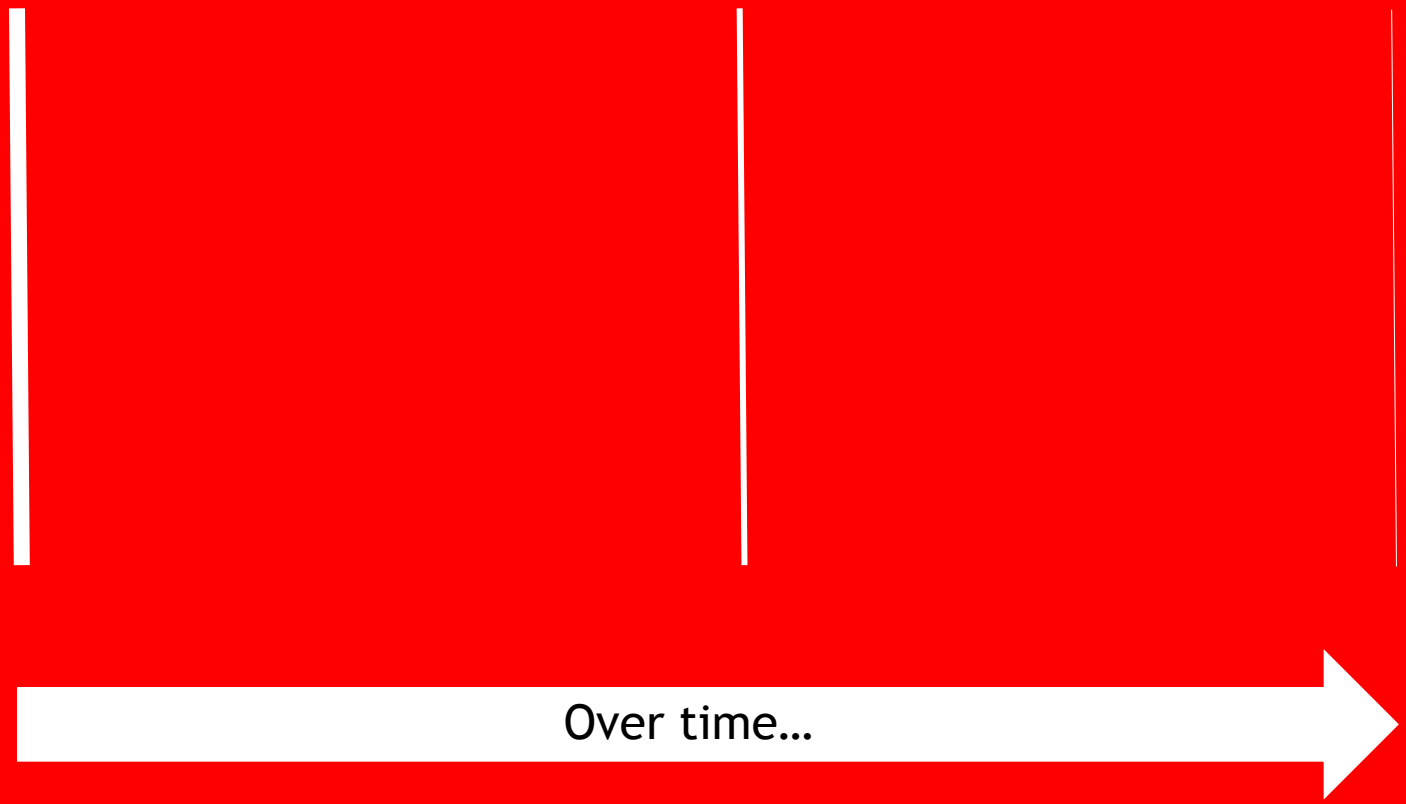
Understanding

Forgetting

Taught

Learned

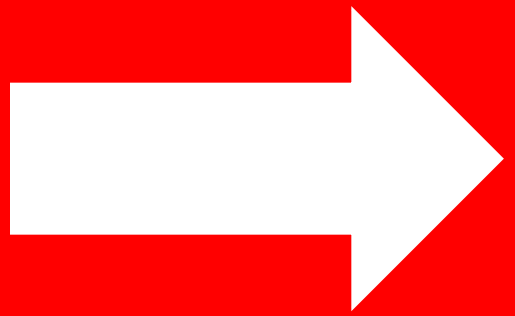
Fading



End of lesson

Three days later

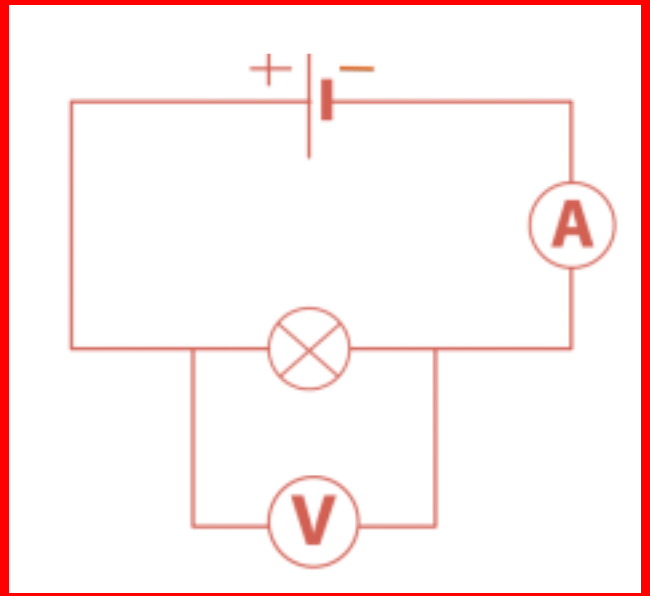
That makes sense!



I've forgotten it!

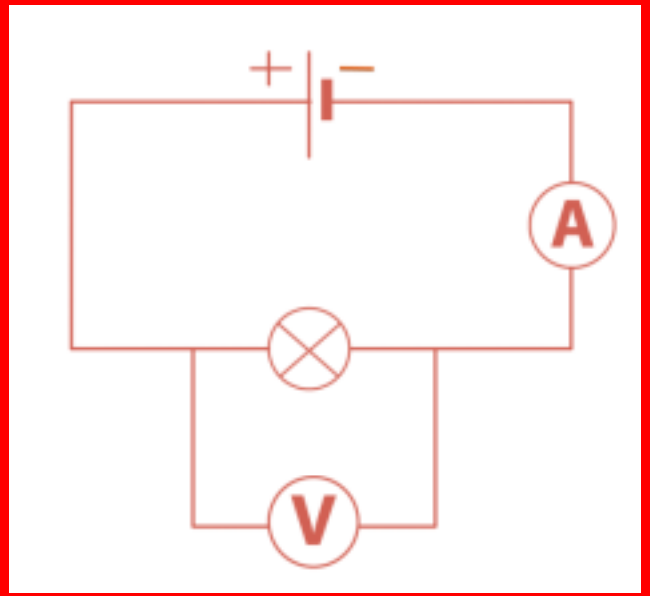
Example

- Task was to draw a graph based on a table of results from an experiment in the previous lesson.
- Started by asking them: “What was this experiment about?”
- **EVERYONE** was asked to **THINK** about this, and everyone was asked to **WRITE IT DOWN**.

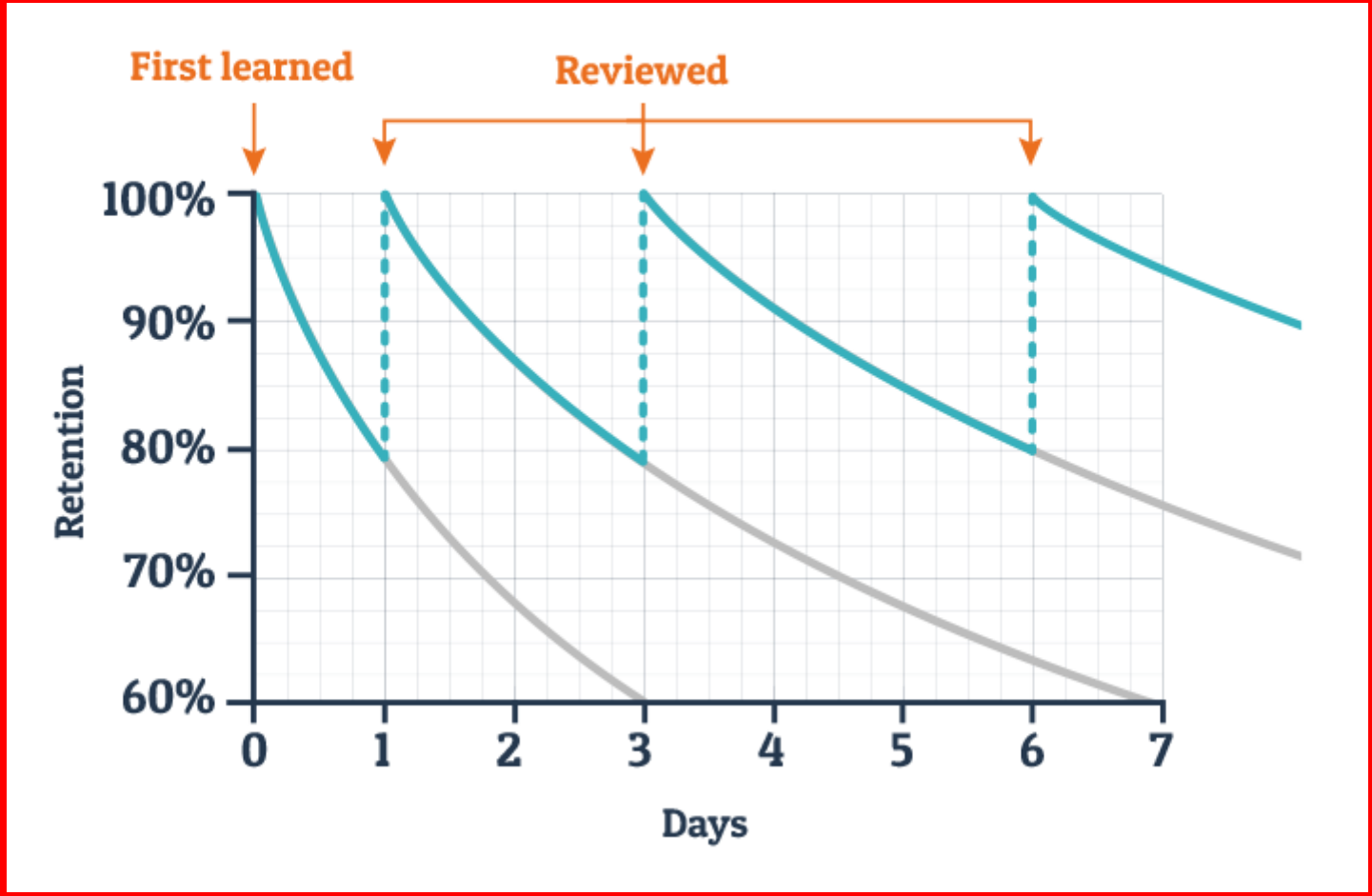


What students said

- “To find out how much voltage was in the bulb.”
- “To find out how much voltage you can get from a bulb when the brightness changes.”
- “To find out if increasing or decreasing the voltage impacts on the brightness of a bulb.”

