

# SCIENCE OF LEARNING

CONFERENCE 2025

PLATINUM SPONSORS



GOLD SPONSORS





# **Knowledge-Rich Curriculum & Explicit Instruction**

**Dr Nathaniel Swain**



# Many Strands Are Woven into Skilled Reading



**Figure 1.9 Reading Rope**  
(Scarborough, 2001)





# Facilitating grappling with text

(Swain, 2023)

Teachers can facilitate students' grappling with text by:

- Guiding discussion and shared analysis of text as a group
- Providing relevant vocabulary and background to access the texts' meaning
- Modelling strategies to make sense of the text and actively check comprehension
- Provide alternative ways of engaging with the content of the text, with a view to return to it with increased understanding
- Breaking down complex parts of the text, and building students' ability to follow this process independently.



# How important is knowledge?



Where is *knowledge* in  
reading comprehension?

**Have you every tried writing  
something that doesn't require any  
inferences? I have.**

Tell me what you think of the opening  
to my story.



## **Some writing that (I hope) doesn't require any inferencing...**

*At 6:00am, which is early in the morning, most people are still sleeping. However, it is important to wake up at this time because there are many things that need to be done in the day. So, John, the main character, did in fact wake up at 6:00 am. He brushed his teeth for two minutes. One of the first things to do after waking up is to brush your teeth. This order is common in North American countries, but teeth-brushing usually occurs after breakfast in Australia. Brushing teeth involves using a toothbrush and toothpaste to clean your teeth and freshen your breath. After brushing your teeth, it is important to take a shower. This is what John did next, for 15 minutes. Showering means standing under a stream of water to clean your body and wash off any dirt or sweat. It is important to shower to stay clean and fresh.*

*Once you are clean, it's time to get dressed in appropriate clothing for the day ahead. Getting dressed is important because it allows you to present yourself in a neat and professional manner. After John got dressed, he went downstairs and had breakfast, which is a common order to do things. Breakfast is the first meal of the day and provides your body with the necessary energy and nutrients to start the day. John had two slices of toast with butter and jam, a bowl of cereal with milk, and a cup of coffee.*

*He then left the house and walked to the bus stop, which was a five-minute walk away. John left his house because he had to go to work, which was not near his house. He waited for the bus for 10 minutes, because it was his means of transportation to get to his destination, and catching buses nearly always involves waiting, as the bus does not come often enough to avoid such a wait. After ten minutes he got on the bus and sat in the third row from the front. The bus ride to his office took 20 minutes.*



*John stirred awake at the crack of dawn, as the dimly lit room started to glow with the morning sun. After peeling himself off the bed, he stumbled into the bathroom and grabbed his toothbrush. Minutes later, he was in the shower, with steam clouding the room.*

*As the water cascaded down his body, John's mind started racing. What kind of day would it be?*

...



**Knowledge is what we infer  
with!**





*Would he get through his work on time? Thoughts of his boss and co-workers entered his mind like gnats at twilight. Downstairs, the kitchen smelled of coffee and toast. John's breakfast was simple, yet satisfying – toast, butter and jam, cereal with milk, coffee.*

*As he stepped out of the door, the cool morning air greeted him, but only pensive walking brought him to the stop, where he waited for ten, lost in thought. Finally, the bus arrived. John boarded and as the bus started rolling, he his stomach rolled too.*





**Writers leave space for inferences, but if you don't have knowledge, you can't make the inference.**





# The role of knowledge in reading comprehension



Surface code

Reading words, knowing meanings

THE TEXT



What is  
text about?

TEXT BASE

Surface Code

TEXT BASE

What is  
text  
saying?

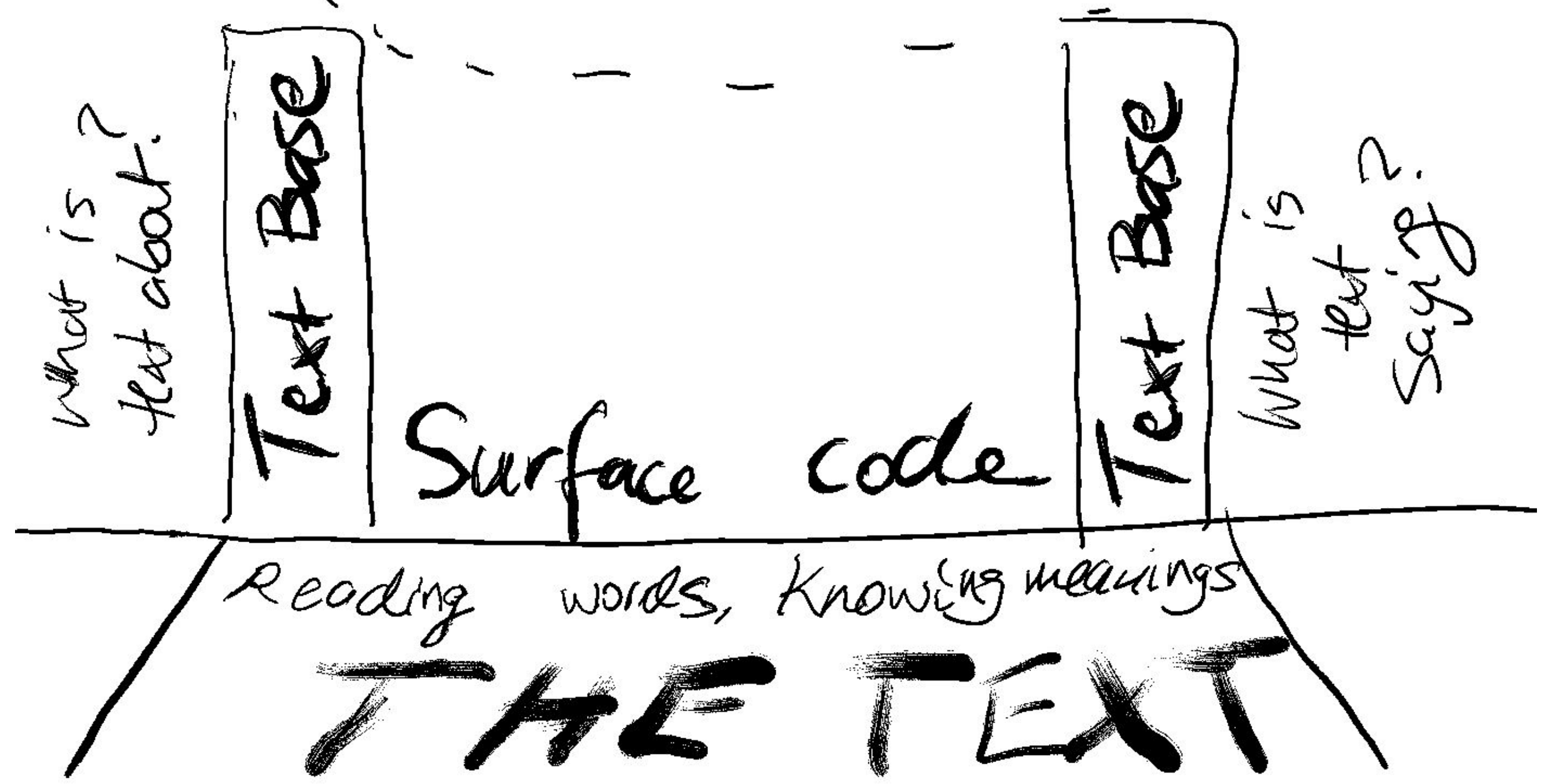
Reading words, knowing meanings

THE TEXT

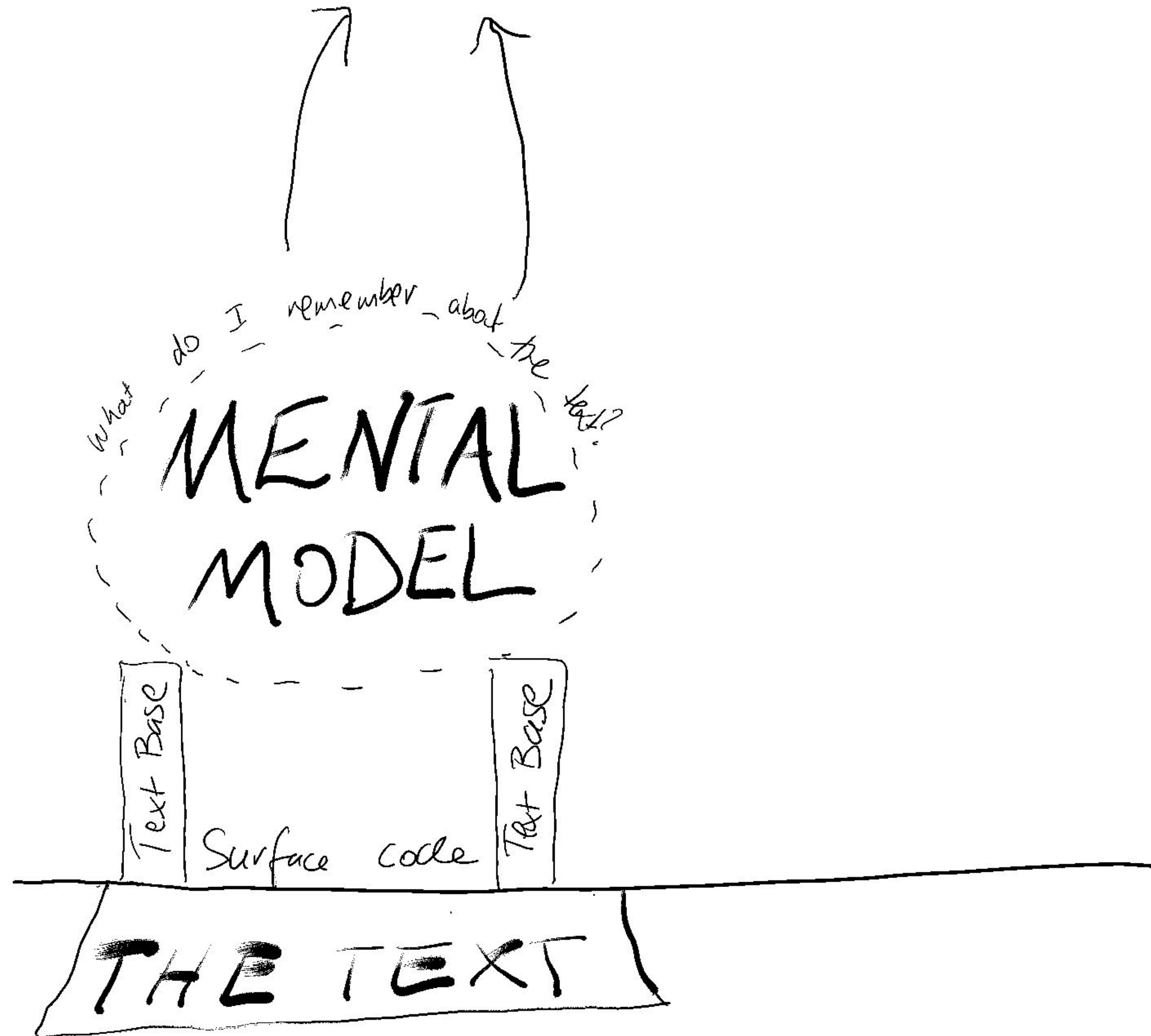


What do I remember about the text?

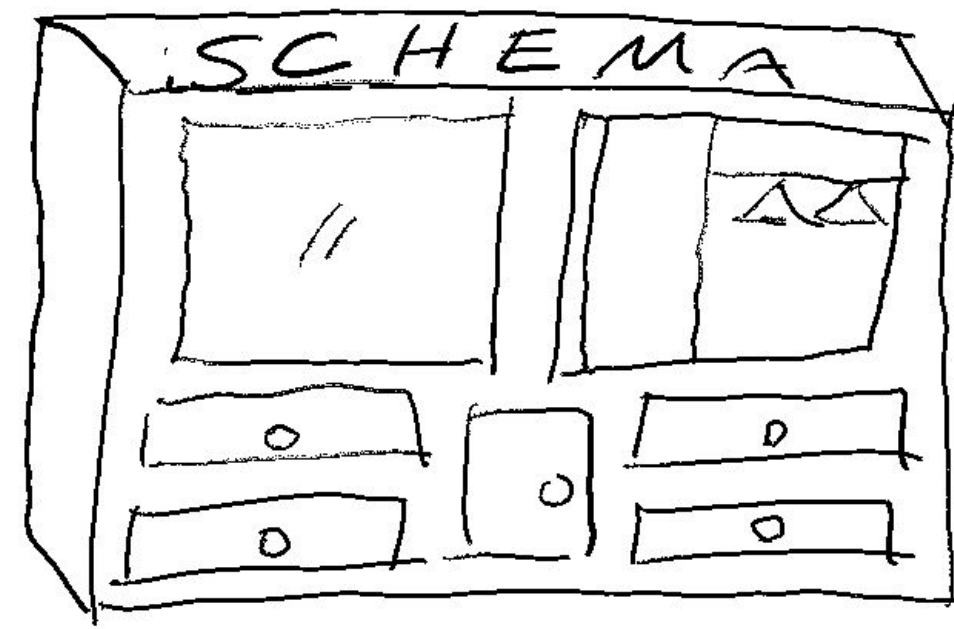
# MENTAL MODEL



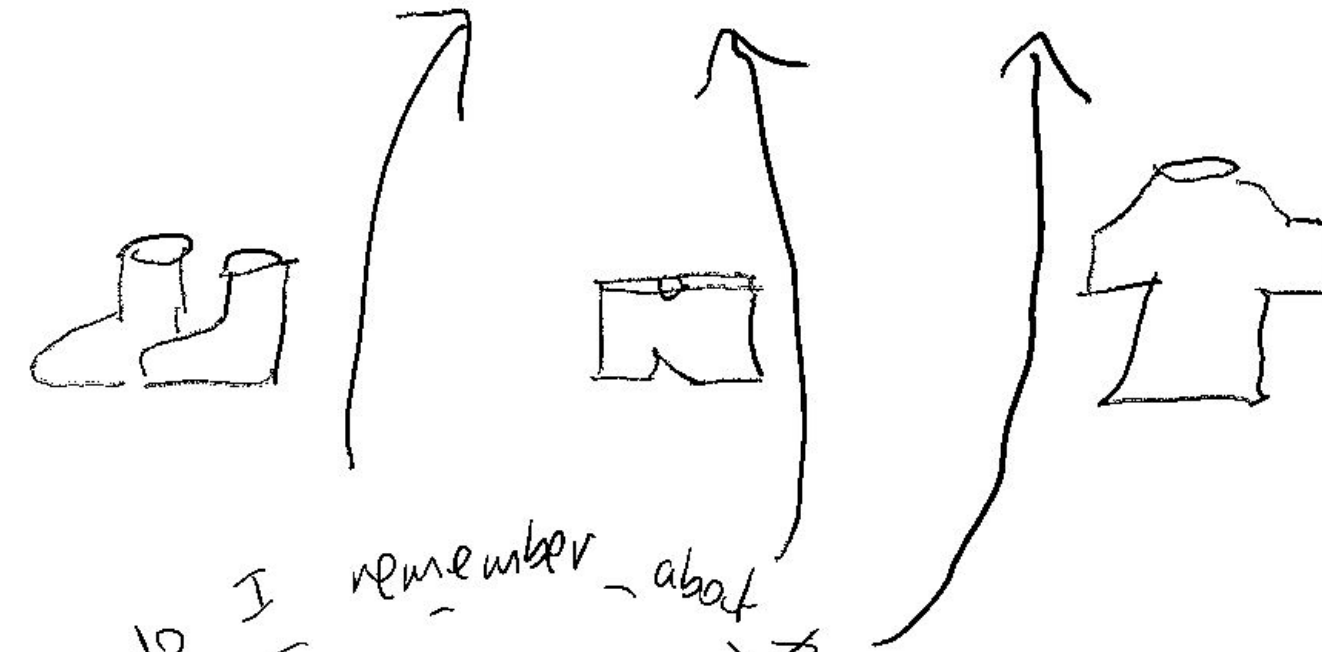








What do I know?  
What do I think about this?



