# Thinking for learning

*'No problem can withstand the assault of sustained thinking.'*

**Voltaire**



## Thinking skills and the holy grail

Having a range of thinking tools available to us is very useful. They help ensure the engagement and stimulation of a wide variety of students. But, there has to be more.....

Teaching thinking skills as a process must not be taught in isolation, learning is complex and this is only one of the underpinning elements of TEEP.

It is not simply about training superior cognitive ability but nurturing students tendencies to explore, to inquire, to seek clarity, to take learning risks, to think critically and imaginatively. These tendencies can be called 'learning dispositions' [so] teaching learning means more than inculcating…skills, it means teaching students to be disposed to learn creatively and critically in appropriate context.

More, in this case is a challenge to achieve for teachers and students alike. The holy grail for teachers must be to develop independent thinkers who can select the most appropriate tools and strategies to solve problems. To get to this point two things must happen. Firstly, students must acquire a working knowledge of thinking tools and techniques. Secondly, they must be given autonomy to choose, try out, modify, fail and succeed. We must surrender intellectual control to our students if they are to progress.

In our results-driven educational world the final grade all too often determines success or failure. The skills, decisions and the thinking processes that we use in our everyday lives determine success after formal education. Many job adverts demand qualities such as analysing, adaptability and interpersonal skills. Young people are rarely given the opportunity to develop these explicitly. We can plan our lessons to develop these skills in our students. The lesson focus must sometimes shift from solely content to include the process of learning. Thinking tools can play an important role in developing the learning of our students.
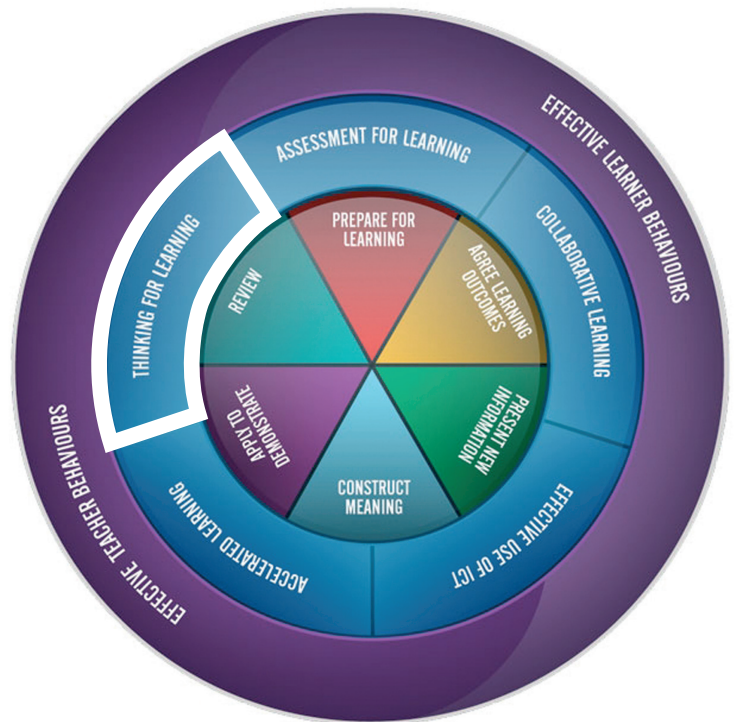
## The steps to the thinking skills holy grail

1. Plan lessons so that the students use a variety of tools and techniques over time.
2. Allow students to reflect on and evaluate the use of these tools.
3. Allow students to reflect where else these tools could be useful.
4. Make the thinking process explicit and show you value the reasoning and the thinking process itself.
5. Plan a whole school approach, especially a consistency of language.
6. Plan lessons that give students a choice of tools and techniques.
7. Plan schemes of work in which these skills are specifically developed.
8. Plan open-ended activities so that students can plan a route and make choices.
9. Make sure that tasks are worth some serious thought.
10. Establish trusting relationships with your students (Leat, 2000).