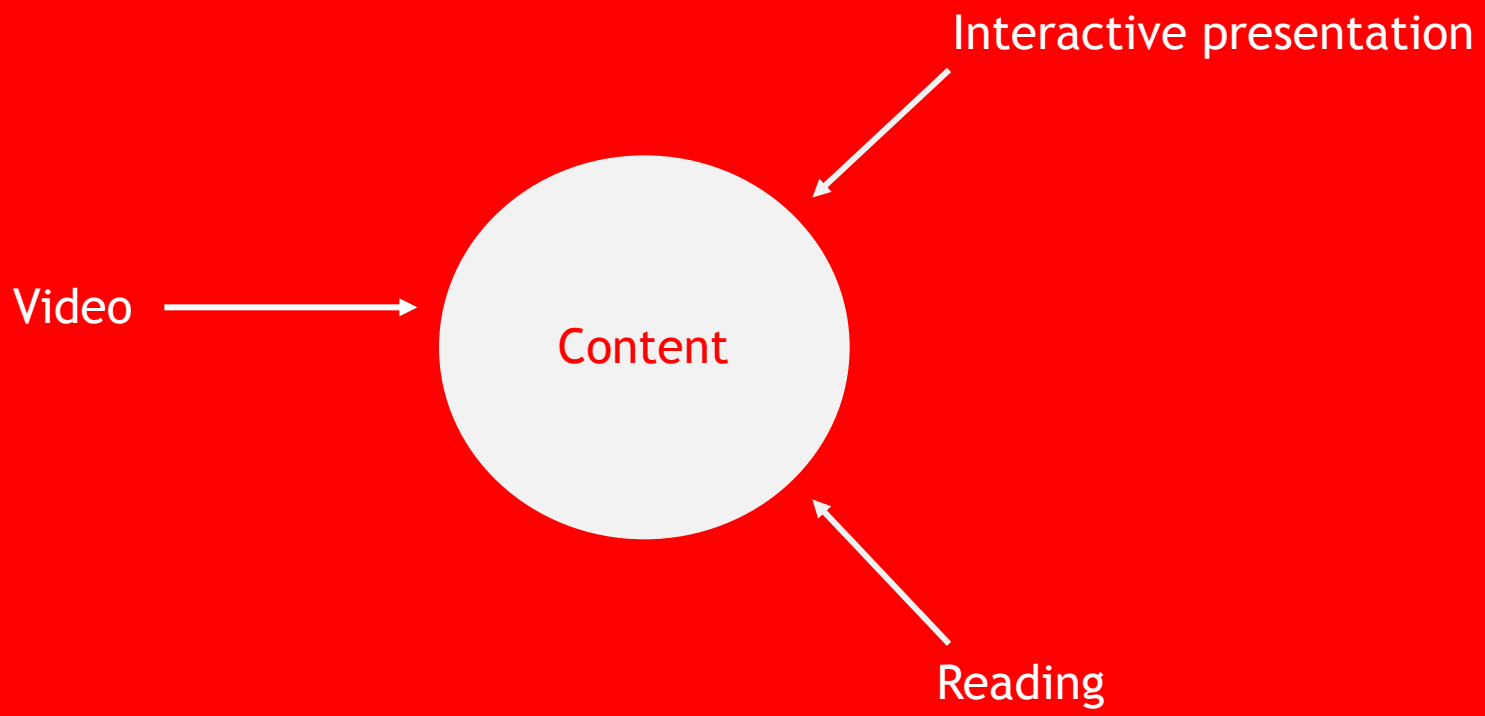


Ebbinghaus' Forgetting Curve

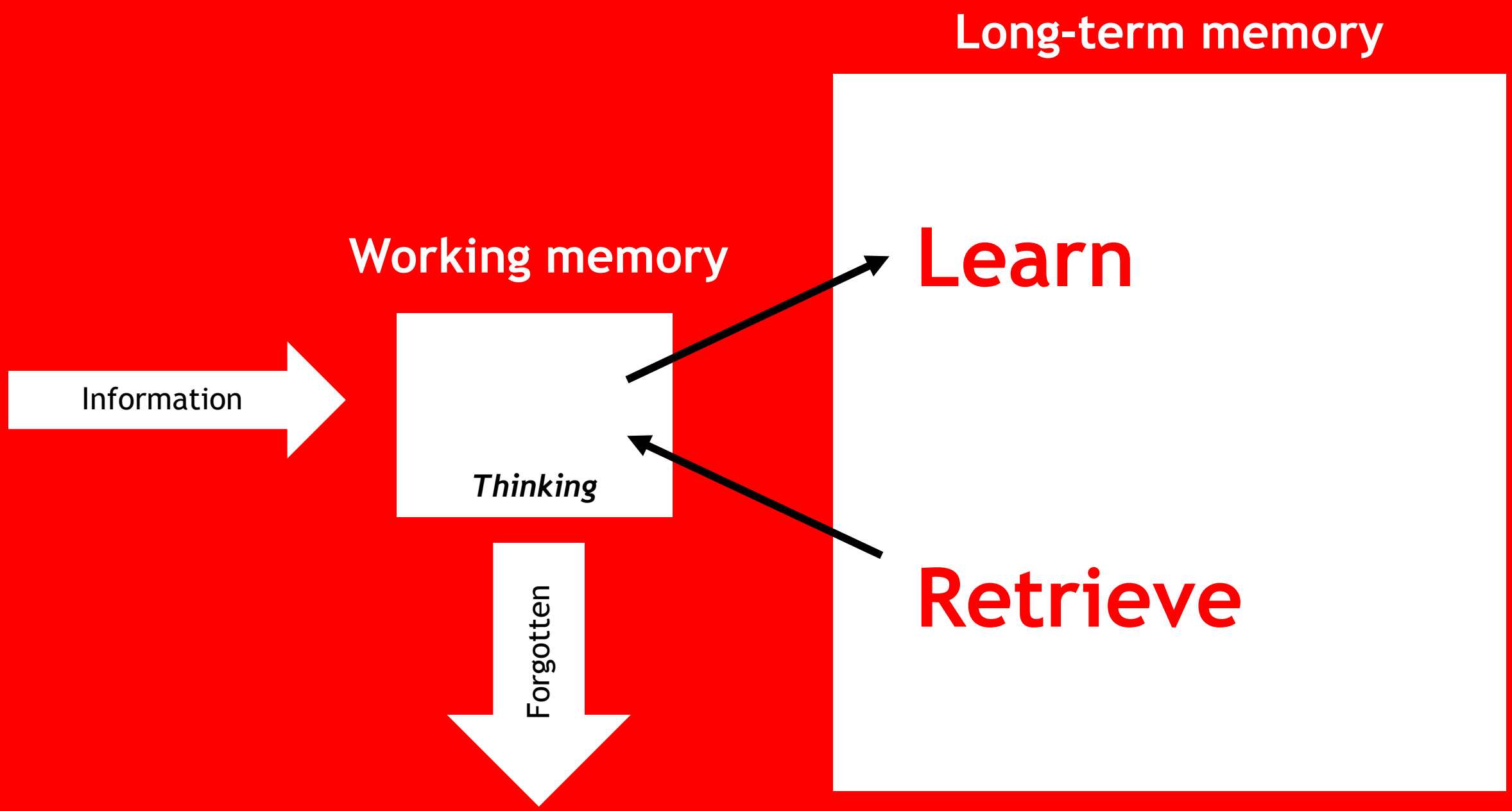


Revisiting is important

Present from different angles



Retrieval more effective than revisiting


Long-term memory
Working memory
Learn
Information
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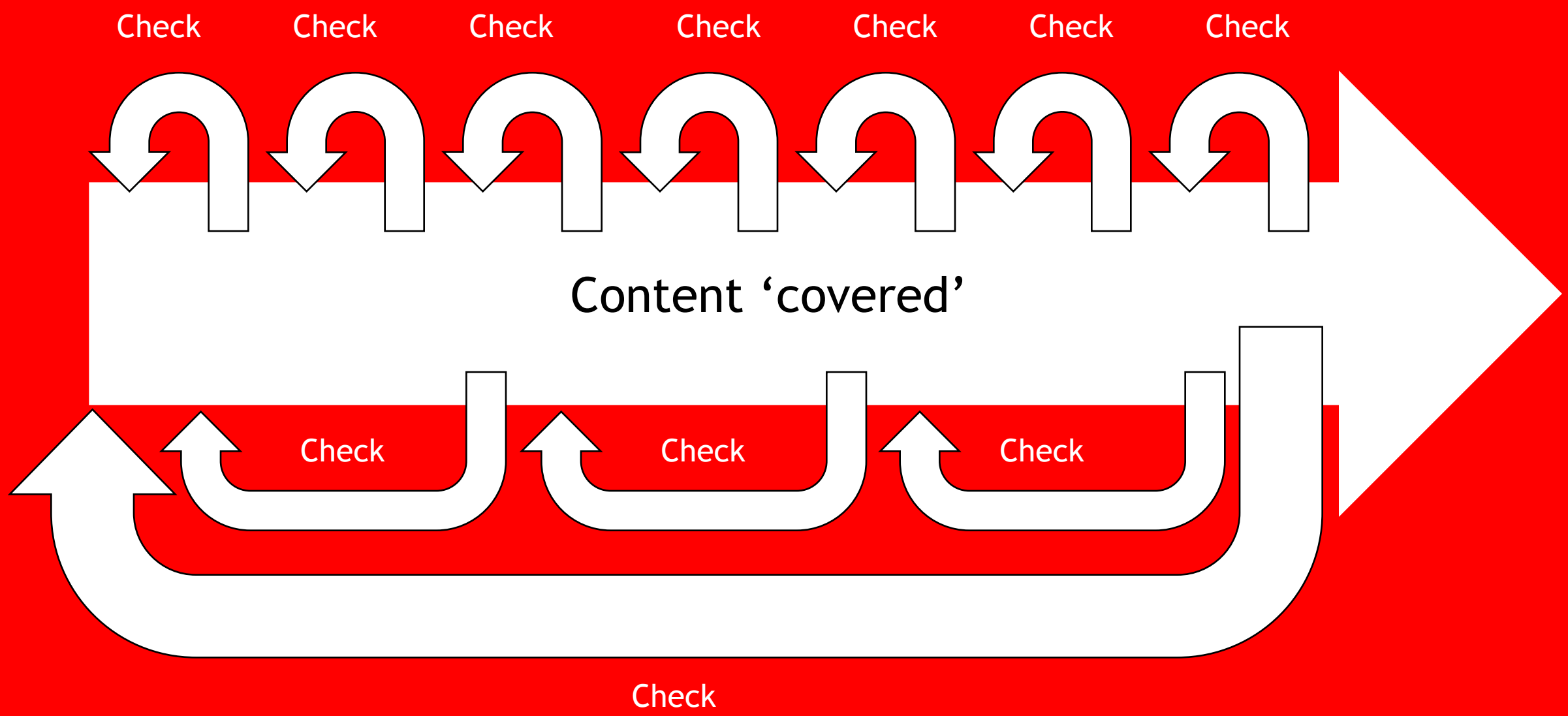
The Testing Effect

Recall of knowledge from long-term memory strengthens the memory of it.

Guard against forgetting

Retrieval Practice

Spaced Practice


Check
Check
Check
Check
Check
Check
Check
Content ‘covered’
Check
Check
Check
Check

Assessment	In school	Purpose
Minute-by-minute	• Questioning, discussion, observation • Show-me boards	Formative
Lesson-by-lesson	• Daily Review • Exit Tickets	Formative
Week-by-week	• Weekly Review	Formative-Summative
Month-by-month	• Monthly Review	Formative-Summative
Topic-by-topic	• Topic Review	Formative-Summative

Minute-by-minute

Pose, Pause, Pounce, Bounce

Pause

- ‘Everyone think about that for a moment.’
- ‘Take 10 seconds to think about that.’
- ‘Think about that – everyone.’
- ‘Chat to a partner for 30 seconds.’
- ‘Take a minute to talk about that.’