What do I remember about the text?  
**MENTAL MODEL**

Text Base

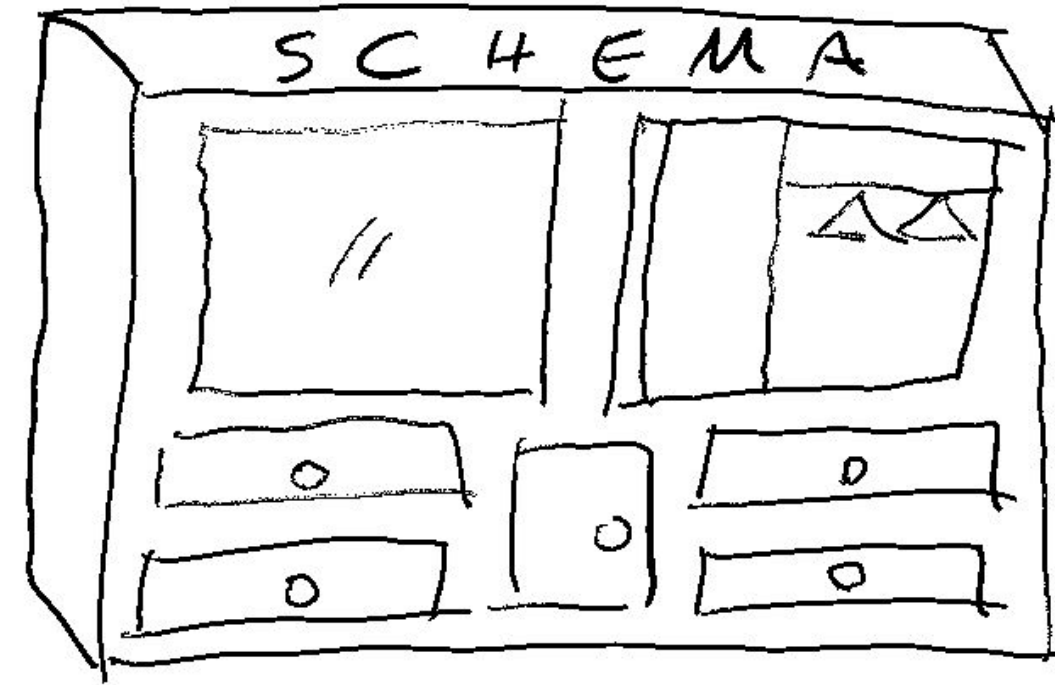
Surface code

Text Base

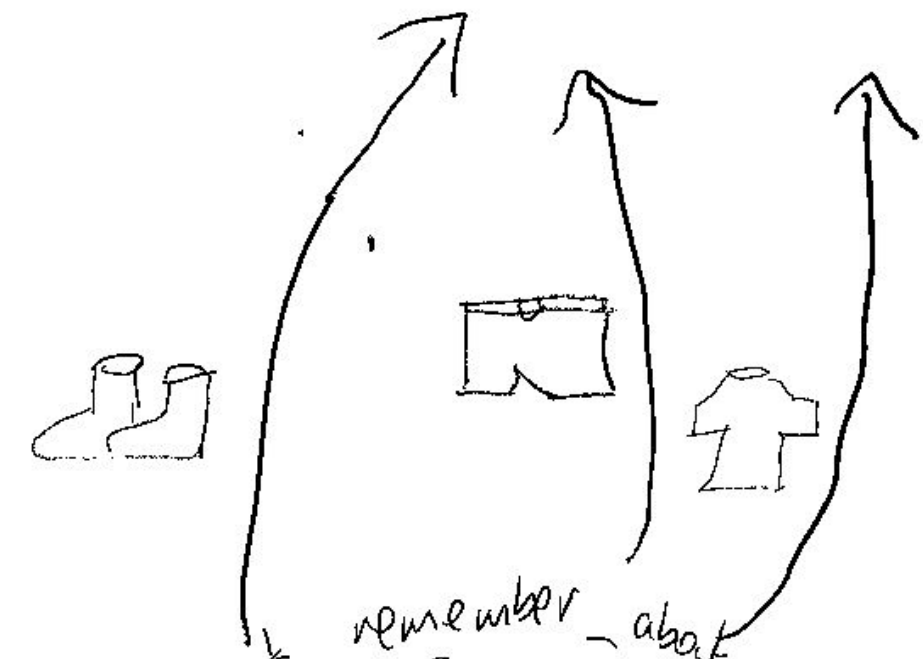
**THE TEXT**



What do I  
know  
now?



What do  
I  
think  
now?



