2 Language of learning

What do you know about 'big picture' learning? Your brain may have trouble taking on a whole concept or big idea at once … so you can 'nibble away' at a concept and build a model up over time. To do this, it often helps to be able to map out your learning journey so that you know where you are going.

OVERARCHING IDEA

- Patterns, order and organisation

GENERAL CAPABILITIES

Literacy

Critical and creative thinking

Personal and social competence

KEY INQUIRY SKILLS

Processing and analysing data and information

Communicating

THINK ABOUT LEARNING

- Which coloured hat should you 'wear' to think creatively?
- What's the difference between a 'fat' and a 'skinny' question?
- What can you do to make a good first impression?
- How do we communicate our feelings without using words?
- Who gave dinosaurs their names and why?
- What do emotions have to do with memory?

What does your learning journey look like?

YOUR QUEST

The three-floor thinking model

On what floor is your thinking?

First-floor thinkers gather information. It is on this floor that the groundwork is laid.

Second-floor thinkers process the information. On this floor, thinkers decide which information is relevant and which is not, and then try to make some sense of it. This may involve brainstorming and playing with the ideas, looking for patterns or analysing data.

Third-floor thinkers apply information. They understand what needs to be done and complete it. It is on this floor that tasks are prioritised and further ideas are synthesised or evaluated. This may also be the floor for assembling the parts and adding the creative finishing touches.

Are you on your first, second or third thinking floor?

INVESTIGATE, DESIGN AND CREATE

1 Select a project topic from one of the following and use the three-floor thinking model to gather, process and apply your information. Include information on the chemical and physical properties of your selected topic. Invent, design and construct a model of a device or method that would help to:
   (a) identify a range of common rock types
   (b) sort household wastes
   (c) recycle household wastes
   (d) test the effectiveness of detergents
   (e) test the effectiveness of toothpaste.

2 Use the three-floor thinking model to gather, process and apply information about an example of how science informs laws and guidelines about health or our environment. Present your findings as an advertisement that incorporates multimedia or animation to effectively communicate the relevant scientific understanding behind the law or guideline. You may select one of the following examples or identify your own example. Some examples of laws and guidelines influenced by our scientific knowledge include:
   - quarantine laws
   - food handling laws
   - bushfire safety guidelines
   - laws about the wearing of seatbelts
   - chemical storage guidelines
   - fire restriction day laws.

Problem solving with thinking hats

What's the problem? What are the facts? What other information do we need to find out? Does this new information help us to suggest possible solutions to the problem? Of these suggestions, which is the best idea and why?

1. What is the problem?

If there is a problem, this often suggests that something could be improved or made better. Your black thinking hat is a good hat to put on for thinking about this. (For more information on thinking hats, refer to *Science Quest 7*, chapter 2.)

Once you have pinpointed your problem, you can start thinking about what end results or outcomes you would like. It is sometimes also helpful to consider the hurdles that may impede your success and how high you will need to jump to overcome them!

It is often useful to write a problem statement to help you focus on the issue. For example, you may state 'who', 'does' (action verb) and 'what' for your problem. However you express it, it's important that you take ownership of the problem and phrase it in your own words.

2. What are the facts?

This is the time to put on your white thinking hat and move into your first-floor thinking room. It is here that you lay the groundwork. If you are accurate, persistent and thorough in this stage then your progress through the other phases is likely to be much smoother.

Start with what you already know about the problem. Ask yourself questions about who, where, when, why, how and what has been tried so far. You can document this initial information as a KND chart by listing what you 'know', 'need to know' and 'need to do' in a table or columns with these title headings.

3. After the facts

Once you are clear about what the problem is, you need to look at it from different perspectives. Remember that there is usually more than one side to a problem. When you are finding your information, consider different points of view so that you can better understand the issue. It is also useful to talk to others to find out how they feel about it.

During this phase, the information that you find may require you to modify or rephrase your problem statement.

4. What are some possible solutions?

Now it is time to move up to your second floor of thinking and put on your blue and yellow thinking hats.

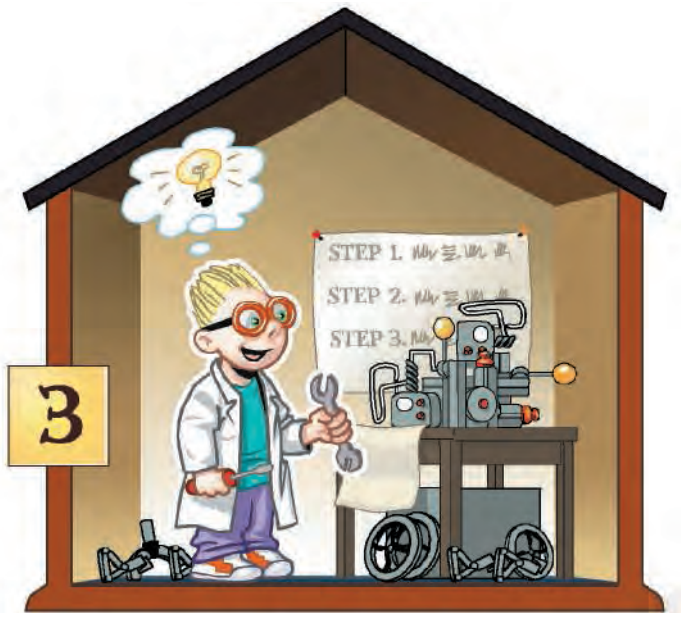
With your blue hat on, you can think about what you now know and try to make sense of it. You can use target maps to determine what is relevant to possible solutions and what is not.

Then you can put on your yellow hat. This is when you and your team can become a real 'think tank'. You may find thinking keys and visual thinking tools very useful in this creative part of problem solving. Some of the really useful keys are the 'What if' and the 'Forced relationship' keys. (See *Science Quest 7*, section 2.3 for more information on thinking keys.) Most brainstorming webs help you to develop your creative thinking. Brainstorming can be well recorded on mind maps, cluster maps or single bubbles.

5. Which is the best idea?

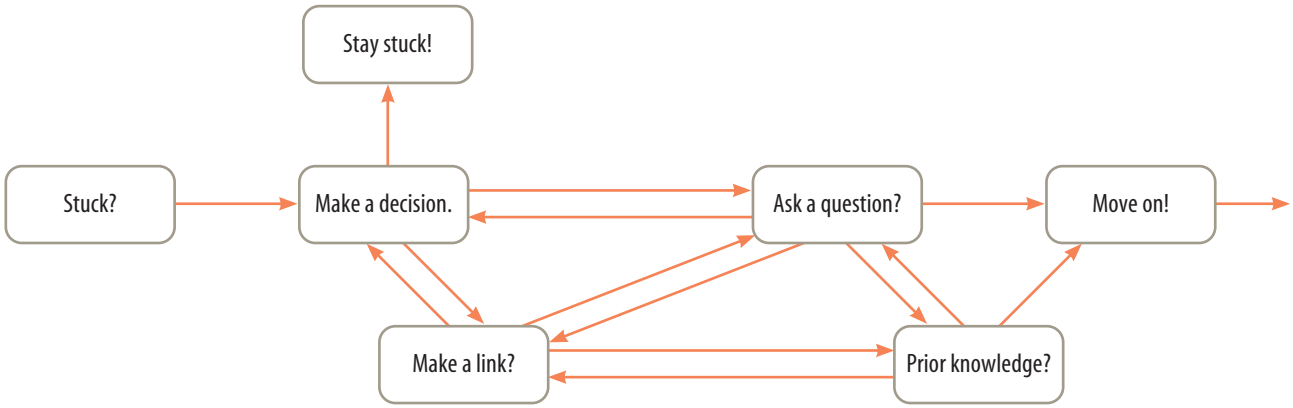
Your critical thinking becomes very important in selecting the best possible solution to your problem. Many of the **habits of mind** may help you to use intellectual behaviours that support the development of critical thinking. This is when task-specific graphic organisers such as priority grids can help you to structure your thinking, organise your ideas and stay focused.

Selection criteria can also be useful to help you to select the most appropriate alternative or idea. These may include consideration of its usefulness in achieving something, effects that it may have or how feasible it is.



6. Your action plan

You are up on the third floor now. This is where your green thinking hat can be put to good use. The time has come to divide and prioritise tasks and check your timelines. You can use thinking process maps to help both creative and critical thinking. You may use them to decide what needs to be done and then to order or sequence this within a time frame. Visual maps that may help you with this include timelines and flowcharts.



When you are working on trying to solve a problem, it is easy to get 'stuck'. The important thing is not to give up and to develop your own strategies to help you 'move on'.

UNDERSTANDING AND INQUIRING

REMEMBER

1 If there is a problem, what does this often suggest?

2 Suggest a way that a problem statement can be constructed.

3 Which thinking hat and thinking floor are used for fact finding?

4 Suggest how target maps can help you in the problem-solving process.

5 How can yellow thinking hats and visual tools help you to solve problems?

6 Which visual tools may be useful in helping you develop your action plan?

THINK, DISCUSS AND INVESTIGATE

7 (a) Appropriate use of language can also help you to clarify problems. Some personal problem statements may begin as shown below. For each of these, complete the sentence to describe a personal problem that may be experienced by someone your age.
- 'I feel angry when . . .'
- 'It worries me that . . .'
- 'I'd love to be able to . . .'
- 'I hate it when . . .'
- 'It stresses me that . . .'

(b) Select one of these problems and go through the problem-solving stages 2–6 shown on pages 33–4.

8 (a) In your team or class, brainstorm examples of problems that would fit under each of the problem categories below.
(i) What is unjust in Australia?
(ii) What takes too long?
(iii) What costs too much?
(iv) What is disorganised?

(b) Select one of these problems to research and put together a suggested action plan solution.

9 (a) Some believe that teaching people to think critically is the best training for informed and intelligent democratic citizens. Do you agree with this idea? Why? Show your responses in a SWOT analysis.

(b) Are asking questions, probing assumptions and seeking reasons valued in all cultures? Give examples to support your response.

10 (a) Brainstorm a list of at least 10 things that need improving at your school.

(b) For each item, suggest a reason why it needs to be improved.

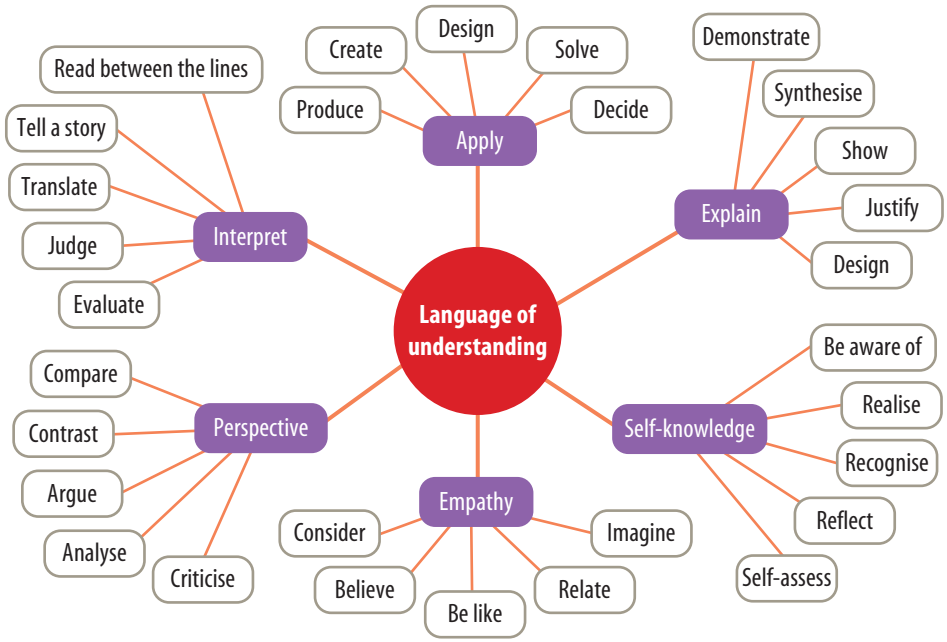
(c) Select one of these things to investigate and creatively problem solve.