‘Amplify’ student responses

- Repeat them
- Make teaching points from them
- Get other students to comment on them
- *Drill-down* into student thinking

Lesson-by-lesson

- Daily Review
- Exit Tickets

Daily Review

1. Complete: “Elements in the Periodic Table are arranged in order of increasing…”

2. True or false: calcium is metal element.

3. Draw a diagram showing the electron arrangement of a sulfur atom.

‘Write down everything you know about Edward I’

True or False Entry Pass

Read the following statements and decide if they are true or false. If you think a statement is false please correct the statement.

Last lesson

Deforestation has lead to the Orangutan being extinct.

Last Week

Capybaras can survive underwater for up to five minutes and can sleep in the water as long as their tails are above the water surface.

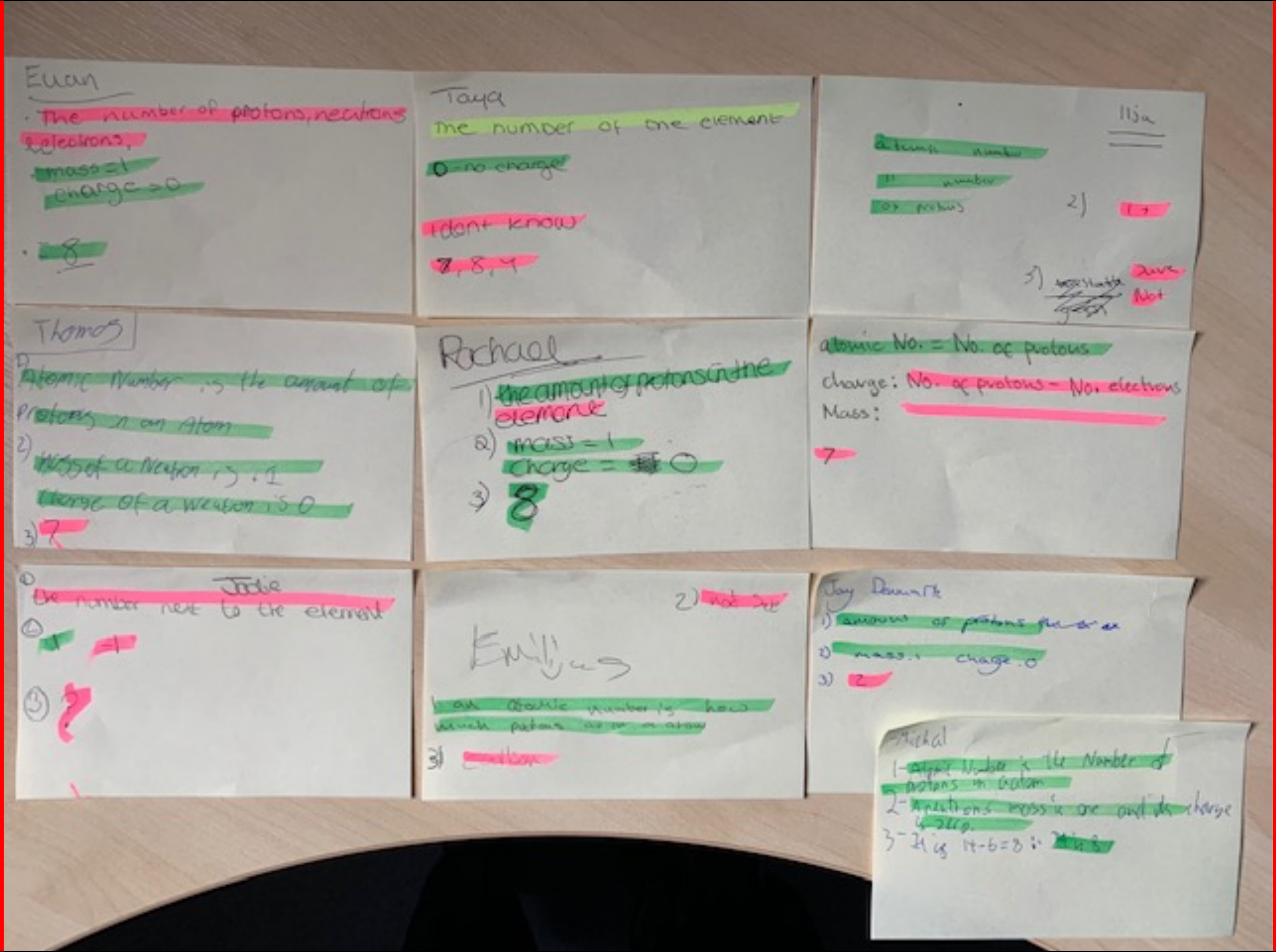
Last Topic

A Headland and Bay forms when hard rock (clay) lies in-between two areas of soft rock (limestone and chalk).

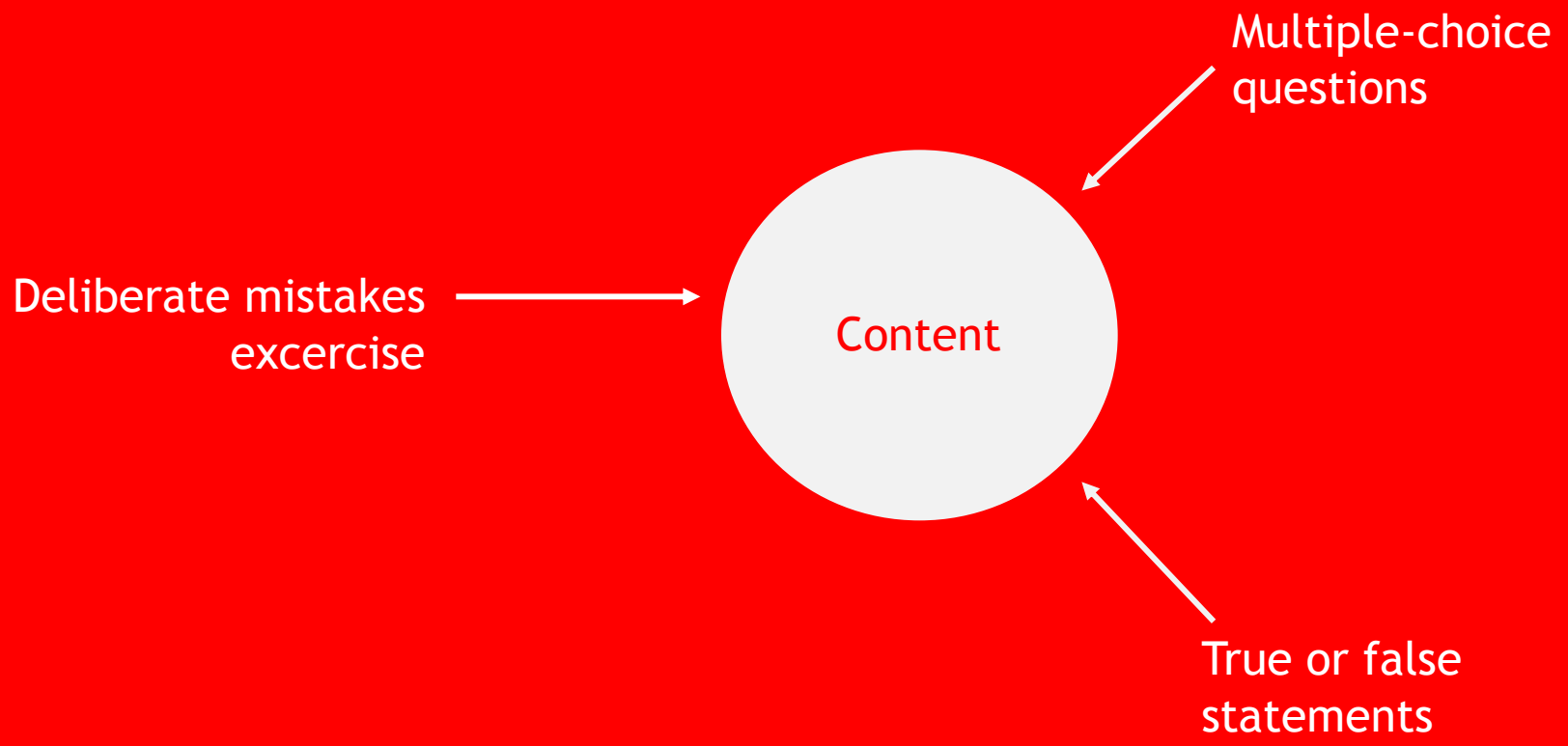
Purpose of Daily Review

- The Testing Effect
- ‘Activate’ learning
- Making learning visible
- Respond

Exit Tickets


Euan
The number of protons, neutrons
electrons,
mass = 1
charge = 0
8
Taya
The number of the element
0 - no charge
I dont know
Ilja
Thomas
Atomic Number is the amount of
protons in an Atom
mass of a Neutron is 1
Charge of a Neutron is 0
3) 7
Rachael
1) the amount of protons in the
element
2) mass = 1
Charge = 0
3) 8
atomic No. = No. of protons
charge: No. of protons - No. electrons
Mass:
7
Jodie
the number next to the element
Emily
Jay
3) 2
Michal

Assess from different angles



Multiple choice questions

What is 20% of 300?

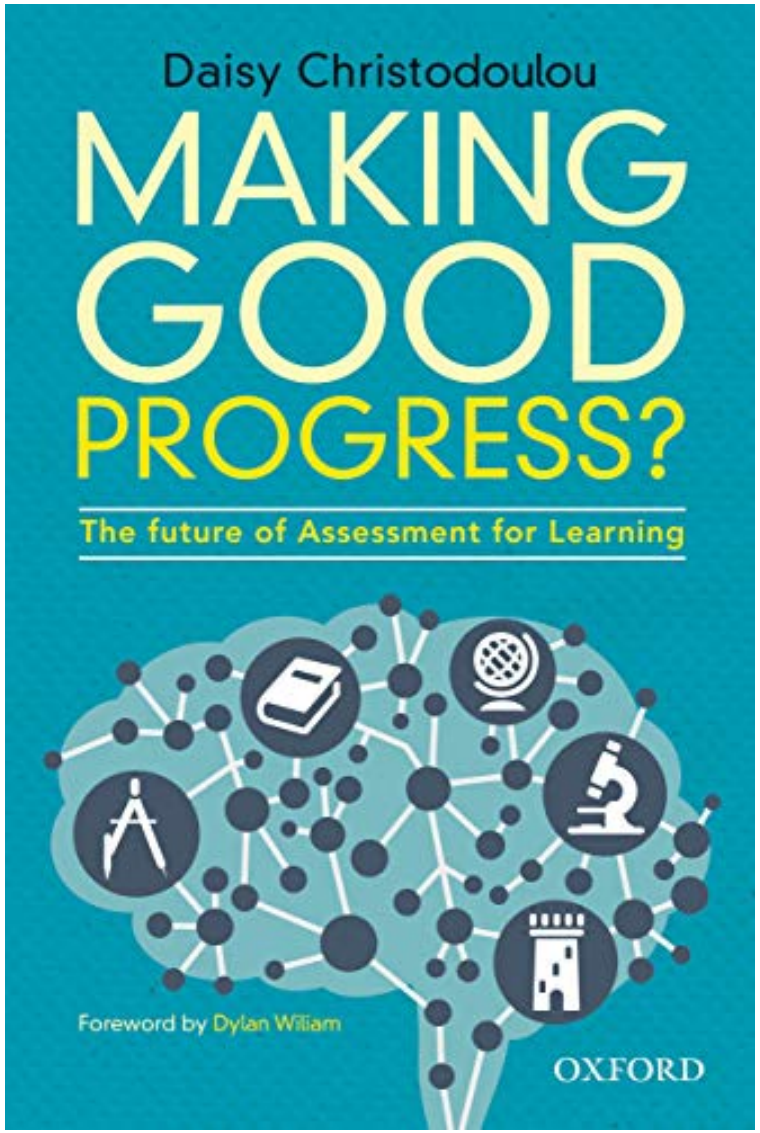
A. 30
B. 60
C. 15
D. 6000

C. Confusing percentages with division
A. Good at calculating 10% but unsure how to calculate 20%
D. Confused percentages with multiplication

Multiple choice questions

Liberal ideology…

A. Was invented in the eighteenth century to serve the interests of the British Liberal Party.
B. Developed as a hostile response to the emergence of industrial capitalism.
C. Is a compromise between socialism and conservatism.
D. Is a long-established creed which focuses on individual freedom.