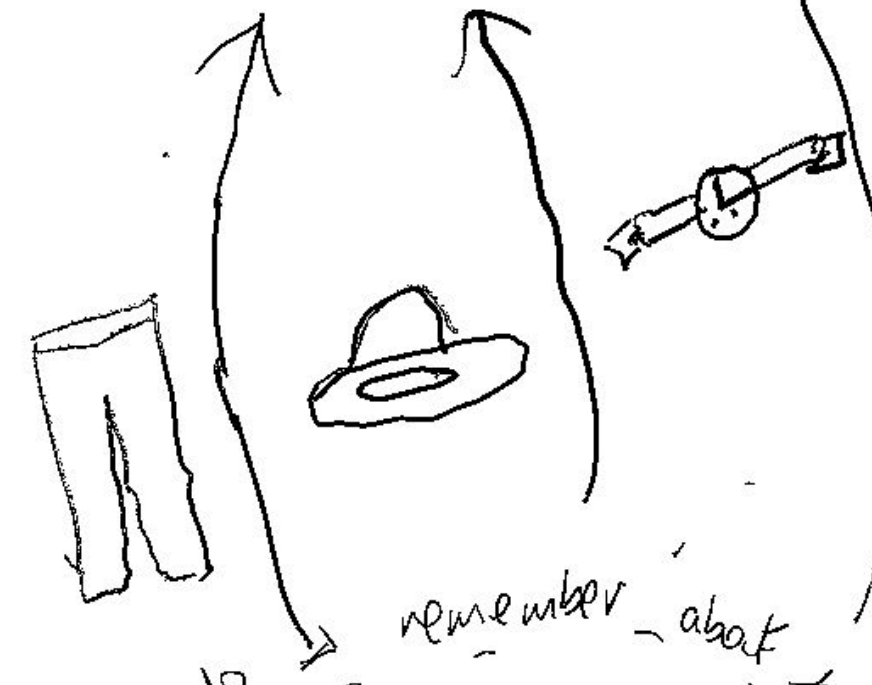
MENTAL  
MODEL

Text Base

Surface code

Text Base

THE TEXT



MENTAL  
MODEL

Text Base

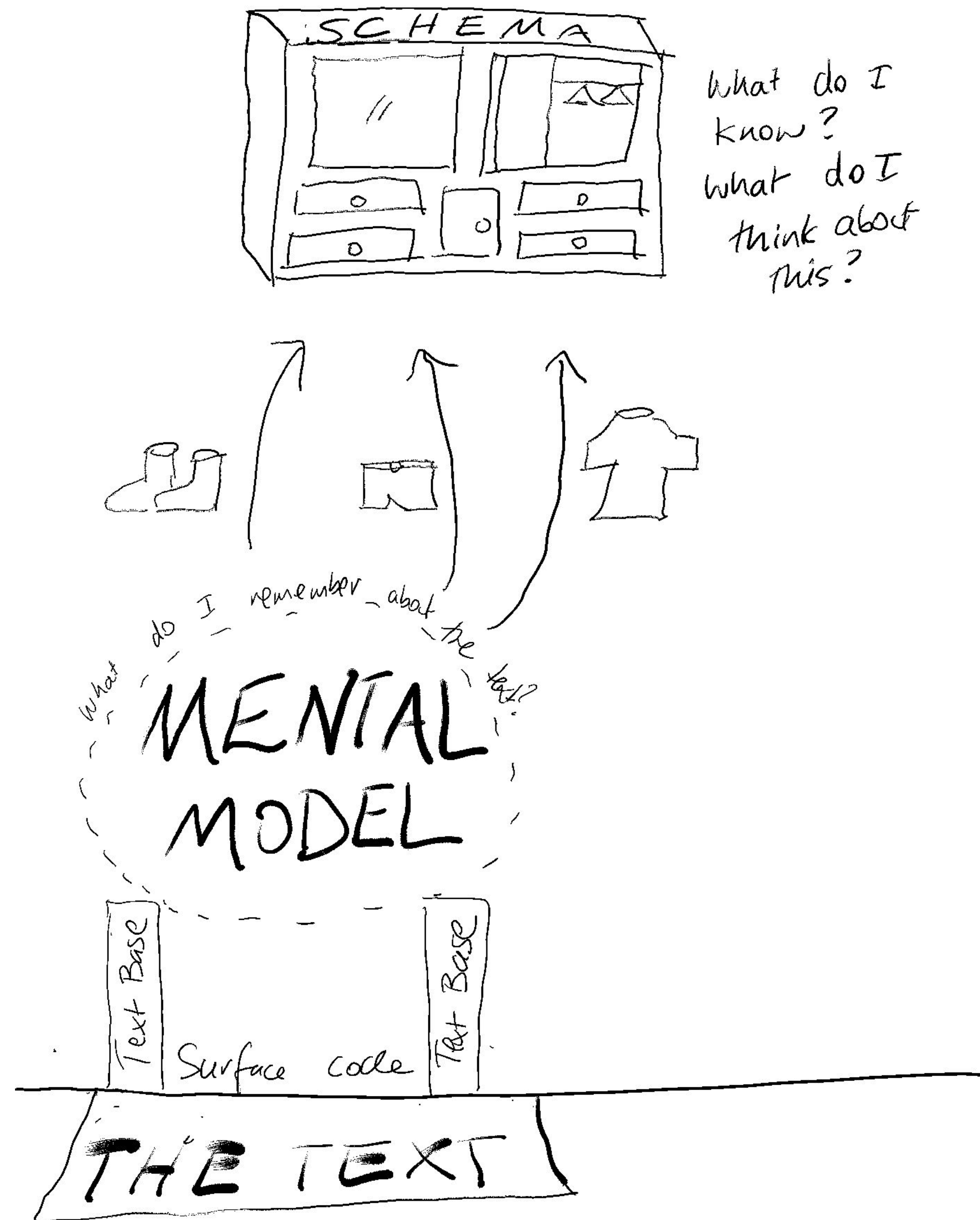
Surface code

Text Base

THE TEXT

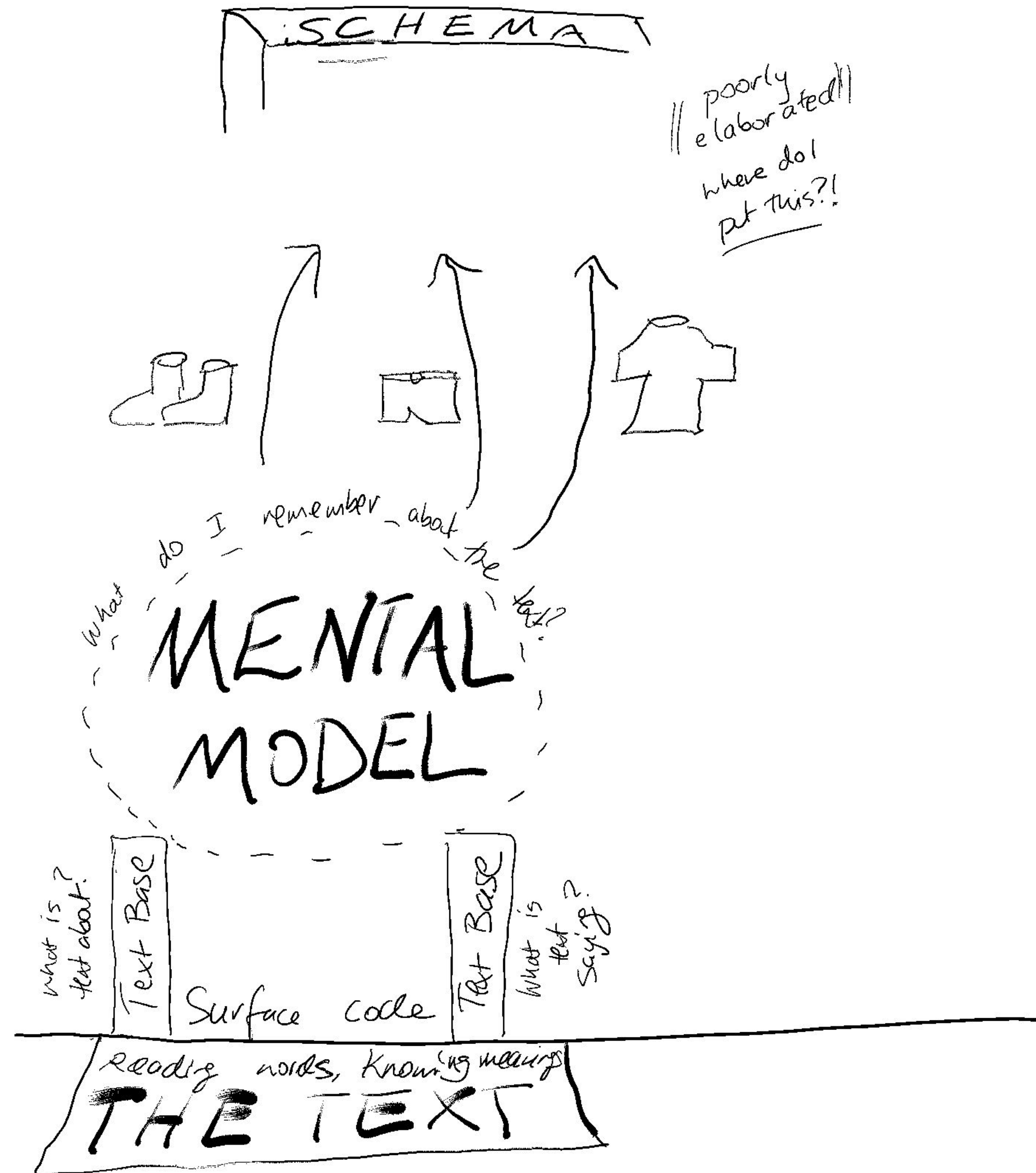


Breakdowns can occur at any point in the model



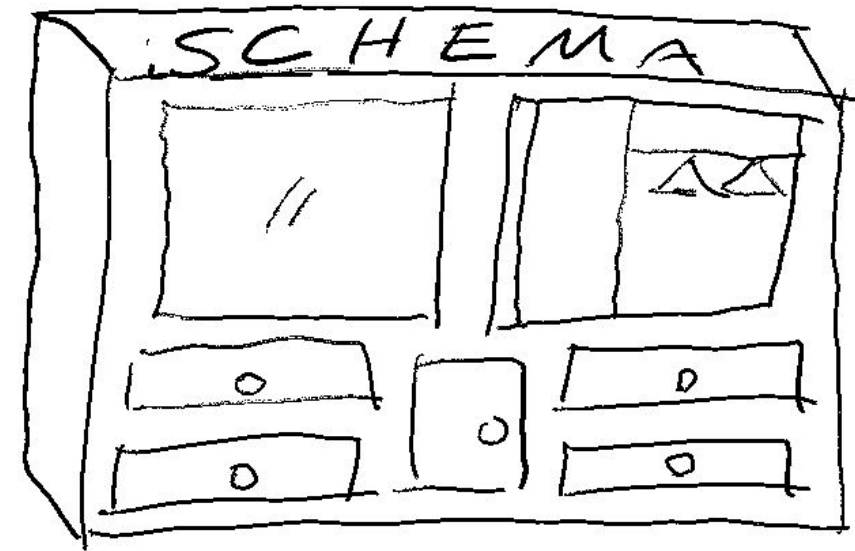


A forgotten  
breakdown can  
be the  
“knowledge gap”





# Reading comprehension: What good readers do ?



What do I know?  
What do I think about this?

**Know relevant background knowledge**

**Schema**

**Monitor comprehension (is this making sense?)**

**Know text structure**

**Have adequate working memory**

**Mental Model**

**Process complex grammar**

**Interpret cohesive clues**

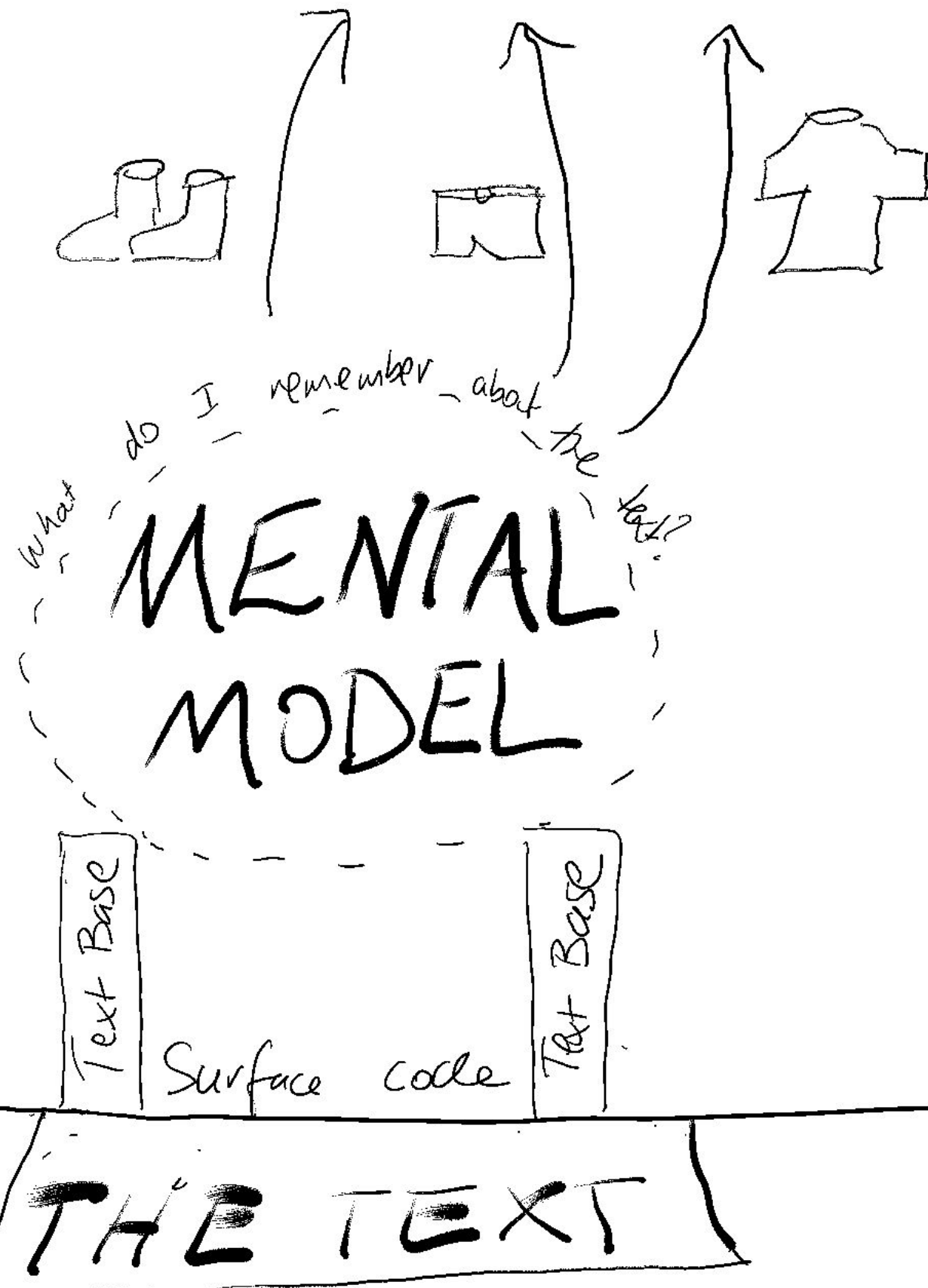
**Fill gaps with inferences**

**Text Base**

**Decode fluently and accurately**

**Know word meanings**

**Surface Code**





**Where did all the knowledge  
go?**



# Knowledge-lite

- Knowledge not specified in detail
- Facts and ideas encountered
- Topics changes daily or within the same lesson (practising the skill)
- Knowledge may have been everyday

# Knowledge-rich

- Knowledge clear and specified
- Knowledge remembered, not just encountered
- Topics are consistent within and across lessons, and build sequentially
- Knowledge is powerful and builds broader understandings



# 1. Little knowledge specified in Curricula

Too many verbs, not enough nouns...

Year 3 – Version 9

AC9E3LE03

discuss how an author uses language and illustrations to portray characters and settings in texts, and explore how the settings and events influence the mood of the narrative

Year 5 – Version 9

AC9E5LY05

use comprehension strategies such as visualising, predicting, connecting, summarising, monitoring and questioning to build literal and inferred meaning to evaluate information and ideas



# Reading Comprehension Assessments *attempt* to avoid requisite knowledge

Vocabulary is intrinsically tied to knowledge

You cannot test reading comprehension without tapping into vocabulary and knowledge.



## Young adventurer



Riders at the Naadam festival horseraces.  
Angus is the rider in green.

2009

Thirteen-year-old Angus Paradise lives on a farm in New South Wales. In 2008, he travelled with his family on holiday to Asia. In Mongolia, he saw the famous Naadam festival horseraces. All of the jockeys were children. Angus wanted to race too, so he decided to enter the 2009 competition.

After he returned to Australia, Angus trained for the long distance competition by riding 22 kilometres after school each day and by running and doing sit-ups.

In 2009, Angus returned to Mongolia. Some of his Mongolian friends arranged for him to ride in a 10 kilometre race for two-year-old horses, and a 15 kilometre race for five-year-old horses. Although he had a bad fall before the races, Angus finished in the top 10 in both events.

His efforts won him the 2009 Young Adventurer of the Year Award.



## 2. The limits of the expanding horizons approach

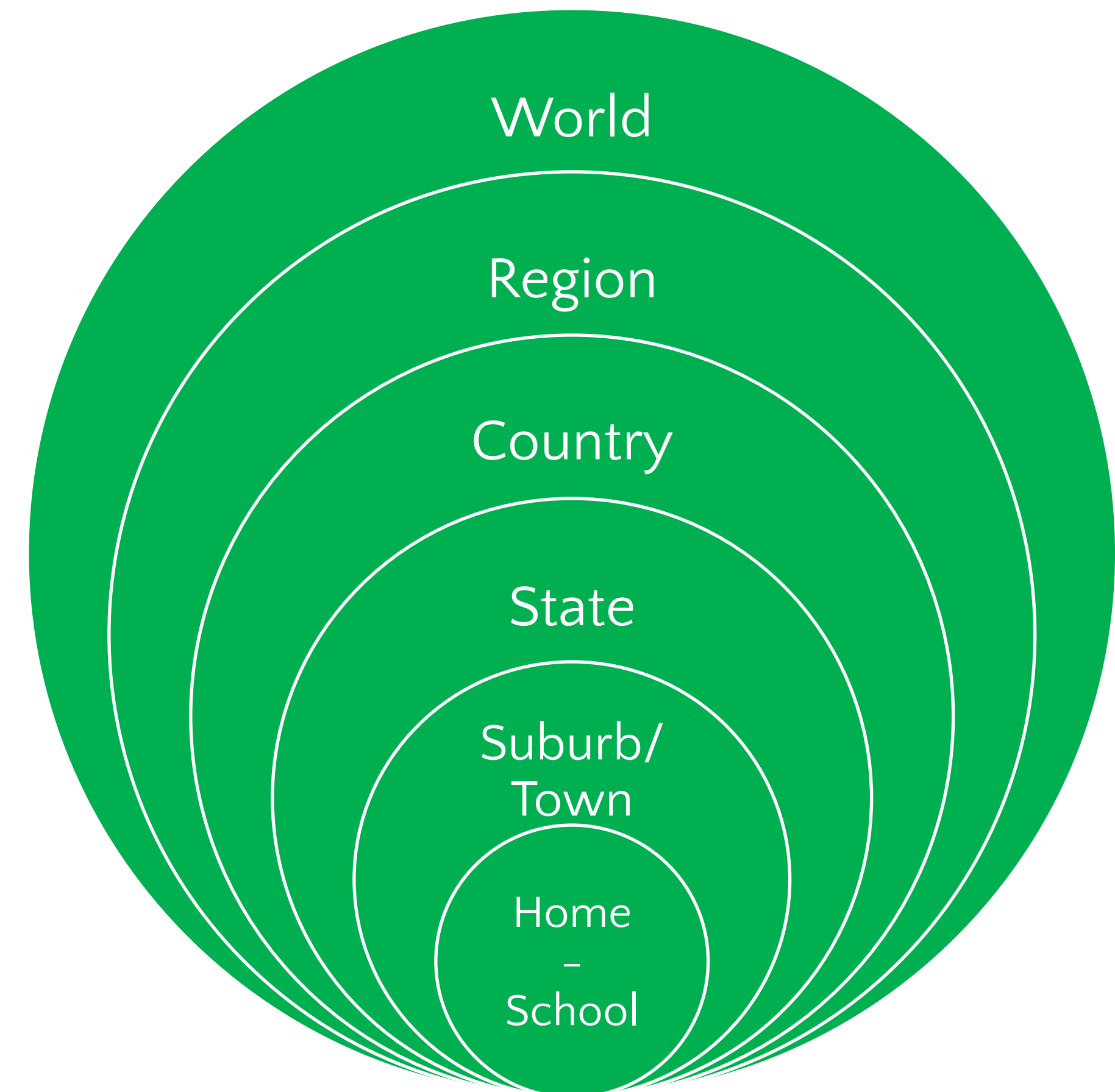
### A community...

#### What is a community?

A community group of people living in the same place or sharing backgrounds or beliefs.

In a community, people **depend** on one another. This means they all have roles or jobs, and need other people to do these for the community to work.

There are many different levels of community (see Diagram)





RETHINKING THE CURRICULUM

# The problem with the expanding horizons model for history curricula

*The predominant model for teaching history lacks coherence and is built on incorrect assumptions about what young children are able to learn.*

By **Kevin S. Krahenbuhl**



Krahenbuhl, K. S. (2019). The problem with the expanding horizons model for history curricula. *Phi Delta Kappan*, 100(6), 20-26.