**The 5 key components for teaching thinking skills are (CUREE, 2001):**

- **concrete preparation** – ensuring students understand the initial problem
- **cognitive conflict** – setting up and managing situations in which students make observations that are puzzling or conflict with previous experience
- **social construction** – students working together on challenging activities to create joint understanding.
- **metacognition** – helping students articulate their own reasoning
- **bridging** – transferring reasoning patterns from an initial context to a new one.

## The Fox thinking tool

The Fox thinking tool is a useful tool to develop thinking skills whilst students work collaboratively. It was developed by Pete Fox of the critical skills programme to improve the quality of students' discussion by providing a structure. It is designed to help students think convergently, arriving at important learning points; and then divergently, to apply this new knowledge.
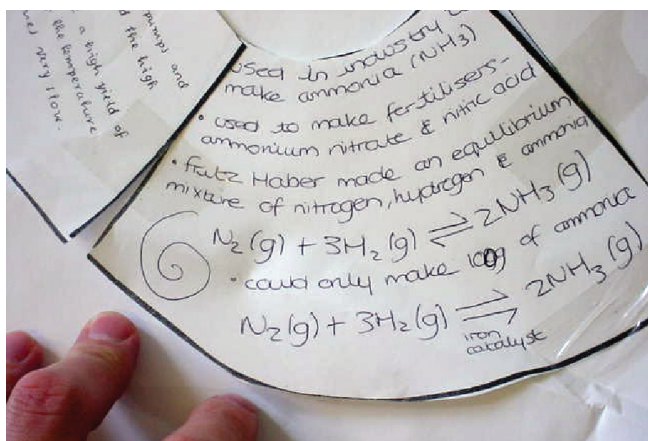


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**A Fox thinking tool in action**

**Steps of the Fox thinking tool**

1 Students in groups read a variety of articles, one article per student.
2 Students write on a section of doughnut to summarise the article.
3 Students write on a new section of doughnut about another aspect of their article – perhaps pros and cons.
4 Students combine pieces together to form a doughnut. A list is compiled of 'facts' that they agree upon from their completed doughnut.
5 Teacher compiles a list of agreed 'facts' taking one from each group in turn.
6 Students are then given stimulus questions to apply this knowledge more widely.

This tool can be very motivating and inclusive. Most students will not submit their part of the doughnut with little or no information on as they very visually let their team down. Students using this tool have retrieved half-hearted contributions to add to them when they have seen what other members of their group have produced.

## Philosophy for children (P4C)

Philosophy for children (P4C) is an approach which builds on four key types of thinking through the use of philosophical dialogue. These are:

- collaborative
- caring
- critical
- creative

P4C has been shown to have a consistent moderate positive effect on a wide range of outcome measures, with students gaining significantly both academically and socially (Topping & Trickey, 2007). This approach has been found to work best when teachers encourage students to reflect, interact, and to critique both their own and others' ideas (Daniel & Auriac, 2011).

In order to foster reflexive and critical thinking in your students, ask them to discuss ambiguous and problematic concepts as a group. You also need to make sure they:

- sit in a circle as a group
- share a source of puzzlement or intrigue e.g. a story or picture
- examine the source and creating relevant questions
- give reasons for opinions, and distinguish good reasons from bad ones.

To start using P4C in your practice you could try using e.g. the 'believing and doubting game' (**http://p4c.com/articles/believing-and-doubting-game**).

**Steps of the 'believing and doubting' game:**

- You or a student put forward a view.
- In turn, each member of the group become 'believers' by putting forward justifications for this view.
- All members then have to become 'doubters' by listing the reasons for opposing the proposed view, and suggest alternative views.
- Students then ask any questions they have, before coming to their own view and giving their reasons for this view.

To find out more about P4C and to see some relevant resources and activities to try in your classroom, go to **www.philosophyforchildren.co.uk** or **http://p4c.com**

## Project zero

Project zero is an educational research group at the Harvard Graduate School of Education.

One of the projects is the Cultures of Thinking, looking at the process of creating a school-wide culture of thinking that supports the development of students' thinking dispositions. Drawing on previous research by Ron Ritchhart (2002), the Cultures of thinking (CoT) project focuses teachers' attention on the eight cultural forces present in every school, classroom, and group learning situation.