Assessment

Taught

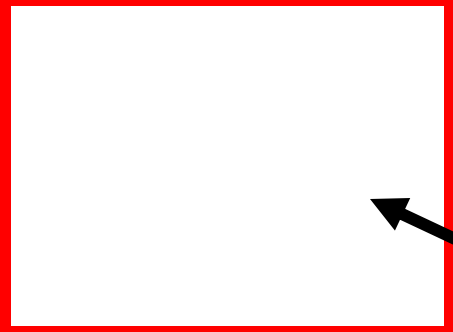
Learned

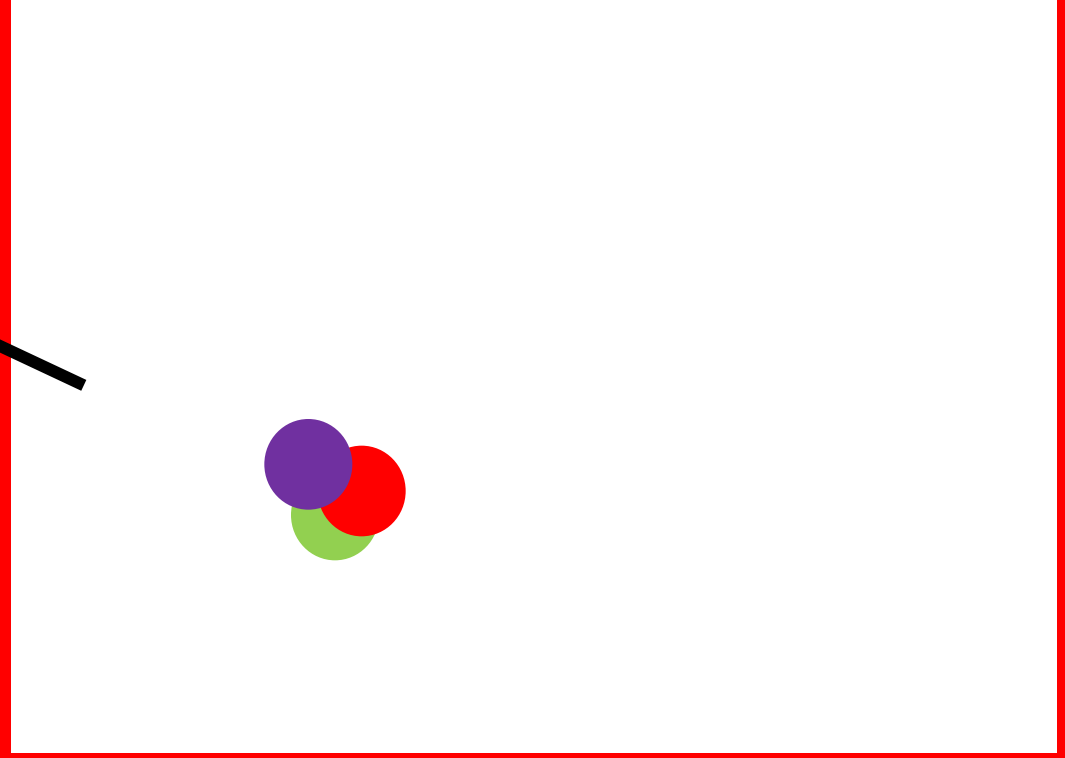
The best way to teach *novices* is different from the best way to teach *experts*

PRINCIPLE 7

Long-term memory

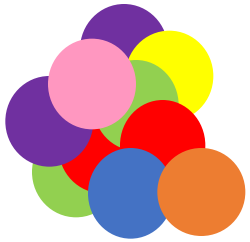
Working memory





Long-term memory

Working memory

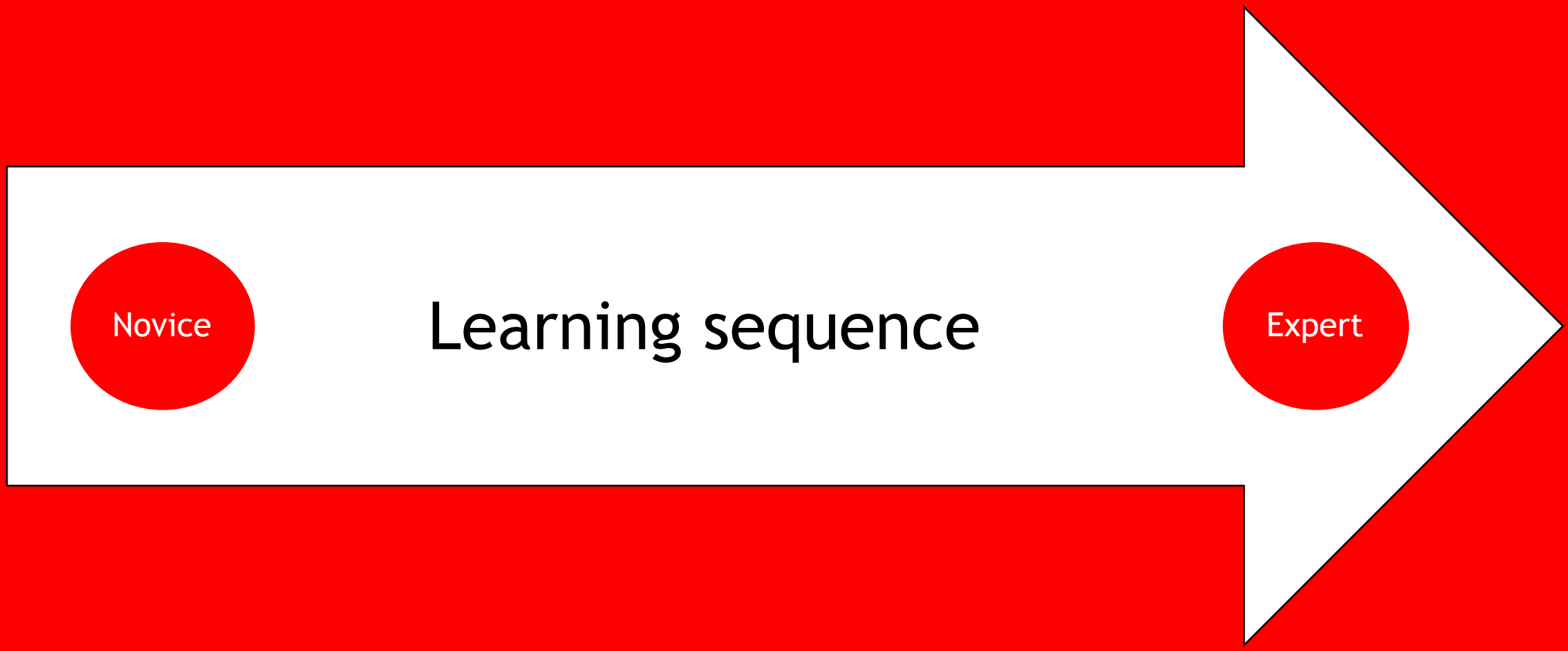


Misconception

- Older students can be taught differently
  - P5 vs S6
- When we start to learn *anything* new, we are all novices
  - We lack deep, domain-specific knowledge
- We become expert once we have learned this
- Novices need taught differently to experts

Internal feedback conversations

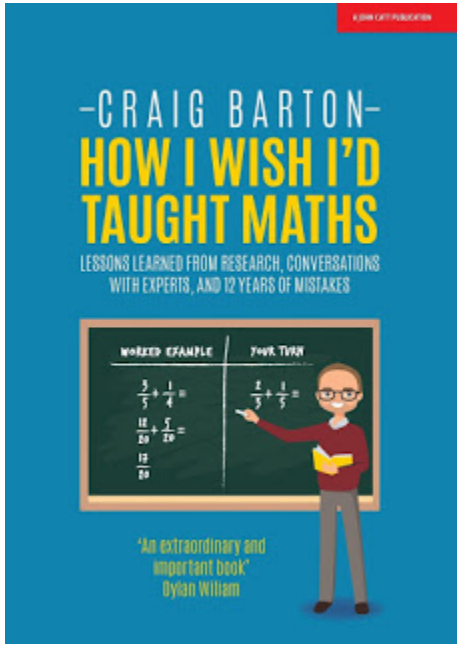
- ‘This seems right to me because...’
- ‘That doesn’t seem to be right because...’
- Experts can self-regulate their learning in a way that novices can’t.


Novice
Learning sequence
Expert

Effective teaching blends *Specific* and *Non-specific* *Teaching* approaches.

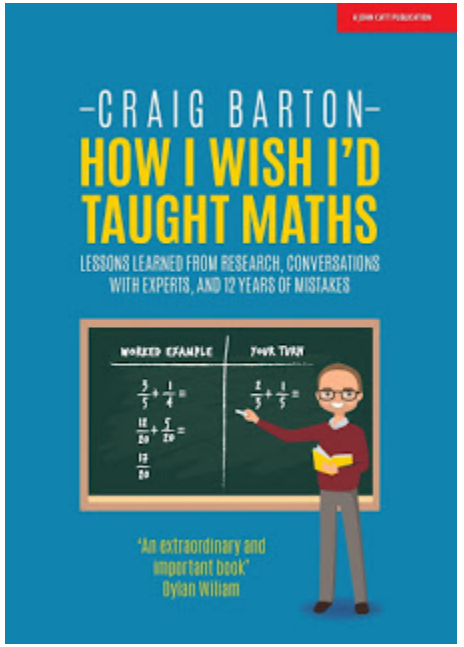
PRINCIPLE 8

How I Wish I'd Taught Maths - Craig Barton



"If someone had asked me to write a book about maths teaching two years ago… it would have consisted of open-ended tasks and ideas that I have developed over many years and used with thousands of students. It would have been full of me exclaiming how much my students enjoyed these activities, the insights they made, the problem-solving skills they developed, the independent learners they became, and the results they achieved...