11 Select one of the following categories of problems and then focus on one problem that is relevant to it. Use your creative problem-solving skills to come up with an action plan.
(a) Social problems (examples include drug abuse, bullying, racism)
(b) Environmental problems (examples include pollution, endangered species, bushfires, droughts, floods)
(c) Global problems (examples include terrorism, disease/health, national disasters)

work sheet 2.1 Thinking keys

The language of understanding

To understand something, you need to know more than 'what' and 'when'; you need to be able to explain the 'why' and 'how'. Evidence of understanding comes when you are able to apply or transfer the new knowledge to a different situation and are able to explain it.



Are you wearing your words?

The words that you use to communicate reveal a lot about you — your beliefs and assumptions, and your feelings about yourself and others. When speaking to others, try to use language that is inclusive (that doesn't make people feel left out and uncomfortable), avoid putting yourself or others down, refrain from labelling others and use proactive rather than reactive language. For example, instead of saying 'There's nothing I can do about it', say 'Let's think of the alternatives'.

Understanding language

When you are trying to make sense of words associated with understanding, it is helpful to divide them up into categories:

- **apply** — How and where can I use this knowledge?
- **explain** — Why is it so? How does it work?
- **self-knowledge** — What are my weaknesses? How do I best learn?
- **interpret** — What does this mean?
- **perspective** — Is it reasonable? Whose point of view is this?
- **empathy** — What are others aware of that I am missing?

An awareness and working knowledge of these types of thinking can increase the depth of your understanding.

Is your learning bag packed?

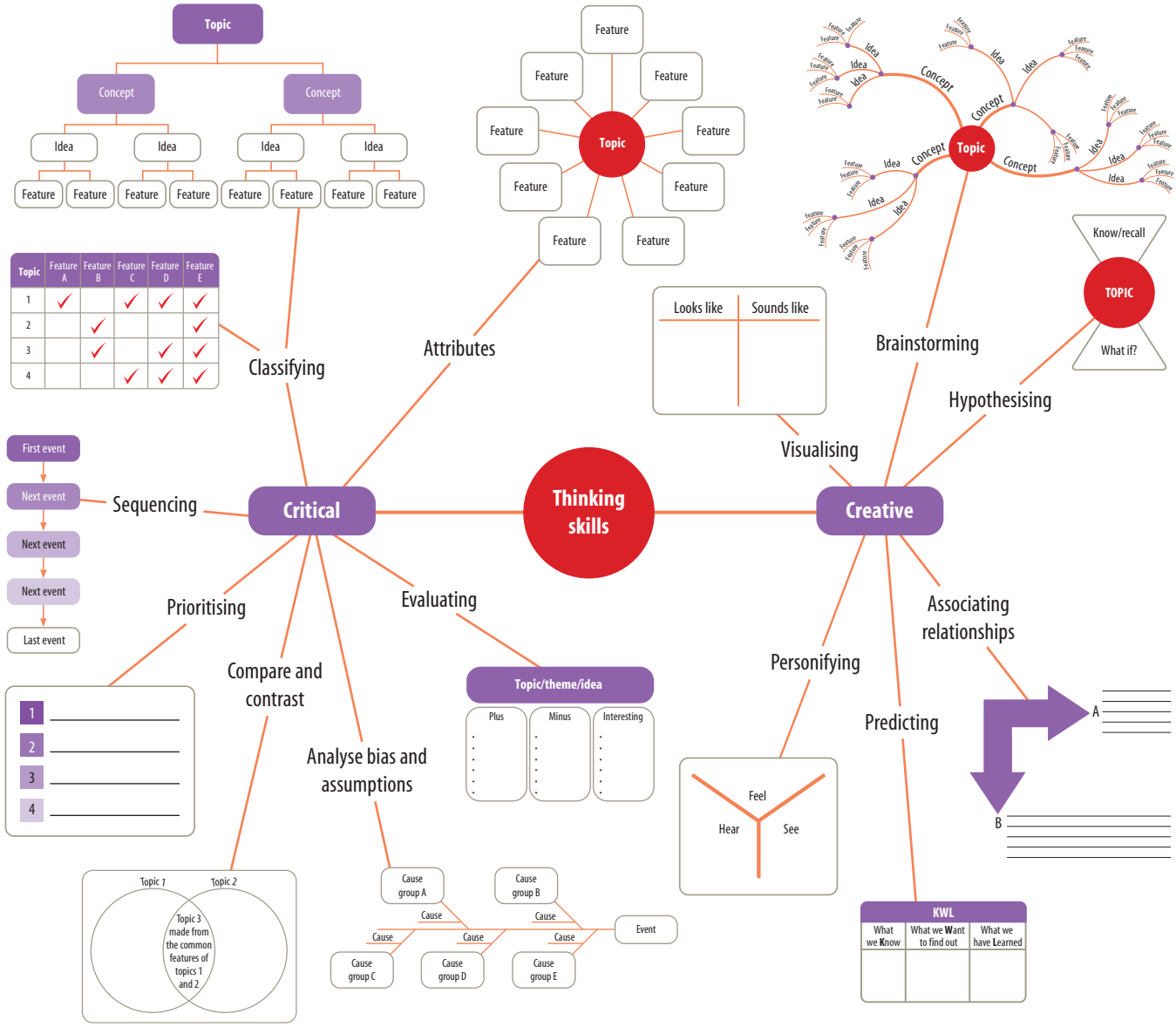
One of the goals of learning is to make information portable, so that it can be used in new situations and locations. Transfer of learning occurs when learning is taken into new contexts and applied in innovative ways.

At first glance, transfer of learning may seem to be difficult and out of reach. You may need to use your critical and creative thinking to make the task more manageable. Visual thinking tools can provide you with opportunities to practise these types of thinking.

'Fat' and 'skinny' questions

If you don't ask the right question, you won't get the right answer! 'Skinny' questions usually require only a brief, simple response. For example, 'Name your best friend' or 'Have you had science class yet?'.

'Who influences you and how?' is an example of a 'fat' question. These questions take time to think through. This is because they require deeper understanding. They need a lot of discussion, and explanations that include relevant examples.



UNDERSTANDING AND INQUIRING

THINK AND DISCUSS

1 Suggest ways that you can use language positively when you are communicating with others.

2 For each of the questions below, provide a response and suggest which type of understanding it belongs to.
   (a) Why is it illegal to smoke cigarettes in restaurants and other public areas?
   (b) What are the different points of view about stem cell research?
   (c) What would it be like to be a genetic engineer?

3 When you 'think about your thinking' you are being metacognitive. You can develop this type of learning by writing your thoughts and reflections in your learning journal. In your team, discuss specific strategies to help incorporate metacognition in your learning.

4 Australia is often described as being a multicultural country because it contains people from many different cultural groups.
   (a) In teams, identify examples of two different cultural groups in Australia.
   (b) Use a KWL tool to record what you already know, what you need to find out and what you have learned after researching about the different perspectives each of these cultural groups may have on science.
   (c) Suggest three 'fat' questions that would help you to deepen your understanding of the different cultural perspectives.
   (d) Share your findings with others in the class and create a class collage of the different cultural perspectives of science.

At first glance

Your understanding can be influenced by trust. When you meet someone for the first time, you may be lucky enough to have **rapport**; however, trust needs time to develop. Your verbal and non-verbal communication can influence not only how others see you, but also how you see yourself.

Rapid rapport

You meet someone for the first time and want to make a good impression. In fact, you *really* want to make a good first impression! Good rapport may be initiated by non-verbal signals such as eye contact, mirroring behaviour, posture or breathing. In fact, non-verbal cues are thought to make up about 65 per cent of your first impression. Only 35 per cent of your impact is due to verbal cues such as words, pace, inflection, pitch and volume.

If you want to develop rapport, then you can pay attention to another person's body language and subtly mirror it. For example, you could mirror their gestures, postures, muscle tension and facial expressions. You can also show active listening skills in both verbal and non-verbal ways.

When you meet someone for the first time, what sorts of things make a good impression on you? What sorts of things make a bad impression?

Listening skills

THE BIG BAD Ws

Are you a good listener? Do you really listen to what the other person is saying, or do you:

- want to interrupt?
- want to have your own conversation within (rehearsing what you want to say)?
- wait for an opportunity to make public only your own wishes and wants?

THREE Ps OF LISTENING SKILLS

When you are listening, do you:

- pause and not talk over the other person?
- probe what they are really saying? Are there generalisations, omissions or distortions in their comments? Do you need to ask questions to gain clarity about what they really mean?
- paraphrase what they have said to show that you have been listening and to develop rapport?

INQUIRY: INVESTIGATION 2.1

Another perspective

KEY INQUIRY SKILLS:

- evaluating
- communicating

Scientists often observe animals in the natural wild habitat. Some animals react aggressively to the presence of humans, although the scientists make painstaking efforts to be unobserved. Often the presence of humans changes the animals' normal behaviour.

DISCUSS AND EXPLAIN

1 Find out more about scientific observations of animals in the wild and summarise your findings into a PMI chart.

2 (a) State and justify your opinion about scientists observing animals in the wild.
(b) Suggest comments that a scientist involved may have regarding your opinion.

3 Use your imagination to write a story from the perspective of the animal being observed.

INQUIRY: INVESTIGATION 2.2

Active listening

KEY INQUIRY SKILLS:

- communicating
- processing and analysing data and information

There are many ways to help you develop your active listening skills. Some people use the PACTS method:

Paraphrase or play back what has been said in your own words.
Affirm or appreciate what has been said.
Clarify or check on specific details of what has been said.
Test options and prompt talk that tempts new ideas.
Seek out and be sensitive to the talker's feelings.

Practise the PACTS method:

1 Research a scientific discovery, summarising your findings into a cluster map or mind map.
2 In a team of three, decide who will be persons A, B and C.
3 Person C watches and records a PMI on what happens between person A and person B.
   - Person A talks about 'their scientific discovery' for two minutes, while person B listens.
   - Person B then paraphrases what person A has said, asks questions to clarify, and provides affirming comments to show what they particularly appreciated.
   - Person C shares their PMI chart with persons A and B and the team discusses it.

4 Now, swap roles, with person A watching and recording a PMI chart on what happens between person B and person C. Person B talks about 'their scientific discovery' for two minutes, while person C listens. Repeat the steps from the previous exercise.
5 Individually reflect on what you have learned, and how you could use this to become a more effective listener.

What are you saying?

Whether you are talking informally or giving a formal presentation, it is good to consider how you communicate your thoughts, emotions and attitudes. For instance, when you are having a conversation, do you map what you or the other person is saying in your mind? This can help to clarify and give structure to your shared dialogue.

If you were to look at a road map, you would find that locations are indicated by different fonts (for example, larger or coloured letters) and areas are indicated by colours or shading. In a conversation, your non-verbal signs indicate parts that have greater influence or meaning (for example, when you increase your volume or alter your tone). There are often hidden meanings (assumptions and beliefs) below the surface of language. Can you think of any examples?

