

2

Learning keys

Do you have keys to unlock your own learning? What happens when you learn? Is your learning similar to or different from how your friends or family learn? What has your brain got to do with learning? How can you

learn better with others? In this chapter, we will explore different ways of learning and thinking. We will also introduce you to some 'thinking tools' and 'learning keys' to help you become a better learner.

OVERARCHING IDEA

- Patterns, order and organisation

GENERAL CAPABILITIES

Literacy

Critical and creative thinking

Personal and social competence

SCIENCE INQUIRY SKILLS

Processing and analysing data and information

Communicating

THINK ABOUT LEARNING

- Which coloured hat is associated with thinking about what is good about an idea?
- What are examples of activities that involve audio learning?
- What are three different types of intelligence?
- How can you use an 'alphabet' key to help unlock your thinking?
- What are two ways of practising collaborative skills with your partner?
- What are potential benefits of being an active learner?
- Which three 'question words' are linked to the 'Have or not?' question key?
- Which four thinking tools can be used to quantify or rank??

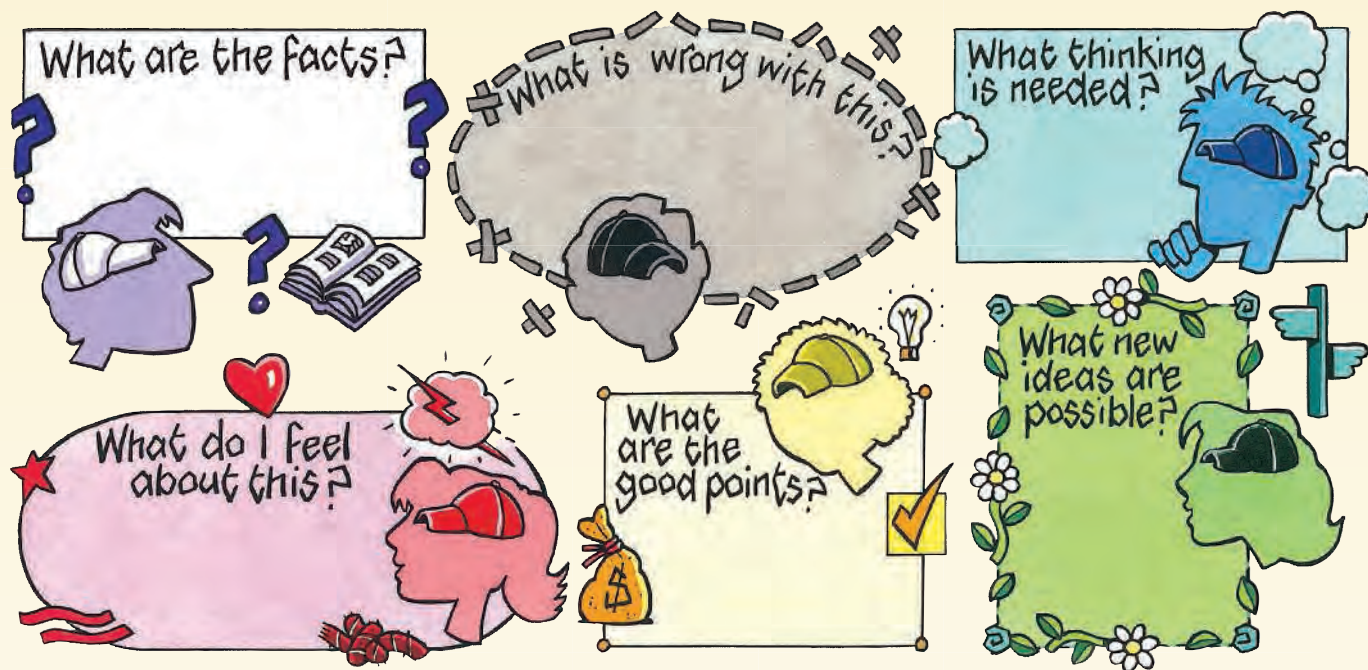


SOLUTION

Thinking with different hats

There are a number of very useful tools that can help develop your thinking. One of these was created by a great thinker by the name of Edward de Bono. He created the idea of using different

coloured **thinking hats** for different types of thinking. These hats don't even have to be on your head. The idea behind each hat just needs to be *in* your head.



THINK AND DISCUSS

Six thinking hats

- Look at the different types of questions that can be asked when 'wearing' the different coloured hats. These hats can be used to help direct your thinking about a particular problem in different ways.
- With your partner, select one of the following problems.
 - Unhealthy food in school canteen
 - Too much homework
 - Too much school litter
 - Sleepy students
- Using each coloured hat, write down an answer using that type of thinking.
- Taking turns, share your answers with your partner.
 - How were your answers and those of your partner similar, and how were they different? Suggest some reasons for these findings.
 - If you were to think about this particular problem again, how would your thinking be different?
- Suggest two other problem-type questions that could be used with the thinking hats.
- Add these to a class collective thinking jar, for some more 'hat thinking' at another time.

Problem: Students are to wear only black coloured clothes to school.

Red hat: How do you feel about wearing only black clothes to school?

Yellow hat: What's good about the idea?

Black hat: What's wrong with this idea?

White hat: What information do you have (or need to have) on this idea?

Green hat: What are some ways to help this to happen?

Blue hat: What do you need to do next, or have done so far?

Tinkering with your toolbox

Can you describe when, where and how you learn the best? Do you know why?

There are many factors that may influence how you learn and think, such as:

- visual — colour, lighting, shape
- audio — sound, music
- kinaesthetic — movement, dance
- interactive — social, teams.

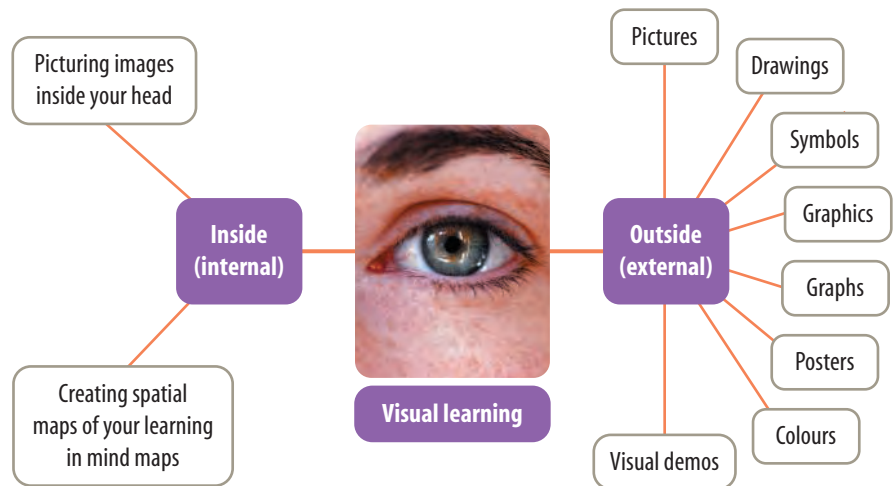
These factors can link with the types of tools in your multiple intelligence toolbox. Although you may have a preference for some of these over others, it is important to try them all whenever you can.



Look

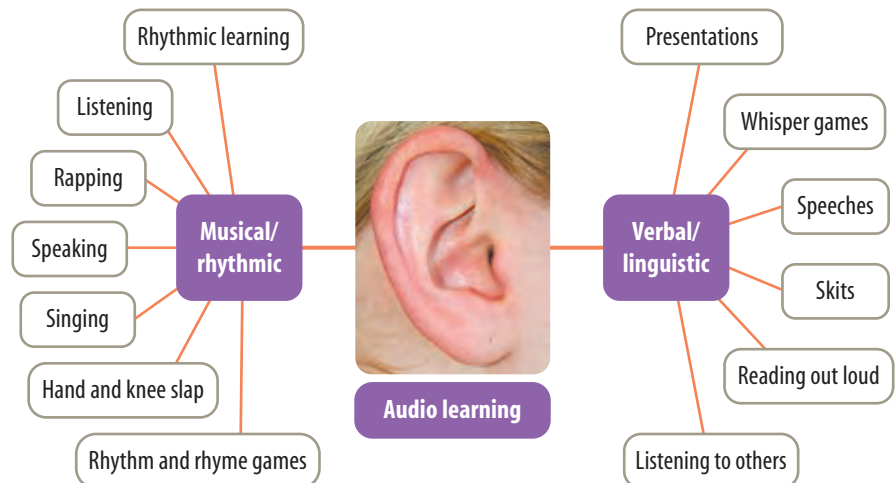
Visual learning can involve seeing an image in your mind or seeing with your eyes.

Looking at advertisements for various products, you will be able to see how they have used various visual cues to help you remember their product. The Nike sports clothing company, for example, has a tick symbol. How many symbols from other advertisements can you remember?



Hear

Audio learning can include musical/rhythmic and verbal/linguistic activities. Many melodies that you know well (such as *Row Row Row Your Boat*, *Twinkle Twinkle Little Star*, *Humpty Dumpty* and *Jack and Jill*) can be linked to new learning by rewriting the lyrics with keywords from your lesson or topic. Different types of music can also help you focus on the task that you are involved in.



HOW ABOUT THAT!

Smell and an awareness of aromas can help you become a very effective learner. Research suggests that peppermint, basil, lemon, cinnamon and rosemary enhance mental alertness. Lavender, chamomile, orange and rose calm nerves and encourage relaxation.

Your olfactory regions are rich in receptors for endorphins, chemicals that generate feelings of pleasure and wellbeing. You can distinguish odours with only tiny variations in their chemical structures. Can you think of examples of odours that make you remember something happy?



INQUIRY: INVESTIGATION 2.1

KEY INQUIRY SKILLS:

- questioning
- communicating

These are great activities to try when you are reviewing a topic.

ADD-ONS

- To start, one student comes to the front of the room and acts out or postures something that they have learned from the topic.
- Another student joins the first student to act out something they have learned, then other students do the same, creating a 'living sculpture'.

BRAIN BALL TOSS

- Six to eight students stand in a circle facing each other about 3 metres apart.
- To start, one person tosses a ball or beanbag to anyone in the circle.
- The student who catches it asks a question from the topic, then throws the ball or beanbag to another student who must answer the question. They, in turn, throw the ball or beanbag to another student, and ask a new question (and so on).

Do

Kinaesthetic learning can involve learning through movement, touch and feeling, role-plays, pantomime stories, puppet shows, stretching, building models, exercise, sign language, hands-on experiments and dance. Movement and activity are also important to get more oxygen to your brain so that you can think better.

Together

It can be fun to learn with others. Interactive or social learning can involve learning through sharing, peer teaching, collaboration, discussion, and learning in pairs, groups and teams, and can help in your own development of self-awareness and an awareness and empathy for others. Learning these sorts of interpersonal skills is very important for both your learning and sense of wellbeing.

Self

Not all learning needs to be with others. It is also important to learn how to learn on your own, by yourself. Solo thinking activities, such as imagery, journal writing, focusing and concentration exercises, self-assessment and reflection, are also important.

UNDERSTANDING AND INQUIRING

THINK, REMEMBER AND CREATE

- 1 Create a mind map to describe your ideal learning environment.
- 2 Create a poem or song to describe yourself as a learner.
- 3 Design a game that helps others find out the type of learner they are and what their ideal learning environment is like.

INVESTIGATE AND DESIGN

- 4 (a) Record images that you have when you think of the aromas of the following.

(i) Freshly baked bread	(ii) Garlic
(iii) Strawberries	(iv) Orange juice
(v) Manure	(vi) Freshly baked chocolate cake
(vii) Freshly mown grass	
- (b) Compare your images with a partner. How are they similar and how are they different?
- (c) Design an experiment to find out which aromas relax you and which ones make you mentally alert.