How I Wish I'd Taught Maths - Craig Barton



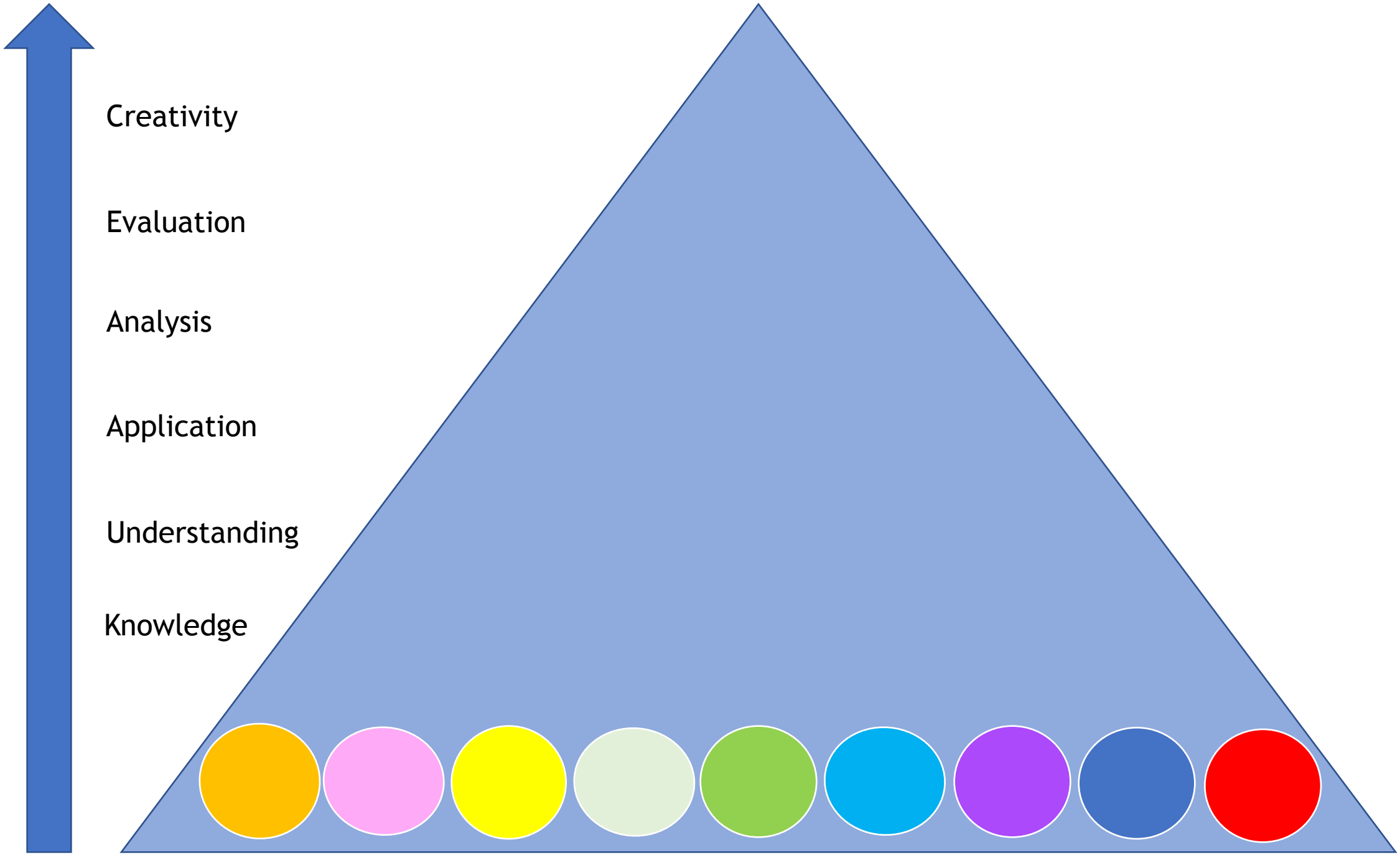
…I would have extolled the benefits of discovery learning, inquiries, projects, puzzles, student-centred learning, and of me as a teacher taking a back seat (I would probably have used the phrases 'teacher should be the facilitator of learning' more than once). The one noticeable absence from this hypothetical book, of course, would have been any research to back-up my claims. And if someone had pointed out this tiny omission, I would have replied with a patronising smile and explained 'I don't need research, I know it works'."

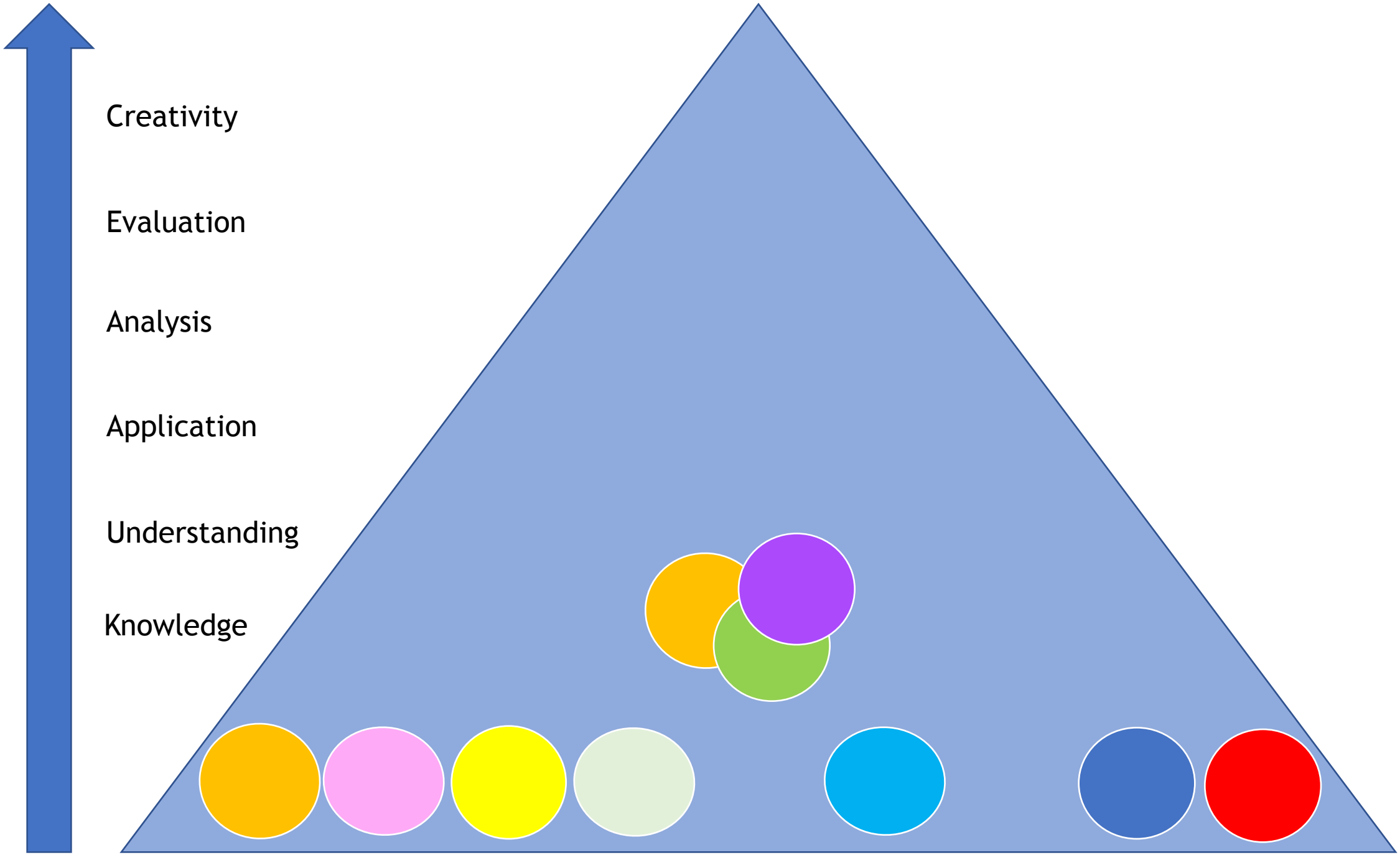
Specific Teaching

Novices

Direct-interactive instruction

Formative assessment


Creativity
Evaluation
Analysis
Application
Understanding
Knowledge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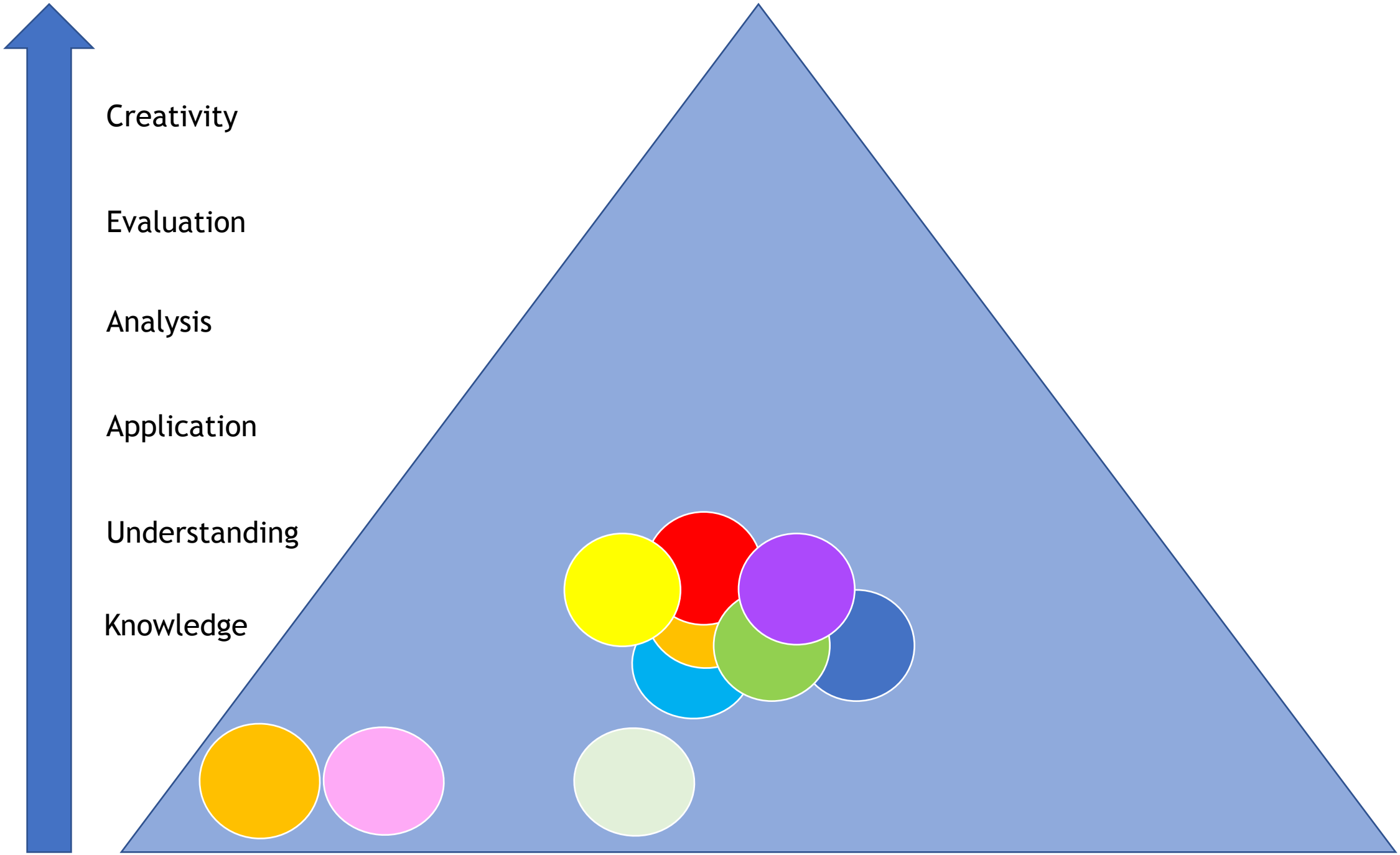
Understanding
Knowledge