# Baseball study – Recht and Leslie

**Poor readers** who know more

understand and remember more

than **great readers** who *know less* about the topic.

Recht, D. R., & Leslie, L. (1988). Effect of prior knowledge on good and poor readers' memory of text. *Journal of Educational Psychology*, 80(1), 16.



# Good readers know things ...

**So, how do you teach knowledge?**

It's **not** just about **activating**

It's about *Building* Knowledge

(Velcro metaphor, Wexler)



# Knowledge as an anchor for learning and literacy



# Traditional comprehension strategies

- Summarising, Finding the Main idea, Inferring, Predicting
- Significant Research underpinning
- Limitations
  - Intervention length
  - Content specificity

## **Ask the Cognitive Scientist: The Usefulness of Brief Instruction in Reading Comprehension Strategies**

*By Daniel T. Willingham*

[Download the Article \(211.68 KB\)](#)

*American Educator, Winter 2006-2007*



# Knowledge Building

Building Knowledge is critical for boosting reading comprehension and other academic outcomes over time.

When teaching detailed content knowledge explicitly, this combination can enrich our students' academic outcomes



# Comprehension Strategies?



*After initial instruction:*

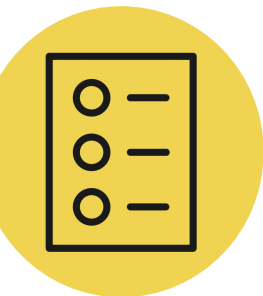
- Embedded
- Modelled
- Not lesson after lesson just on the strategy



**Predict**

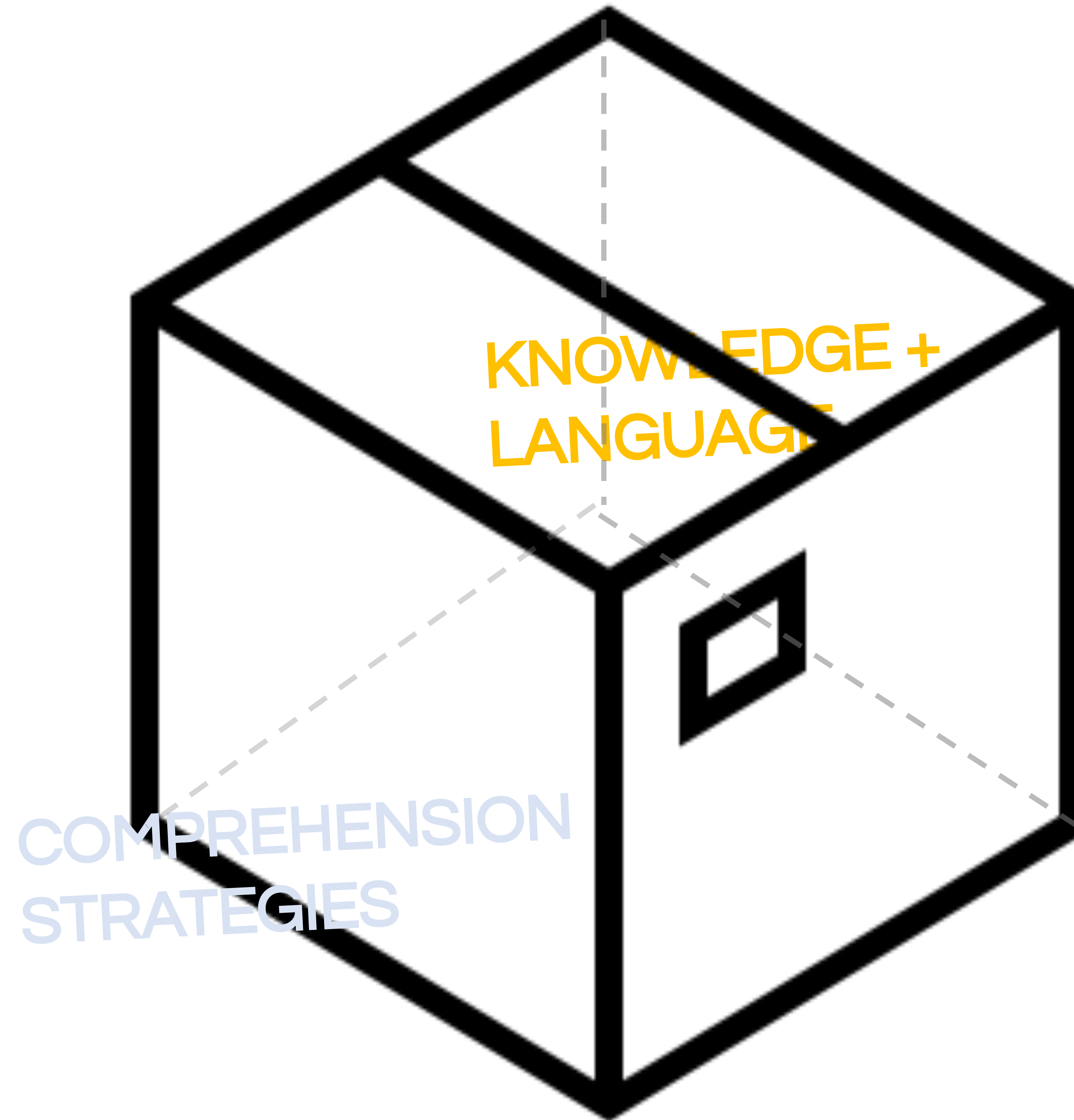


**Check it makes sense**

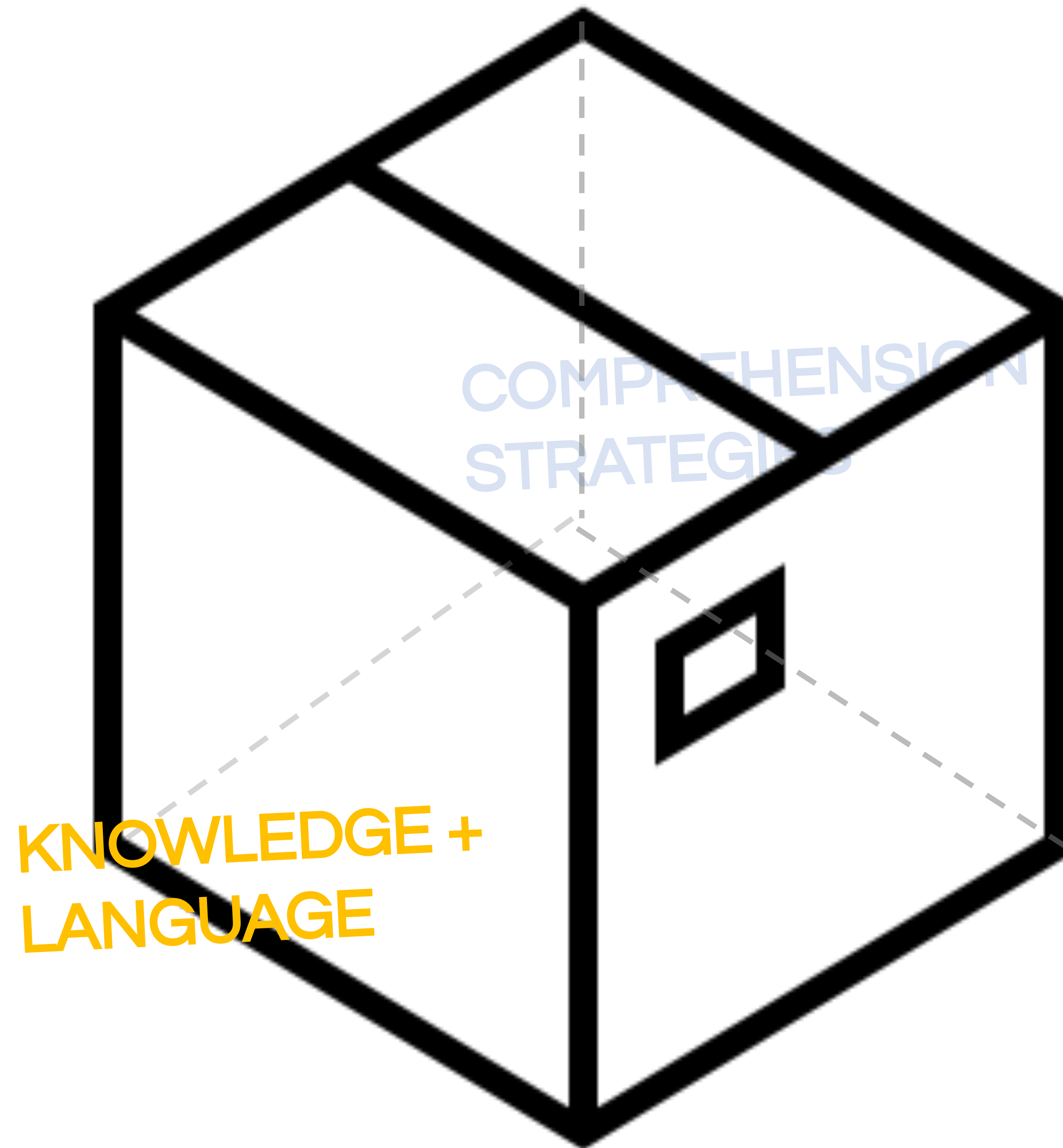


**Summarise**

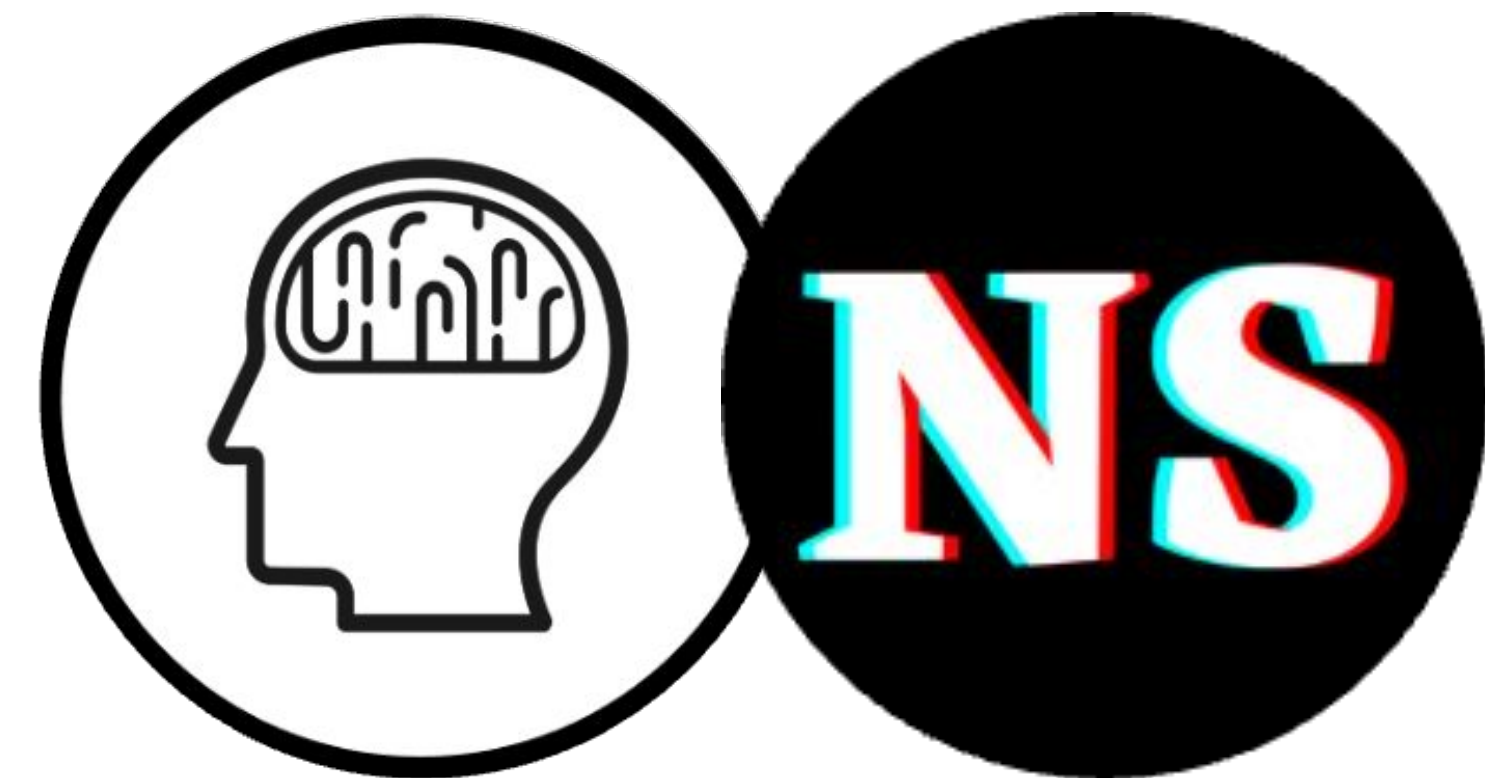












# Knowledge Rich Curriculum

Making Lots of Velcro!