Intelligence multiplied

Did you know that it's not how smart you are that is important, but how you are smart?

A great thinker by the name of Howard Gardner introduced a theory about eight different types of intelligence. He referred to these as:

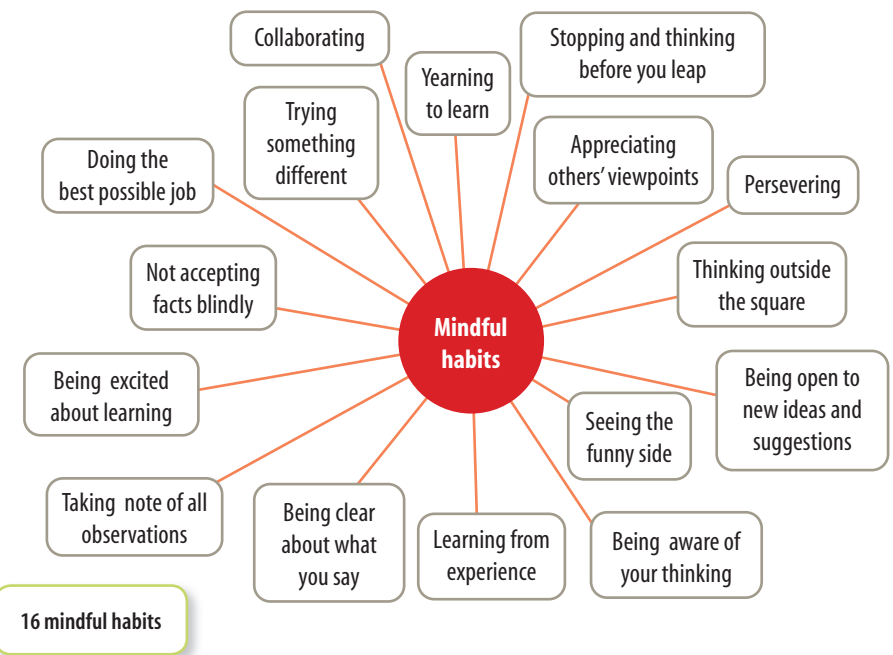
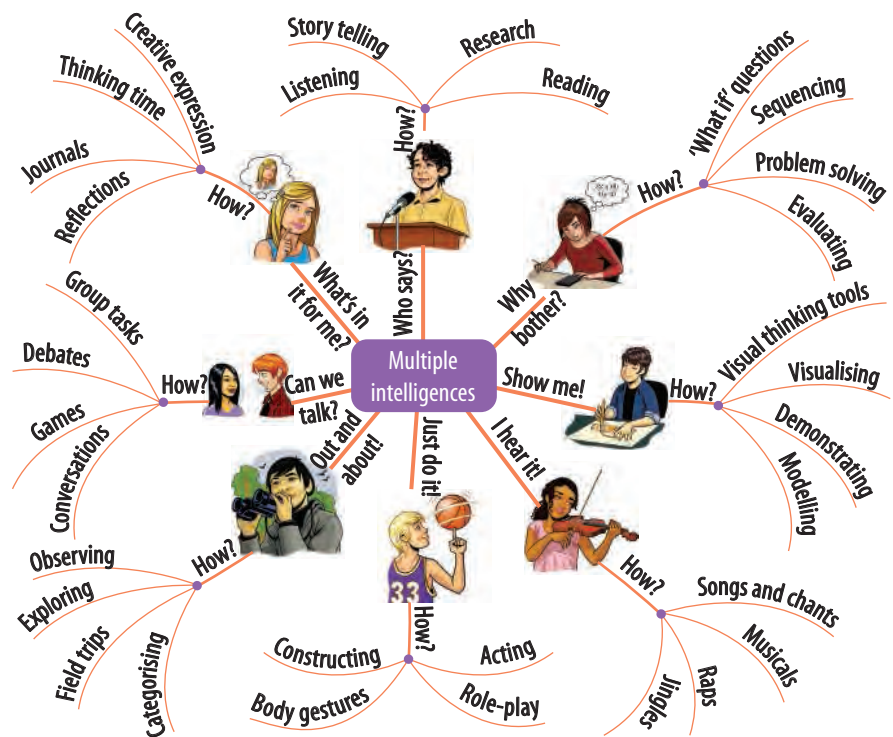
- bodily/kinaesthetic intelligence
- verbal/linguistic intelligence
- logical/mathematical intelligence
- visual/spatial intelligence
- musical/rhythmic intelligence
- interpersonal intelligence
- intrapersonal intelligence
- naturalist intelligence.

By using a variety of strategies that use all types of intelligence, you can increase the effectiveness of your learning.

Mindful habits

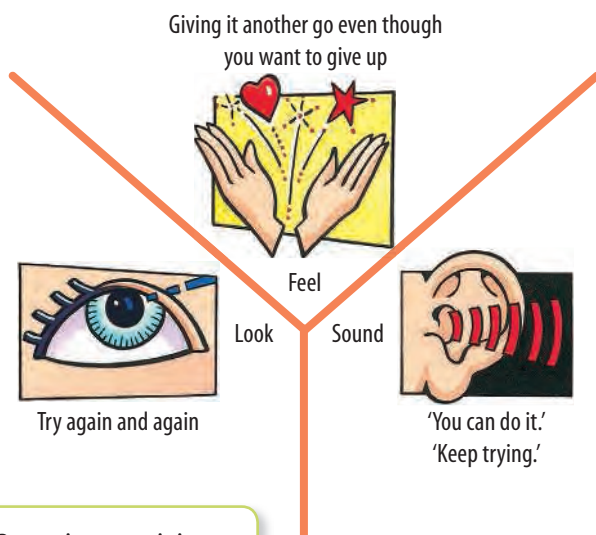
When on the 'road of life', it is a very good idea to be thoughtful about what you are doing. Sometimes it is less important to know something than to know how to act when you have that knowledge. Two 'mindful' thinkers Bena Kallick and Arthur Costa thought a lot about how some types of thinking and behaviour are more useful than others on our life's journey. They called these 16 types of thinking behaviours '**habits of mind**'. Why not use them on your journey on the road of life!

You can use your **multiple intelligences** to help you understand how to develop some very useful mindful habits.

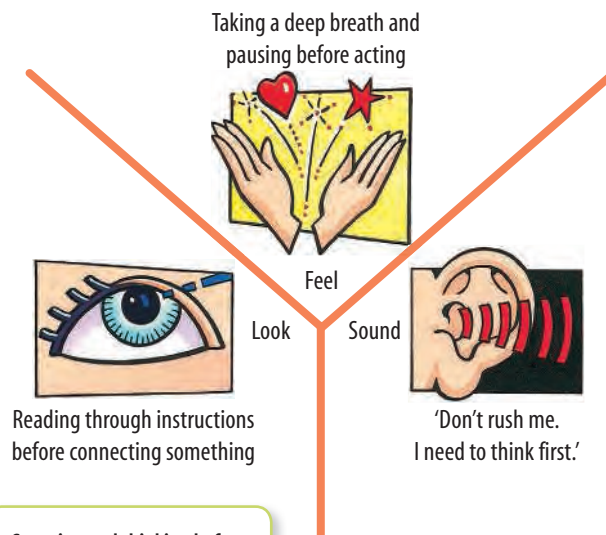


For example, using your verbal/linguistic, visual/spatial and intrapersonal intelligences, you can construct Y charts for what the mindful habits may sound

like, look like and feel like. The charts at the top of the next page show you examples of this for 'persevering' and 'stopping and thinking before you leap'.



Persevering — persisting even when things get tough. Can you suggest other comments for this Y chart?



Stopping and thinking before you leap — considering the consequences first. Can you suggest other comments for this Y chart?

UNDERSTANDING AND INQUIRING

REMEMBER

- Match each of the following statements to a multiple intelligence. For each type of intelligence, name a strategy that could be used to develop it.

(a) What's in it for me?	(b) I hear it!
(c) Who says?	(d) Just do it!
(e) Why bother?	(f) Can we talk?
(g) Show me!	(h) Out and about!
- List three different mindful habits that you would like to focus on developing this month.
- Which three multiple intelligences are used in a Y chart?

THINK AND DISCUSS

- In your team, select three mindful habits.
 - Discuss how you could describe each of these mindful habits.
 - For each mindful habit, brainstorm what it would 'look like', 'feel like' and 'sound like'. Record your brainstorm in a Y chart, cluster map or mind map.
 - Compare your records with those of other teams.
 - Make any modifications or additions you wish to your charts or maps.
- Which mindful habits would be useful to develop your
 - logical/mathematical intelligence
 - musical/rhythmic intelligence
 - interpersonal intelligence
 - bodily/kinaesthetic intelligence?

- Which mindful habit matches each of the following descriptions?

- Working through frustration
- Self-evaluating
- Controlling quality
- Wide-eyed
- Adventurous
- Cooperative
- Trying hard to understand others
- Curious
- Diligent
- 'Counting to 10' before acting
- Looking at situations in alternative ways
- Checking over your results several times
- Compassionate
- 'Hanging in there'
- Laughing at yourself

THINK AND CREATE

- Use your musical/rhythmic or bodily/kinaesthetic intelligence to show three different mindful habits.
- As a team, create examples of how you could teach a classmate something about 'mindful habits' using each of the different types of multiple intelligences.

INVESTIGATE

- Find out the exact terms used by Kallick and Costa for the 16 habits of mind.
- Find out more about metacognition and ways that you could do more of it yourself.

work
sheet

→ 2.2 Intelligence toolbox

Thinking keys

A creative thinker by the name of Tony Ryan developed the idea of '**thinking keys**' to unlock your thinking. The 12 thinking keys, and how they can be used, are shown below.