Creativity
Evaluation
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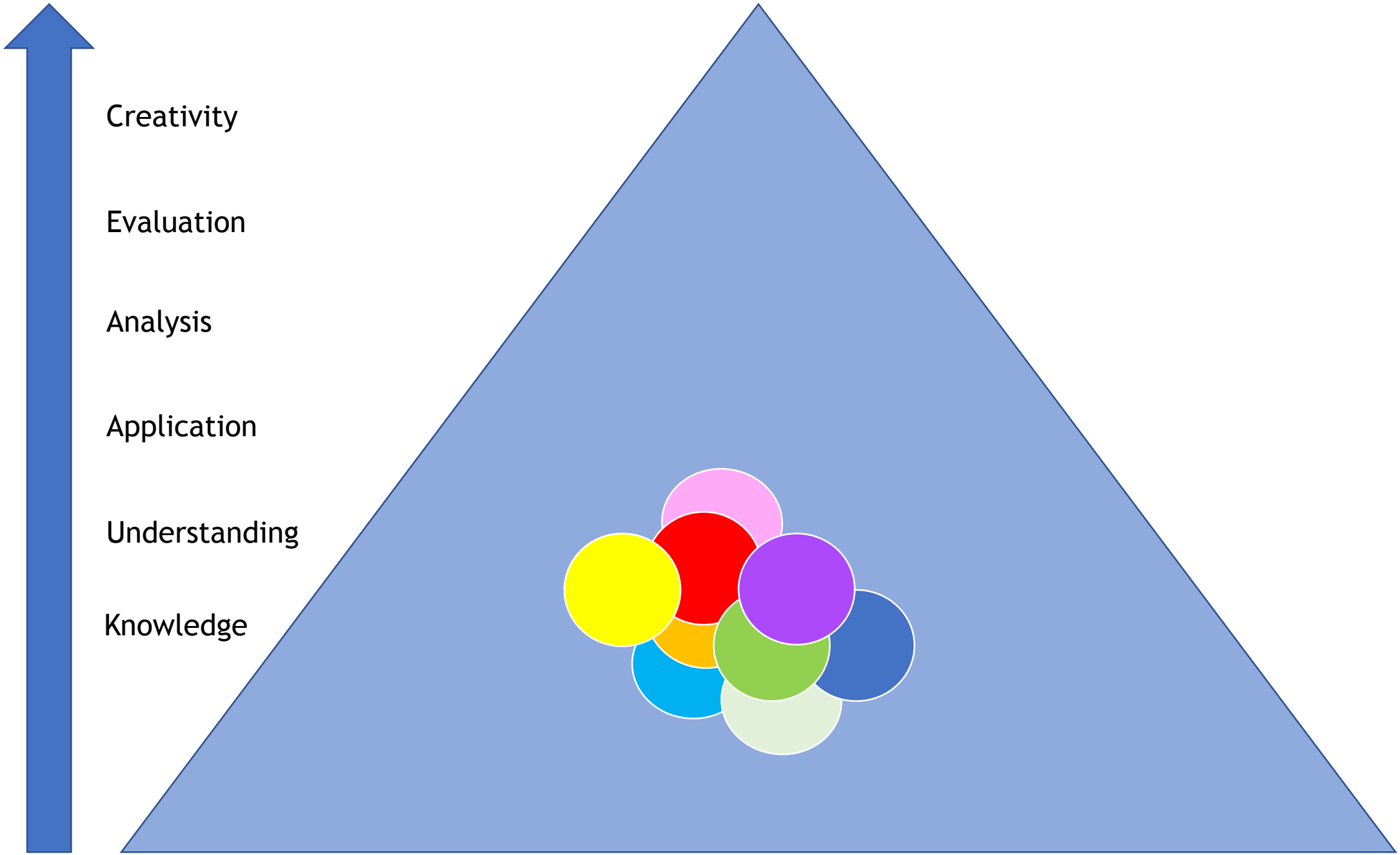
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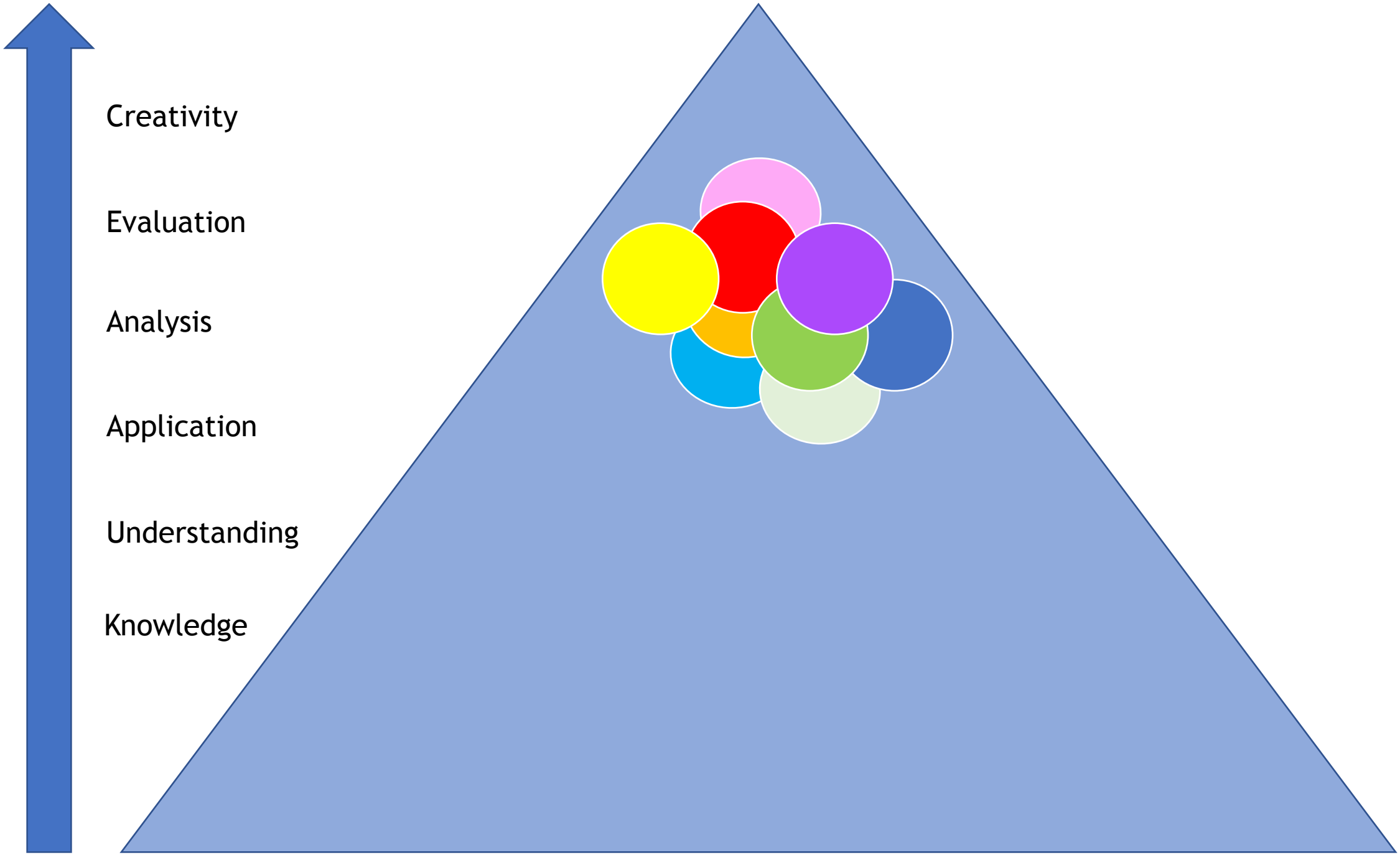
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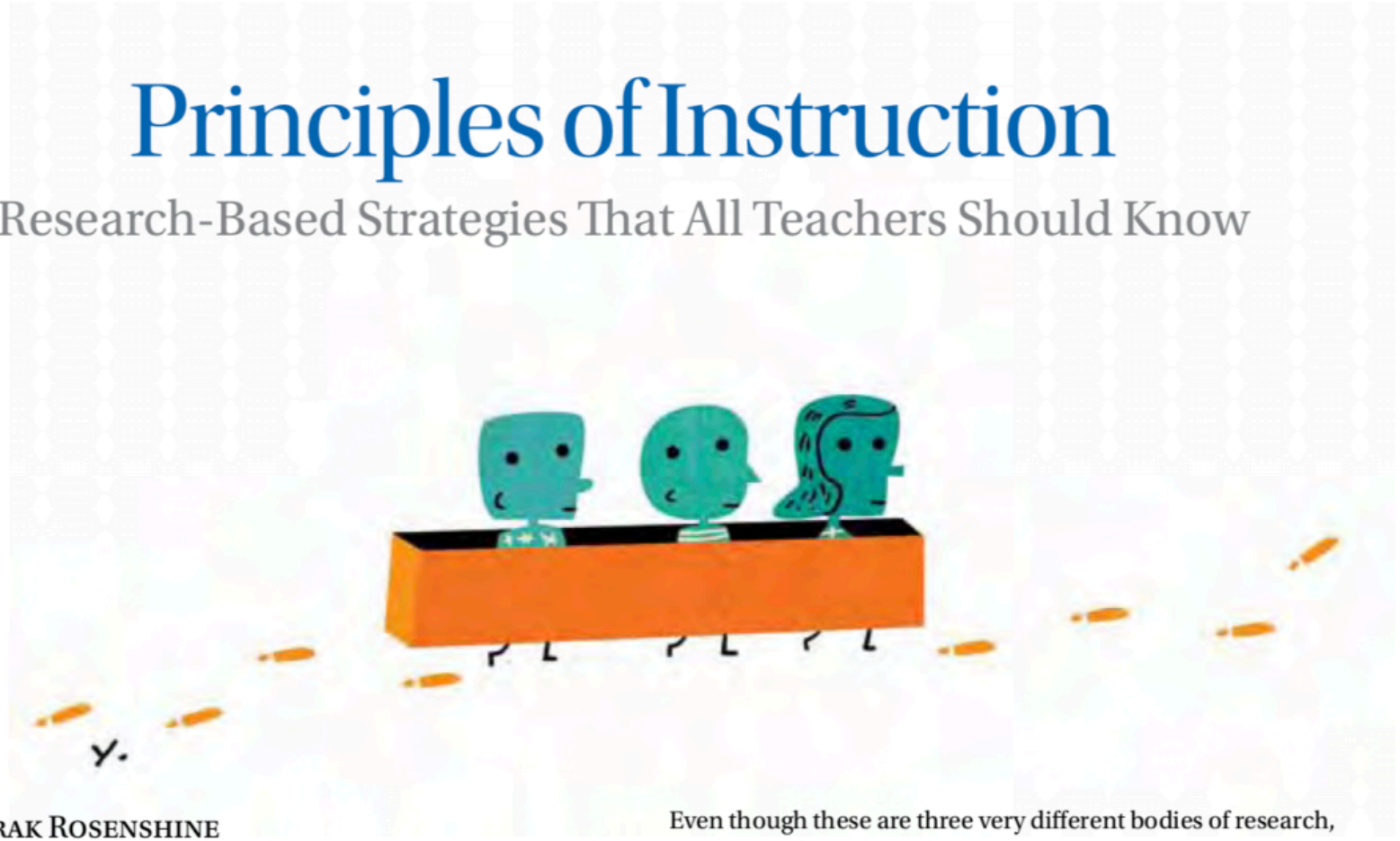
Principles of Instruction

Research-Based Strategies That All Teachers Should Know



By Barak Rosenshine

This article presents 10 research-based principles of instruction, along with suggestions for classroom practice. These principles come from three sources: (a) research in cognitive science, (b) research on master teachers, and (c) research on cognitive supports. Each is briefly explained below.

A: Research in cognitive science: This research focuses on how our brains acquire and use information. This cognitive research also provides suggestions on how we might overcome the limitations of our working memory (i.e., the mental "space" in which

Even though these are three very different bodies of research, there is *no conflict at all* between the instructional suggestions that come from each of these three sources. In other words, these three sources supplement and complement each other. The fact that the instructional ideas from three different sources supplement and complement each other gives us faith in the validity of these findings.

