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Welsh Assembly Government

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How to develop thinking and assessment for learning in the classroom

Guidance

Guidance document No: 044/2010
Date of revision: November 2010

How to develop thinking and assessment for learning in the classroom

Audience

Teachers and senior managers in primary and secondary schools, further education colleges; local authorities; tutors in initial teacher training; and others with an interest in education. The booklet is essential for those practitioners involved in the development programme for thinking and assessment for learning.

Overview

This booklet is part of a series of guidance materials to support practitioners in implementing higher-quality teaching and learning by focusing on developing thinking and assessment for learning.

Action required

Schools' senior managers and local authority advisers are requested to raise awareness of these resources within their schools, and to encourage teachers to use the materials to support their focus on quality teaching and learning.

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Additional copies

This document can be accessed from the Welsh Assembly Government website at www.wales.gov.uk/educationandskills

Related documents

Why develop thinking and assessment for learning in the classroom? (Welsh Assembly Government, 2010)
Developing thinking and assessment for learning programme leaflet (Welsh Assembly Government, 2009)
Developing thinking and assessment for learning poster (Welsh Assembly Government, 2007)

WAG10-10789
ISBN: 978 0 7504 5861 0
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1. Introduction

This document attempts to draw together successful and popular teaching strategies/tools that have been used in the classroom to develop better quality thinking and assessment for learning. In the document *Why develop thinking skills and assessment for learning?,* Welsh Assembly Government, 2010, a number of parallels were drawn between both initiatives. In essence, the two are inextricably linked. It follows, therefore, that similar teaching tools may be used to stimulate better quality thinking and assessment for learning.

However, as both developing thinking and assessment for learning also retain several specific characteristics as shown in the earlier document, it is important for teachers to be clear why any particular teaching tool or strategy is used, and how it fits with the underlying principles of developing thinking and/or assessment for learning. This document separates the two approaches when discussing principles, but the suggested tools and strategies have been brought into a single alphabetical list for ease of reference. These are cross-referenced to the area of *developing thinking* or *assessment for learning* that they can potentially develop.

Teachers in the development programme are asked to select <u>three</u> principles (see page 9) to trial in the classroom. The principles selected could all be from *developing thinking* or all from *assessment for learning* or a mixture of both. Teachers could try to develop these principles with one or more of their classes.

2. Group work

One of the overriding features of improving the quality of thinking and developing assessment for learning is the importance of establishing effective group work in the classroom. For the experiences to be conducive to learning, establishing the right kind of classroom climate is imperative. Learners will need to be coached in (and frequently reminded of) their expected behaviour, with basic rules for interaction **agreed** beforehand. Some basic principles of developing a classroom climate for effective learning are:

- All contributions are valued
- No learners are excluded
- Learners feel safe to be creative and take risks in learning
- Co-operation, collaboration and respect for fellow learners are paramount.

One of the most powerful tools in promoting these values is teacher-modelling. If learners witness teachers actively promoting these values, then they are more likely to embrace them.

2.1 Why develop quality group work?

Constructivism is the label given to a set of theories about learning. If behaviourism treats the organism as a black box, cognitive theory recognises the importance of the mind in making sense of the material with which it is presented. Constructivism, particularly in its 'social' forms, suggests that the learner is much more actively involved in a joint enterprise with peers/the teacher of constructing new meanings.

Vygotsky (1896-1934) observed that when children were set tasks on their own, they rarely did as well as when they were working in collaboration with a peer or an adult. It was by no means always the case that the adult/peer was teaching them how to perform the task, but that the process of engagement enabled them to refine their thinking or their performance to make it more effective. Hence, for him, the development of language and articulation of ideas was central to learning and development.

He developed one of the most significant bases of social constructivist theory in his work on the 'zone of proximal development' (ZPD), where 'proximal' simply means 'next'. It is common to differentiate learners into 'cannot yet do', 'can do with help', and 'can do alone'. The ZPD is about 'can do with help', not as a permanent state but as a stage towards being able to do something on your own. The key to 'stretching' the learner is to know what is in that learner's ZPD - what comes next, for them; in other words their **next steps**. The common-sense idea which fits most closely with this model is that of 'stretching' learners.

Other, more recent, research has added to Vygotsky's theories with conclusions such as:

- Nearly 80% of what children learn, they learn from each other.
- Quality collaborative work ensures all learners are involved (inclusive).

- Collaboration ensures better quality outcomes for all.

Very often teachers are reluctant to use small group discussion in the classroom because they think it may lead to a lack of focus on the task. On the other hand, research suggests that small group talk often stimulates and ensures real understanding.

One particularly valuable feature of small group talk is *exploratory talk*. A learner may not have a fully formed idea, but in the process of trying to articulate their thoughts, their own (and other learners') ideas are clarified.