eBook plus eLesson

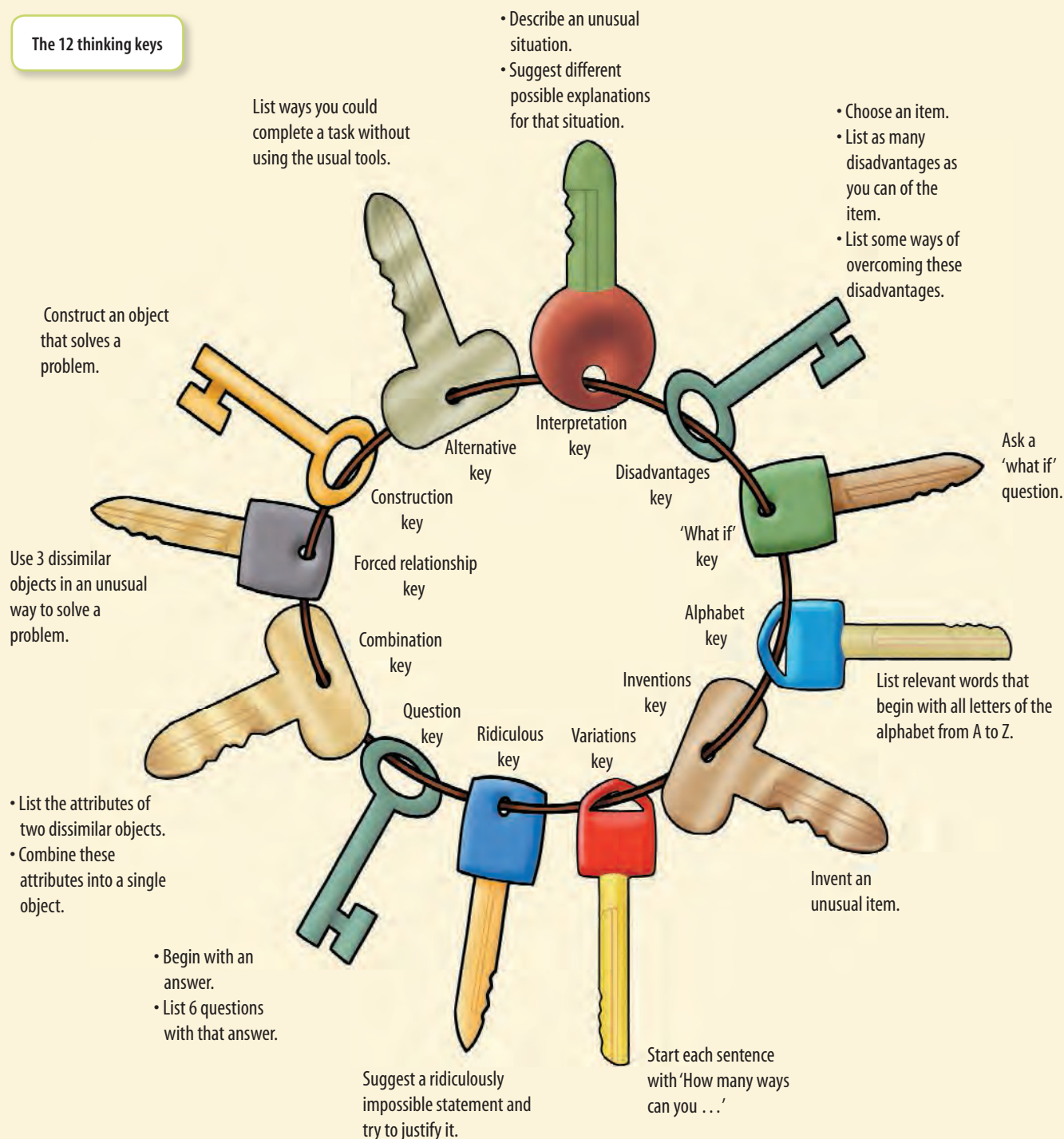
Unlocking learning: flowcharts, cluster maps and concept maps

Find out about some strategies and tools for making learning easier, and fun as well!

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Different keys unlock different types of thinking. These keys can 'tune' or focus your brain into thinking about tasks, situations, or problems in creative, logical or challenging ways.

The 12 thinking keys



These thinking keys can be used to:

- 'switch you on' — they can motivate you, get you excited or interested, or 'hook' you into thinking about something.
- 'open different doors' of your thinking — they can help you look at situations in different ways.
- 'unlock your thinking' — they can help you become more effective at thinking critically and creatively.
- 'unlock your feelings' — they can increase your interpersonal and intrapersonal experiences and help you to reflect.

UNDERSTANDING AND INQUIRING

THINK AND CREATE

- 1 (a) Draw up a table with the column headings 'type of thinking key', 'switch you on', 'open different doors', 'unlock your thinking' and 'unlock your feelings'.
(b) List all the thinking keys from page 37 in the first column.
(c) Use a tick or cross in the other three columns to show which types of thinking each key may be used for.
(d) Compare your results with those of others in your class.
(e) Discuss reasons for any similarities or differences.
- 2 Use your 'what if' key to write a story about one of the following.
(a) What if mosquitoes were the size of humans?
(b) What if all plants were purple?
(c) What if there were only female humans on Earth?
(d) What if we could have holidays on Mars?
- 3 Use your 'disadvantages' key to unlock your thinking on a key, a test tube and a stapler.
- 4 Use your 'alphabet' key for one of the following.
(a) Biological classification
(b) Arthropods
(c) An ecosystem
(d) Water
(e) Chemicals in your home
(f) Food webs
(g) Effects of rotation of the Earth
(h) Effects of Earth's orbital motion around the sun
(i) Weather and climate
(j) Gravity
- 5 Use your 'variations' key to list as many ways as possible to do one of the following.
(a) Hang out the washing
(b) Get to school
(c) Tell someone not to be a bully
(d) Encourage a timid team-mate to contribute to discussion
- 6 Use your 'ridiculous' key to justify one of the following.
(a) Children should be paid to go to school!
(b) A ridiculous statement of your own choosing
- 7 Use your 'question' key for the following terms. Research the terms if you do not know what they mean.
(a) Platyhelminthes
(b) Arachnids
(c) Diprotodon
(d) *Bufus marinus*
(e) Isobar
(f) Convection
(g) Colloid
(h) Biodegradability
- 8 Use your 'interpretation' key for one of the following.
(a) A fellow student with bright purple spots on their face
(b) One of your teachers shrinking to the size of a coffee mug
(c) A giant hole in the middle of your schoolyard
- 9 Use your 'combination' key to create items from two of the following.
(a) Pen and sunglasses
(b) Phone and a microwave oven
(c) Paperclip and feather
- 10 Use your 'inventions' key for one of the following.
(a) Banana peeler
(b) Hat with four functions
(c) Attachment that can be worn on your finger to assist in your learning
(d) Earring with three functions
- 11 Use your 'construction' key to make a model of one of the following from household materials.
(a) To show how mixtures can be separated
(b) To illustrate how gravity affects objects on Earth
(c) To demonstrate the water cycle
(d) To show why we have seasons
- 12 Use your 'forced relationship' key to work out how to catch a cockroach with a match, a toothpaste tube and a mug.
- 13 Use your 'alternative' key to work out four ways to tie your shoelaces without using your hands.

Learning together

Who will your partner be today? How will they be selected? Once you have your partner organised there are lots of different ways in which you can interact.

There are also many different ways to 'pair up' to discuss your thoughts before they are shared with a larger group. It could be the 'shoulder partner' who sits next to you, or even a 'face partner' who sits behind or in front of you in class. You can even be paired with someone who is the same star sign or who has the same favourite learning colour or music. It's a good idea to work with as many different partners as you can to share your thoughts with throughout the year. You will learn a lot more and become a better thinker as you will have the opportunity to see things through different eyes and broaden the way that you see the world. Developing ways to communicate with your partners involves knowing what to say and when to say it.

Are you a good listener?

To communicate effectively with others also means being able to listen to others with respect, empathy and understanding. Do you really listen to what others are saying or are you rehearsing what you are going to say when it's your turn to speak? Are there other things going on that distract you from really listening to what is being said? What sorts of things do you find distracting? How could you be a better listener?

Are you easy to understand?

Are you a vague or specific communicator? Do you use specific terminology or do you overgeneralise? Do your thoughts spill out of your mouth in a jumble or are they organised and concise. What are some strategies that you could use to help you organise your thoughts? By organising your thoughts before you let them out, you can learn to express yourself with clarity and precision.

None of us is as clever as *all* of us!

You can learn a lot more when you learn with others. You learn not only the content of the topic you are studying, but also how to get along and work with other people. Developing helpful habits, such as well-developed social and collaborative skills, can be very useful throughout your life.

Getting along

There are many social skills that you can focus on developing during your teamwork. These include:

- resolving conflicts or disagreements respectfully
- controlling impulsive actions and comments that may hurt others
- looking at each other while you talk and using people's names
- using both non-verbal and verbal praise and encouragement
- actively encouraging others to be involved and feel valued.

Face to face

Some of the collaborative skills that you can develop while working as a team involve



how you interact with your team-mates. You can practise these by:

- actively listening with understanding and empathy
- being patient and understanding
- choosing fair ways to make decisions
- taking turns equally and not leaving anybody out
- criticising ideas rather than people
- sharing materials and equipment
- keeping each other focused and on-task
- being organised and well prepared, and managing time effectively
- helping others out when they have difficulties.

Often, establishing some learning team guidelines, such as 'only one person speaks at a time' or 'always being respectful of the feelings, opinions and space of others', can help you to interact effectively as a team.

Hogs and logs

One way to make teams work more effectively is to allocate roles. The illustration on the right describes the various roles that can be allocated, including examples of the way a person in each role might talk or act. These roles help you to work effectively together, particularly if you are given a project or a discussion topic but not told exactly how to perform the project or discussion.



INQUIRY: INVESTIGATION 2.2

Helpful habits

KEY INQUIRY SKILL:

- communicating

- 1 In your team, discuss the following helpful habits and suggest (i) how they can be useful to both the individual and the team, (ii) some strategies that could be used to develop them, and (iii) some obstacles that make them difficult to achieve.
 - (a) Persistence (optimism, sticking to the job, effort and hard work)
 - (b) Confidence (failing wisely, taking responsible risks and speaking up)
 - (c) Resilience (keeping perspective, maintaining your cool and bouncing back)
 - (d) Organisation (goal setting and time management)
 - (e) Social skills (tolerance, following instructions, resolving conflicts, managing impulsive behaviour)
- 2 Share and record the findings of your discussion with other teams and then collate them all into a class instruction and information booklet on helpful habits for your team activities.

UNDERSTANDING AND INQUIRING

THINK AND COMMUNICATE

- 1 What is empathy? What do you think it means to listen with empathy? What does empathy look like, feel like and sound like? Show your team-mates examples of how you could listen to someone with empathy.
- 2 In your team, brainstorm as many ideas as you can that:
 - (a) would help you to listen to what others are saying
 - (b) hinder or get in the way of listening to others.
 Summarise your brainstorm into a colourful mind map with diagrams, pictures or sketches.
- 3 Complete the following activity in a pair.
 - (a) Partner A listens to partner B speak for three minutes about their favourite topic or hobby. Partner B must not interrupt, make any comments or ask any questions during this time.
 - (b) After the three minutes, partner B paraphrases what the speaker, partner A, said.
 - (c) Partner B may then make appropriate comments or queries.
 - (d) Repeat steps (a) to (c) with the roles reversed.
 - (e) Construct a PMI (plus, minus and interesting) chart to summarise your feelings and comments on this experience.
- 4 In a pair, act out the following:
 - (a) What do all birds have in common?
 - (b) You have found yourself in the year 2050. What is it like?
 - (c) You have just discovered a new form of life under the microscope. What does it look like?
 - (d) Gravity on Earth has increased by three times. How does this affect life on Earth?
- 5 Partner A of your team pair chooses one of the following activities. Partner B suggests some information. Partner A then adds another suggestion to build onto the answer. Then you both take turns building on each other's answers.
 - (a) List the differences between mosquitoes and butterflies.
 - (b) Describe a day in your life as an ant.
 - (c) Recall all you can about snails.
 - (d) Create a mind map to show all you know about spiders.

- 6 In a team, brainstorm as many different ways as you can to select partners within your class. If any of these are games, outline the rules that would be involved.
- 7 In pairs, suggest four reasons why a team of four allows more effective communication than a team of three members. Discuss your suggestions in a group of four.
- 8 Find someone in the class who matches one of the criteria in the list below. Get them to sign their name next to the criterion. No person can sign more than one criterion. As you are seeking out criterion-classmate matches, think carefully about how you are communicating with them. Think about both your verbal and non-verbal messages during your communication.
 - (a) Likes to get up early
 - (b) Loves music of the 70s
 - (c) Watches old movies
 - (d) Sends text messages more than three times a day
 - (e) Keeps a diary or journal
 - (f) Has a younger brother
 - (g) Has a pet cat
- 9 In your team pair, take turns telling each other what you think about:
 - (a) the benefits of eating breakfast
 - (b) the reasons people decide to become scientists
 - (c) life as an astronaut.

CREATE

- 10 Use the illustrations on the previous page to make up your own poster illustrating the roles, team talk and team actions.
- 11 In a team, consider how you think team members should be assessed on their effectiveness. Design a rubric similar to the one shown below to evaluate how well each member of the team did their job and how well the team worked together.