UNDERSTANDING AND INQUIRING

THINK, DISCUSS AND CREATE

1 (a) Think about an occasion when you met someone for the first time. List the sort of things you noticed about them in the first few minutes.
   (b) Compare your list with others in your team. Use a Venn diagram to show any similarities and differences.
   (c) With your team, discuss the similarities and suggest reasons for your shared first impressions. Use a cluster map to summarise the key points of your discussion.
   (d) With your team, discuss whether the features of a good first impression are always the same or if they change in different situations.
   (e) Use a diagram, sketch or caricature of yourself to describe the first impressions that you give to others.
   (f) On the basis of this activity, are you likely to change anything you do or say prior to meeting someone you want to impress? Jot these ideas down in your personal learning journal and think about how you can go about incorporating them into situations when meeting someone for the first time.

2 (a) Score yourself between 0 and 4 on the following questions (where 0 is *never* and 4 is *always*).
   (i) I fidget when someone is talking to me.
   (ii) I finish other people's sentences.
   (iii) I talk over other people.
   (iv) My body language suggests that I'm not interested in what people are saying.
   (v) I interrupt when someone else is talking.
   (vi) I don't look at the speaker when they are talking to me.
   (vii) I think about what I will say next, rather than listening to the person talking.
   (viii) While listening, I sneak a look at my watch.
   (b) Comment on what you have learned from this quiz and what you could do to be a more effective listener.

Coded communication

Have you ever been misunderstood? It's not always because of what you say, but sometimes the way that you say it!

Turning on your transmission

Interpersonal communication is the transmission of information between two or more people. The sender encodes the message and the receiver decodes the message. Verbal communication involves speaking or writing the words whereas non-verbal communication relies on other methods.

VERBAL COMMUNICATION

Verbal communication includes not only *what* we say, but also *how* we say it. We often modify our verbal messages to match our perceptions of the intended receiver. You can also learn a lot about the attitudes of others not only by what they say or write, but also by interpreting how they communicate it.

NON-VERBAL COMMUNICATION

Non-verbal communication can be divided into three general categories: kinesics, personal space and paralinguistics. **Kinesics** involves the use of bodily movements or actions to convey a specific meaning or idea and is often referred to as body language. Personal space is the 'invisible' physical area surrounding your body that you regard as your personal territory. **Paralinguistics** involves *how* or the *way* that something is said.

INQUIRY: INVESTIGATION 2.3

Do you get the message?

KEY INQUIRY SKILL:

- communication

(a) Look at the body posture gestures and facial expressions on these two pages and select the attitude or emotion that best matches them from the following list.

curiosity	shyness
empathy	determination
enthusiasm	confidence
puzzlement	happiness
welcome	excitement
suspicion	scared
confused	anger
upset	rejection

(b) In your team:

(i) Write the terms in (a) onto different cards.
(ii) Shuffle the cards and place the pack face down.
(iii) Take turns to pick up a card and mime the emotion for other members of the team to guess.
(iv) Keep scores for each team member to see who gets the most correct.
(v) Brainstorm other examples of emotions or attitudes and write these on additional cards.
(vi) Repeat steps (ii) to (iv) with your new set of cards.
(vii) Were some emotions or attitudes easier to guess than others? Suggest reasons for this.
(viii) Suggest how this activity may be used to increase the effectiveness of your communication with others.

UNDERSTANDING AND INQUIRING

REMEMBER

1 Describe what is meant by 'interpersonal communication'.
2 What is the difference between verbal and non-verbal communication?
3 Is verbal communication related only to what we say? Explain.
4 Use a cluster map to show details of the three general categories of non-verbal communication.

THINK AND DISCUSS

5 (a) In your team, discuss examples of appropriate and inappropriate methods of verbal and non-verbal communication. Summarise your discussion into a visual thinking map such as a mind map or cluster map.
(b) Share a summary of your discussion with other teams.
(c) Back in your teams, reflect on similarities and differences of the discussions.
(d) Suggest what your class can do with the information gained and communicated during this activity.

INVESTIGATE, DISCUSS AND PRESENT

6 Identify three advertisements that include 'scientific claims' to support a particular product or practice.
(a) State the scientific claim.
(b) Investigate other resources to see whether there is unbiased evidence to support the claim.
(c) Describe any verbal or non-verbal communication that is used to support the scientific claim.
(d) Design a 'fair test' that could be used to collect evidence that may support or disprove the scientific claim used in the advertisement.
(e) Construct a PMI chart about the advertisement based on how effectively it provides data to support the scientific claim made about it.
(f) Based on your findings, in which ways could you improve:
(i) the advertisement so that it is more scientifically accurate?
(ii) the product so that it more effectively meets the scientific claim?

7 Find out more about kinesics, personal space and paralinguistics. Discuss with your team some rules or guidelines that could be used to make your communications with each other more effective. Present your findings and discussion summary as a communication guideline or rule book, cards, brochure or poster.

Telling tales

To be an effective learner, you need to develop both 'I' and 'we' learning. This means that you need to consider activities and strategies that tap into both your **intrapersonal** and **interpersonal intelligences**.

Intrapersonal and interpersonal intelligences deal with people — yourself and others. Some may suggest that these two intelligences are intimately related because you cannot fully know others until you know yourself!

Morals — learning how to live together

The idea of morals and ways of behaving may have originated from not wanting others to experience something that we would not like to experience ourselves. By identifying with others and treating them with the respect and care that we would want ourselves, we can become valued members of our communities. This can also lead to a happier life for both yourself and those around you.

One way in which morals have been passed down over many generations has been by telling stories. Many fairytales and fables have such messages woven into them.

Telling tales

Hans Christian Andersen (1805–1875) was one of the first known creators of fairytales and wrote more than a hundred stories. A number of his stories dealt with the main character feeling uncomfortable with themselves or wishing to be somewhere or something else. You may know two of his stories: *The Little Mermaid* and *The Ugly Duckling*.

The Ugly Duckling **is a story about a very ugly baby 'duck'. It is another story about viewing the world from different perspectives. The other ducks teased her and made fun of her because they thought that she was so ugly. As she got older, however, instead of growing into an adult duck, she became a beautiful swan. It was a pity that she didn't have the classification knowledge that you will have by the end of Year 8. She would have been saved a lot of pain and suffering — but then so would she have if the ducks had shown some empathy!**

Aesop's fables are further examples of stories with morals that suggest ways or behaviours to help people live and get on together. *The Crow and the Pitcher* is one example. Other examples of some fables and their morals are shown in the table below.

Examples of Aesop's fables and their morals

Fable	Moral of the story
The Boy and the Nettles	Whatever you do, do with all your might.
The Crow and the Pitcher	Necessity is the mother of invention.
	Little by little does the trick.
The Dancing Monkeys	Not everything you see is what it appears to be.
The Eagle and the Fox	Treat others as you would like to be treated.
The Four Oxen and the Lion	United we stand, divided we fall.
The Fox and the Goat	Look before you leap.
The Mule	Every truth has two sides.
The Wolf and the Kid	It is easy to be brave from a safe distance.

UNDERSTANDING AND INQUIRING

INVESTIGATE AND THINK

1 Aboriginal and Torres Strait Islander people have traditional stories that are passed from one generation to the next. Find examples of traditional stories:
   (a) used as a basis to understand their ecosystem
   (b) used to describe their special relationship with the land, native flora and fauna
   (c) about the formation of Australian landform features (for example, the Twelve Apostles, Cradle Mountain, Pinnacles, Flinders Ranges or Warrumbungles).

2 Use the 'thinking floor model' to collect information, organise it and then construct your own story on one of the following.
   - Why Australian flora and fauna are different from those of many other countries
   - Why kangaroos have a pouch and hop
   - The impact of cane toads on our native animals
   - Why southern Australian koalas have different sized ears from northern Australian koalas
   - How cutting down trees can affect the survival of other Australian organisms
   - How to encourage children (and adults) to appreciate, respect and take care of one of the following:
     — the diversity of living things on our planet
     — their environment
     — their bodies.

3 Identify a product that you would like to sell and develop an advertising campaign for it that includes claims from scientific perspectives and uses story telling.

Tell a tale

Did your parents read to you when you were little? Reading or being read to stimulates your imagination and takes you on an emotional journey. Stories can help you to learn about other people and how they communicate, express themselves, think and feel, and ways that they can support each other.

Stories can also help you to discover more about yourself. You may explore your strengths and vulnerabilities and your likes and dislikes. Stories can even help you to develop your imagination and creativity, and to think up your own ideas and be flexible in your thinking. This type of open-ended thinking can open up lots of new possibilities, rather than focusing on a single right answer. As a storyteller, you can provide a framework for your reader's imagination to flourish.

The Crow and the Pitcher **is a fable about a crow dying of thirst. The crow found a pitcher and excitedly flew down to drink from it. Sadly, when he got there, it contained only a very small amount of water at the bottom that he could not reach. He tried all sorts of ways to get to the water, but his efforts were in vain. Then he had a brainwave; he collected some stones and dropped them one by one into the pitcher. Finally, the water level rose high enough for him to drink it. His life had been saved.**

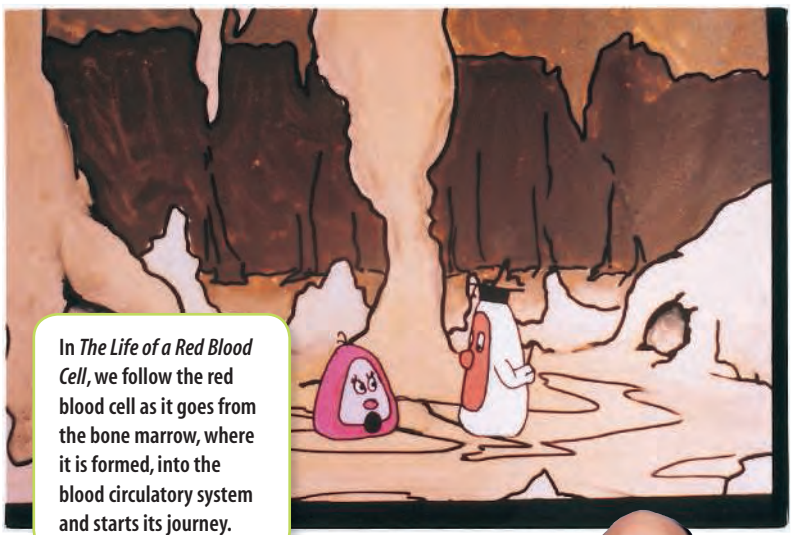
Cartoon quest

Telling the 'story' . . .

You may be wondering how telling fairytales and fables fits into the seriousness of learning science and being an effective scientist. No matter how clever you are or how much you can remember or understand, it is very important for you to be able to communicate your ideas to others effectively. Wouldn't it be great if you could have lots of fun at the same time?