Purpose
The first requirement is to decide the purpose of the discussion, such as:

- **problem-solving** *(thinking about cause and effect and making inferences)* – e.g. a sequencing activity
- **discussion** *(considering evidence, information and ideas)* – e.g. a controversial topic
- **production** *(forming opinions and making decisions)* – e.g. collaborating to write a text.

When participating in small group discussions, some learners may rigorously stick to their own opinions, without listening to others. This is a strong indicator of pre-concrete and concrete operational thinking and is frequently encountered in younger learners. Neil Mercer (*Words & Minds,* Routledge, 2000) has found that if this happens, learners often fail to engage with other viewpoints. If learners are expected to come to a **consensus** by the end of the set time limit, there is more pressure on them to engage with each other's ideas. They are then more effective in justifying in public which arguments they believe are the most convincing

2.2 What is quality group work?

The following are all features of quality group work:

- The task is meaningful with an appropriate cognitive demand.
- The task has parameters that are understood by learners.
- The size and makeup of the group is suitable and manageable.
- Learners' rules for behaviour (ground rules) are displayed.
- Learners decide on the roles required for the task.
- The membership of each group is maintained for a short time and then randomised.

2.2.1 Task setting

The task set needs to be interesting and relevant to the learners, this will improve their engagement and motivation. In other words it has to be something that the learners want to find out about, solve or discuss. In some good practice classrooms it might be that within (or before) a topic, learners set the task themselves by posing a good open question.

The task challenge relates back to Vygotsky and his ‘zone of proximal development’, i.e. next steps. With the level descriptions as the learning spectrum, teachers need to understand how to set tasks that enable learners to move to their next steps. These next steps are small in comparison with shifts between characteristics of level descriptions.

Learners need to understand the parameters of a task and teachers therefore need to set the parameters. However, great care is needed that the parameters don’t close the task down too much, which could limit the quality of learners’ outcomes. Examples of good practice might include ‘produce a presentation that you could deliver to the class in 3 minutes’. In this way, learners are clear of the size of the presentation but can choose how to present, therefore giving opportunity for creativity in their response. Another one could be ‘describe and explain the main features in a river’s journey from source to sea’. This is clear yet does not limit learners to the number or types of features (or indeed stages) that they choose.

2.2.2 Group size

The size of the group is influenced by:

- the task
- the learners and their ability to work in larger groups
- the classroom itself.

When starting group work, strategies such as ‘think-pair-share’ or ‘talk partners’ might be more easily managed (by teachers and learners) than larger groups. This eases learners into collaborative work. Tasks for paired work are generally shorter and more focused than those for group work. In general, the longer and more complex a task, the larger the group needs to be. However, most research points to a maximum group size of 6 to ensure all are involved. With young adults and adults themselves the maximum group size, shown by research, is twelve.

Most teachers already in the development programme have reorganised their classrooms to ‘cabaret style’. Learners sit around desks in groups rather than facing the front. This gives the impression that group work is important as well as ensuring that precious time is not wasted moving furniture. Learners can easily face the front for any whole-class teaching.

2.2.3 Deciding on the makeup of the group

In order to remove the teacher as the ‘director’ of learning in lessons where paired or group work is used, it is important to use some means of randomising pairs or groups.

Using PowerPoint, teachers can type the name of each learner on a separate slide. The time gap between slides can be set at zero. When View Show is activated, all the names spin around. If right click is used, one name is selected. This name can then be temporarily deleted (and so on) while all the class are allocated partners randomly.
(Of course there are various other ways to allocate random partners, such as using lollipop sticks with one stick per learner, but teachers should ensure that the method is *seen to be* fair and genuinely random.)

Teachers who have used this strategy have found that there has been a significant gain in focus and improved behaviour, even among the least expected learners. Possible reasons for this include:

- learners accept this is a fair system
- learners experience a range of learning methods as they engage with a wide variety of approaches
- learners get to know others in the class they might not otherwise socialise with
- learners are not distracted by being left wondering if selection has been made on the basis of ability/ behaviour/ favouritism etc.

This is only likely to succeed if a suitably rich task is selected.

However, the makeup of pairs or groups can be manipulated to ensure that learners are learning from those with a deeper understanding, if the need arises.

2.2.4 Ground rules

Some teachers have found great success in establishing basic rules for group work through class discussion; the learners themselves are central to devising a common list of values and rules for participation, and these are drawn up for all to see. As all learners have ownership of these values (having agreed themselves that they are vital), then they are more likely to enforce them.

The class could be invited to create their own rules for successful small group talk, or they could be given a prompt list such as that below and asked to invent one rule for each point.

- taking turns
- listening to others
- interrupting
- looking at the person speaking
- asking for reasons
- how to agree with someone
- how to disagree with someone
- ensuring everyone is treated fairly
- coming to a conclusion/ decision.