THINK

- 12 Suggest how you can create a good relationship with other members of the team. Why not make a list of 'getting to know you' questions that you all can answer?
- 13 Make up your own team/group identity. Decide on a name, logo or a group cheer/handshake.
- 14 Brainstorm phrases and actions that would help you perform effectively in each of the cooperative roles shown in the illustration top right of the previous page.

Example of an assessment rubric

Role/task	Score			
	0	1	2	3
A				Job always done really well
B	Not done			
C			Usually ok	
D		Sometimes job done well		

Unlocking learning

Learning can be scary! It can be full of lots of words and experiences that are new to you. It can also be messy, frustrating, difficult and time consuming. So ... why learn? Why bother?



If you are told something, does that mean that you have learned it?

Listening isn't learning

Teaching is more than telling, and learning is more than listening. Although you may learn many things by listening, just 'being told' is not the most effective way to learn. You may be able to remember some of what you heard, but you may not understand it. Think about the last lesson that you were in. What do you remember from it? What did you learn? What did you understand? What does it mean 'to understand'?

Are you an active or a passive learner?

Do you lift the lid on your brain and wait for information to be poured in? Are you a passive learner? If so, you may not be learning very much. You need to be actively involved in your learning to get the most out of it.

If you are an active learner then you have more chance of developing an understanding of what you are learning. You are more likely to be able to remember it and explain it to others. Very

importantly, you will be better equipped to be able to transfer this learning into new situations. This is a very valuable life skill to develop. It is an especially important skill for a scientist.

If it gets too hard, do you just give up?

What do you do when you are introduced to something new? What do you think? Do you try to connect this new information to what you already know? If so, how do you go about it? Do you ever give up because it looks or sounds 'too hard'? If you do get stuck in your learning, what can you do to move on? What sorts of questions and strategies could you use to help get through the difficult and frustrating times in your learning?

Linking your learning

When possible, it is a good idea to try to link your new learning to your previous knowledge. At times, you may even find that your new learning may change how you think about things! As well as learning new things, it is worthwhile thinking about strategies that you used to 'move' from what you used to know to what you now know. This type of thinking about your thinking (metacognition) will help you to become a more active and effective learner.

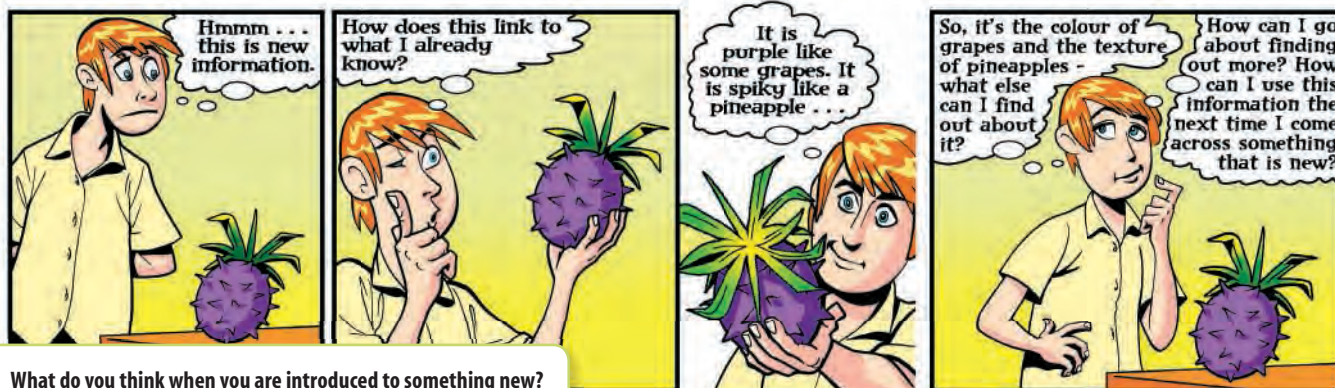
Recognising what is new is a great way to start learning

What do you do when you come across a word that you haven't seen before? Does it contain parts that you have seen before in other words? Do these parts of the word give you a hint about its meaning? Sometimes this may be helpful — at other times, you need to find other ways to help you learn the new terms and link them to what you already know.

The first step is to recognise the new term. The next step is to remember what it means and what other terms or ideas it could be linked to. It may be helpful to talk to others and to tell them how you remember the term and hear how they go

about it. This type of shared learning can be quite powerful in helping you to develop your scientific literacy. It can help you to learn new ways to be

able to communicate what you know. Talking and sharing your learning can help you get closer to understanding what you are learning.



What do you think when you are introduced to something new?

UNDERSTANDING AND INQUIRING

THINK, INVESTIGATE AND DISCUSS

- 1 (a) Construct a table with two columns. Label the first column 'Learning question' and the second column 'My response'.
- (b) Write the questions from the *If it gets too hard, do you just give up?* section on page 42 in the first column.
- (c) Add your responses to the questions in the second column.
- (d) With a partner or within a small group, discuss your responses.
- 2 Discuss with your partner or team how the 'habits of mind' (see section 2.2) may help you to be a more effective and active learner.
- 3 Create a cartoon to show what two of the following might look like in your classroom.
 - (a) Passive learning versus active learning
 - (b) Metacognition or 'being aware of your thinking'
 - (c) Persevering when 'stuck' in your learning
 - (d) Making links between 'old' knowledge and 'new' knowledge
- 4 (a) Make up your own set of term recognition cards. On one side write the following statements and on the other side add a coloured circle, as in the table below.

On front of card	On back of card
Never seen the term before	Red circle
Recognise the term	Orange circle
Recognise the term and can give definition or description	Yellow circle
Recognise the term and could help others to understand it	Green circle

- (b) These cards can be used at the beginning and end of each topic you study. You can create your own list of the words in bold in the chapter or use a list supplied by your teacher. Score each term between 0 (never seen the term before) and 3 (recognise and could help others to understand the term). Use this to inform yourself and your teacher about where you are in your learning of these terms.
- (c) Score each of the terms in the table below. Either as a class or in a team, hold up the card for each term. Share what you know about the terms with others in your team or class.
- (d) Use a variety of sources to collect information on each of the terms and then construct a mind map or concept map to link them (you may add other terms that are not on the list).

How well do you recognise these terms?

Term	Term comfort zone (circle the appropriate score)			
Mollusc	0	1	2	3
Cnidarian	0	1	2	3
Arthropod	0	1	2	3
Amphibian	0	1	2	3
Annelid	0	1	2	3
Reptile	0	1	2	3
Vertebrate	0	1	2	3
Echinoderm	0	1	2	3
Marsupial	0	1	2	3
Nematode	0	1	2	3
Invertebrate	0	1	2	3
Monotreme	0	1	2	3

Question keys

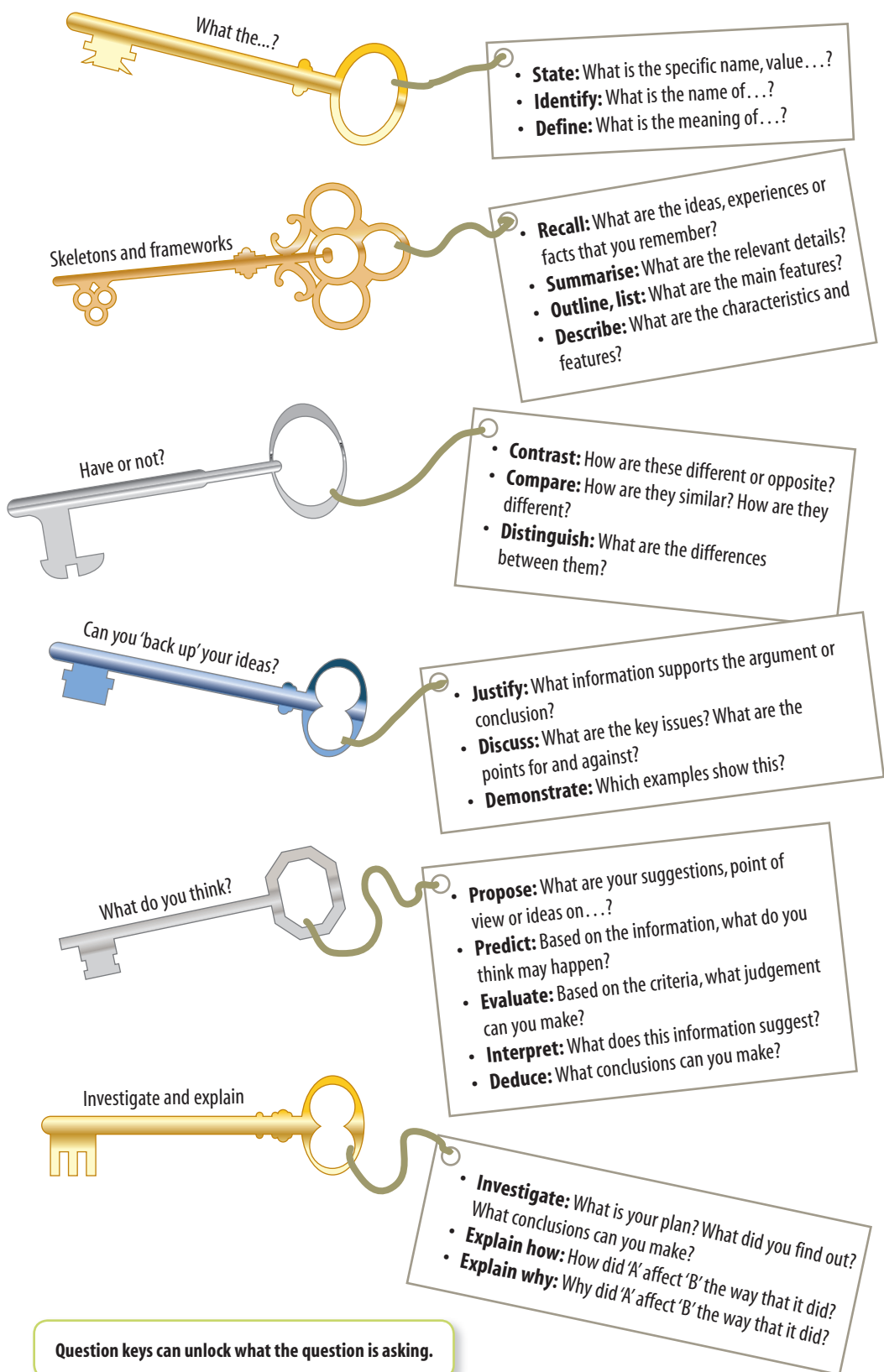
How do you find out what a question is asking?
How can you unlock it?
Are there any clues?
What are the words in questions that tell you what to do?

Levels of thinking

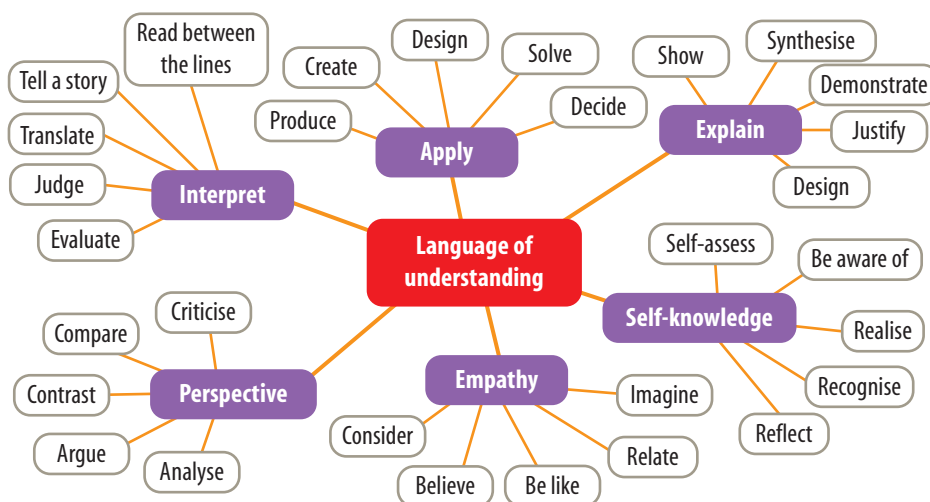
Some question words, such as 'identify', do not require much thinking and may just require you to recognise and recall a name or list of names. Others may require you to think quite deeply and make comparisons or predictions, while other question words may expect you to explain your reasoning and understanding. Yet others, such as 'construct' or 'design', may require you to build, create or investigate a particular object or problem.