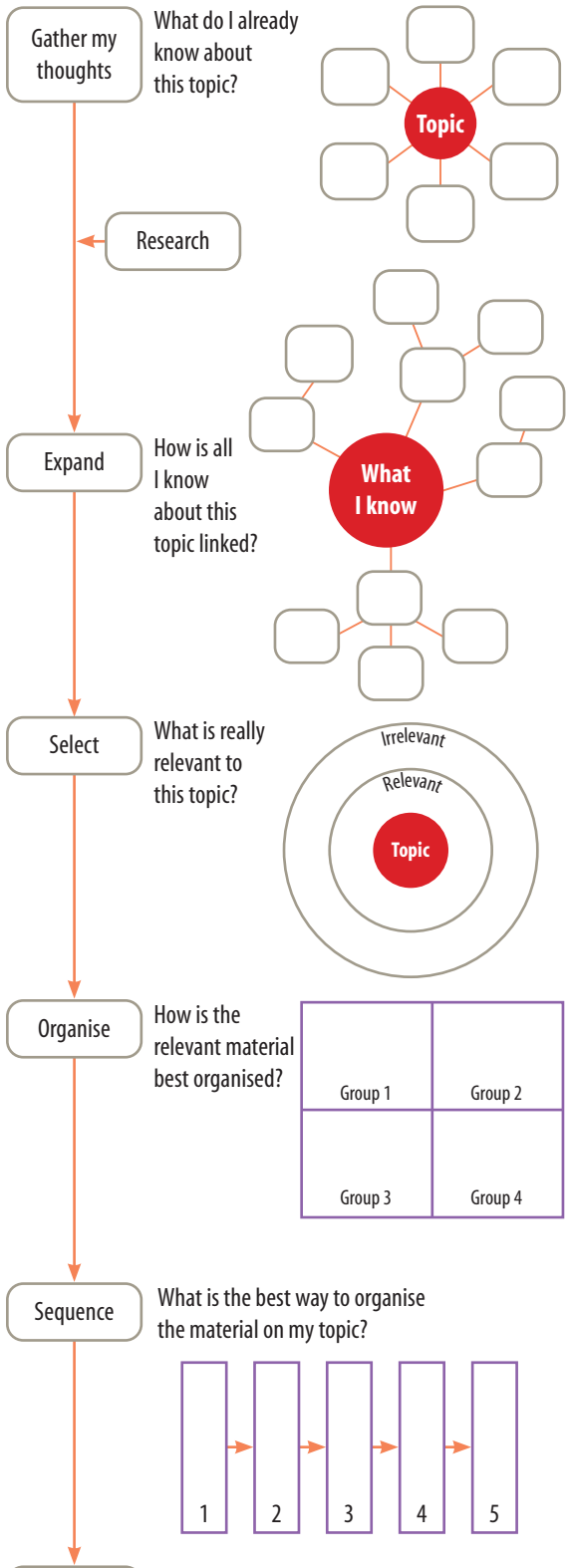
One man who has found a way to do this is Bruno Annetta, a filmmaker, graphic designer, actor and science teacher. Through his animated cartoons, Bruno can communicate scientific ideas effectively *and* share his excitement about the wonders of science. His cartoon *Foodchain* is shown on the next page and an image from his animation *The Life of a Red Blood Cell* is shown below.

'I've always found it easier to remember information by doing something with it that was personal to me. The basic idea for the film *The Life of a Red Blood Cell* came out of me trying to remember the circulatory system when I first encountered it in Year 9 (Form 3). I created the animation in my head and later turned that idea into a film.'



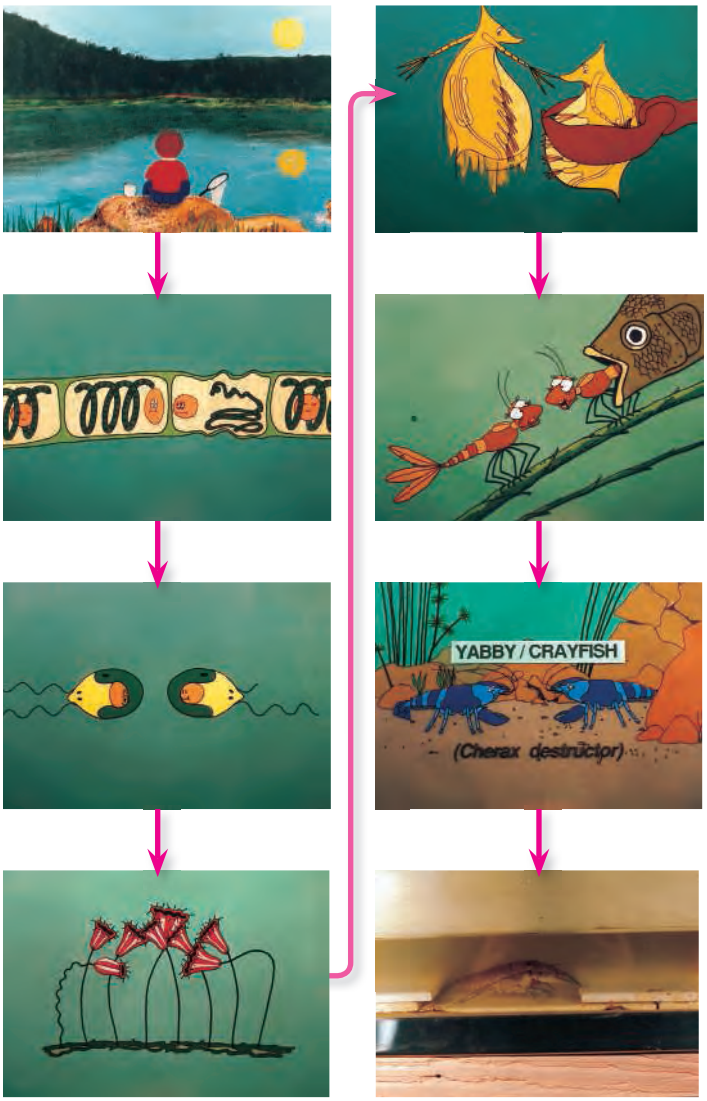
In *The Life of a Red Blood Cell*, we follow the red blood cell as it goes from the bone marrow, where it is formed, into the blood circulatory system and starts its journey.

'I believe that, through the use of animation, humour, music and story telling, learning can be fun and easy. I have used science in the making of animated films. An understanding of light, lenses and different coloured filters is crucial in exposing film correctly. I believe that through combining the sciences with the arts, one has a richer and more fulfilling life.'



You may find visual thinking tools useful in planning your story.

SCENES FROM *FOODCHAIN*



This is a musical and wacky animated look at a food chain from a freshwater ecosystem. It starts with a zoom in to a small section of pond in front of a child fishing. A series of cartoon character organisms are encountered and information is presented in the form of images, song and comical dialogue.

The zoom takes us to a microscopic view of *Spirogyra crassa* (commonly used filamentous algae). The 'crass' nuclei refer to chloroplasts, sugar production and aerobic respiration. They also allude to the fact that they are a 'duck's dinner'.

We are then introduced to *Chlamydomonas* (a mobile single-celled plant), which is the first organism of the food chain being investigated. Through their dialogue we learn about *Euglena* and are introduced to the terms 'autotroph' and 'heterotroph'.

Vorticella 'suck in' the *Chlamydomonas* and lead us to the second level of the food chain — the first-order consumer. Eight *Vorticella* clinging to a twig sing an opera tune — 'O sole mio'. They each represent a different note from an octave. Their scientific name is *Vorticella octava*.

The names and personalities have been carefully chosen to aid memory of each organism and their scientific name. *Daphnia magna* (water flea) are portrayed as 'toffy', upper middle-class women.

Damselfly nymphs feed on *Daphnia* and are portrayed as street smart, young girls. Incidental characters such as the Australian pygmy perch are introduced to allow for discussion to flow into food webs.

Yabbies are presented as 'true blue' Aussies and scavengers (scientific name — *Cherax destructor*). The story ends with one of the yabbies being caught by the child who we saw sitting on the bank at the start of the video. This finishes the food chain with 'man' as the last organism.

Videomicroscopy of the real organisms is provided at the end of the program, along with their scientific names.

UNDERSTANDING AND INQUIRING

REMEMBER

1 How can 'telling stories' help you in your learning of science and being a scientist?

2 Describe how Bruno Annetta shares his passion for science and learning.

3 In which part of the body is a red blood cell formed?

4 Use information in the *Foodchain* cartoon to answer the following questions:
   (a) Give a scientific name for filamentous algae.
   (b) What is special about *Euglena*?
   (c) Name an organism that eats *Chlamydomonas*.
   (d) How did Bruno use music to help you remember the species name *Vorticella octava*?
   (e) What is the common name for *Daphnia magna*?

INVESTIGATE, THINK, DESIGN AND CREATE

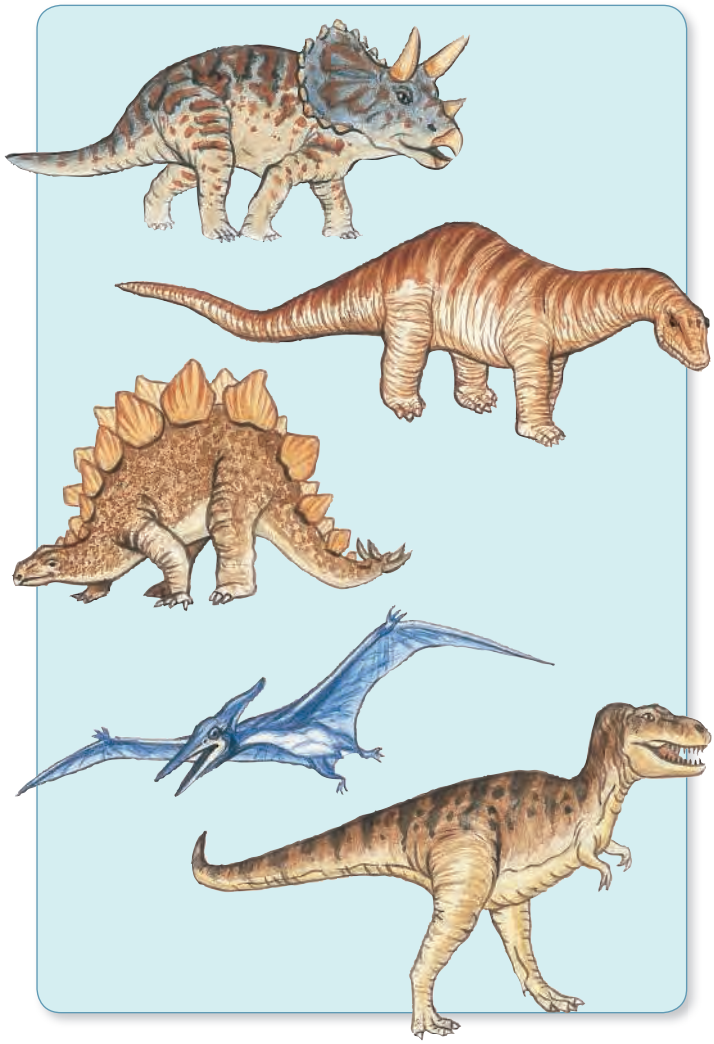
5 (a) Select one of the following topics for a story: skin cells, neurons, chloroplasts, nucleus, amoeba, fungi, muscle tissue, connective tissue, white blood cells, swine flu, solar-powered cars, oxygen, electronic optics, mitosis.
   (b) Brainstorm and list the key ideas or facts that could be included in your story.
   (c) Construct a storyboard or flowchart to show how your story will be sequenced.
   (d) Add more details (picture, songs, words) to your story.
   (e) Present your story to the class as a cartoon, PowerPoint presentation, Flash animation or storybook, or in some other creative way.

Unlocking meaning

Scientists use a language that may appear alien, but once you find some of the keys and can unlock the meaning of words, it starts to make sense.