Education involves helping a novice develop strong, readily accessible background knowledge. It's important that background knowledge be readily accessible, and this occurs when knowledge is well rehearsed and tied to other knowledge. The most effective teachers ensured that their students efficiently acquired,

01 DAILY REVIEW

Daily review is an important component of instruction. It helps strengthen the connections of the material learned. Automatic recall frees working memory for problem solving and creativity.

02 NEW MATERIAL IN SMALL STEPS

Our working memory is small, only handling a few bits of information at once. Avoid its overload — present new material in small steps and proceed only when first steps are mastered.

03 ASK QUESTIONS

The most successful teachers spend more than half the class time teaching, demonstrating and asking questions. Questions allow the teacher to determine how well the material is learned.

04 PROVIDE MODELS

Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud help clarify the specific steps involved.

05 GUIDE STUDENT PRACTICE

Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term memory. More successful teachers built in more time for this.

06 CHECK STUDENT UNDERSTANDING

Less successful teachers merely ask "Are there any questions?" No questions are taken to mean no problems. False.
By contrast, more successful teachers check on all students.

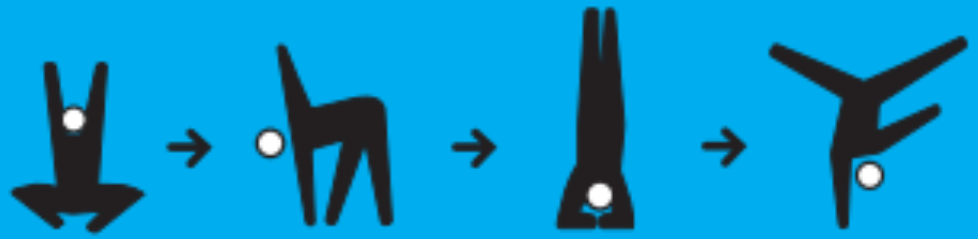
07 OBTAIN HIGH SUCCESS RATE

A success rate of around 80% has been found to be optimal, showing students are learning and also being challenged. Better teachers taught in small steps followed by practice.

08 SCAFFOLDS FOR DIFFICULT TASKS

Scaffolds are temporary supports to assist learning. They can include modelling, teacher thinking aloud, cue cards and checklists. Scaffolds are part of cognitive apprenticeship.

09 INDEPENDENT PRACTICE



Independent practice produces 'overlearning' — a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.

10 WEEKLY & MONTHLY REVIEW

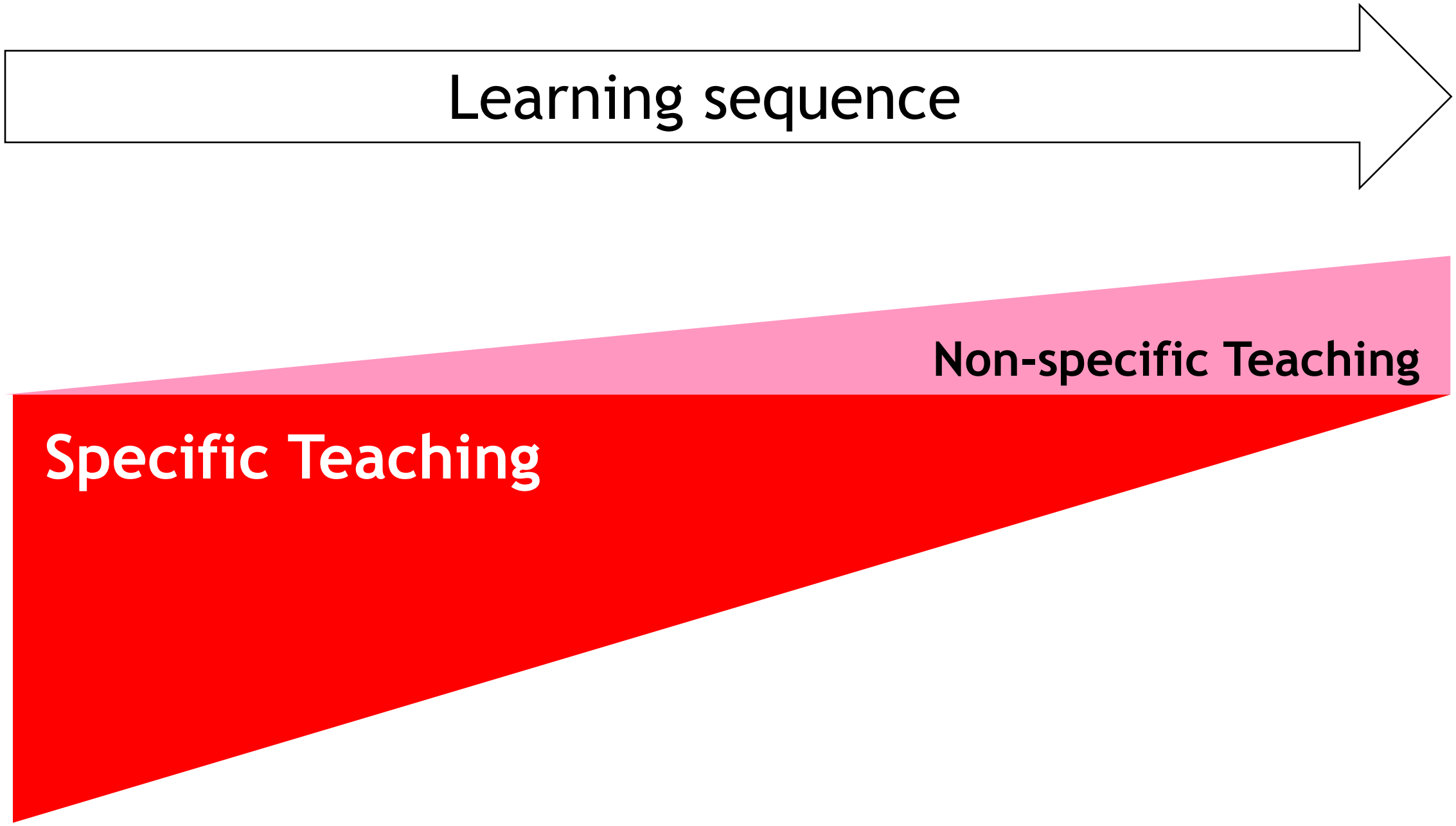
The effort involved in recalling recently-learned material embeds it in long-term memory. And the more this happens, the easier it is to connect new material to such prior knowledge.