These forces act as shapers of the group's cultural dynamic and consist of language, time, environment, opportunities, routines, modeling, interactions, and expectations. As teachers strive to create cultures of thinking in their classrooms, they make time for thinking, develop and use a language of thinking, and make the classroom environment rich with the documents of thinking processes.

This work doesn't happen by teachers merely implementing a defined set of practices; it must be supported by a rich professional culture. Indeed, a core premise of the CoT project is that for classrooms to be cultures of thinking for students, schools must be cultures of thinking for teachers.

## De Bonos thinking hats

Like all brilliant ideas, De Bono's thinking hats are simple. They help frame different ways of thinking about a topic. They can be used individually, in groups, or be sequenced for particular tasks. They are summarised in the table. Whilst we recognise this has been around for a number of years, we feel it is still relevant and can play a great part.

| | | |
|---|---|---|
| **Red hat thinking**<br>**Hunches**<br>**Feelings**<br>**Gut reactions**<br>**Guesses** | • The colour of emotions – love, anger and danger.<br>• This hat ensures you value your emotions but also not let them dominate your thinking.<br>• This is often the default 'hat' for students. | |
| **White hat thinking**<br>**Facts**<br>**Data**<br>**Proof**<br>**Information** | • The colour of purity, pure driven snow.<br>• This is a hat to collect facts, data or evidence.<br>• Make no judgements with it on. | |
| **Yellow hat thinking**<br>**Advantages**<br>**Improvements**<br>**Optimism**<br>**Improvements** | • Yellow – bright and positive.<br>• Postive, logical thinking. If everything goes well then, this will happen.<br>• Use this to find good points of your work. | |
| **Black hat thinking**<br>**Downside**<br>**Weak points**<br>**Pessimism**<br>**Negatives** | • Dark and sinister – the negative thinking hat.<br>• Use this to criticise your method, results or situation.<br>• Don't over use. | |
| **Green thinking hat**<br>**Creative**<br>**Solutions**<br>**Ideas** | • The colour of newly created shoots.<br>• The creative hat, use to generate ideas, explore.<br>• Make no judgements with it on. | |
| **Blue hat thinking**<br>**Analysis**<br>**Planning**<br>**Reasoning**<br>**Decisions** | • Think of the sky or the sea – big open spaces.<br>• This is the big picture hat.<br>• Always come back to this hat to make the final decision or to think about your next move. | |

# Questions using Anderson's taxonomy

Building on Bloom's taxonomy, Anderson and Krathwohl (2001) have made some apparently minor but significant modifications, note the new top category of creating. Plan questions to progress through these in each lesson, or to target students of different abilities with appropriately challenged questions. Some question stems are included to show what kinds of questions may be asked at each level.