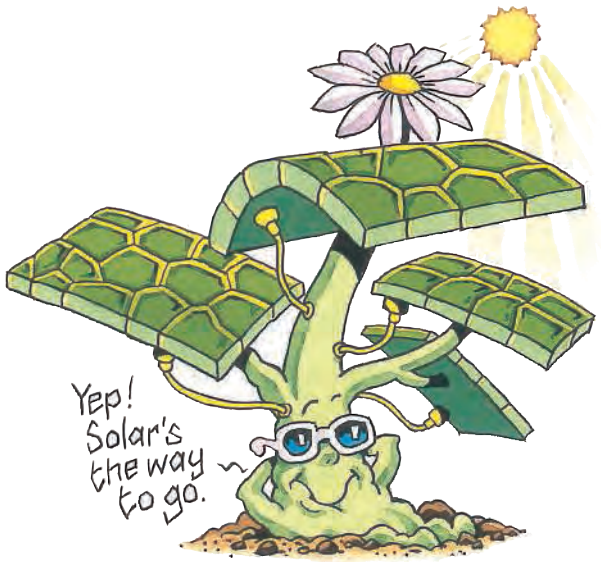
Name me a dino . . .

Tyrannosaurus, Pterosaurus, Stegosaurus . . . Did you ever wonder why the dinosaurs had such big names? Do you know what they mean? The term 'dinosaur' was actually decided on by the British anatomist and paleoontologist, Sir Richard Owen in 1842. *Dino* means 'terrifying' and *saur* means 'lizard'. Some dinosaurs were named for their unusual head or body features, others for their teeth or feet, or after a person or place.



Unlocking patterns

Many scientific terms, like others in our language, begin with a particular **prefix** and end with specific **suffix**. These can give you hints as to what the words mean. For example, the terms 'chlorophyll' and 'chloroplast' both begin with *chloro*, which comes from the Greek word *chloros*, meaning 'green'. Chlorophyll is the green pigment found in the chloroplasts of plant cells. This green pigment captures light energy so that plants can made their own food using the process of photosynthesis (*photo* = light and *synthesis* = to make). The presence of chlorophyll in the chloroplasts is the reason that they (and plants) appear to be green.



Leucoplasts (*leuco* = 'white') and chromoplasts (*chromo* = 'colour'), like chloroplasts, are plastids found in plant cells. Leucoplasts are not coloured as they do not contain coloured pigments. Chromoplasts are coloured and contain pigments other than chlorophyll. They are responsible for pigment synthesis and storage and are found in the coloured parts of plants, such as fruit and petals, giving them their characteristic colours. These pigments can be extracted and used as plant dyes.

Chemicals such as those in foods that you eat also have clues in their names that help you to work out what they are made of. You may have heard of glucose, sucrose and starch. Gluc*ose* and sucr*ose* are both sugars. Glucose is a *mono*saccharide

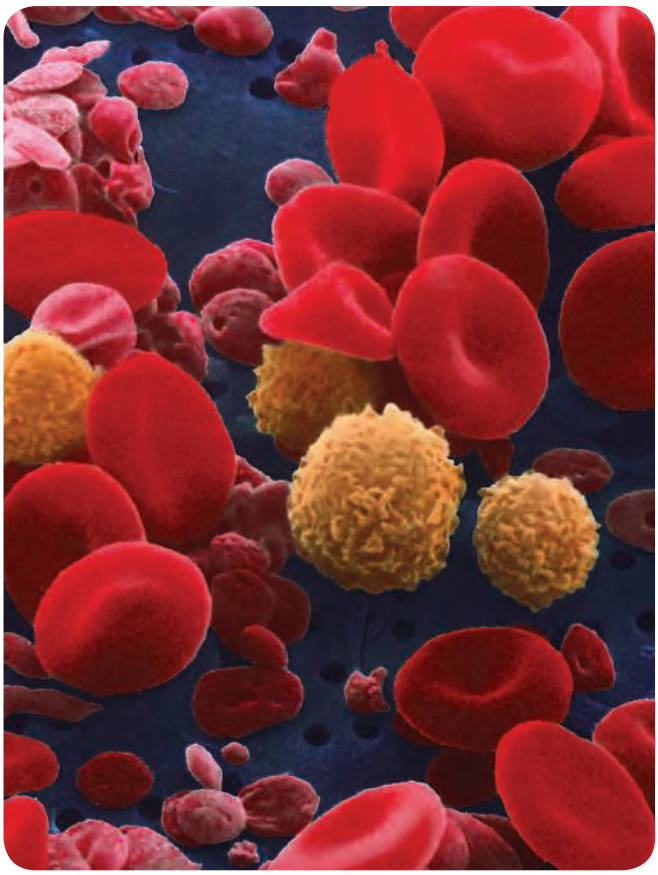
(*mono* = 'one' and *saccharide* = 'sweet'). Sucrose is a *di*saccharide and made up of two monosaccharides. Starch is a *poly*saccharide and is made up of many monosaccharides.

There are other prefixes that provide you with clues about size and number. A microscope (*micro* = 'small' + *'scope'* = view) and megafauna (*mega* = 'large' + *fauna* = 'animal') are examples of terms that indicate size in their names. Can you deduce which numbers are indicated in the following words: *uni*cellular, *bi*nary, *di*chotomous, *tri*pod, *quad*rant, *deci*mal, *centi*grade, *milli*pede?

'CELL SPEAK'

Later, when you study different types of blood cells, you will come across terms containing the suffix or prefix *cyte*. This is a variation of *cyto*, which means 'cell'. Examples of terms that you may come across include:

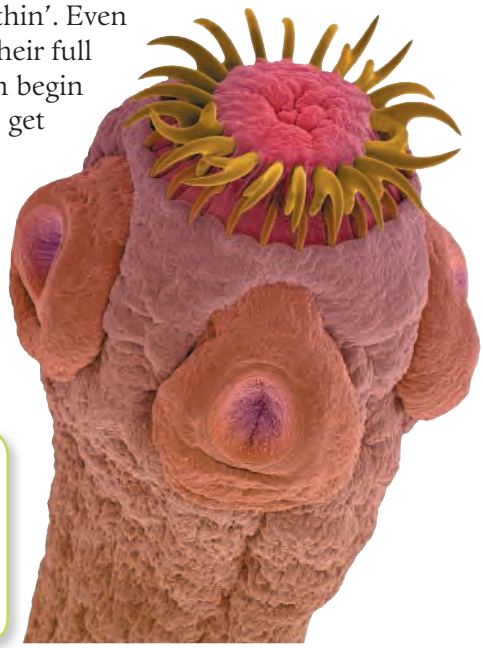
monocytes	cytosol	phagocytosis
phagocytes	cytoplasm	endocytosis
leucocytes	cytology	exocytosis
lymphocytes	cytoskeleton	
erythrocytes	cytotoxic	



Erythrocytes (red blood cells) and leucocytes (white blood cells)

INSIDE OR WITHIN

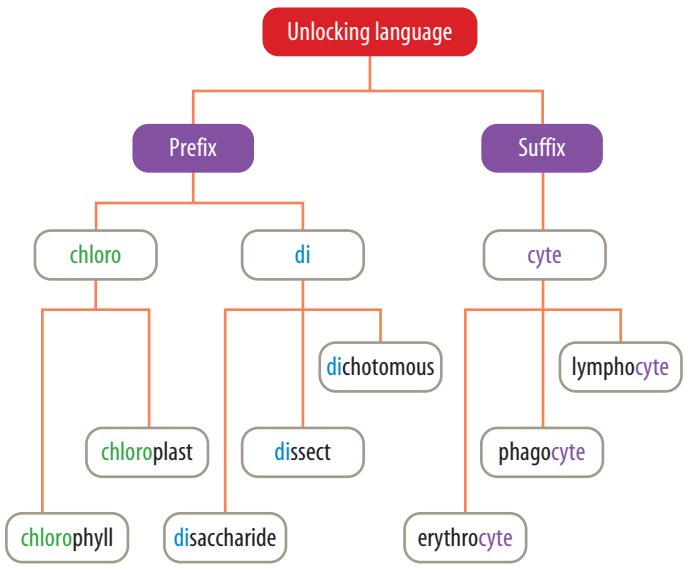
In science, you will learn about endoskeletons, endocytosis, endoplasmic reticulum, the endocrine system and endoparasites. The prefix *endo* in these words tells you that they all have something to do with 'inside' or 'within'. Even without knowing their full definitions, you can begin to see patterns and get an idea as to what they may refer to.



Tapeworms are endoparasites and live inside their host. You can see the hooks and suckers that it uses to attach itself to its host.

NUMBERS OR WORDS?

In science you also need to know the difference between two different ways of describing your data. One of these is *quali*tative and the other is *quanti*tative. Qualitative data describes your observations in words (describing the 'qualities' of the data), whereas quantitative data uses numbers (or 'quantities').



The prefixes and suffixes of scientific terms often give you hints as to what they mean.

UNDERSTANDING AND INQUIRING

REMEMBER

1 Suggest what type of animal may have *saur* in its name.

2 Outline the difference between the terms 'prefix' and 'suffix'.

3 Identify the shared meaning between the terms:
(a) chlorophyll and chloroplast
(b) monocytes, leucocytes, erythrocytes.

4 (a) Where are you likely to find leucoplasts, chromoplasts and chloroplasts?
(b) Describe how they differ.

5 Outline the difference between qualitative and quantitative data.

6 Suggest the suffix that sugars may share in their names.

7 Distinguish between monosaccharides, disaccharides and polysaccharides.

8 If you came across two words and one began with *micro* and the other with *mega*, predict what the difference between them would be.

THINK, INVESTIGATE AND DISCUSS

9 (a) Carefully examine the dinosaur names below and discuss with your partner any clues that may help you predict their meaning.
Triceratops, *Spinosaurus*, *Ceratosaurus*, *Heterodontosaurus*, *Pentaceratops*, *Microdontosaurus*, *Microceratops*
(b) Find out the meaning behind the dinosaur names above.
(c) Based on your findings, comment on any patterns and suggest groups you could divide them up into.

10 Find out about the life and scientific contributions of Sir Richard Owen in 1842. Report your findings in a timeline.

11 Research examples of Australian megafauna. Report on clues within their names that help describe what they may have looked like.

12 Find out what palaeontologists do, investigate their distinct ways of working and representing their specialised knowledge, and give an example of a contribution an Australian palaeontologist has made to our understanding of ancient life in Australia.

13 Find out prefixes for one, two, three, four, ten and hundred that have originated from Latin or Greek words. State an example of a scientific term that is used for each.

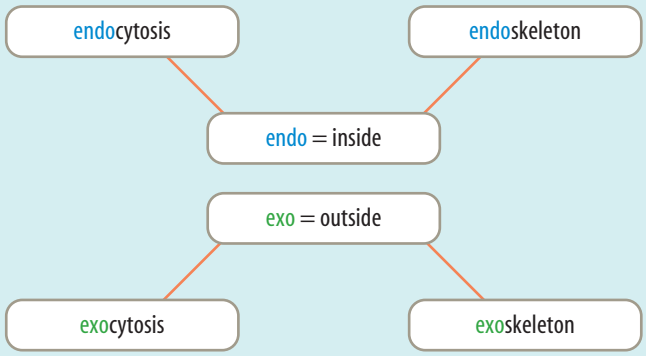
14 Find out the meaning of and similarities and differences between the following:
(a) microscopes, telescopes, periscopes
(b) millimetre, centimetre, nanometre, kilometre
(c) binary fission, dichotomous key, binocular
(d) *Tyrannosaurus*, *Pterosaurus*, *Stegosaurus*
(e) anatomist, scientist, palaeontologist
(f) cardiac, renal, pulmonary
(g) dehydrated, deoxygenated, denatured

15 Throughout history, coloured pigments from plants and animals have been used by humans. Find out about two plant and two animal examples. Identify the scientific names of the pigments and what they mean.