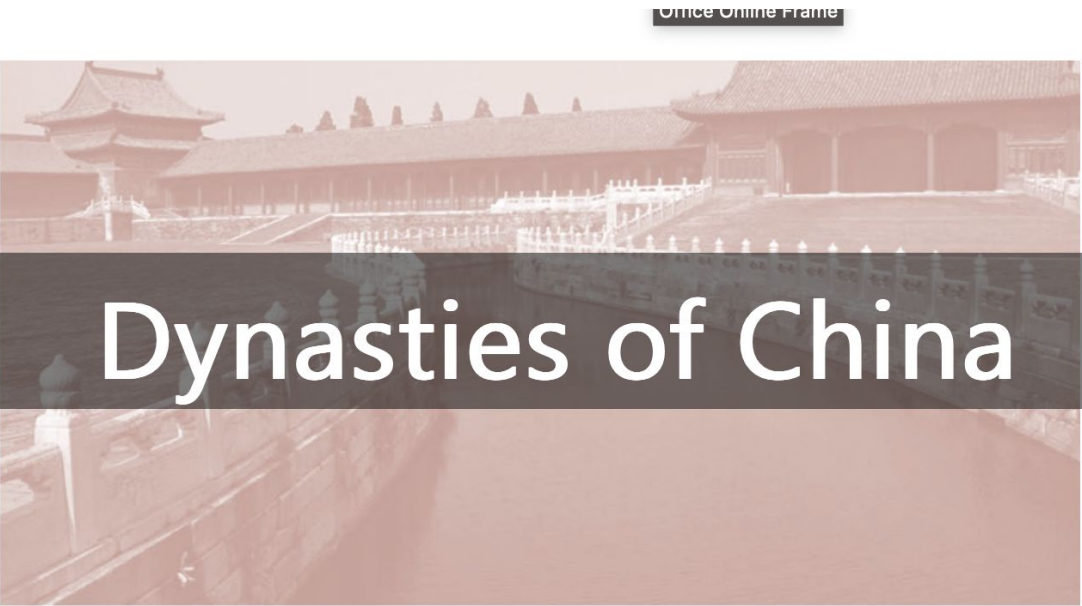




# Three World Religions

How might learning about other people religions be helpful?  
Who was Moses, and why did the Jewish people want to leave Egypt?  
How did Moses and the Jewish people escape, and what happened when they did?  
What is the story of Jesus?  
What is the story of Muhammad?

YEAR 1 HISTORY, UNIT ??



# Dynasties of China

What were some of the things the first emperor did to unite China?  
Why might the Chinese have wanted to protect their silk industry?  
Why might it be said that Wu Zhao's rise to power was an extraordinary achievement?  
What great advances happened during the Tang Dynasty?  
How did Emperor Hui Zong fall from power?  
What was the difference between life in the countryside and life in the city in southern China during the Song dynasty?  
What made the Mongols such fearsome warriors?  
Why might the development of the postal service have been considered one of Kublai Khan's greatest achievements?  
How did the Manchu gain control of China?  
What brought about an end to two thousand years of rule by emperors in China?

YEAR 4 HISTORY, UNIT 6

# The Culture of Japan



How would you describe the geography of the country of Japan?  
What is it like to live in modern Japan?  
What are some of the Japanese traditions that are still practiced in modern Japan?

YEAR 2 GEOGRAPHY, UNIT 3



# England in the Golden Age

Lessons 6 – 10

YEAR 5 HISTORY, UNIT 6



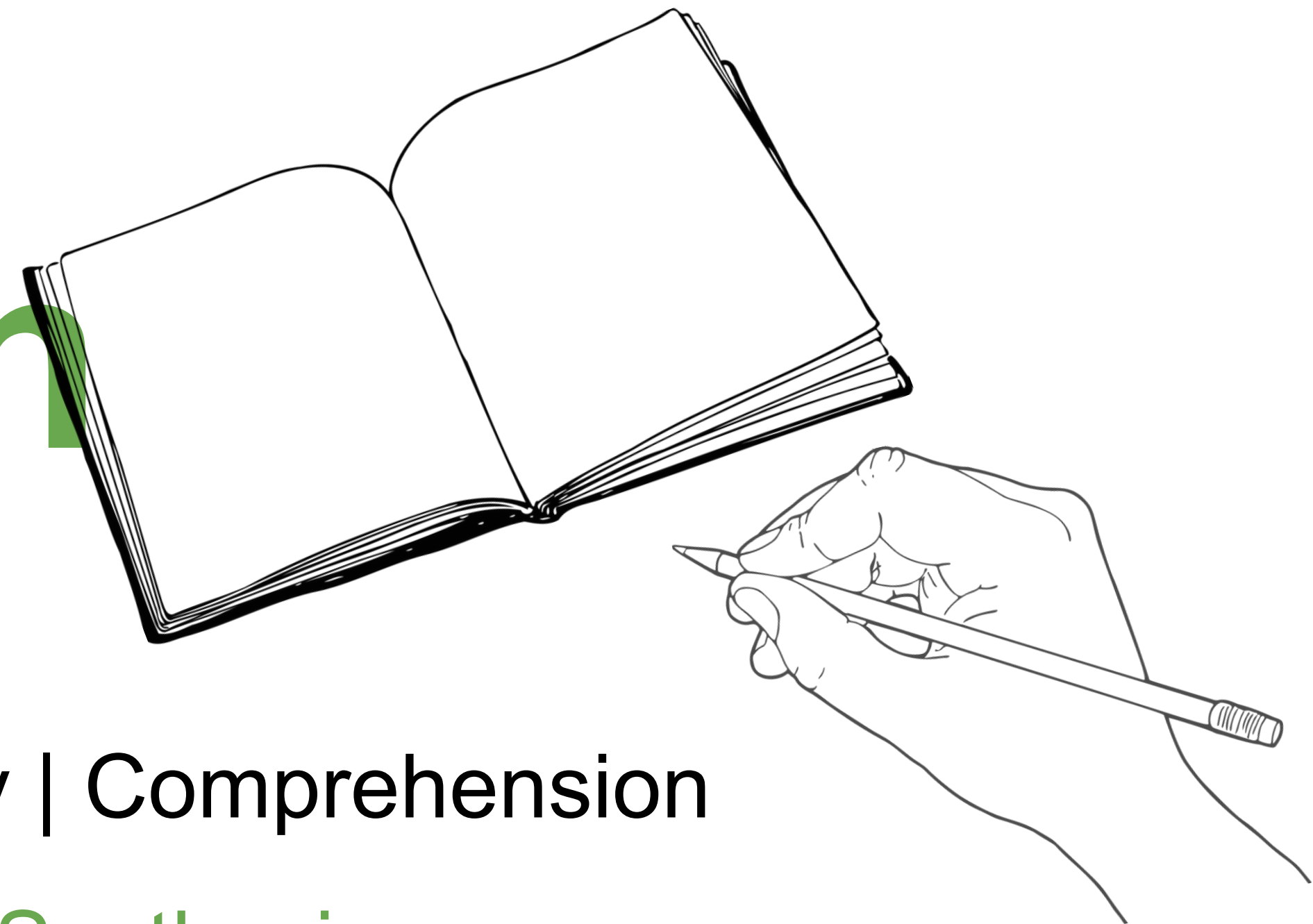
# The Age of Exploration

How did the search for the Spice Islands change history?  
What development enabled Europeans to travel farther?  
Why do you think Portugal is described as a seagoing pioneer?  
Why do you think Columbus kept a secret log?  
How did European explorers and colonists treat the indigenous people of the Americas?  
How important was it for explorers to have finally circumnavigated the globe?  
How did European exploration of the Americas lead to settlement and colonisation?  
The French and the English had different approaches to settlement in North America. In what ways were they different?  
How did the death of a king affect the Spice Trade?  
How did the Age of Exploration lead to the development of the slave trade?

YEAR 5



# read2Learn



Knowledge | Vocabulary | Fluency | Comprehension  
| Synthesis

Read to Learn



# read2Learn

**Knowledge rich curriculum**

**Modelling and facilitating comprehension of complex text**

**Explicit vocabulary instruction**

**Embedding of history, geography, and civics skills**

**Building depth and breadth of content/knowledge**

**Link to writing instruction (w2L)**





# World Rivers

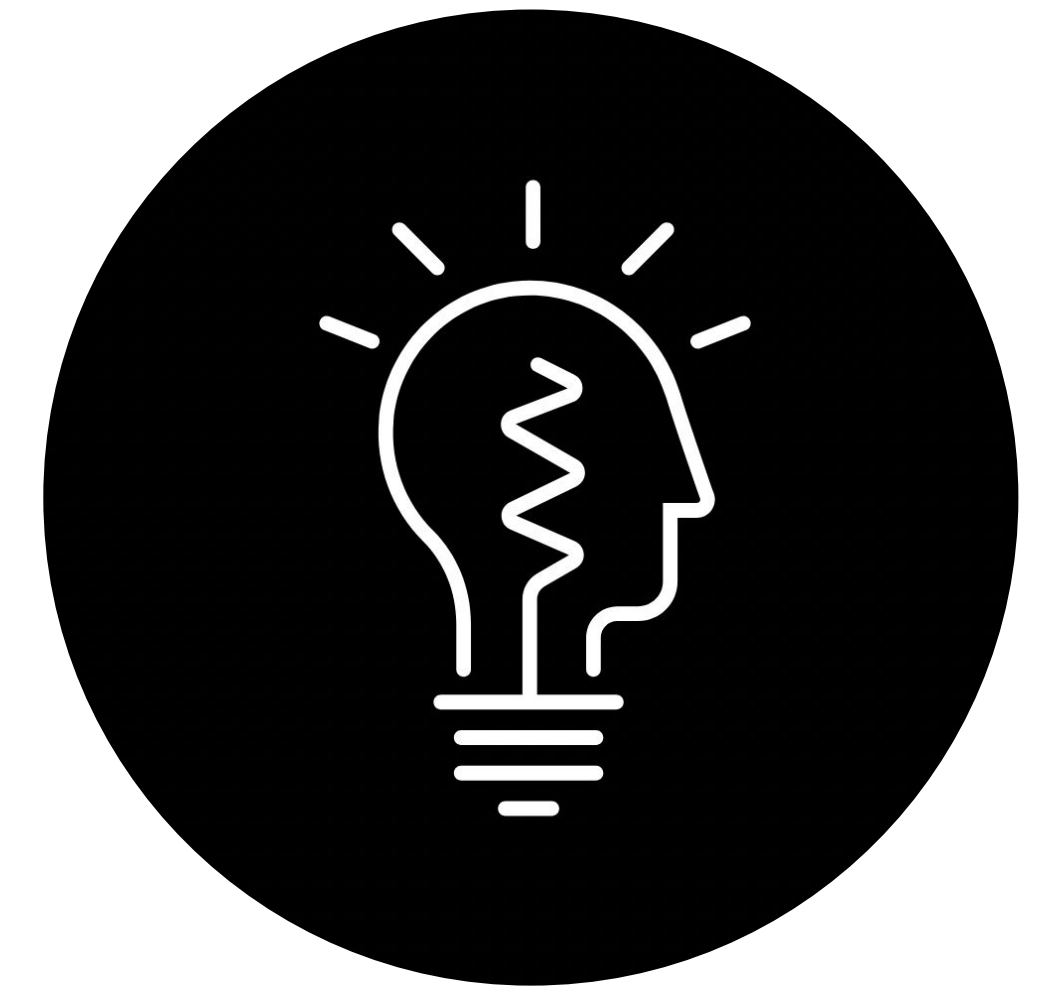
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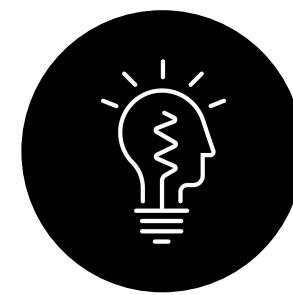


TODAY'S LEARNING GOAL

**I will explain why crops are grown close to the Nile and Yellow Rivers.**







Teacher and students read together.



Why is the Nile an important river for the Egyptian people?



The Nile is an important river for the Egyptian people because \_\_\_\_.

## The Nile River

The Nile River, the longest river in the world, is the most important river in Egypt. Its **riverbank** is lined with trees and behind the trees is sand. It stretches right through the Sahara Desert as far as the eye can see. The population of Egypt lives close to the Nile as it is its main **source** of drinking water. It provides water for farmers who have used it for irrigation of **crops** for thousands of years.



### Vocabulary

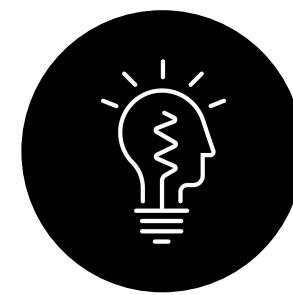
**riverbank**, n. land at the edge of a river

**source**, n. where something comes from

**irrigation**, n. the process of watering crops by using water from a river.

**crops**, n. plants grown for eating





Why is the Nile an important river for the Egyptian people?



The Nile is an important river for the Egyptian people because **it provides them with drinking water and it provides irrigation for crops.**

## The Nile River

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### Vocabulary

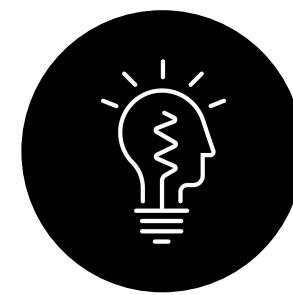
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What would happen to the rice fields near the Yellow River if the irrigation ditches were ruined?



If the irrigation ditches were ruined, the rice fields near the Yellow River \_\_\_\_.

## Huang He: The Yellow River

The Huang He, or Yellow River, found in China, is also used for irrigation of crops. Its name comes from the yellow **silt** in its water. Water from the river is **diverted** into ditches so that the river water can flow through to rice fields. Clearing out the ditches of weeds and twigs is **essential** in allowing the rice to grow, thus providing an **income** for farming families.

Some Major Rivers of Asia



### Vocabulary

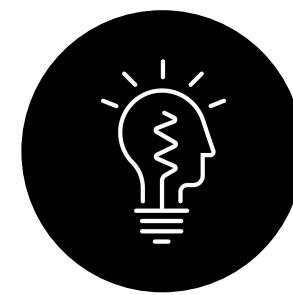
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**diverted**, v. shift something onto a different path

**essential**, adj. extremely important

**income**, n. money you earn





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What would happen to the rice fields near the Yellow River if the irrigation ditches were ruined?



If the irrigation ditches were ruined, the rice fields near the Yellow River **would not survive** (because they **would not receive** irrigation water).

Some Major Rivers of Asia



### Vocabulary

**silt**, n. tiny pieces of soil or earth carried by water in a river

**diverted**, v. shift something onto a different path

**essential**, adj. extremely important

**income**, n. money you earn



# Knowledge and stories are the anchor point for building language and literacy

- Can't teach vocabulary in a vacuum
- Can't teach comprehension strategies in a vacuum
- Knowledge-rich units, and narrative texts are strong anchor points for retention

Tricot, A., & Sweller, J. (2014). Domain-specific knowledge and why teaching generic skills does not work. *Educational Psychology Review*, 26(2), 265–283.  
<https://doi.org/10.1007/s10648-013-9243-1>



# Questions to ensure it's knowledge rich?

- How texts are chosen, modelled, and how then read and unpacked? Can students grapple with texts?
- Do texts connect over time?
- Are they rigorous in the content they dive into?
  - Is it everyday content students basically know? **Avoid this content.**
  - Is it vague, general or random? ☐ **make more rigorous and connected.**





# HORSHAM WEST & HAVEN PRIMARY SCHOOL

## TEACHING A UNIT

- . It was amazing to have a unit that was so thorough and detailed (and free!).
- . Having something so incredible pre-planned took a lot off the plates for teachers as most of the work had been done for you. We taught the Vikings unit during Term 2 to lessen our Literacy planning load. We knew students were getting a great unit of work and being engaged in higher order thinking, but the actual planning of lessons was reduced substantially. We are doing this again this term.
- . The units open themselves up for further exploration.