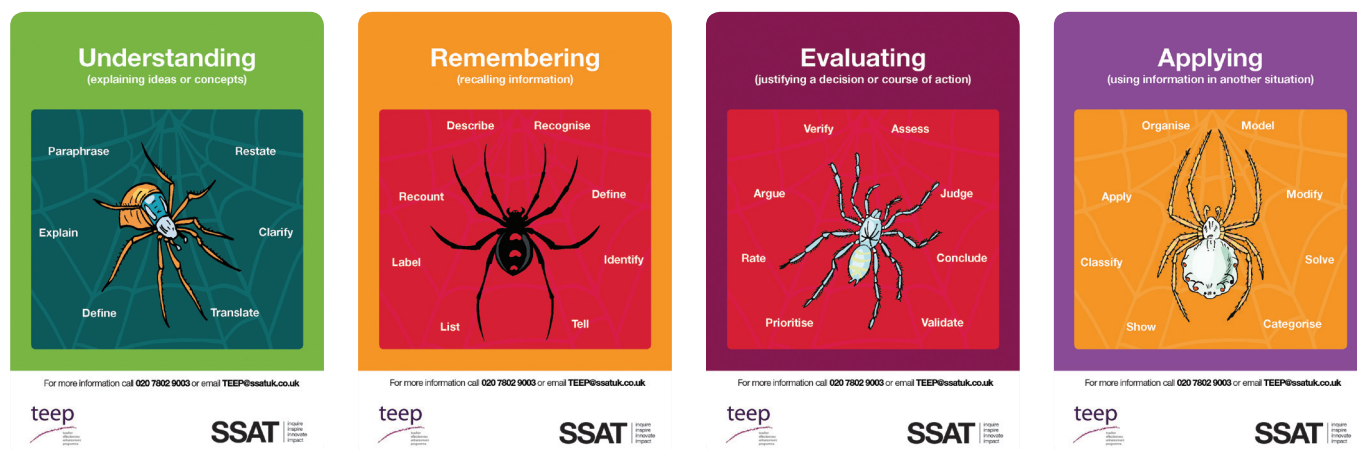| | |
|---|---|
| **Creating** | • How would you have handled...?<br>• What are the possible solutions...?<br>• Can you create new and unusual uses for...?<br>• How effective are...? |
| **Evaluating** | • Is there a better solution to...?<br>• Defend your position using...<br>• What changes would make it even better? Explain.<br>• Would you recommend this... and why? |
| **Analysing** | • Which event could not have happened if...?<br>• Can you compare your answer with that presented in...?<br>• How is this similar to...?<br>• Explain what must have happened when... |
| **Applying** | • Can you think of another instance where...?<br>• What would you change if...?<br>• Would this information be useful if you had to...?<br>• From the given information develop a set of instructions |
| **Understanding** | • Can you explain that in your own words?<br>• What do you mean by...?<br>• Can you provide a definition for...?<br>• Who was the key character? |
| **Remembering** | • How many...?<br>• How was it that...?<br>• Who spoke...?<br>• What happened when...?<br>• Describe what happened at.... |

# Debriefing thinking

Without a debrief the thinking skill activity is simply an entertaining way of learning facts. With a debrief the students not only reflect on what they have learned, but how and why. This is a time during the lesson when most learning will take place, but this requires careful planning from the teacher. A good starting point is the use of a common language between staff and the students. Share words e.g. appraise, decipher, paraphrase and allow time to discuss how they thought about a task. Students find it motivating when they see how many ways they have been thinking.
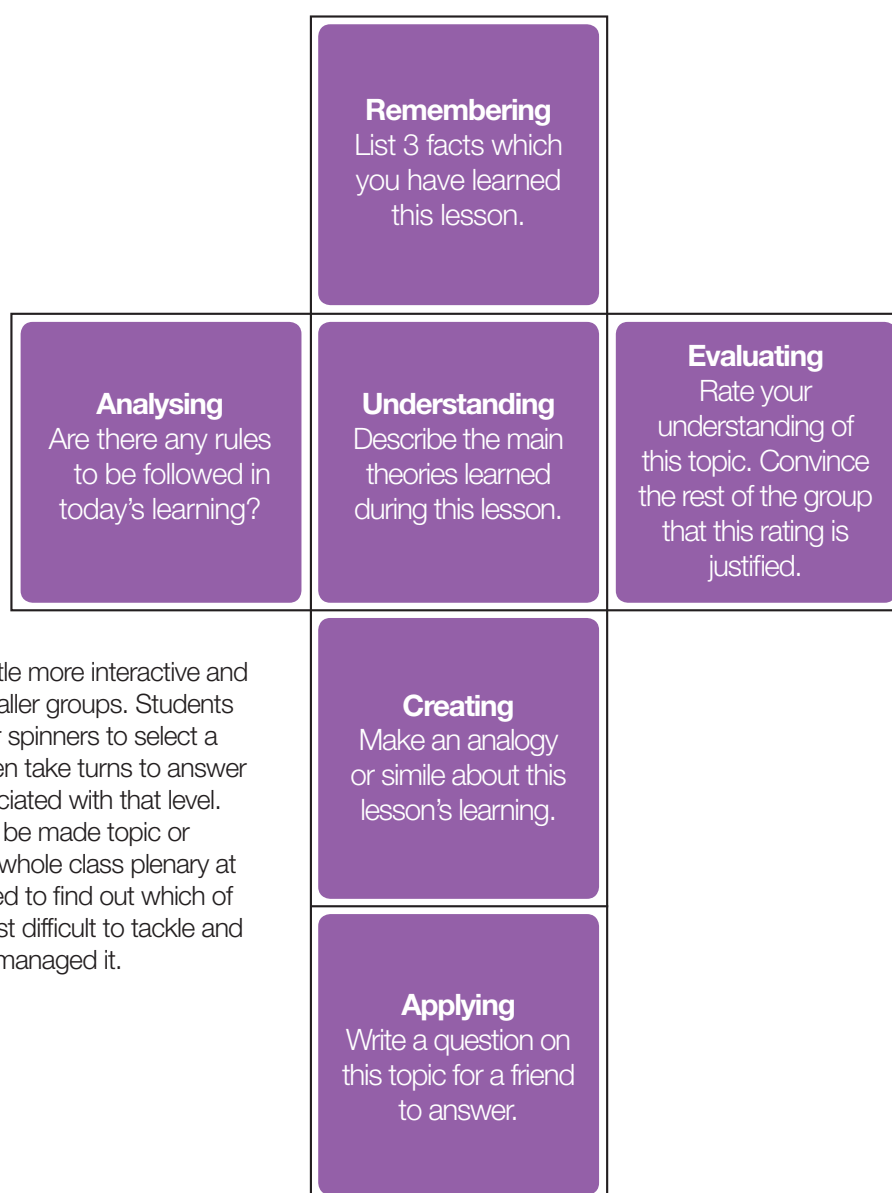
**Top tips for teachers when debriefing**