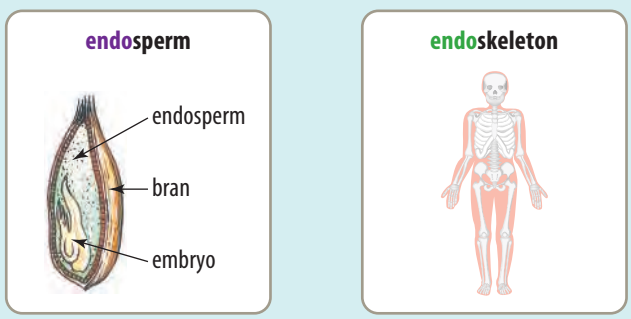
16 Chlorine is an element. Suggest what colour it may be.

17 Find out the history behind the names of the elements in the chemistry periodic table. Present your findings as a picture book.

18 Find out the definition and two key points for each of the 'endo' and 'exo' words shown in the diagram below.



19 (a) Find at least five examples of scientific terms that begin with the following prefixes: endo, bio, anti, chloro, thermo, bi, hetero.
(b) Create your own set of scientific terminology cards, using a particular colour for each prefix and adding a diagram or image for each that provides a hint of its meaning. The illustration below shows what your cards may look like.
(c) Design a game that uses the cards to teach students about scientific terminology. Include an instruction brochure or rule book with your game.
(d) Play your game and those of others.
(e) Construct a PMI chart for each game that you play.



An example of what your cards may look like

Total recall?

eBookplus eLesson

Teen brain
Take a fascinating look inside the teen brain.
eles-0224

Find out how you remember, to help you to remember how to remember better!

What is memory?

If a friend gave you her phone number, how long could you remember it without writing it down? While learning is about gaining new knowledge, memory is about retaining and then retrieving that learned information.

That is, for us to remember something, we have to be able to **record** the experience and **store** it in an appropriate part of the brain. If we are unable to **retrieve** or pull out that information, we have forgotten it.

Building memories

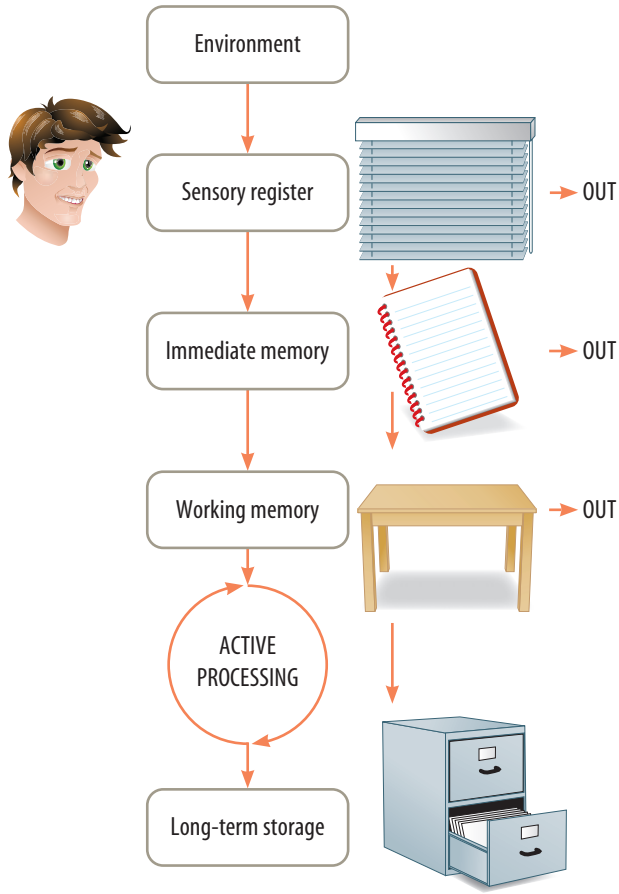
MODELLING MEMORY?

Scientists construct models to communicate ideas. Models can be concrete (for example, a plastic model of the brain) or symbolic (for example, a map or diagram). Models provide the opportunity for learners to bring previous knowledge into their working memory. This helps learners to attach meaning to, and make sense of, their new learning.

A model can be used to represent various stages in how information is processed by your brain. Shown at right is a simplified version of an information processing model. While this model has many limitations, it provides a framework that can be used to help you attach previous knowledge to new learning about the stages of memory.

FILTERING

What was that? You use your senses (for example, sight and hearing) to detect various stimuli in your environment. Incoming information is filtered through a system called the **sensory register** (shown in the model as venetian blinds). This system filters incoming information on the basis of its importance to you. Your sensory register involves your **thalamus** (a part of the limbic system of your brain) and a portion of your brain stem called the **reticular activation system** (RAS). The more important the information is to your survival, the higher the chance that it will get through for further processing in your brain.



The information processing model provides a simplified explanation of how your brain deals with external stimuli (information) from your environment.

REMEMBER ME?

Even if information has made it through your sensory register, it doesn't mean that you will remember it. You will remember information only if you have stored it in **long-term storage** (shown in the model as a filing cabinet). It is the job of your **hippocampus** to encode it and send it to one or more of the long-term storage areas in your brain. This encoding takes time and is usually done during deep sleep.

Memories are not stored as a whole or in one place. When you retrieve and reconstruct memories, storage areas distributed throughout your brain are activated. While long-term storage can be thought

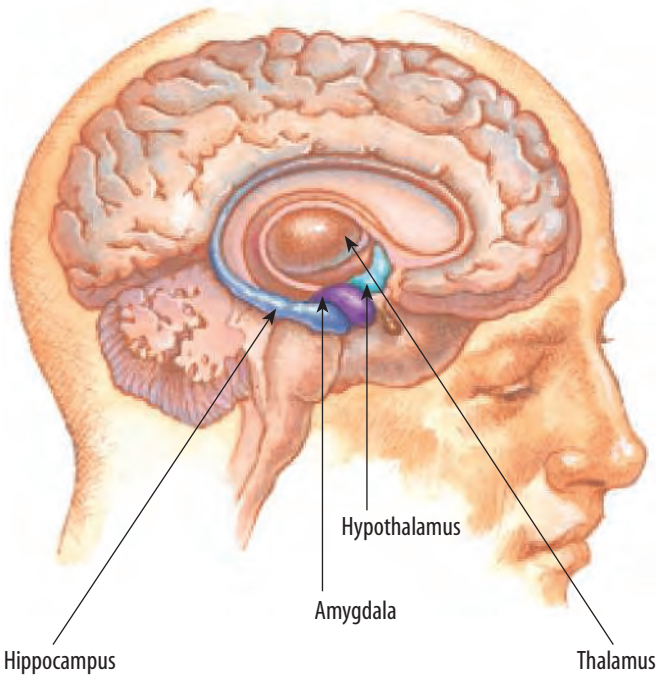
of as *where* your memories are stored in your brain, your long-term memory relates to the dynamic process of *sorting* and *retrieving* the information.

HOW ABOUT THAT!

Memory is not stored in just one place in your brain. It is currently thought that memories exist as patterns of connections at the synapses between the brain's neurons. To store a particular memory, nerve signals travel along a specific pathway through certain synapses. Each time this memory is remembered, nerve signals are reactivated to again travel along this pathway.

JUST VISITING?

Before any information is stored in long-term storage, it needs to pass through your temporary short-term memory. Examples of short-term memory include immediate memory (shown as a notepad in the model) and working memory (shown as a table in the model).



'Notepad' memory

Information that has made it past your thalamus moves to your immediate memory where a decision is made about what to do with it. Your past experience helps to determine its importance. An example of the length of time information will stay in this type of memory is when you temporarily remember a phone number and ring it. After this time the information may be lost or, if considered important enough, moved to your working memory.

'Working table' memory

It is within your working memory that information generally captures your focus and demands attention. There is a limited capacity (amount of information dealt with) and time limit for this type of memory. Research suggests that this capacity changes with age. Between the ages of 5 and 14 years there is a range of about 3–5 'chunks' that can be dealt with at one time; after this age it increases to about 5–7 chunks. This limited capacity is one of the reasons why you need to memorise songs, poems or other information in stages. By memorising a few lines at a time and repeating them (or rehearsing them) you are able to increase the number of items in your working memory. This is an example of chunking.

Studies have suggested that the time limit in working memory is about 10–20 minutes. This is often the amount of time you can spend on one activity. This time, however, can be influenced by interest and motivation. Both of these can have emotional elements and also involve a special part of your brain called the **amygdala**.

Remember to learn

Your past experiences influence new learning. What you already know acts as a filter to help you focus on things that have meaning and ignore those that don't. Your self-concept (how you see yourself in the world) is also shaped by your past experiences. It is your self-concept that often determines how much attention you will give to new information.

You can transfer things from your short-term memory into your long-term memory by rehearsing information (practising) and applying meaning to it. The two key questions asked in the decision of whether to move information into long term memory are:

- does it make sense?
- does it have meaning?

I don't understand! This is the type of comment made when a learner is having trouble making sense of new learning. Determining whether new

information 'makes sense' is related to whether the new information fits in with what you already know.

Why do I have to know this? Whether the new information 'has meaning' relates to whether it is relevant to you and whether you consider that the purpose of remembering it is worthwhile. You can improve the chance that you remember something by making connections between the new learning and your previous knowledge.

If both sense and meaning are present, there is a very high chance that the information will be sent to long-term storage.

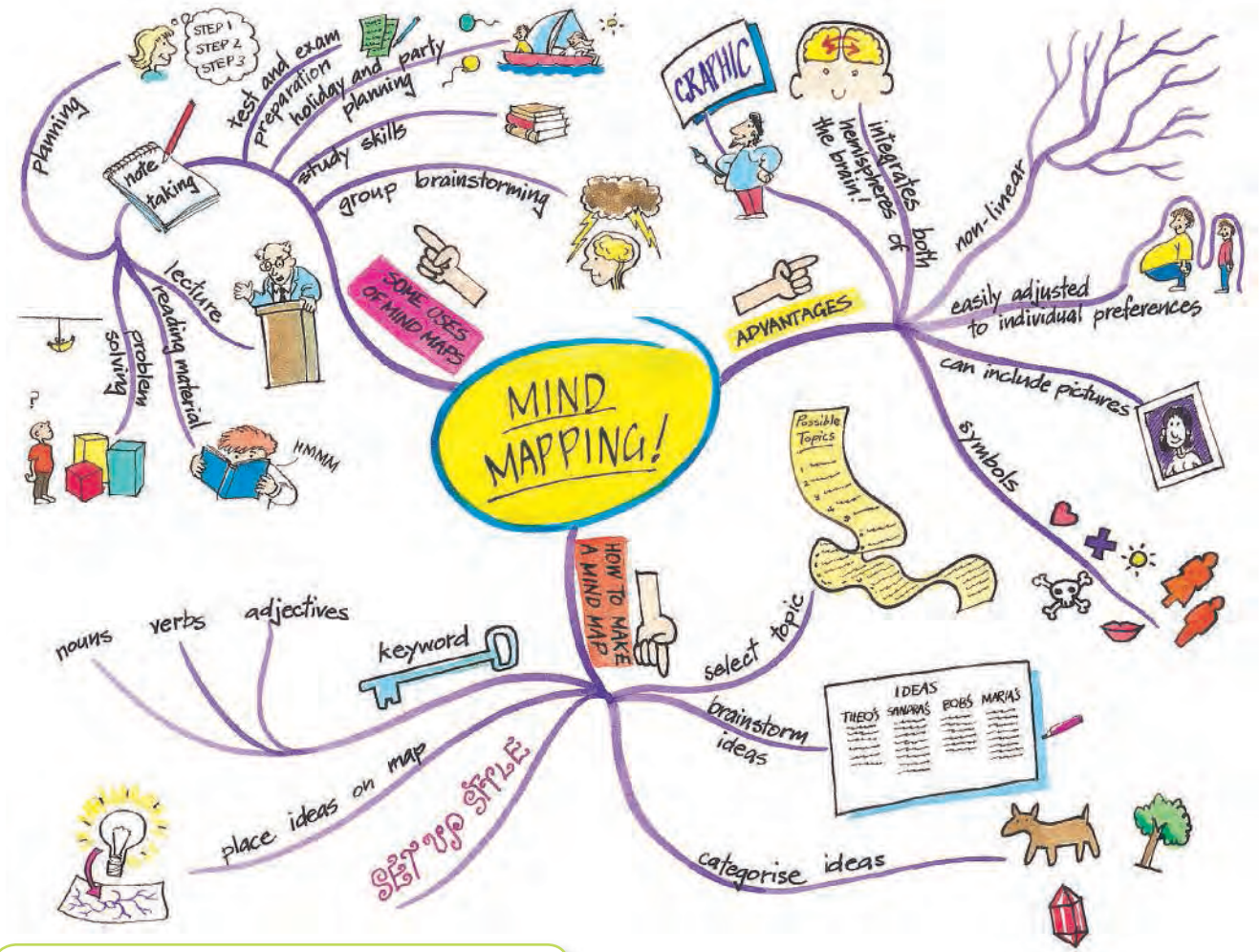
Is meaning present?		Is sense present?	
		No	**Yes**
Yes		Moderate to high	Very high
No		Very low	Moderate to high