# Explicit Direct Instruction Lesson Components



REVIEW



ACTIVATING  
PRIOR  
KNOWLEDGE



RELEVANCE



CONCEPT/SKILL  
DEVELOPMENT





**READ ALOUD**

(Teacher or  
Student)



**INDEPENDENT  
READING**



**INDEPENDENT  
WRITING**



## A Young Boy's Dream

Ivar did not want to leave his homeland, but he longed to sail on one of these great ships. He had listened to the stories of the old sailors. He already knew how to find his way by using the sun and the stars as guides. And he knew what to do if his ship ever got lost at sea: The Vikings had noticed that birds at sea usually flew toward land. So, they took caged birds with them on their ocean voyages. If they became lost, the sailors simply released the birds—and followed them to safety.

Ivar imagined what it would be like to sail on a long journey. He knew that at the beginning of the voyage, the ship sailed close to the coastline and beached on land for the evening. The sailors would light campfires and hang big cooking pots over them.

When the ship sailed into the open ocean, the voyage would become more difficult. The sea might be dotted with icebergs. The waves could be fierce. While at sea, there were no cabins on Viking ships to protect the sailors from bad weather. The sailors would be cold and wet most of the time. But when the ship was **moored**, or at anchor, a tent-like awning could be used to provide shelter.



Teacher read-aloud



Why did oarsmen and other Viking sailors have to withstand cold and wet weather?



Oarsmen and other Viking sailors had to withstand cold and wet weather as

\_\_\_\_\_ .



Viking ships were sleek and fast, but while at sea they offered little protection to the people on board.

### Vocabulary

**moored**, v. secured in place using chains, ropes, or an anchor



### Building a Viking Ship

Ivar had listened to the stories of the old sailors. He already knew how to find his way by using the sun and the stars as guides. Ivar imagined what it would be like to sail on a long journey. He knew that at the beginning of the voyage, the ship sailed close to the coastline and beached on land for the evening. When the ship sailed into the open ocean, the voyage would become more difficult. The sea might be dotted with icebergs. The waves could be fierce.

Olaf’s crew also built Viking warships. Ivar saw one of these mighty vessels resting at anchor nearby. Olaf had carved a serpent-like creature on the warship’s curved **pro**w to frighten enemies. Ivar imagined the ship’s brightly coloured sail full in the wind.

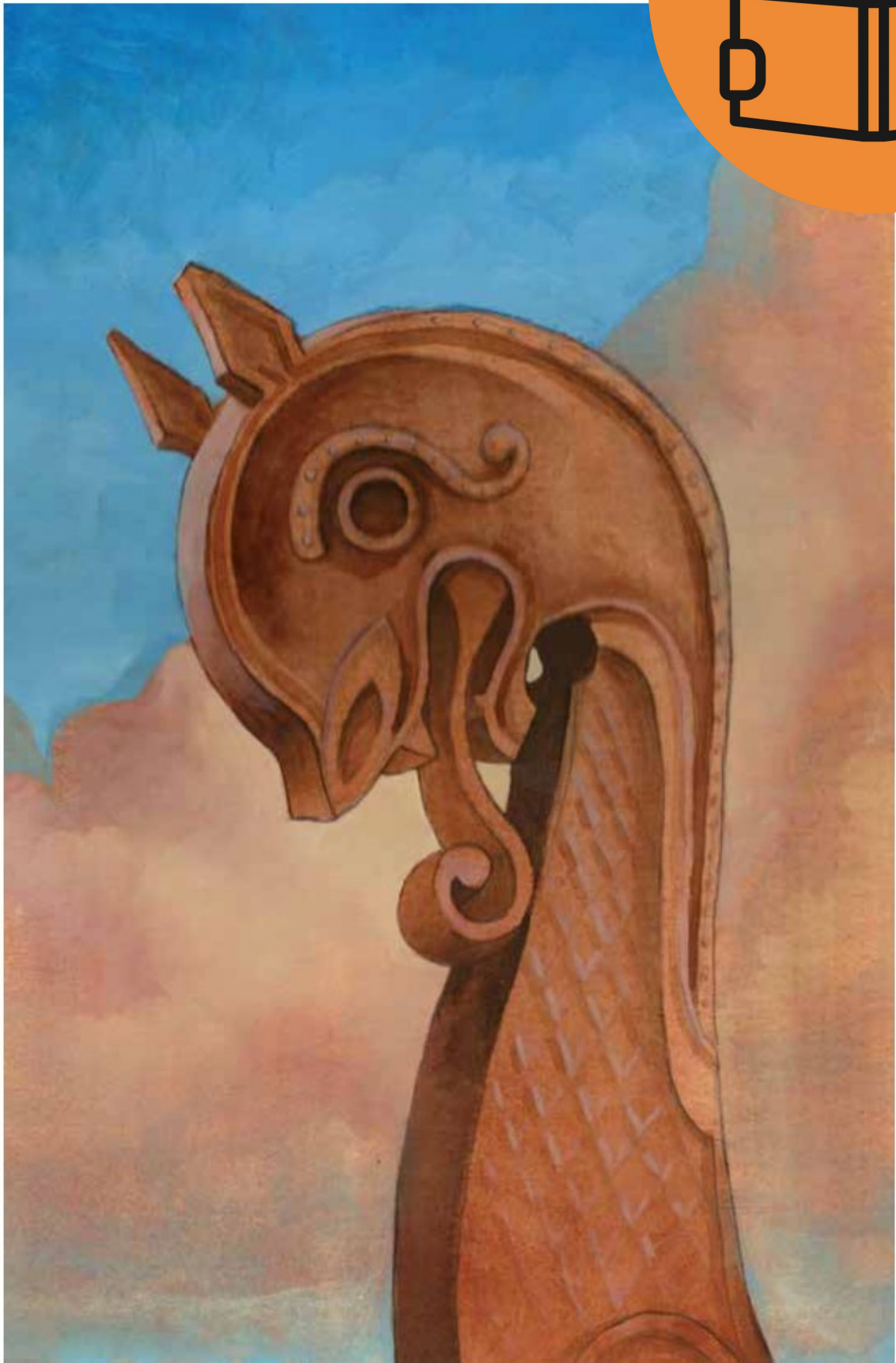
Right **n**ow, Olaf the Shipbuilder was carving a tree trunk into the long **ma**st that would support the cargo ship’s sail. All around him, workers were chopping and pounding the oak boards of the great ship.

Olaf shouted, “Ivar, what brings you here today?”

“My father has returned,” Ivar shouted back. “His longship needs repairs.”

“What a lucky time for the jarl to come home!” shouted Olaf. “His old shipmate, Sigurd the Storyteller, is visiting me now. He has just returned from Greenland. We will bring Sigurd with us. It will be a nice surprise for Tor.”

The storyteller was an important person to the Vikings. Not only did he tell stories and recite poems, he also brought news from faraway places.



Serpent-like or dragon-like creatures were carved on a ship’s curved prow.



Predict



Check it makes sense



Summarise

### Vocabulary

**prow**, n. the pointed front end of a ship

**mast**, n. a large vertical post on a ship that helps hold up the sails





## Building a Viking Ship

1. Why did the Vikings need excellent ships?
2. How did the Vikings navigate?
3. How does Ivar imagine and describe a typical Viking voyage?
4. How was Ivar able to describe a voyage if he had never taken a trip on a longship?
5. Why did Olaf the Shipbuilder carve a serpent-like creature on the longship's prow?
6. Why were storytellers important in Viking culture?



**Full  
Sentences**



**Capital  
Letters**



**Punctuation**



# Aussie Units – History and Geography





# **Link to Writing Instruction**

## **Example CFUs using TWR**



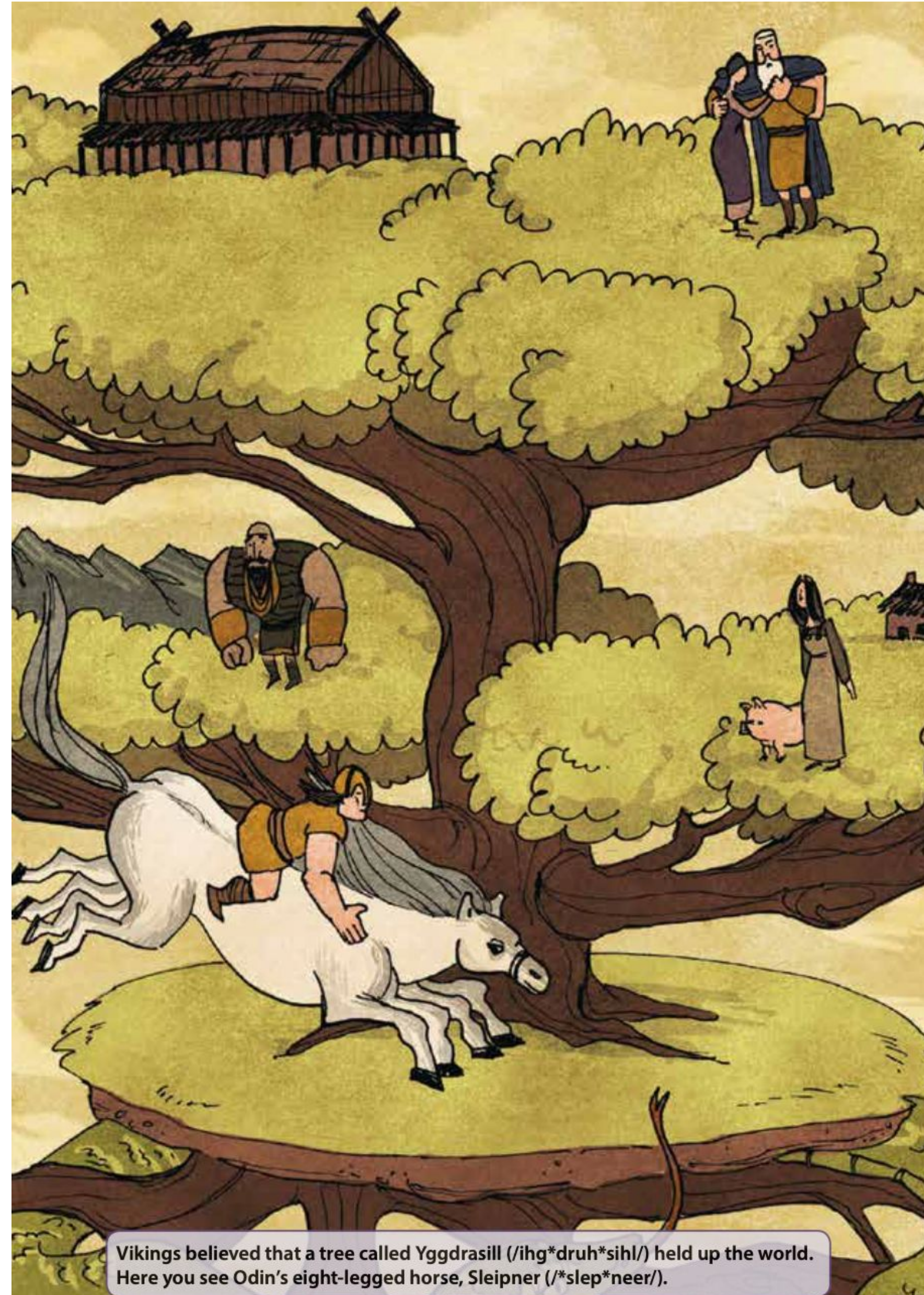


## Religion of the Vikings

The Vikings, who were also called the **Norse**, told stories called **myths**. These stories were meant to explain things about their world that they could not understand.

These stories were passed on from generation to generation.

Norse myths are not unlike the myths of ancient Greece, Rome or other ancient peoples. They tell about many powerful gods and goddesses.



Vikings believed that a tree called Yggdrasill (/ihg\*druh\*sihl/) held up the world. Here you see Odin's eight-legged horse, Sleipner (/slep\*neer/).



Teacher and students read together.



Vikings parents told their children stories about gods and goddesses ...



... because \_\_\_\_\_.

... , but \_\_\_\_\_.

... , so \_\_\_\_\_.