Science Quest question patterns

When you browse through the 'Understanding and inquiring' questions for each spread in this textbook, you may see a pattern as to which of the question terms are used. In the 'Remember' sections, the information that you need to answer the question will be located somewhere in that



When you are trying to make sense of words associated with understanding, it is helpful to divide them up into categories. There are many different ways of doing this. You just need to find the way that suits you.



spread. You won't need other resources to find the answer. The question words that you will find in this section include: *define, identify, outline, which, list, what is, recall and describe* and *explain why*.

In the 'Think' sections, you need to consider the information in the pages of the spread, but you may also need to think or discuss to be able to respond to the question. You may need to do something more with the

information other than simply recall it. Examples of question words in these sections include: *identify, explain, state how, what would, calculate, classify, differentiate, justify, outline, summarise, construct, compare and contrast, propose and interpret*.

The 'Analyse', 'Investigate' and 'Design and create' sections often require you to think even more deeply about the question and your response. In the 'Analyse'

sections you may need to *suggest, predict, evaluate or interpret*, whereas for the 'Investigate' sections you may need to *design* an investigation, *conduct* it and *explain* the results that you get. The 'Design and create' questions may require a different type of thinking. You may need to use your imagination and creativity to apply what you have learned to *design* and *create* or *construct* something.

UNDERSTANDING AND INQUIRING

REMEMBER

- 1 **State** two question words that could require you to respond with the name of something.
- 2 **Identify** the term used to ask you what the meaning is of something.
- 3 **Distinguish** between the terms '**contrast**' and '**compare**'.
- 4 Compare the terms '**predict**' and '**evaluate**'.
- 5 **State** one new question word that you learned today. **Describe** how you are going to remember it.
- 6 **List** the types of question words that you could find in each of the *Science Quest* 'Understanding and inquiring' sections (in the blue panels).

THINK AND DISCUSS

- 7 **Propose** an idea for a school science excursion.
- 8 (a) **Predict** what you are going to have for dinner tonight.
(b) **Justify** your suggestion in part (a).

- 9 **Demonstrate** that you understand the meaning of the term '**deduce**'.

- 10 **Explain how** you go to school.

- 11 **Explain why** you go to school.

- 12 (a) **Formulate** five questions of your own about scientific topics.
(b) **Suggest** how you could find out the answers to them.

INVESTIGATE

- 13 Etymology is the study of the origin of words. **Find out** about and report on one of the question words on these pages.
- 14 **Create** a rhyme, story, poem or song to help you remember the meaning or use of four question words on this page.
- 15 **Research** a current Australian scientific issue (for example, involving the environment, medicine, genetic engineering, nanotechnology or stem cell research) and use a PMI (plus, minus and interesting) chart to summarise the key points of the issue.

'See Quest' tools

There are so many different ways to see and share what is happening inside your brain. Here are some tools that can be used to make your thinking visible so that you can share and discuss it with others.

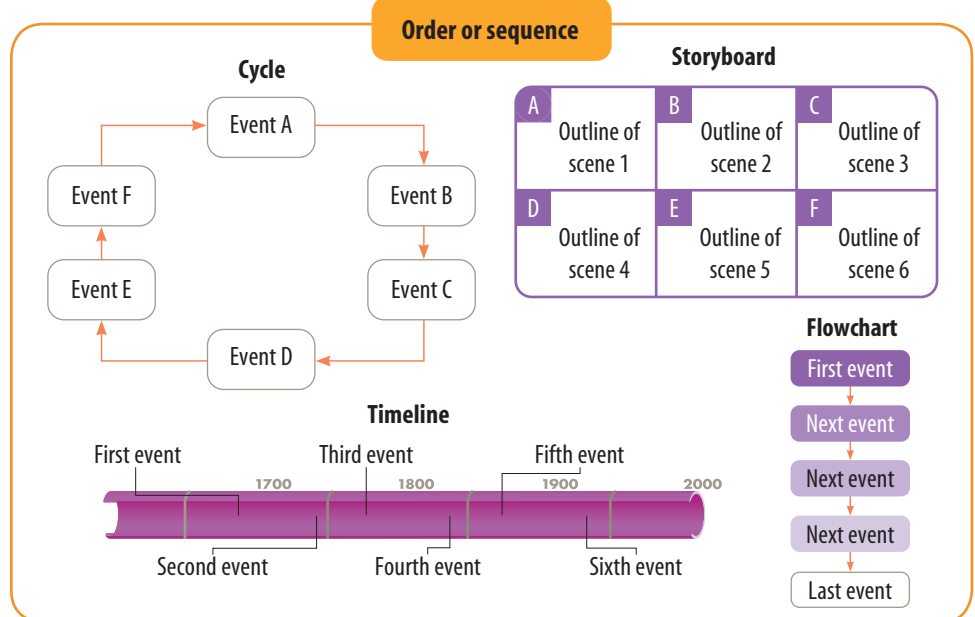
Structuring your thinking

Like a builder, it is important for you to use the right tool to get the job done.

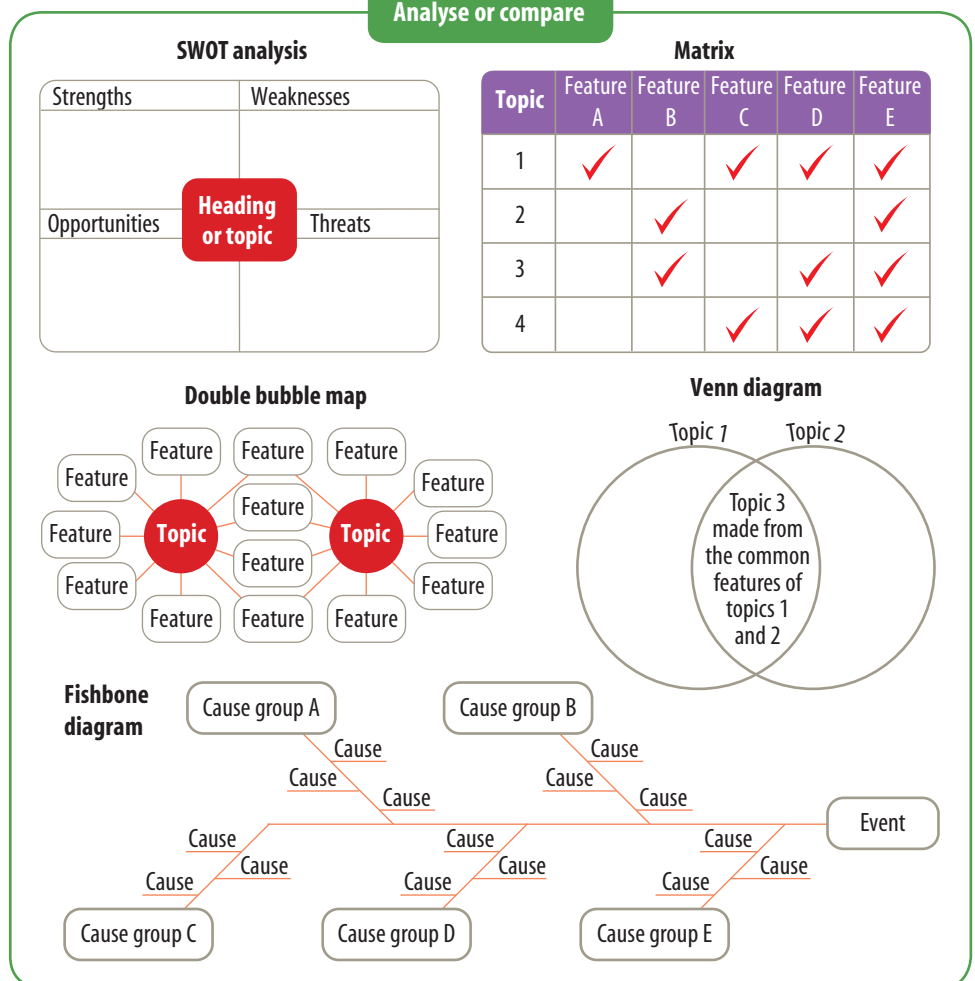
- **Storyboards, flowcharts, timelines and cycles** are useful tools to sequence your thoughts.
- **Matrixes and SWOT analysis charts** are useful when you want to classify or organise your thoughts.
- **Priority grids, target maps, continuums or pie charts** can be used to quantify or rank ideas.
- **Concept maps, PMI charts and Y charts** help you to visualise or reflect on an idea.
- **Venn diagrams and fishbone diagrams** are useful tools to focus your thoughts, such as when you need to analyse and compare things in order to make a decision.

There are also times when combinations of these tools can help you to use your brain and time more effectively.

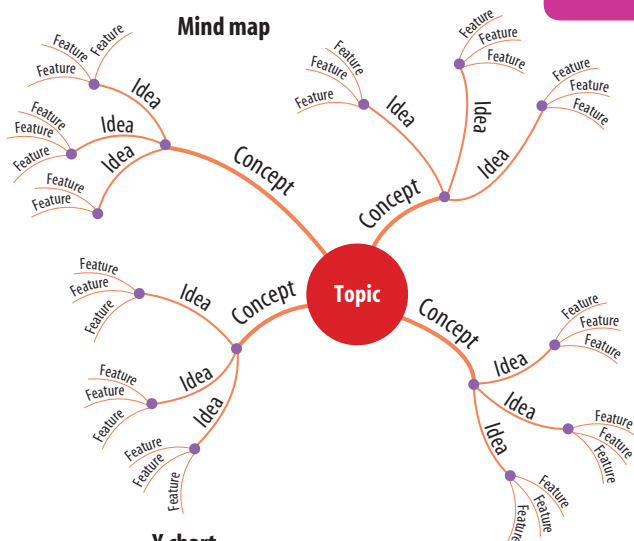
Order or sequence



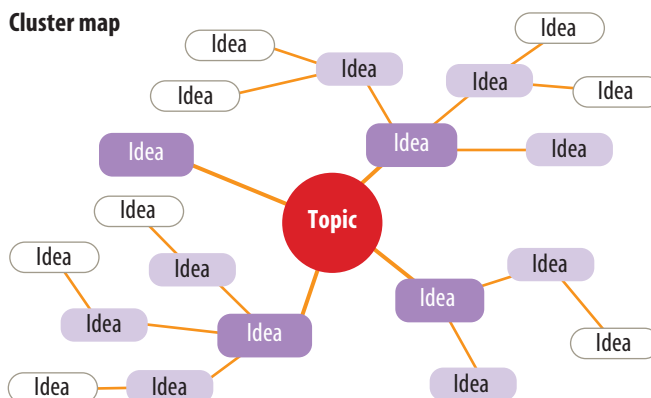
Analyse or compare



Visualise or reflect

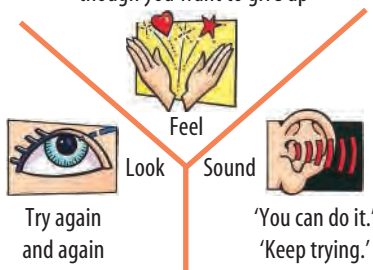


Cluster map

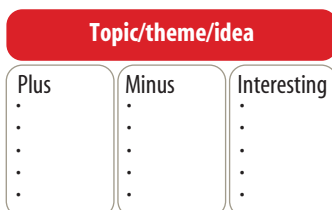


Y chart

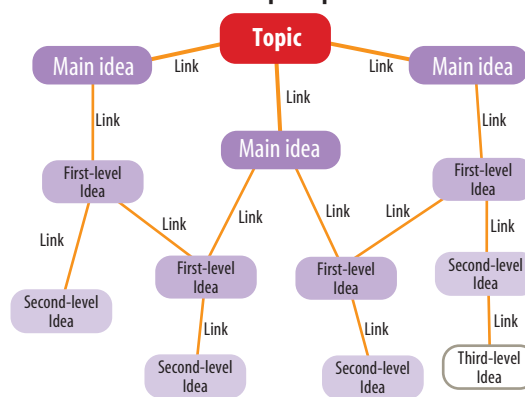
Giving it another go even though you want to give up