Memory aids

Have you used a **mnemonic** in your learning today? A mnemonic is something that helps you to remember something else. It may take the form of a word, poem, story or image. Here are some examples of mnemonics:

- *Tell a tale:* Make up a story using the words or information that you need to learn.
- *Link-it:* Link the words or pieces of information together with images.
- *First letter:* Acronyms use the **f**irst letters of the words to make a new word. The example below shows how this can be used to help you remember some of the different memory systems for different types of learning:

Spatial memory
Procedural memory
Episodic memory
Working memory
Semantic memory



Mind mapping can help you find sense and meaning in your learning.

Mind mapping

Mind maps help create memory (learning) in a way similar to that of the brain by presenting information in a visual and connected form. Mind maps contain information in a predigested form that the memory can most easily assimilate and access.

WHY USE THEM?

Mind maps appeal to the right side of the brain, which processes colours, relationships, pictures and symbols. Using mind maps can increase your understanding of information and boost your recall of it dramatically.

UNDERSTANDING AND INQUIRING

REMEMBER

1 Give two reasons scientists use models.
2 What is the key role of the sensory register in the information processing model?
3 Identify the part of the brain involved in transferring information from short-term memory to long-term memory.
4 Outline the difference between long-term storage and long-term memory.
5 State the approximate capacity and time limits of working memory.
6 List the five different memory systems described in this section.
7 What is a mnemonic? Give an example.
8 State the two questions 'asked' to determine whether information moves into long-term memory.
9 Suggest the advantage of traumatic or emotionally charged events being remembered more deeply.

INVESTIGATE, THINK AND DISCUSS

10 Outline some research on chemicals that can affect memory.
11 Get a pencil and paper and then concentrate on the number below for 7 seconds. After 7 seconds, look away and write the number down. Did you get it right? Compare with others in your team.

5167340

Now repeat the procedure again with the number below. Did you get it right? Compare with others in your team. Did you get the same results for each number? Discuss your results with your team. Suggest a reason for any differences between results.

3847918362

12 Although we all use the same senses to collect information from our environment, they do not contribute equally to our learning. Learners develop preferences for certain senses over others. This is where terms such as 'visual', 'auditory' and 'kinaesthetic' learners originate.
(a) Research each of these and develop a set of questions that can be used to determine which preferences you and others in your class have.
(b) Discuss the impact that these differences can have on your learning.
(c) Suggest how you can use this knowledge to be a more effective learner.
13 Find out the possible effects of the following chemicals on learning: adrenaline, phenylalanine, norepinephrine, calpain and choline.
14 Find out more about memory drugs. Construct a PMI chart to summarise and share your findings.
15 Write a newspaper article, cartoon or web page on ways to improve your memory.
16 Find out more about research on memory and chemicals that may be used to enhance or erase it. Organise a class debate on one of the following statements.
(a) Drugs that have an effect on memory should be illegal.
(b) Everyone should have access to drugs that erase memories.
(c) Research on drugs that alter memories should be stopped.

INVESTIGATE, CREATE AND PRESENT

17 Find out more about the information processing model; then, in teams of 8, discuss how you could act it out. Include the following roles: sensory register, immediate memory, working memory, long-term storage (two people), incoming information (three people).
18 Research the structure and function of the thalamus, amygdala or hippocampus and construct a model to communicate your findings to others.

eBookplus

19 Use the **Memory games** and **Brain games** weblinks in your eBookPLUS to test your memory and learn more about the brain and nervous system.
20 Learn how your brain controls all your thoughts, actions and feelings by completing the **Brain control** interactivity in your eBookPLUS. **int-0010**

Venn diagrams

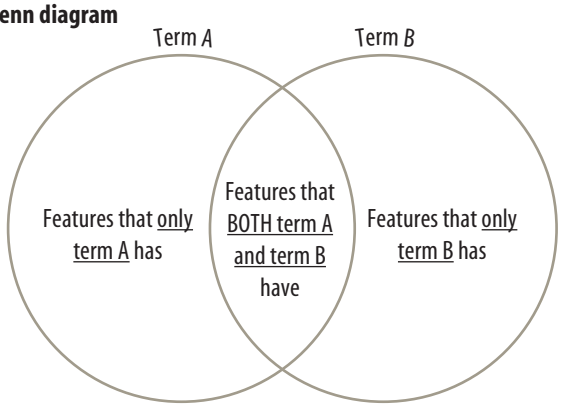
1. Draw two circles that overlap in the middle.
2. Write one of the words that you are comparing above each circle.
3. Write in the things that they have in common in the overlapped middle section.
4. Write the differences between them in each of the non-overlapped sections.

how to ...?

why use?

To show similarities and differences between two separate topics, terms or ideas

Venn diagram

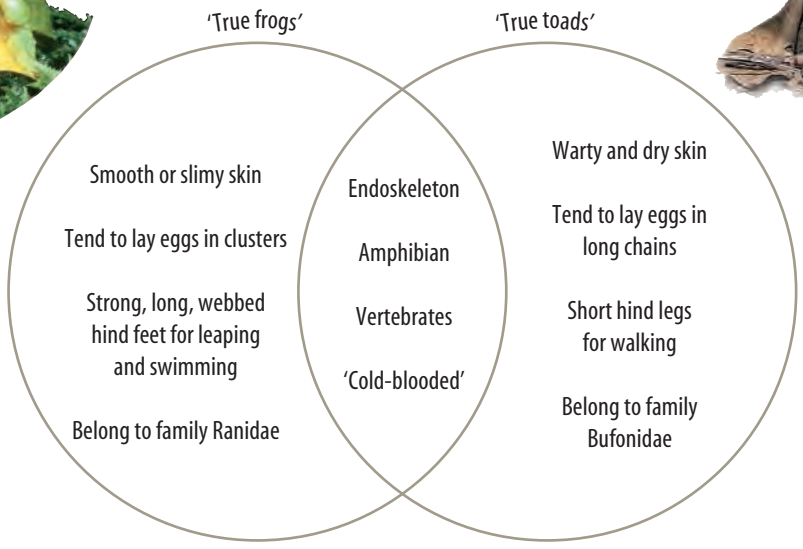


question

Compare these two topics.

What are the similarities and differences between term A and term B?

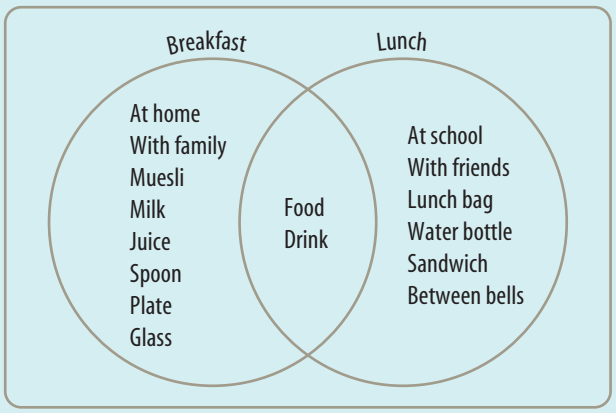
example



UNDERSTANDING AND INQUIRING

THINK AND CREATE

1 Using the figure below, construct your own Venn diagram about your breakfast and lunch during school days.



2 Construct Venn diagrams on the following topics:
(a) 'school day activities' and 'weekend activities'
(b) 'books' and 'movies'
(c) 'fruits' and 'vegetables'.

3 Research the meanings of the words below and then construct a Venn diagram to show similarities and differences between them.
(a) 'chlorophyll' and 'chloroplast'
(b) 'leucocyte' and erythrocyte'
(c) 'prefix' and 'suffix'
(d) 'endoparasite' and 'ectoparasite'
(e) 'cilia' and 'flagella'
(f) 'plant cells' and 'animal cells'
(g) 'vertebrates' and 'invertebrates'

4 (a) Carefully observe the information in the boxes above right, then construct Venn diagrams to compare the different types of dinosaurs.
(i) *Microceratops* and *Triceratops*
(ii) *Triceratops* and *Pentaceratops*
(iii) *Microdontosaurus* and *Heterodontosaurus*
(iv) *Microdontosaurus* and *Microceratops*

(b) Suggest the meanings of the prefixes *micro*, *tri*, *penta*, *micro* and *hetero*.
(c) What do you think the prefix *donto* might refer to? Justify your response.