## Vocabulary

**Norse**, n. another term for Vikings, people who lived in Scandinavia long ago

**myth**, n. an idea or story that many people believe but is not true



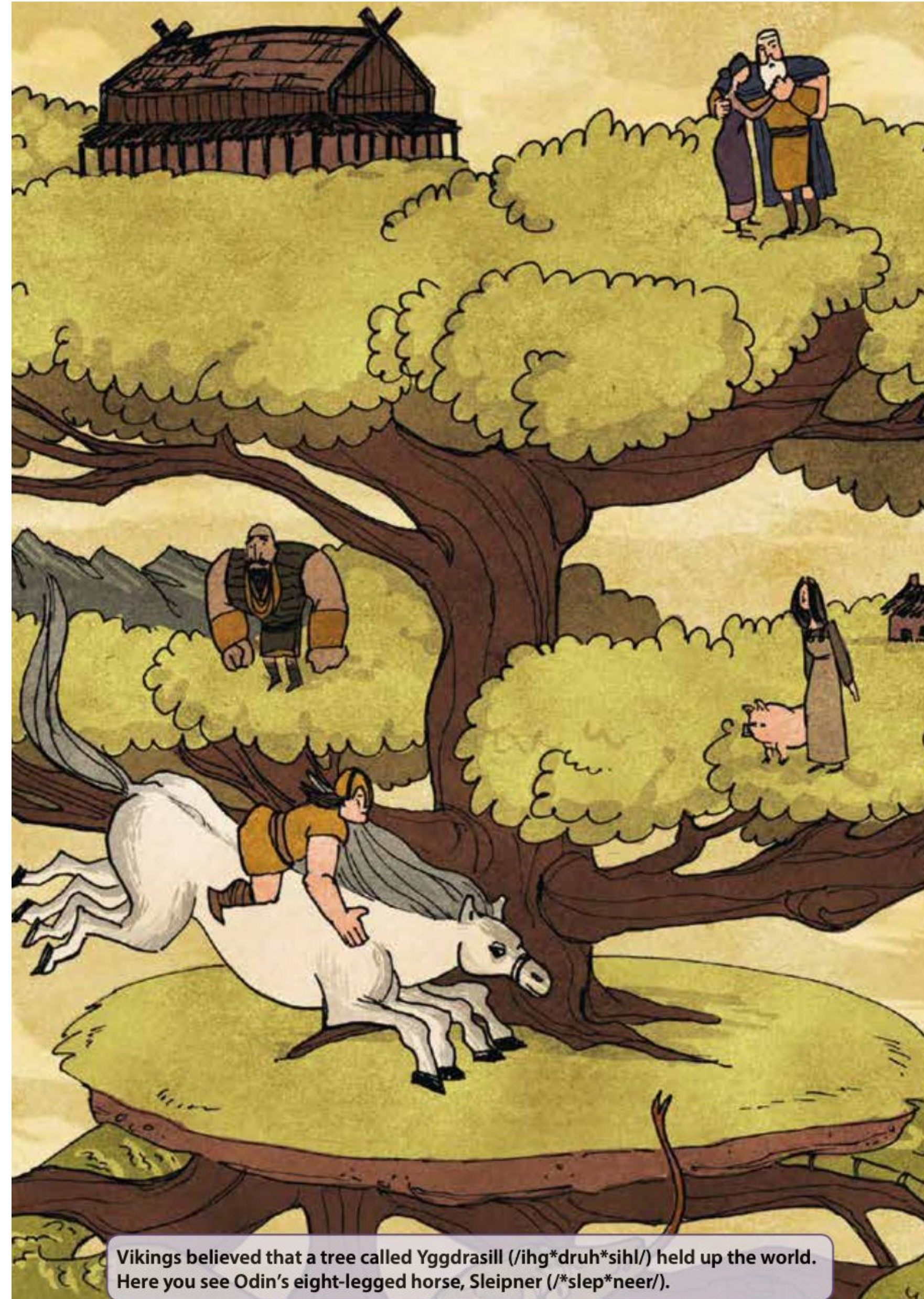


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Teacher and students read together.



Vikings parents told their children stories about gods and goddesses...



... because **they wanted to make sense of the world around them.**

... , but **these were myths.**

... , so the myths **were passed on from generation to generation.**

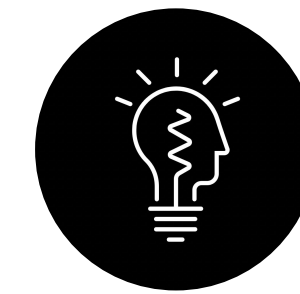
## Vocabulary

**Norse**, n. another term for Vikings, people who lived in Scandinavia long ago

**myth**, n. an idea or story that many people believe but is not true



## Expanding Sentences – Geography, Science, History



Kernel: The river has overflowed.

When? ..frequently.....

Adjectives? ..raging.....

How? ..abruptly.....

What? ..its shallow banks.....

**Frequently, the raging river has  
abruptly overflowed its shallow  
banks.**

### STEPS

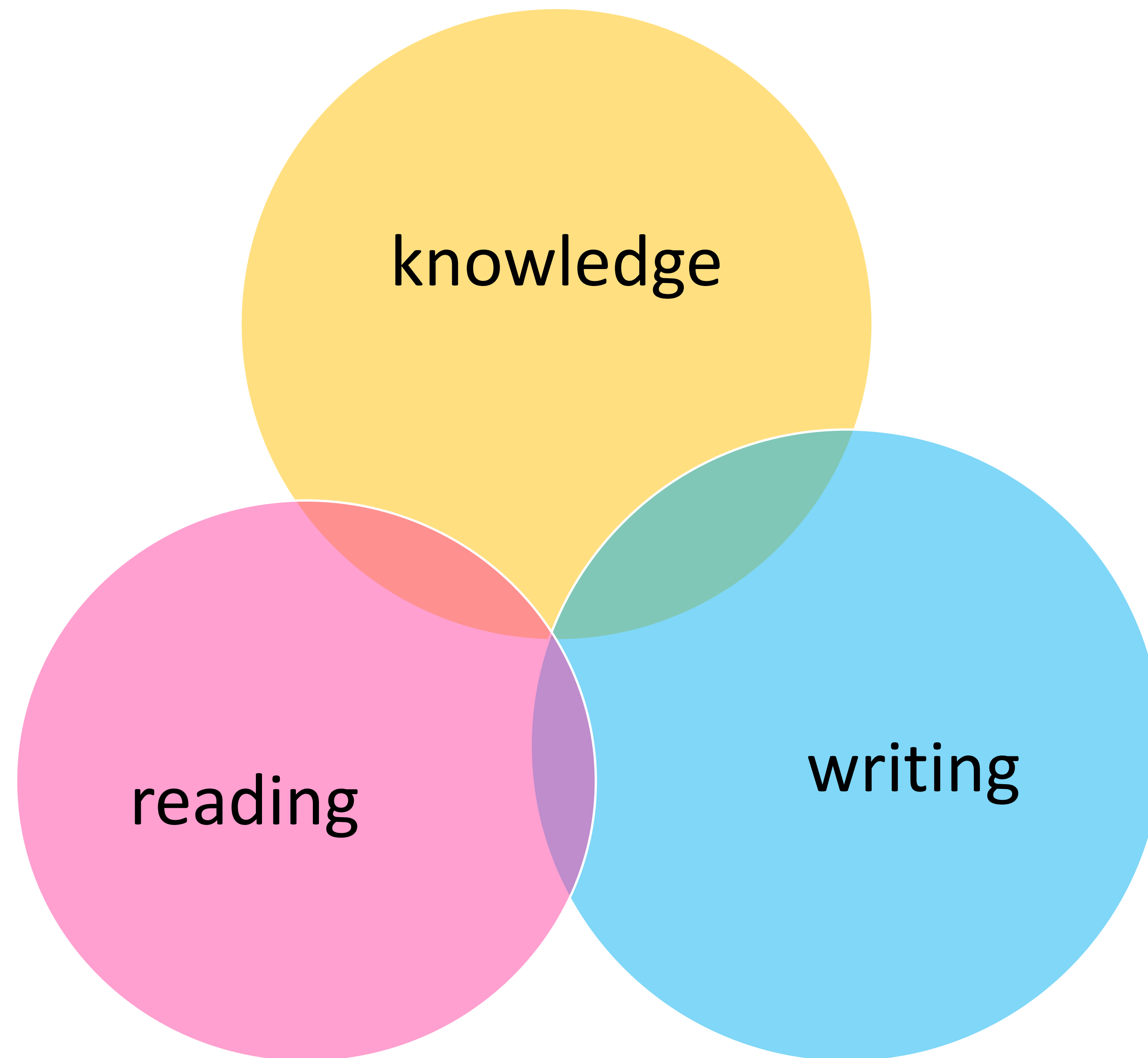
1. Read the sentence kernel.
2. Answer the 'Wh' questions.
3. Rewrite the sentence kernel and expand it using the 'Wh' questions.



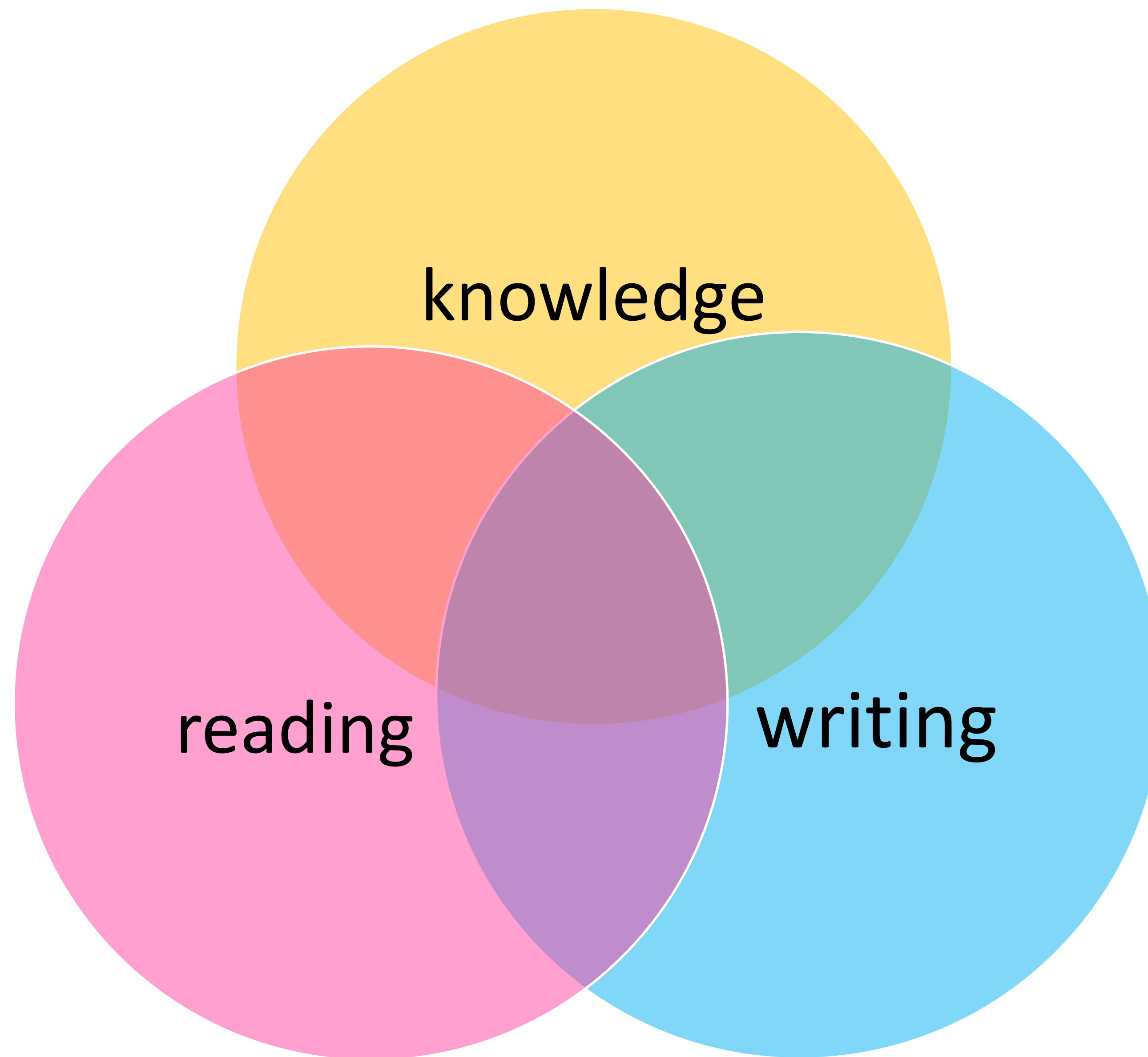
# The Writing Revolution Principles

- Students need explicit instruction in writing, beginning in the early years.
- Sentences are the building blocks of all writing.
- When embedded into the content learning areas of the curriculum, writing instruction is a powerful teaching tool.
- The content of the curriculum should drive the writing activities.
- Grammar is best taught in context of student writing.
- The two most important phases of writing process are planning and revising.









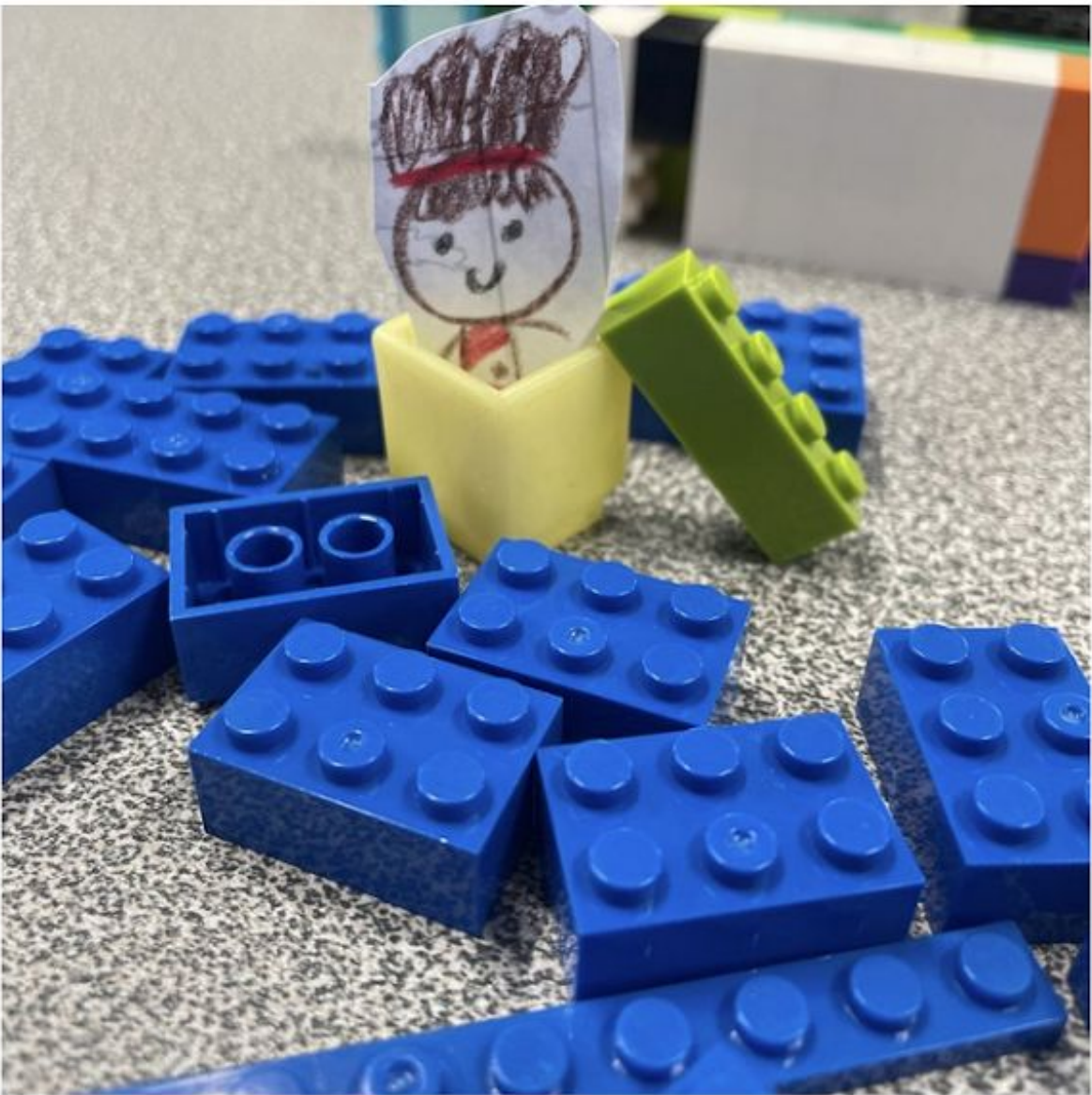




**Inquiry or Knowledge-Rich?**



HIGHLIGHTS FROM A MESOPOTAMIAN CITY BY SOME OF OUR YEAR 2 STUDENTS. FEATURING RIVERS, CANALS, FARMERS, PRODUCE, INFRASTRUCTURE, LIVESTOCK AND TRANSPORTATION



# COGNITORIUM

A NEW BLOG ABOUT TEACHING

A GROUP OF LEARNERS IN THE FIRST YEAR OF PRIMARY SCHOOL.