PMI chart

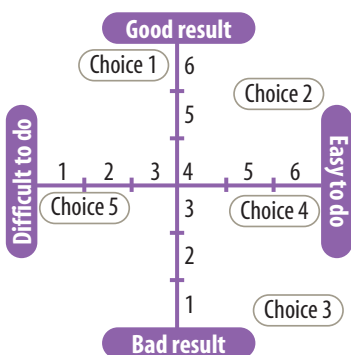


Concept map



Quantify or rank

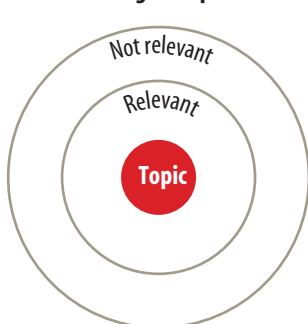
Priority grid



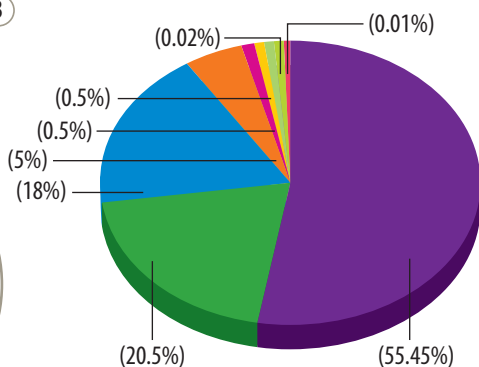
Continuum



Target map



Pie chart



UNDERSTANDING AND INQUIRING

REMEMBER

- State the visual thinking tools that are best for helping you to:
 - sequence your thoughts
 - classify information
 - quantify or rank ideas
 - analyse and compare.

THINK AND DISCUSS

- Select a different visual thinking tool to respond to each of the following.
 - To instruct someone how to tie a shoelace or a necktie
 - The similarities and differences between the stories of *Goldilocks and the three bears* and *Jack and the beanstalk*
 - The amount of chocolate eaten in a week for each member of your class



2.3 Mapping your future

Cluster maps and concept maps

1. Think of a topic and write it in the middle of a sheet of paper.
2. Around your topic, write down any ideas that link with it. Draw lines from the ideas to your topic.
3. Write down new ideas that are related to your first ideas, and link them with lines.

How can I develop the particular idea?

question

how to ...?

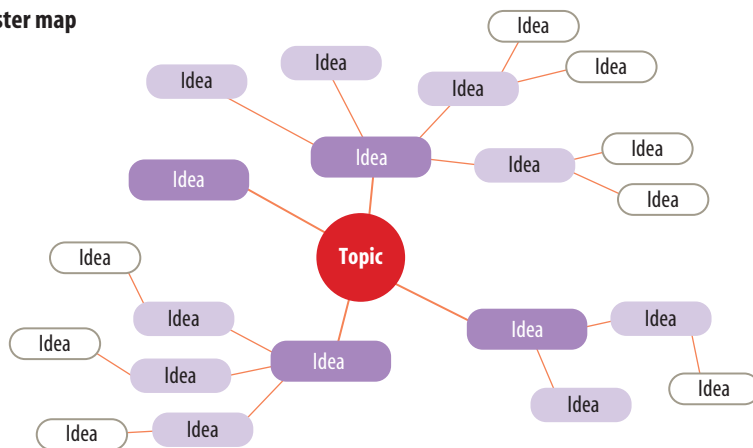
To stimulate the generation of new ideas

why use?

also called

Clustering; mubbles; brainstorm map; spider diagram

Cluster map



comparison

Similarity

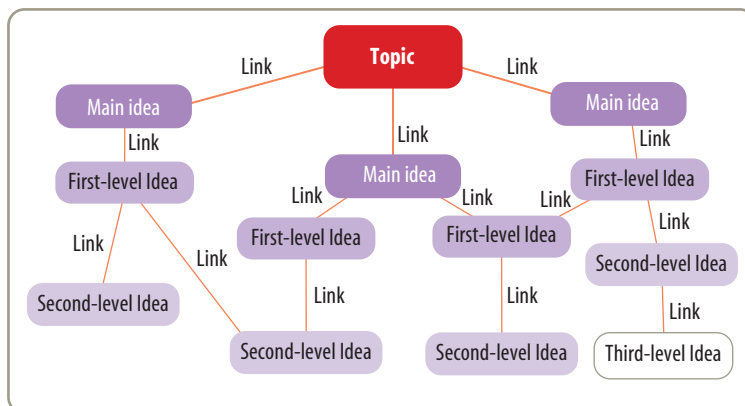
Both show links between related ideas or features.

Concept map

example

Difference

Concept maps organise links into a hierarchy and describe the links; cluster maps just show the links.



THINK AND CREATE

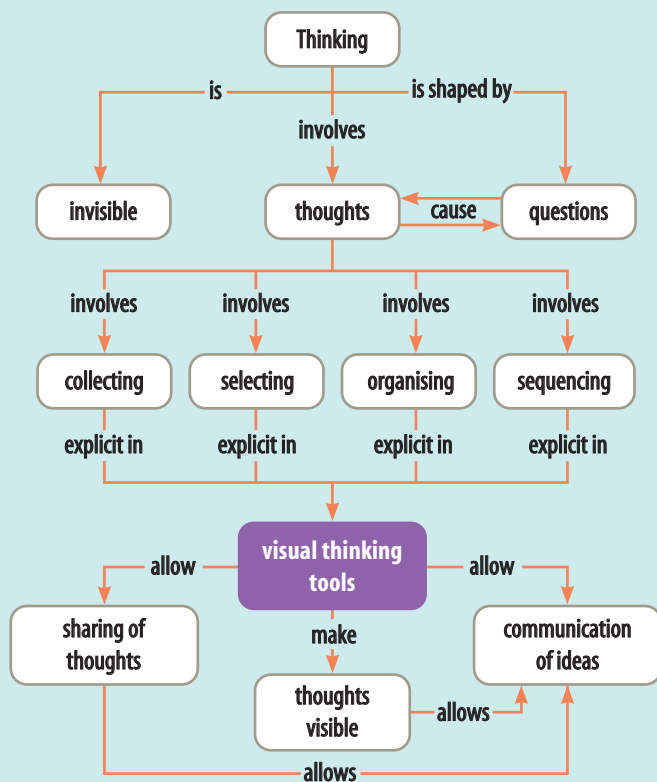
- 1 (a) The cluster map on the right gives examples of how 'play' can help you to learn. Form teams of four and then divide into pairs. Each pair in the team has the task of constructing two cluster maps, based on two of the following 'play' themes: cognition, healthy lifestyle, creativity, social skills.

Report back to your team with your maps and discuss each in detail. Add any other suggestions you wish to each map. Share and discuss the maps constructed by the entire class in a gallery of cluster maps.

- (b) Divide the following themes within the class and construct assessment rubrics for each theme.
- Being a good friend
 - Resolving conflict
 - Sharing and taking turns
 - Making predictions
 - Improving fine motor skills



- Developing self-trust
- Thinking flexibly
- Extending ideas



- 2 The concept map on the left shows how thinking tools can be used to:

- show your thinking about your thinking
- help you to think in different ways.

- Suggest how concept maps can help you to communicate your thoughts and ideas with others.
- Construct your own concept map on ways that help you to communicate your ideas.
- Construct a cluster map to show ways in which asking questions can help you to learn.

- 3 (a) Create a cluster map for the information shown in section 2.10.
- Compare and discuss your concept map with at least three others in the class.
 - On the basis of your discussions, modify your concept map to include your new ideas or links.
 - How effectively do you think you communicated your cluster map information to others? How effectively do you think others communicated information to you?
 - Suggest ways in which communication could have been improved.
 - Comment on how this question benefited, changed or added to your thinking.

Feeding your brain

Brain 'food'

When your brain gets 'hungry', it needs oxygen and glucose as 'food'. Breathing helps you to feed your brain oxygen. You breathe more during exercise to ensure that your brain gets the oxygen it needs. You also feed your brain glucose from the foods that you eat.

Feeling thirsty?

Dehydration is a very common problem that is linked to poor learning. As the brain is made up of 80 per cent water, this is another very important 'food' for the brain. Dehydration can result in a loss of attentiveness and then tiredness, laziness and sluggishness can set in.

When you feel thirsty it means that the amount of water in your body has dropped, and that the

salt concentration in your blood is increasing. An increase in salt levels in your blood can lead to the release of fluids from your cells into your bloodstream. This can result in an increase in your blood pressure and increase in stress. Drinking water can decrease these effects within five minutes.

'Brekkie' for the brain

Some of the foods that you eat contain proteins. Protein foods that are best for boosting your alertness and mental performance include eggs, fish, turkey, tofu, pork, chicken and yoghurt. This is because proteins are made up of amino acids, which can have different effects on the brain. For example, the amino acid



tyrosine enhances thinking, while tryptophan has a calming effect.

Your brain also uses tyrosine to make chemical messengers such as dopamine and norepinephrine, which are very important for alertness, quick thinking and fast reactions. Norepinephrine enables your body to 'get up and go' when action is required. This might be when you are riding a

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eLesson



A model of the brain

Find out what happens in the brain when you learn.

eles-0855

Fresh vegetables

(2–5 serves per day)
leafy greens, broccoli,
garlic, peas, carrots,
potatoes, tomatoes



Fresh fruit

(2–3 serves per day)
bananas, avocados,
berries, oranges



Drinks

(8–12 serves per day)
pure water, green tea,
fresh fruit juice



Carbohydrate

(1–5 serves per day)
whole grain bread,
pasta, cereal, rice



Protein

(2–3 serves per day)
meat, fish, yoghurt,
eggs, beans, seeds,
nuts, turkey, liver,
kidney, shellfish,
soybean



HOW ABOUT THAT!

It is better for your brain if you nibble during the day, rather than having one or two big meals. Too much time between meals can cause loss of concentration and decreased alertness. Do you eat to get rid of hunger or boredom, rather than for optimal learning? Before you put that next piece of food into your body, think what else it can do for you!

roller-coaster, are involved in an accident, or when there is a conflict from which you need to 'fight' your way out. At school, norepinephrine may be useful in doing maths calculations, maintaining your attention span and increasing your conscious awareness.

In these types of situations, norepinephrine is released all over your body and it increases the blood flow to your brain, which increases your alertness. Too much norepinephrine can make you feel 'hyper' and stressed; too little can cause drowsiness and make you feel 'out of it'. Foods in which tyrosine is found include meats, fish, eggs, tofu and milk products. If you want to get your day going, a

'thinking breakfast' including any of these would be a great start!