1 Allow sufficient time to be thorough in this process.
2 Plan a structure for debriefing, for example how long will you discuss the content and how long will you discuss the skills and processes the students have been through.
3 Plan enough open questions and allow students the chance to discuss in groups before answering, either as a group or individually.

4 Encourage students to answer at length – wait time after response will elicit more from the student.
5 Be prepared to go with the flow. Do not set a rigid agenda, as there will be many successful ways of thinking about the same task.
6 Train the students to use the thinking language so that they can explain their ideas in detail.
7 Value student input, summarise their ideas, make connections to the lesson outcomes and to wider learning. Analogies and real life examples can be useful here.
8 Give feedback that is evaluative on the process of learning. Students can be trained to do this too.
9 Stimulate students to ask questions during this time; the whys are useful here.
10 Use the thinking spiders hierarchy to motivate students to higher levels of thinking

# Two ways to use the thinking spider's hierarchy



**Understanding**
(explaining ideas or concepts)

Paraphrase — Restate
Explain — Clarify
Define — Translate

**Remembering**
(recalling information)

Describe — Recognise
Recount — Define
Label — Identify
List — Tell

**Evaluating**
(justifying a decision or course of action)

Verify — Assess
Argue — Judge
Rate — Conclude
Prioritise — Validate

**Applying**
(using information in another situation)

Organise — Model
Apply — Modify
Classify — Solve
Show — Categorise

For more information call **020 7802 9003** or email **TEEP@ssatuk.co.uk**

The first way is fairly straight forward. Make cards identifying thinking words from Anderson's taxonomy or your TEEP Thinking Spider posters.

Once you have established what thinking has been happening in the class spend a moment attaching these cards to the appropriate level of thinking on your posters or other class display. This will require some discussion to assign them correctly. It will be evident where your students have been thinking and what the next step should be.

**Remembering**
List 3 facts which you have learned this lesson.

**Analysing**
Are there any rules to be followed in today's learning?

**Understanding**
Describe the main theories learned during this lesson.

**Evaluating**
Rate your understanding of this topic. Convince the rest of the group that this rating is justified.

**Creating**
Make an analogy or simile about this lesson's learning.

**Applying**
Write a question on this topic for a friend to answer.

Another way is a little more interactive and can be done in smaller groups. Students use Thinking Die or spinners to select a challenge. They then take turns to answer the challenge associated with that level. These devices can be made topic or subject specific. A whole class plenary at the end can be used to find out which of the levels were most difficult to tackle and how other groups managed it.