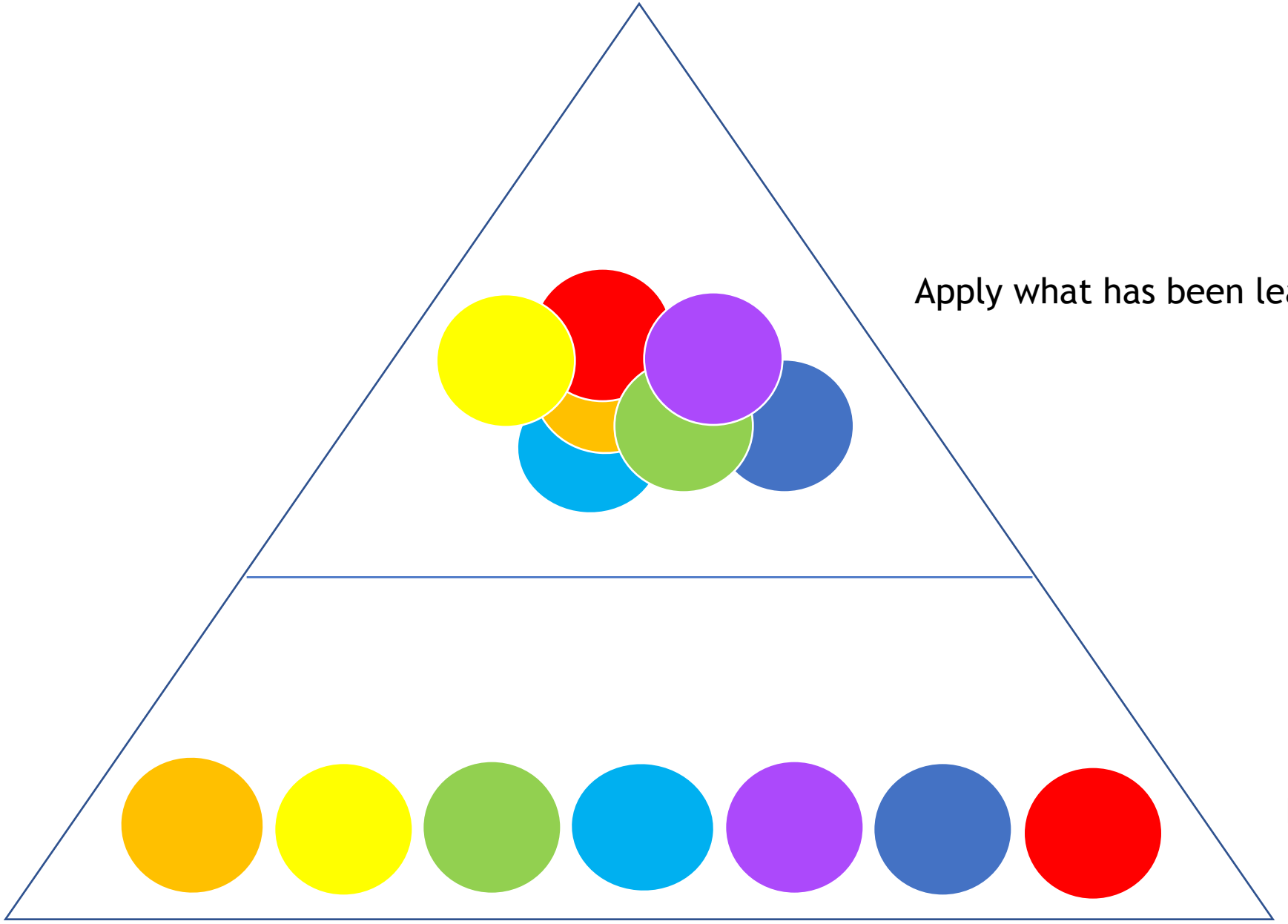
Non-specific Teaching

Experts

Student-led learning

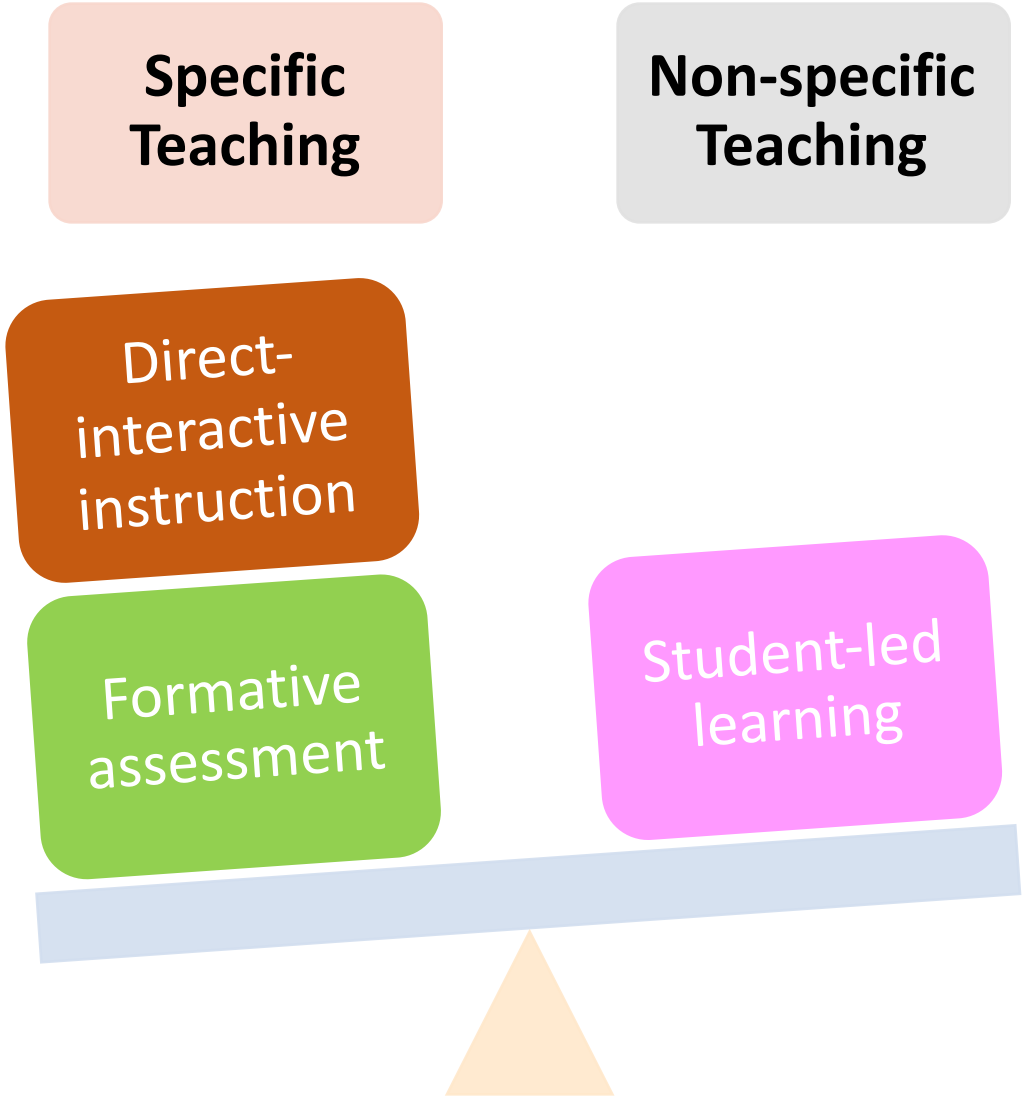
- Learning by *research* and *enquiry*
- *Applying* learning in open-ended tasks
- *Consolidating* learning independently


Learning sequence
Non-specific Teaching
Specific Teaching



Apply what has been learned

Build the knowledge structure



Teacher-student relationships

Summary

1. The most important consideration is the extent to which *all students are learning what we plan for them to learn*.

2. Learning usually requires *deliberate effort*.

3. We need to plan with *working memory and long-term memory* in mind.

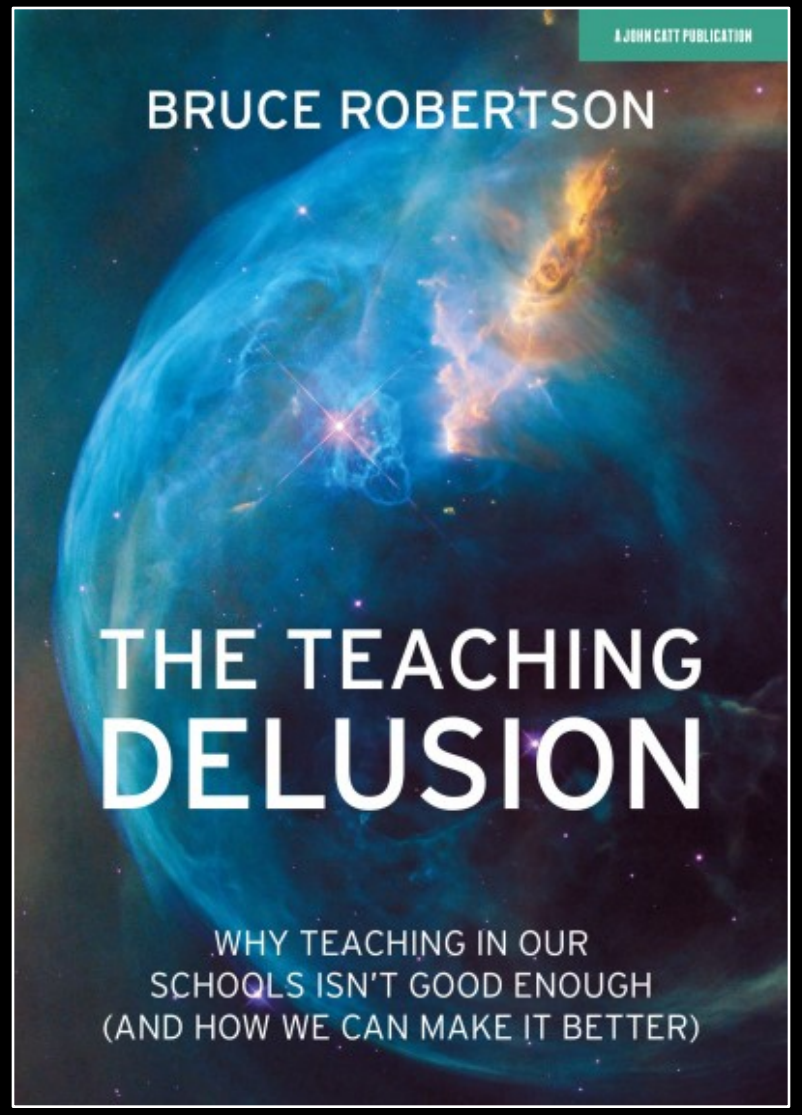
4. *Being busy* and *learning* are not the same thing.

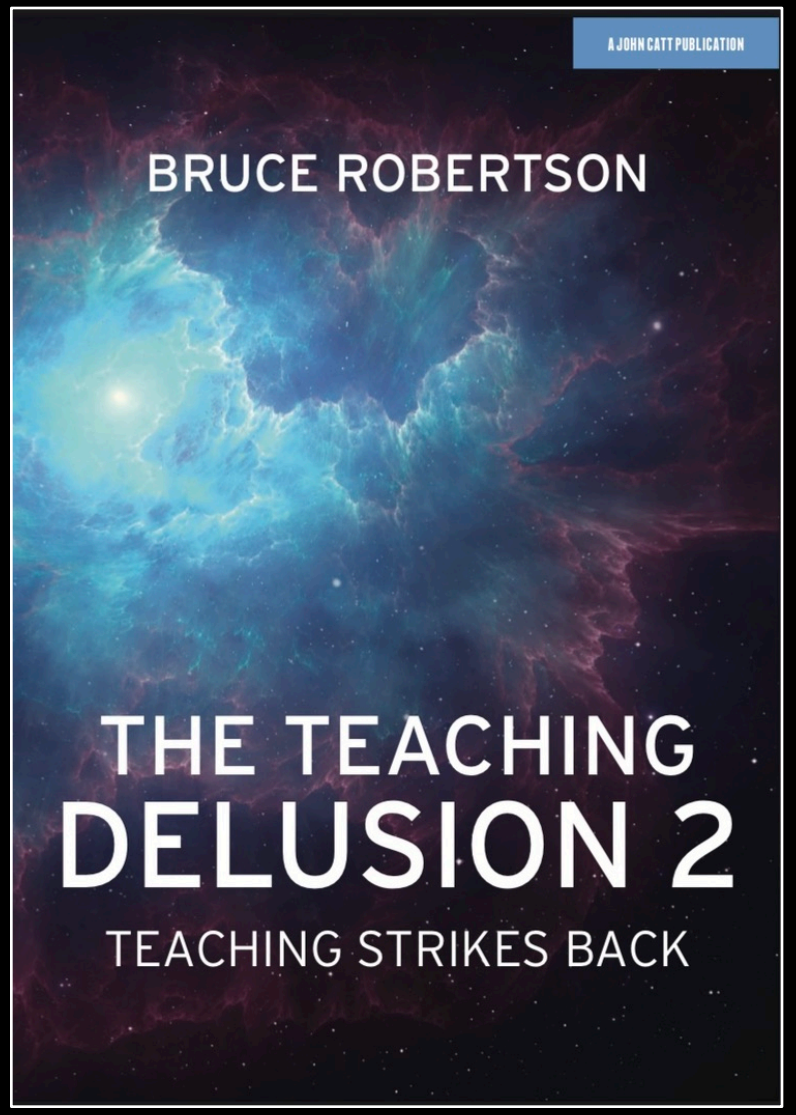
Summary

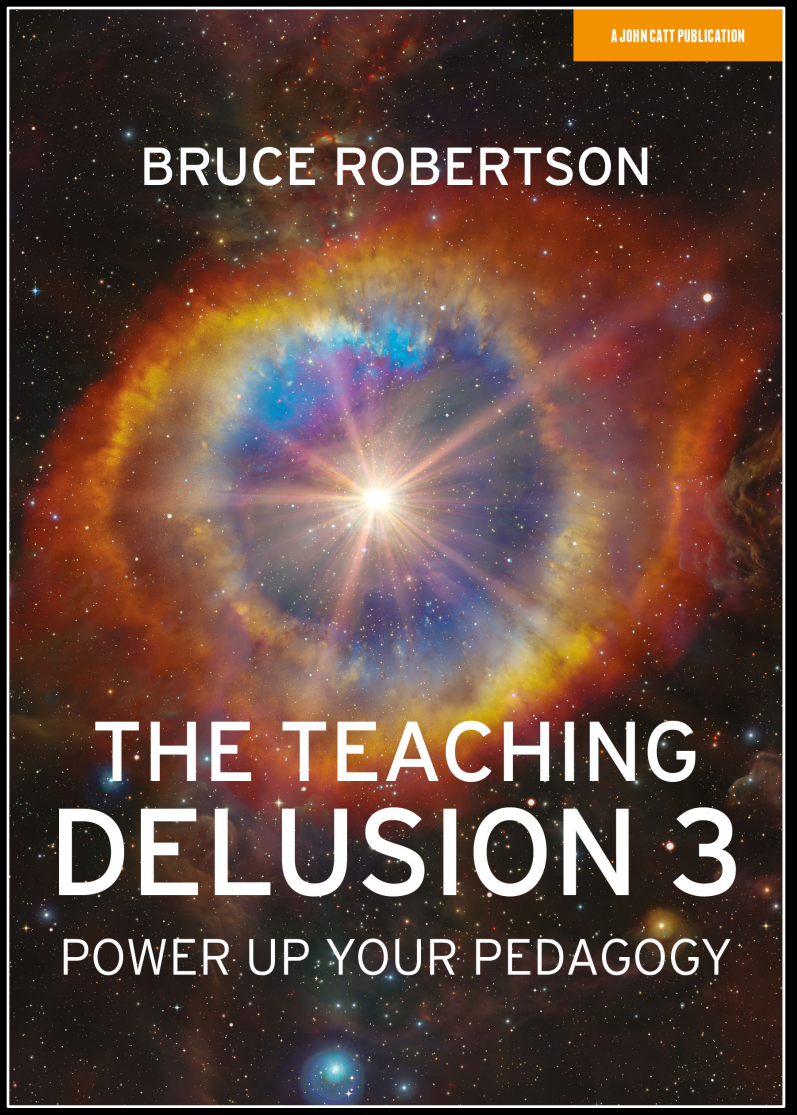
5. *Desirable difficulties* propel learning forward.
6. A *teaching-learning gap* is inevitable (but reducible).
7. The best way to teach *novices* is different from the best way to teach *experts*.
8. Effective teaching blends *Specific* and *Non-specific Teaching* approaches.

Aims

- To develop your understanding of key messages from **cognitive science** and **educational research** about high-quality teaching and learning.
    - Make you think.
    - Challenge and consolidate.
    - Whet your appetite.
    - Influence your classroom practice, making it *even better* than it is already.







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