Minerals and your A, B, Cs

Vitamins that are very important to learning include vitamins A, C, E and most of the Bs. These vitamins assist our alertness, memory, visuo-spatial ability, attention span and planning/organisational skills.

Minerals that are important to learning include magnesium, sodium, potassium, zinc, iron, boron and selenium.

Other hungry-brain foods

Leafy green vegetables, salmon, nuts, lean meats and fresh fruits are some other brain foods.

A chemical called calpain is found in milk, yoghurt and leafy green vegetables (such as spinach and kale). It is thought to act as a 'cleaner' for spaces between your neurons, making transmission of neuron messages more efficient and hence helping the effectiveness of your learning.

UNDERSTANDING AND INQUIRING

REMEMBER

- 1 State the two 'foods' that your brain is most hungry for.
- 2 What is the name of the chemical that is the sole source of fuel for your brain cells?
- 3 Why is dehydration linked to poor learning?
- 4 What effect can drinking coffee and tea have on the amount of water available to your brain?
- 5 List five examples of protein foods that are best for boosting your alertness and mental performance.
- 6 (a) List four foods that are sources of tyrosine.
(b) What is the link between tyrosine and norepinephrine?
(c) Suggest how norepinephrine is useful for your learning.
- 7 Name the chemical in milk and yoghurt that acts as a 'cleaner' for the spaces between your neurons.

INVESTIGATE AND DESIGN

- 8 Design an experiment to find out which aromas relax you and which make you mentally alert.
- 9 (a) Research cookbooks for recipes that are good for your brain.
(b) Make up a class 'brain food' cookbook.
(c) Have each class member prepare a 'brain food' and have a class 'brain feast'.

- 10 In groups, design and make thinking breakfasts and lunches that you can share at school.
- 11 (a) Keep a diary for a week to determine which times of day you find learning and thinking the easiest and the hardest. Include what you have eaten and when in your diary.
(b) Do you have learning highs and lows?
(c) Does the type of food eaten or time it was eaten have any effect?
(d) Compare your thinking and learning diary with other team-mates. What are some interesting similarities and differences?

INVESTIGATE

- 12 Brainstorm a list of examples of thinking foods. Survey your school canteen or cafeteria to find out how many of these thinking foods they have.
- 13 (a) Megadoses of vitamins can be toxic. Find out the recommended amounts of vitamins A, B, C and E for your age group.
(b) Many vitamin supplements are absorbed better if taken with some foods than with others. Find out which foods increase absorption and which decrease absorption.

Discovering your brain

How often have you thought about your brain? Did you know that your brain:

- is made up of about 80 per cent water, 10 per cent fat, 8 per cent protein and small amounts of other substances
- is made up of about one hundred billion cells and is the most complex organ in your body
- will grow to about the size of a large grapefruit?

Throughout the day your brain is constantly registering your environment and monitoring vital signals such as your heart, hormone levels, breathing and digestion. It is also continually matching new learning with that from your past, and attaching emotions to each event and thought, to make patterns of meaning that make up the 'total picture'.

Celebrating your cerebrum

The largest part of the brain is called the **cerebrum**. It makes up about 80 per cent of your brain and is

responsible for higher order thinking and decision making. Your cerebrum is made up of billions of nerve cells (called **neurons**), with four primary areas called **lobes**. The functions of the four lobes are described in the diagram below.

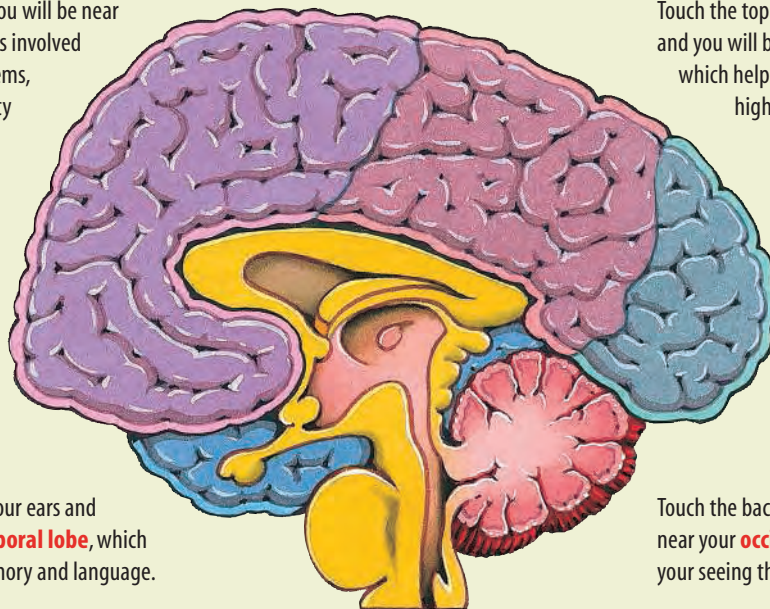
Left and right — two brains in one?

Your cerebrum is also divided into left and right sides or hemispheres. Although each hemisphere processes information differently, they are both involved in putting together the total picture of what you sense around you. For example, when you listen to someone speak, your left side processes words, definition and language. Research suggests that the right side processes the inflection, tones, tempo and volume of the speaker, which assists in getting meaning of the conversation rather than just the words.

Researchers also found that there can be patterns relating to which side of your brain you favour throughout the day. It is not uncommon to switch

Touch your forehead and you will be near your **frontal lobe**, which is involved in helping you solve problems, and in judgement, creativity and planning.

Touch the top part of the back of your head and you will be near your **parietal lobe**, which helps you with language and your higher sensory functions.



Touch above and around your ears and you will be near your **temporal lobe**, which is involved in hearing, memory and language.

Touch the back of your head and you will be near your **occipital lobe**, which is involved in your seeing things.

The four primary areas of your cerebrum are called lobes.

from right-brain to left-brain dominance sixteen times a day!

When learning, you may be activating more of one hemisphere than another. However, for optimal

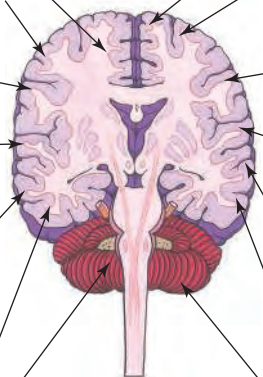
learning, it's important to involve learning activities that include the strengths of both hemispheres (even if it can feel a little uncomfortable sometimes). This will allow you to focus on 'whole-brained' learning.

Right cerebral hemisphere

1. I don't mind randomness.
2. I learn best when I make up the whole picture after learning its parts.
3. I want to use diagrams, graphics and pictures.
4. I prefer to see or experience a topic before I learn about it.
5. I like collecting information about how things relate to each other.
6. I prefer learning environments that are spontaneous rather than structured.
7. I like novelty and surprises without a definite outcome.

Left cerebral hemisphere

8. I prefer things in order.
9. I learn best when I learn the parts after seeing the whole picture.
10. I want to use symbols, words and letters.
11. I like to read about a topic first before it is discussed in class.
12. I like to collect relevant facts about a topic.
13. I prefer precise, organised instructions.
14. I want organisation and predictability.



HOW ABOUT THAT!

Like your thumbprint, your brain is unique. Not only may it be a different size and weight from your friends, but the learning connections between cells in your brain are different. These connections are made as a result of your experiences and this forms your own personal 'cognitive map', which can change over time as you build up more experiences. This difference in our brain's 'internal wiring' can explain why people at the scene of the same accident can have such different eyewitness reports.

INQUIRY: INVESTIGATION 2.3

Nostril breathing

KEY INQUIRY SKILLS:

- questioning
- communicating
- processing and analysing data and information

Did you know that, on average, you breathe through one nostril for about three hours until the tissue becomes slightly engorged, then you switch to the other? The nostril that you breathe through affects which brain hemisphere may be dominant. When your breathing is left-side dominant, your learning may be right-brain dominant, and vice versa.

Research has suggested that the information received by the brain from the 'dominant' nostril can change our interpretation of different smells. If our left nostril is the more active we will remember the smell more emotionally, whereas if our right nostril is more active we can describe the smell more objectively.

- 1 Outline what the research suggests (or claims) about use of different nostril sides and interpretation of smell.
- 2 Think about this suggested connection.
- 3 Construct a PMI chart (refer to section 2.7) to organise your data. Use 'P' = supports/agrees with the claim,

'M' = does not support/disagrees with the claim and
'I' = interesting information that is neither for nor against the claim.

- 4 Consult a variety of resources to gather relevant information that will help you to decide whether you agree with it or not.
- 5 Share your PMI chart with others in the class, adding any relevant points that you may have missed.
- 6 On the basis of your PMI summary, decide whether you agree or disagree with the research claim on the following scale: 0 = strongly disagree; 1 = disagree; 2 = agree; 3 = strongly agree.
- 7 As a class, be part of a human 'opinion' scale with the left wall of the classroom being '0' and the right wall being '3'. Chat with others near you about reasons for their view and then hear from your class members at other points along the scale.
- 8 Construct a suitable hypothesis for this research claim and design an experiment to test it. If possible, perform the investigation and share your findings with others. Reflect on your design and discuss ways in which you may improve it if you were to do it again. Suggest other relevant research questions that could be investigated.

Windows of your brain

Next time you enter your classroom, notice what you see around you. Are there any posters, plants, colours, objects or shapes? Because 80 to 90 per cent of all information absorbed by your brain is

usually visual, changes in colour, size, contrast, shape and movement around your environment are very important. Your eyes can register 36 000 visual messages in an hour, and about 40 per cent of all the nerve fibres in your brain are connected to the retinas in your eyes.

UNDERSTANDING AND INQUIRING

REMEMBER

- 1 State the name of the most complex organ in your body.
- 2 List five functions of your brain.
- 3 How is your brain different from that of others in your class?
- 4 Name the part of your brain that is responsible for higher order thinking and decision making.
- 5 Draw an outline of your brain and label the four lobes of your cerebrum. Add to each label why the lobe is important.
- 6 What is another name for nerve cells?
- 7 Draw a picture that summarises the types of thinking in the two hemispheres of the brain.
- 8 Approximately what percentage of information received by your brain is visual?
- 9 List the important visual aspects of your learning environment

INVESTIGATE AND DESIGN

- 10 Swara yoga is a branch of yoga that develops an awareness of breathing through your nostrils. This involves learning to control your breath moving through your nostrils, to 'control' the activity of your brain hemispheres in a way that suits the type of activity that you are involved in.
 - (a) Find out more about the practice of alternate nostril breathing. In your report include what you consider to be the advantages and disadvantages of doing this.
 - (b) Design some activities that can test your nostrils, breathing and left- or right-hemisphere dominance.
 - (c) A peak expiratory flow rate meter like the one shown below can be used by people with asthma to measure the volume of a whole breath. Draw



the plans for your very own clever and creative invention that measures which nostril is being used more frequently. Make up a colourful brochure that could be used to market it to fellow students.

- 11 (a) Albert Einstein had an average-sized brain. Find out what other sorts of information has been found out about his brain. Which thinking hat are you using?
(b) Present your information in a creative way. Which thinking hat are you using now?
- 12 Emotions can change the parts of your brain that are most active. Research and report on your findings as annotations on a diagram of the brain.
- 13 Select one of the environmental influences on learning listed below and find out what effects it may have on your body, and consequently your learning.
 - Colours
 - Type of lighting
 - Plants
 - Room arrangements
 - Seating options
 - Objects

THINK AND DESIGN

- 14 (a) Think of an activity, hobby or interest and prepare a presentation that introduces the topic by:
 - (i) giving an overview ('big picture') of the topic, then introducing the sub-topic details
 - (ii) giving details of the sub-topics and then the 'big picture'.
(b) Which one was easier for you to put together?
(c) Did you use more words, symbols and letters, or more pictures, graphs and charts?
(d) Was there a lot of factual information on the topic?
(e) How were your presentations similar to and different from those of others in the class?