## Activities to stimulate thinking

### Odd one out

Simply provide a selection of numbered keywords upon the topic being studied.

| 1 Topic | 2 Jaffa cake | 3 Tunnocks teacake | 4 Ginger snap |
|---|---|---|---|
| 5 Garibaldi | 6 Hob Nob | 7 Rich tea | 8 Mars bar |

Then select these in groups of three and ask which is the odd one out. Asking why they think this will not only get your students to consider the content of the subject, but also the thinking behind making their decision.

**Example 1: Using the above table which, out of 1, 4, 8, is the odd one out?**

The answer could be 4 as 1 and 8 are tasty chocolate bars that have a certain amount of flex in them, whilst a ginger snap is a rigid tasty biscuit. The beauty of this activity is that there is often no right answer. The important thing is to analyse, decide on an answer and justify your choice. The thinking might require a description by recall or a visualisation of the product itself. Students may juxtapose, examine and test their criteria for groups. Differentiating between items by comparing and contrasting can lead to high quality judgements.

An alternative method of extending the discussion about the content knowledge is to ask the question 'What would you have to do to the odd one out to stop it being so?' This stimulates a review of what they know about the subject. To answer the question here you could coat it in chocolate, individually wrap the ginger snaps or re-form it into a bar shape.

There is no reason to make them so clear cut as often the murky ones will lead to a more in depth discussion of what students do and do not understand.

**Example 2: Using the above table, which out of 4, 5, 6, is the odd one out?**

- Could be 5 as this is an oblong shape while the others are round.
- Or could it be 5 as this is the only one named after an Italian patriot, showing that to answer an apparently simple question requires consideration of what is known.

### Picture from memory

This is an effective way to start a lesson, it encourages students to discuss in detail, ask questions of each other and consider memory techniques.

**All you need to do is:**

1 Select a picture, diagram or graph that you want your students to study.

2 Group the students into teams, around 5 works well.

3 Students are given one sheet of plain paper to recreate whatever is on your sheet.

4 Students nominate their first candidate to come up and view the image.

5 Restrict this by time. About 30 seconds is usually challenging.

6 Send the students away to draw what they saw!

7 Encourage the students to describe what they saw to their team.

8 They then send a different student to view the image.

9 Keep going until each student has been.

While debriefing this bear in mind some of the strategies that the students may have employed; some may have divided the sheet into grids, you do 'top left', while others may be more specific 'there is something next to the circle, what is it?' A relatively simple activity can lead to some complex discussions of how they did it.

### Mysteries

These intriguing activities are used to generate discussion by making students hypothesise, suggest or deduce. They must 'unpick' information by classifying it and then use it to reason an answer to a big question, such as 'Should the speed limit be reduced to 20mph in built up areas?' Here's how to set one up:

1 Get the big question right! Make sure it is interesting and will lead to debate and that you can provide potentially conflicting information for the students to use. Remember this is the content of your lesson so combination of facts and opinion is useful.

2 Do not reveal the question at the start.

3 Provide around 20 pieces of information cut up in an envelope.

4 Allow students 5 minutes to read through this information and classify it in any way they see fit.

5 Review groups into which the information has been placed. How did they go about doing this? The debrief language is helpful here.

6 Now reveal the big question and ask them to rearrange the information to respond.

7 Review again using the debrief words.

8 Students can now complete an **Apply to demonstrate** activity where they can use this information along with their own ideas to show their new learning. For example they might write a letter to persuade someone that their opinion about the big question is correct.

## Hyerle's thinking maps

These are simply a series of generic tools that allow the students to interact and think about a topic in different ways. Don't be taken in by their apparent simplicity. They will develop your students thinking about topics and with consistent and regular use, they may well hold the key to the transfer of thinking skills between lessons and subjects.