Mar 24, 2022

"I LOVE reading...  
Now" - Content that  
gets kids hooked on  
literacy



24 MAR 2022

1. People stopped moving from place to place because they discovered farming.
2. Mesopotamia was known as the "land between two rivers" because it was in between the Tigris and Euphrates rivers.
3. the floodwaters left behind rich <sup>soil</sup> soil.

#### ANCIENT TIMES and THE TWO RIVERS

1. After inventing farming, why did people stop moving from place to place?  
People stopped moving from place to place because they \_\_\_\_\_.
2. Why was Mesopotamia known as the "land between two rivers"?  
Mesopotamia was known as the "land between two rivers" because \_\_\_\_\_.
3. What did the floodwaters leave behind?  
The floodwaters left behind \_\_\_\_\_.
4. What kinds of jobs did Mesopotamians have?  
Mesopotamians had many different jobs including \_\_\_\_\_.
5. Why did Mesopotamian cities have walls surrounding them?  
Mesopotamian cities had walls surrounding them because \_\_\_\_\_.



There is a tributary going to the river. →

The rocks are to show people's houses. →

Irrigation of crops next to the river →

There is fish in the ocean →



Well done!



← The source of the river is at the base of the mountain

← trees and bushes along the river

← There is a bridge made from leaves next to the river

← People here somewhere why do people settle close to rivers?

← river going in to the ocean

← The mouth of the river where the river goes out to the ocean



**Teaching knowledge as part of reading comprehension is a game-changer**

**Our national or state curricula are not always conducive...** Learn to operate within and beyond the curriculum

**Knowledge-rich curricula**  
bring all students to the reading table





# Hear and read more about this...

Reid Smith [Check out Ochre](#)

Smith, R., Snow, P., Serry, T., & Hammond, L. (2021). The role of background knowledge in reading comprehension: A critical review. *Reading Psychology*, 42(3), 214-240.

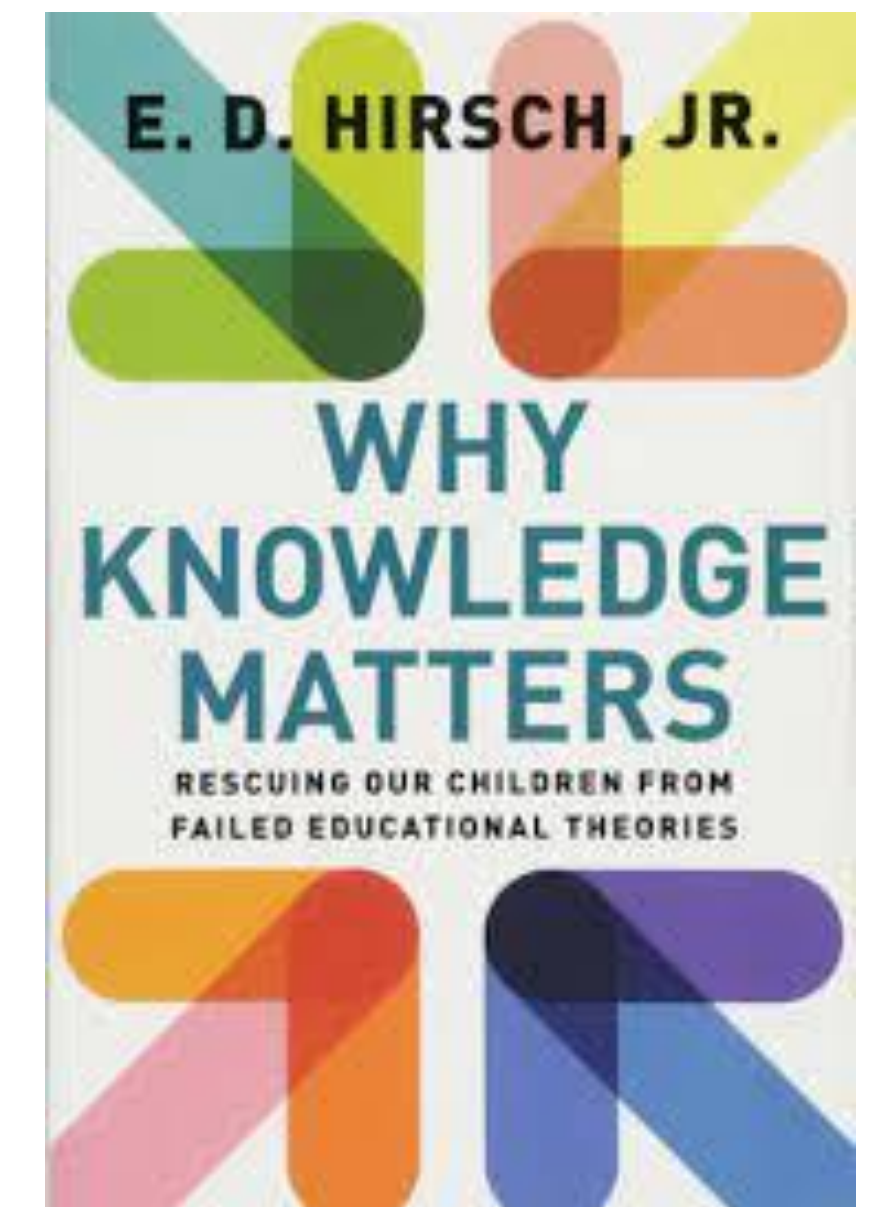
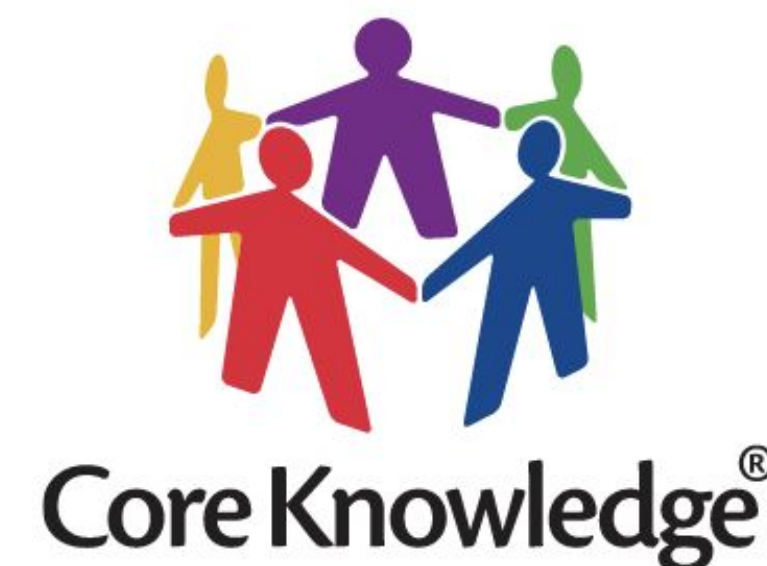
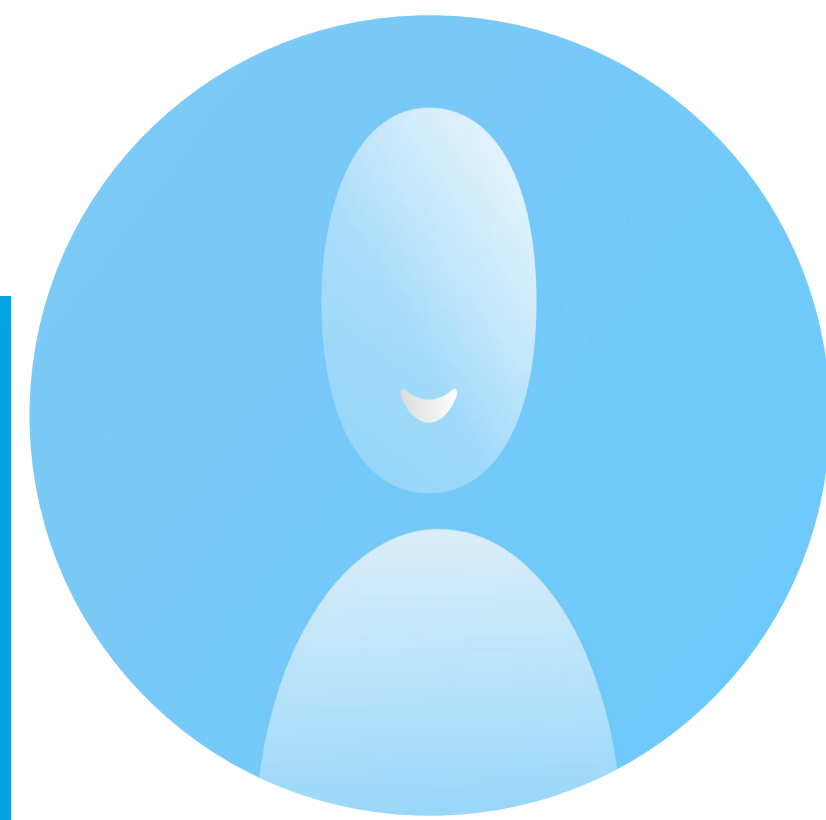
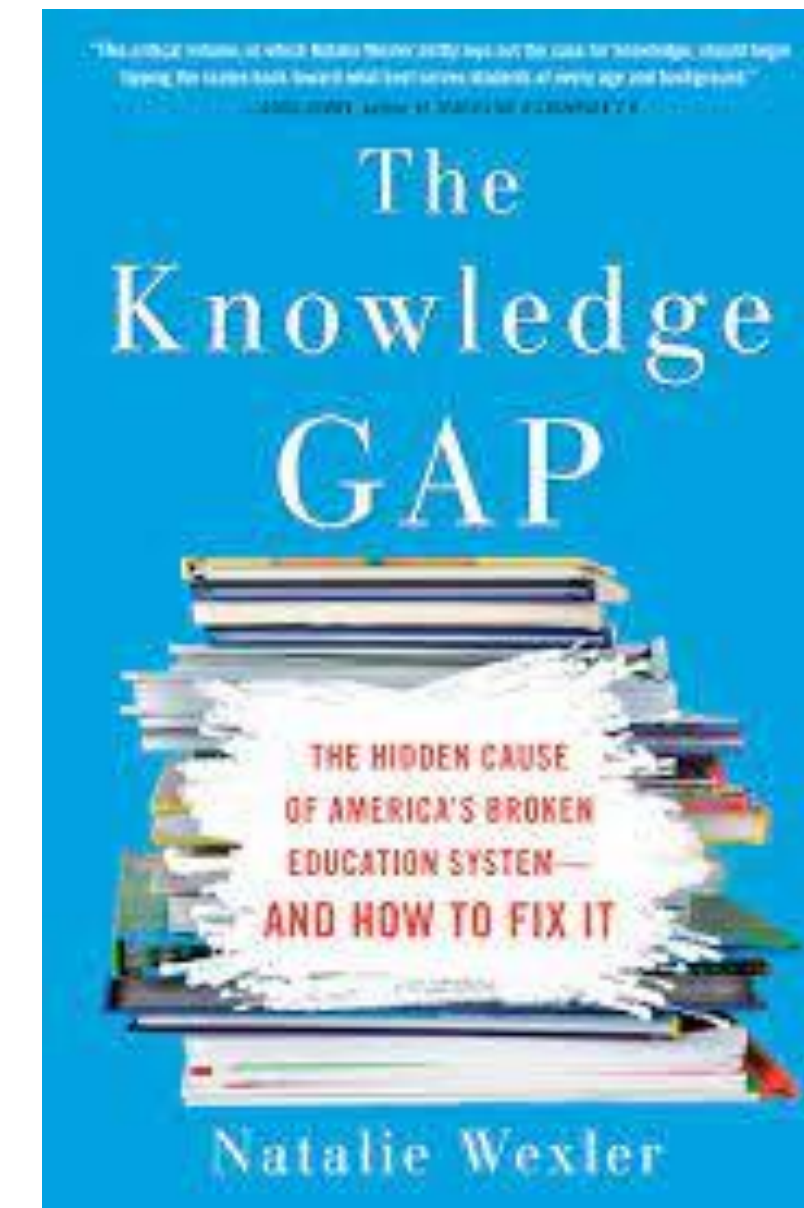
Resources on [Reading Science in Schools](#)

[Brad Nguyen](#) Presentation on TFE

Docklands Primary School

[Core Knowledge Curriculum Series™](#)

[www.curriculum.ELeducation.org/](http://www.curriculum.ELeducation.org/)





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NATHANIEL SWAIN, PhD



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