THINK, CREATE AND DESIGN

- 15 Use food, plasticine or other materials to make a labelled model of your brain.
- 16 Make up a song or poem to help you remember the functions and positions of the four different lobes of the cerebrum. Include some actions if you can.
- 17 Work out whether you are left- or right-brain dominant:
 - (a) Give a mark out of 5 for each of the statements shown in the diagrams on the previous page for each hemisphere of the brain.
 - (b) Add up the total score for each side. In which hemisphere of the brain did you score higher?
 - (c) What does this mean in terms of your learning?

THINKING HATS, KEYS AND TOOLS

- list the colours of the six thinking hats and suggest a question that could be associated with each hat
- use the 'combination' key to design a hat with an unusual function
- describe the difference between the 'variations' key and the 'alternative' key and give examples of how each could be used
- suggest 'question' keys that require 'have or have not' comparisons
- outline the differences between the following 'question' keys: 'evaluate' and 'predict'; 'explain how' and 'explain why'; 'state' and 'describe'
- identify thinking tools that could be used for each of the following types of thinking: analyse or compare; visualise or reflect; order or sequence; quantify or rank

TYPES OF LEARNING AND INTELLIGENCE AND YOUR BRAIN

- provide examples of activities that involve internal visual learning
- suggest examples of activities that involve verbal or linguistic audio learning
- list different types of multiple intelligence
- describe various 'mindful habits' in a Y chart
- suggest strategies that can be used to become an active rather than a passive learner
- name the main parts of the brain
- explain why protein foods are important for the brain and learning

COLLABORATIVE LEARNING

- suggest ways in which communication skills can be improved
- suggest examples of social skills that team members can focus on to develop a more effective team
- describe examples of collaborative skills that are important for an effective team
- outline the difference between a team 'hog' and a team 'log' and suggest strategies to overcome their potential negative impact on teamwork

INDIVIDUAL PATHWAYS

Activity 2.1
Learning
doc-6078

Activity 2.2
Investigating
learning
doc-6079

Activity 2.3
Developing
learning
doc-6080

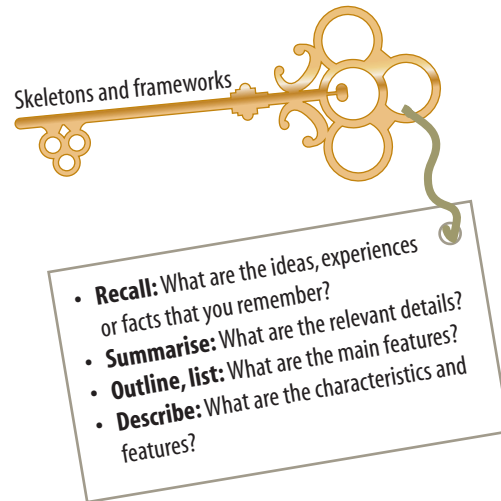
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Summary

eLESSONS

Unlocking learning: flowcharts, cluster maps and concept maps

Find out about some strategies and tools for making learning easier, and fun as well!



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A model of the brain

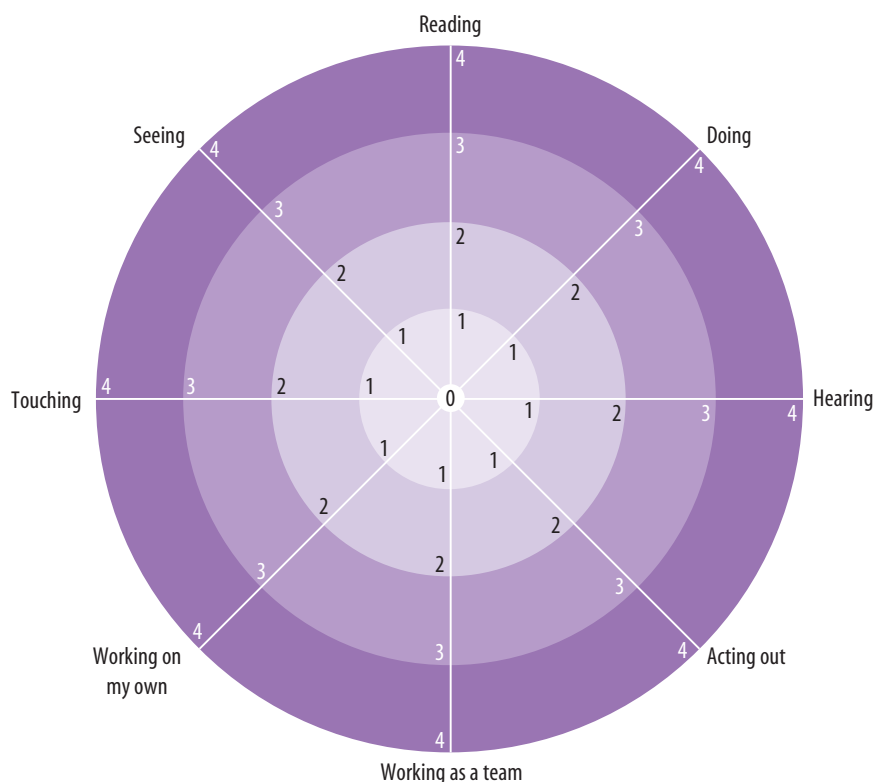
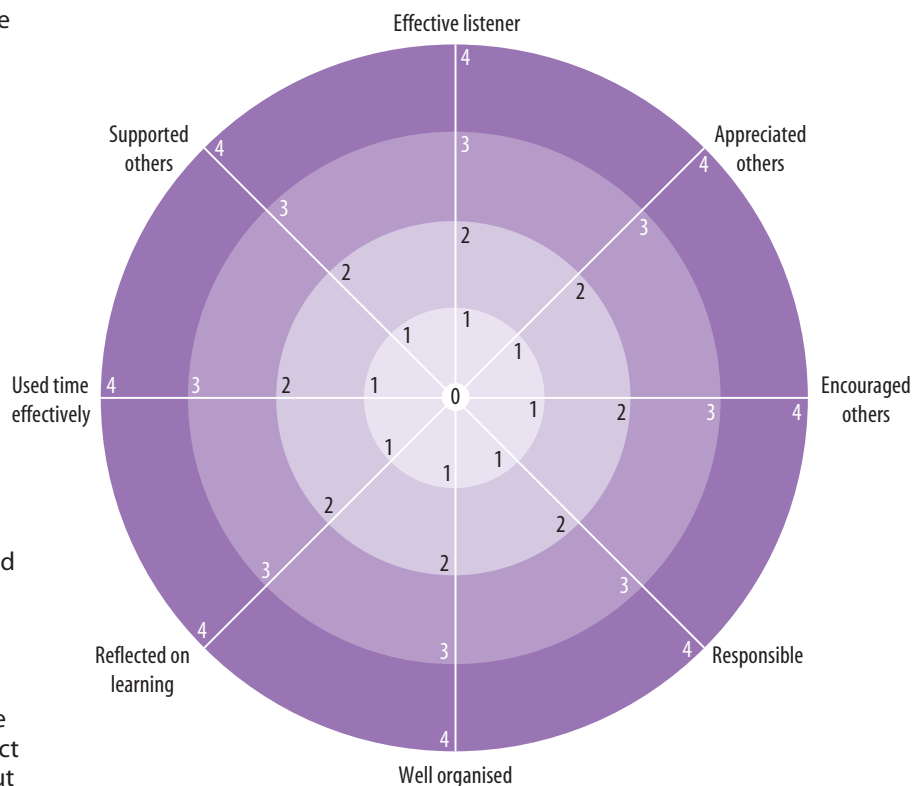
Find out what happens in your brain when you learn.



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LOOKING BACK

- 1 Create a mind map to show what you have learned in this chapter.
- 2 If you were to begin the chapter again, what might you do differently and why?
- 3 Describe your ideal learning environment.
- 4 What type of learner would you describe yourself as?
- 5 (a) Use the diagram at right to score how effectively you think you have been as a team member during your learning on the brain. Give yourself a mark/dot out of 4 for each of the traits in the learning wheel on the right.
(b) Join the dots together to show your team profile.
(c) Comment on your strengths as a team member and suggest ways that you could improve in areas in which you did not score highly.
- 6 (a) Reflect on your learning style and find out your profile in the learning wheel below right.
(b) What other sorts of learning factors are there? Make a list of them and construct another 'wheel of learning'. First find out your own learning profile and then get other team members to try it out.
(c) Compare your learning wheel with those of your team-mates. Use a Venn diagram to show how they are similar and different.
(d) Survey the class to find out the overall pattern of the learning wheel. Is this the pattern that you would have expected? Discuss your view with others in the class. Suggest ways in which you could use this information.
- 7 Use the 'alphabet' key to summarise points that you have learned in this chapter.
- 8 Construct a cluster map or concept map to outline the following.
(a) 'Ways to work as a team'
(b) 'Learning how to learn'
- 9 Create a cartoon or picture book to explain why protein foods are best for boosting your alertness and mental performance. Include examples of foods that are good sources of protein.
- 10 Did you know that *crypto* means secret or hidden? Create your own cryptonym (secret name) book that contains all the prefix and suffix meanings provided in this chapter. Add others of your own.



INQUIRY: INVESTIGATION 2.4

Juggling jigsaws

KEY INQUIRY SKILL:

- communicating

In Juggling jigsaws, each member (or pair) of the team specialises in one specific part of the learning task. Once their part in the learning task is mastered, they become experts on it. The team then reunites and each expert (or expert pair) teaches the others in the team what they have learned.

Expert Team 1 challenge

Each member is to research a part of the brain that is mentioned in section 2.10. Find out the facts and any

interesting research on this part of the brain and how it may be involved in learning. Share your findings with the rest of your Expert Team.

Expert Team 2 challenge

Each member is to find as many songs or poems about the brain as they can. Share your findings with the rest of your Expert Team.

Expert Team 3 challenge

Collectively this team needs to summarise information from section 2.9 and create a song with actions that they can teach to each other and then to the rest of the class.

Expert Team 4 challenge

This team needs to design a classroom that they consider will be an effective learning environment. They then need to build a model of this wonderful learning classroom.

INQUIRY: INVESTIGATION 2.5

Setting goals, being persistent and failing wisely

KEY INQUIRY SKILL:

- communicating

Have you thought about your thinking and learning throughout this chapter? Have you reflected on the 'mountains and valleys' of your learning?

- Construct a learning and thinking journal that includes answers to the following questions.
 - How, what, where and when have you learned most effectively?
 - Which of your social and collaborative skills were the most developed? Which of these skills would you like to focus on developing in your next unit of study?
 - How well did you set goals and how well did you meet them?
 - Were you persistent or did you give up when things got a bit too tough, hard or uncomfortable for you?
 - Everybody fails at some time. It is okay to fail. The important thing is what happens after you fail. Have you failed wisely? What did you learn from failing? How could you use what you have learned to your advantage?
- Select a classmate(s) you respect and have learned to trust during your recent learning. Listen to each other talk about some key points of this learning journey. Share and discuss each other's learning and thinking journals. Make constructive suggestions that may help each other's learning.

- In a pair or team of four, suggest at least six slogans, pictures, visuals, cartoons, stories/fables, quotes or sayings that could be used as prompts to help you to become effective learners.
- What do you think the Cheshire Cat in *Alice in Wonderland* meant when he said, 'If you don't know where you are going, any road will take you there'? Construct a bubble map to record your suggestions.



If you don't know where you are going, any road will take you there.