**Whole part map** – This allows a topic to be broken down showing the links between ideas.
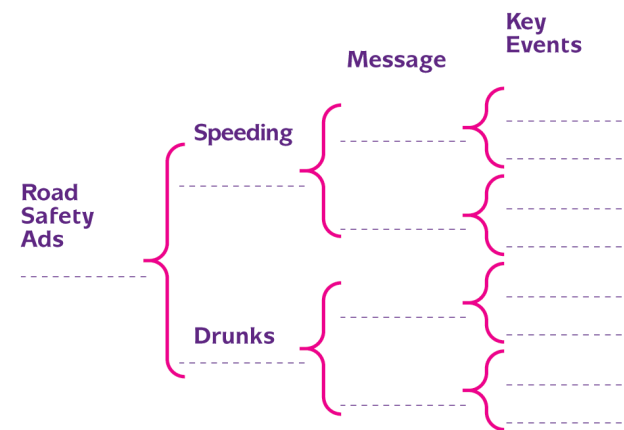


**Circle map with a frame of reference** – This encourages the students to think about other people's points of view. The frame of reference is the box around the outside of the circle, which provides space to brainstorm. If the example below changed its reference to a 10 year old who walks to school rather than a taxi driver the responses would change dramatically.
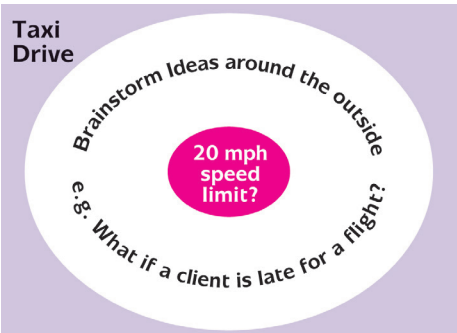


**Comparison alley** – A tool for comparing and contrasting that makes similarities and differences clear.
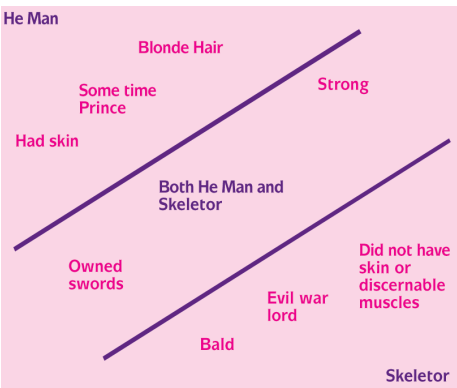


## Taboo

| Item | Taboo words |
|------|-------------|
| Toblerone | Triangle, nougat, chocolate |
| Wagon Wheel | Round, cowboy, chocolate |

Is similar to Odd One Out as it uses the key words of the topic and requires the students to really consider their understanding of it. The game in itself is simple. Students have to describe the keyword without saying it or the other listed Taboo words while the other student has to guess what the word is. The difficulty level can be adjusted by outlawing non-topic references so that the students must talk about their actual content of the subject. For example you could describe a wagon wheel by saying, 'It was used in the wild west on a stage coach, it has spokes and it turned around in circles enabling it to be pulled by a large horse' – with not one reference to the iconic biscuit itself.

## Mind movies

Using 'mind movies' helps students consider things from a different point of view and develops their visual memory skills (Leat, 1998).

**Steps of the' mind movies' approach:**
- Ask students to sit down and close their eyes.
- Read them a passage and asking them to imagine it.
- Once the passage has been read, ask students to continue the 'movie' running in their heads and to imagine what would happen next.
- Students then discuss, in pairs, what they saw.
- Encourage students to write down what was the same and what was different about their movies, and to discuss what they think would happen next.

## Concept Maps

A concept map is a diagram that shows relationships between concepts. It is a graphical tool that enables the user to organise and structure knowledge.

A concept map typically represents ideas and information as boxes or circles, which it connects with labelled arrows in a hierarchical branching structure, with the most inclusive, most general concepts at the top of the map and the more specific, less general concepts arranged hierarchically below. The relationship between concepts can be articulated in linking phrases such as causes, requires, or contributes to.

An important characteristic of concept maps is the inclusion of cross-links.

## Mind Maps

Mind mapping is more flexible, and more personal than concept mapping. This is not to say that mind maps are 'better' than concept maps, but to differentiate between the two.

A mind map is often created around a single word or text, placed in the centre, to which associated ideas, words and concepts are added. Major categories radiate from the centre with lesser categories as sub-branches of larger branches. Categories can represent words, ideas, tasks or anything related to the central concept or topic.

When choosing between concept maps or mind maps, the 'correct' choice is usually that which is the most useful to the user.

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