Microceratops
- Name means 'small-horned face'
- Only 76 cm long
- Lived about 83–65 million years ago

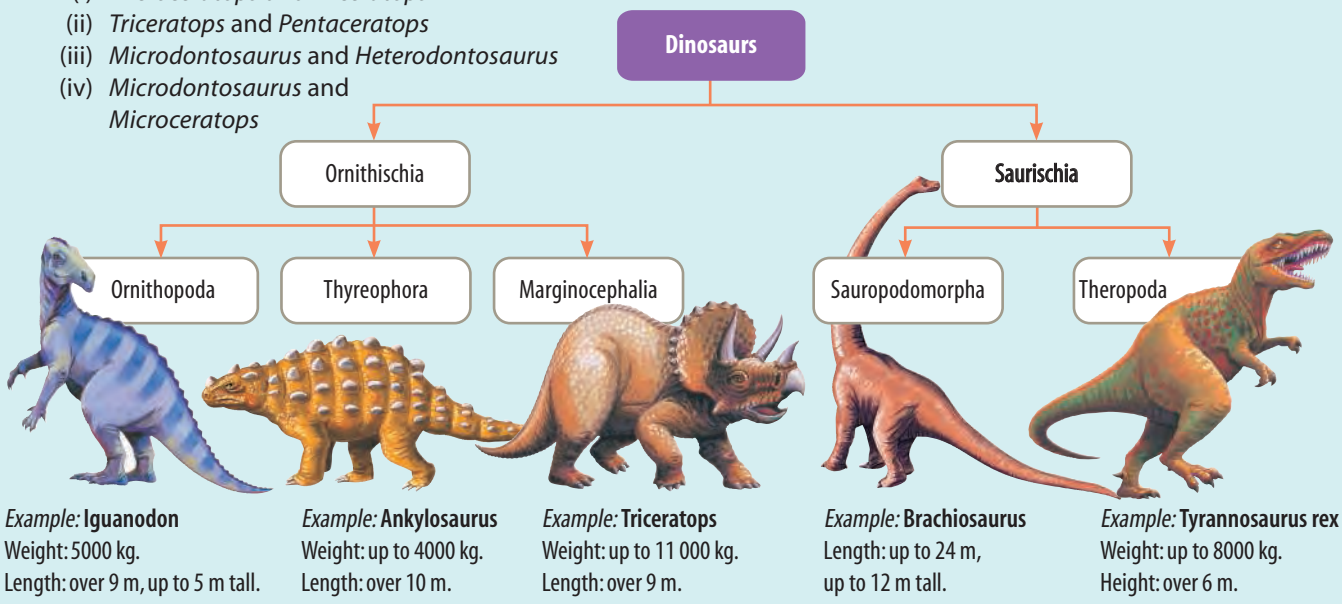
Heterodontosaurus
- Name means 'different-toothed lizard'
- Had three types of teeth
- 2.2 m long
- Lived about 208–200 million years ago

Pentaceratops
- Name means 'five-horned face'
- Had three horns on its head
- 8 m long
- Lived about 75–65 million years ago

Triceratops
- Name means 'three-horned face'
- 'Frilled' dinosaur
- Had three horns on its head
- 8 m long
- Lived about 75–65 million years ago

Microdontosaurus
- Name means 'tiny-toothed lizard'
- 8 m long
- Lived about 75–65 million years ago

5 Use the information in the diagram below to construct the following Venn diagrams.
(a) Dinosaurs under 10 metres long and dinosaurs over 10 metres long
(b) Dinosaurs with horns and spikes and dinosaurs without horns and spikes
(c) Dinosaurs that weighed less than 8000 kilograms and dinosaurs that weighed more than 8000 kilograms



Example: **Iguanodon**
Weight: 5000 kg.
Length: over 9 m, up to 5 m tall.

Example: **Ankylosaurus**
Weight: up to 4000 kg.
Length: over 10 m.

Example: **Triceratops**
Weight: up to 11 000 kg.
Length: over 9 m.

Example: **Brachiosaurus**
Length: up to 24 m, up to 12 m tall.

Example: **Tyrannosaurus rex**
Weight: up to 8000 kg.
Height: over 6 m.

STUDY CHECKLIST

LANGUAGE OF LEARNING

- describe a strategy that helps a problem or issue to be considered from different perspectives
- identify terms associated with each of these categories: apply, explain, self-knowledge, empathy, perspective, interpret
- using a diagram example, identify a visual thinking tool associated with each of these types of critical thinking: compare and contrast, evaluating, prioritising, sequencing, classifying
- using a diagram example, identify a visual thinking tool associated with each of these types of creative thinking: personifying, brainstorming, visualising, hypothesising
- outline the key difference between 'fat' and 'skinny' questions, providing an example of each
- suggest questions that would fit into each of the following categories: apply, explain, self-knowledge, interpret, perspective, empathy
- suggest skills important for effective listening
- provide an example that supports the statement: *Verbal communication includes not only 'what' we say, but also 'how' we say it*
- list examples of activities that involve intrapersonal intelligences and interpersonal intelligences
- describe how prefixes and suffixes can help unlock patterns in scientific terminology
- outline the involvement of the amygdala and hippocampus in building memories
- define the term 'mnemonic' and give an example of one that you have used
- list five different memory systems and suggest a way of remembering them
- construct a Venn diagram to compare and contrast: short-term memory and long-term memory, red thinking hats and white thinking hats, 'explain' and 'empathy', 'fat' questions and 'skinny' questions, leucocytes and erythrocytes

INDIVIDUAL PATHWAYS

eBookplus

Activity 2.1
Learning
doc-6045

Activity 2.2
Investigating learning
doc-6046

Activity 2.3
Developing learning skills
doc-6047

ICT

eBookplus **Summary**

eLESSONS

Teen brain

Take a fascinating look inside the teen brain and discover why teenagers seem to excel at impulsive behaviour that defies adult understanding. The latest science says their brains are physically unable to control some of these impulses until they are at least 25 years of age. A worksheet is included to enhance your understanding of the key concepts from your course.

Searchlight ID: eles-0224

INTERACTIVITY

Brain control

Learn how your brain controls all your thoughts, actions and feelings.

Searchlight ID: int-0010

LOOKING BACK

1 Use your three floors of thinking to help you create your own magazine cover of the key ideas that you have learned from this chapter. Remember to:
(a) gather your information — first-floor thinking
(b) process your information — second-floor thinking
(c) apply your information — third-floor thinking.
(d) **Reflecting on your learning**
Metacognition is the act of 'thinking about your own thinking'. This is when you notice and scrutinise what you are thinking. It also involves thinking about how you are thinking.
- Ask yourself questions like:
- What am I thinking about?
- What am I thinking about what I am thinking about?
- What caused me to think about this?
- What have I learned?
- How do I know that I'm right?
- How might I think about this differently?

2 (a) Use the rating guide below to assess your presentations throughout this chapter.

When I presented information to the class or my team ...

1. I spoke in a clear and effective voice.

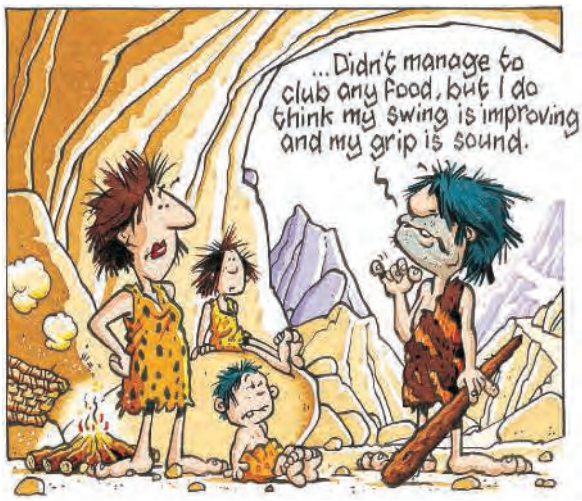
2. I was well organised.

3. I was confident on my topic.

4. I presented information in an interesting and entertaining way.

(b) Describe what you liked about how others in your class presented information.
(c) From your new experiences in presenting and communicating ideas (and observing others), describe things that you could do to be a more effective communicator.

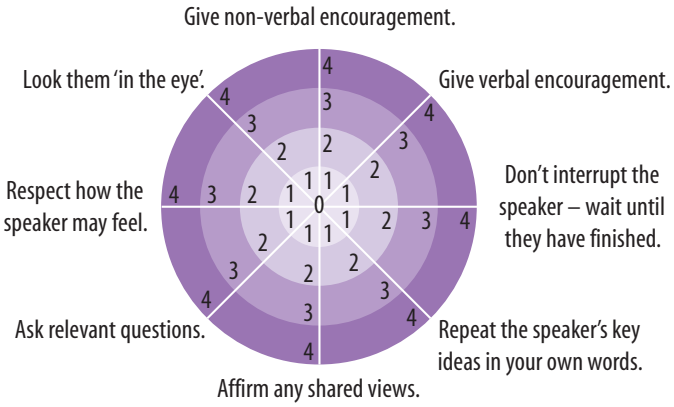
3 Carefully study the cartoon below.
(a) Paraphrase what the caveman is saying.
(b) Predict what his wife will say in return.
(c) Suggest what the caveman may say to his wife's comment.
(d) Describe a time when you were in a similar situation.
(e) Create your own cartoon to describe a situation in which you effectively learned something.



4 (a) Suggest how people remembered and communicated ideas before pen and paper.
(b) What evidence is there that humans have tried to pass knowledge from generation to generation?
(c) Which type of memory system would have been most useful to cave people? Justify your selection with examples.
(d) Suggest examples of inventions that would have been useful to cave people.
(e) Design and construct an 'invention' for cave people. Describe how and when it would be used.

1. Generation of ideas			
1	**2**	**3**	**4**
Few ideas generated	Some of group pushed ideas	Most of group gave creative ideas	All of group gave creative ideas
2. Time management			
1	**2**	**3**	**4**
Lot of time wasted	Often got distracted	Progressed well once on track	Stayed on target; no time wasted
3. Decision making			
1	**2**	**3**	**4**
Group conflicts not resolved	One person took over	Group compromised on important points	All group supportive and encouraged agreement
4. Overall			
1	**2**	**3**	**4**
Goal not achieved	Goal nearly achieved	Goal achieved but no more	Goal exceeded

5 Sit with a partner and position yourself 'Eye-to-Eye and Knee-to-Knee'. This will help you to maintain eye contact and will promote active listening. While positioned this way, take turns to tell each other about the sort of things that you think are important to make a good first impression. Use the active listening wheel below to score how effectively you think you actively listened and then score your partner for their active listening. Discuss what you found easy or difficult, and what you would try next time to enhance your listening skills.



6 Use the rating guide above to assess your individual and team activities throughout this chapter.
(a) How productive was I?
(b) How productive was my team?

7 Use the guides below to reflect about yourself.

How do you most want to be?

Honest	1	2	3	4	5
Caring	1	2	3	4	5
Creative	1	2	3	4	5
Logical	1	2	3	4	5
Independent	1	2	3	4	5
Cooperative	1	2	3	4	5
Playful	1	2	3	4	5
Adventurous	1	2	3	4	5

What are you and what do you prefer ...?

I am a:

Doer ⟷ Thinker

Night person ⟷ Morning person

Listener ⟷ Talker

Follower ⟷ Leader

I prefer:

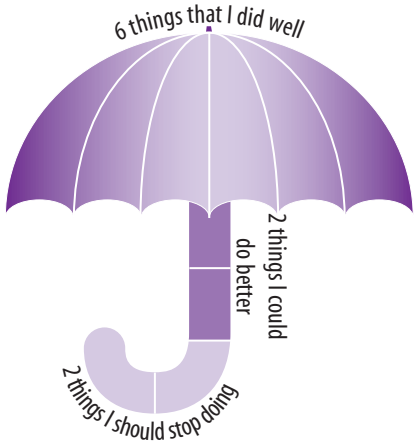
Quiet ⟷ Noise

Dark ⟷ Light

To work alone ⟷ To work in teams

8 Use diagrams and thinking tools to describe yourself in the past, present and future. Explain how and why you arrived there.

9 Use the reflection umbrella to list six things that you do well, two things you could do better and two things that you should stop doing.



10 Self-analysis reflection

I tried to have an open mind and think flexibly.	0 1 2 3 4 5
I understood what I was to do.	0 1 2 3 4 5
I asked when I was not sure what was expected of me.	0 1 2 3 4 5
I persisted, even when the going was tough.	0 1 2 3 4 5
I used my time effectively.	0 1 2 3 4 5
I was well organised.	0 1 2 3 4 5
I contributed to team discussions.	0 1 2 3 4 5
I encouraged others.	0 1 2 3 4 5
I actively listened to others.	0 1 2 3 4 5

The most important thing that I learned during this chapter was ...

work sheets
2.2 Personal learning
2.3 Summing up
2.4 Looking back