This could lead to a set of rules such as the following:

- We make sure everyone has the chance to speak.
- We listen to what our classmates say.
- We don't interrupt.
- We usually look at the person who is speaking.*
- If we disagree with an idea, we say why we disagree.
- We may criticise an idea, but not a person.
- We sometimes introduce a new idea.
- We sometimes back up someone else's idea.
- We sometimes say why we think an idea is flawed/ wrong.
- We sometimes ask for a reason for someone's idea.
- We try to come to an agreement.

* Teachers obviously need to be sensitive to learners who are particularly unsettled by eye contact.

It is likely that different types of group work will require amendments to the rules for different occasions, but the main set of rules which apply in most cases could be displayed prominently in the classroom. These could then be referred to every time small group discussion takes place.

In secondary schools it would probably be necessary to have rules that are started by one class and then added to by others before displaying. However, it's essential that all learners have their own opportunity to develop rules from scratch before adding to others'.

2.2.5 Deciding on roles

For a discussion to be successful, learners need to adopt a range of roles. At first learners will need the teacher to discuss, question learners and model roles. For example the teacher could ask what learners think each of the following roles in a group entail:

- **chairperson** - *leads the discussion, ensures all learners are involved, maintains the rules*
- **ideas person** - *thinks 'outside the box' to suggest ideas*
- **ideas developer** - *reviews ideas and reigns in the most whacky, develops those agreed by the group*
- **questioner** – *asks; Why are we doing that? Why do you think that? How can we do that? etc.*
- **summariser** - *can bring together and express progress as the task develops and, if needed, at the end*
- **observer** – *monitors and evaluates the quality of the group work*
- **envoy** (spy) - *travels briefly to other groups to listen in and bring back ideas might also be used to research in external sources*.

Younger learners might well just have a leader, a scribe, a 'gofer', a researcher etc.

For most subject contexts it is not necessary to develop the skills of all learners in all of these ways. However, successful group work does require the skills to be displayed by some members of the group. Some learners may be able to display all of these skills over time, and obviously it is desirable that as many learners as possible can demonstrate as many of these skills as possible. In some contexts the teacher may wish to allocate roles according to individual strengths, especially if the task is particularly challenging.

Success criteria for each role - ideally these should be developed over time by the groups themselves. Of course many of these skills overlap.

Chairperson

- can clearly state the aim of the discussion
- can keep the discussion relevant
- can help involve all in the group by helping all members of the group feel they have had a fair chance to speak
- can ensure fair play

- can draw the discussion to a successful conclusion.

Ideas person

- is good at coming up with new, interesting and relevant ideas
- does not just say the first thing that comes into their head
- can express good ideas clearly.

Ideas developer

- is quick to understand the ideas of others
- can boost the confidence of the originator of good ideas where appropriate
- can build on the ideas of others, explaining/ developing ideas.

Questioner

- can see possible problems with ideas
- can see when an idea is underdeveloped
- can express any problems clearly
- can help other learners express their reasoning more fully
- can challenge other learners to be more effective in their reasoning/ logic
- can suggest potentially more successful alternatives.

Summariser

- makes sure the group doesn't move to consensus too early
- can identify sources of disagreement and finds possible solutions/ compromises
- can build a consensus which all members of the group think is fair to their point of view
- can clearly state the main points of the discussion
- can leave out what is irrelevant, minor or trivial
- can articulate the views of the whole group clearly and effectively.

Observer

- can evaluate the quality of the talk
- can provide helpful feedback to group members in terms of collaboration/participation/achievement
- can identify strategies used to solve the problem etc.
- can identify strategies that helped make the group discussion effective
- can recommend how the group can be more successful next time.

Envoy/spy

- can pick up ideas quickly
- can clearly report back to the group what others' are doing
- can tactfully suggest modifications
- can research external sources to help the group's knowledge-base.

Eventually, learners will be able to decide on which roles are needed for a specific task - once they understand the task and what is required. Who does which role can be left to learners to decide as long as group membership is going to be changed at a later date.

Teachers already in the development programme found the following

useful:

- Initially, randomly select pairs/groups.

This shifts ownership away from teachers but stops learners selecting friendship groups.

- Maintain this composition for 2 weeks or so (primary) or 4/5 tasks (secondary).

Learners need to develop their expertise in a role before switching to a new one.

- Some teachers then decided to have all past 'chairpersons' in the same group, all past 'ideas people' in the same group etc. for specific tasks.

This ensured that learners developed their abilities in different roles.

The whole idea of roles in groups and the way that group membership is decided will be dependent on the learners involved, their needs and abilities, and the preferences of the teacher. However, learners need to be challenged by group work so that they progress in their ability to perform as any member of a group.

2.2.6 Using random feedback

Within research on learning and teaching called *Complex Instruction, (*Elizabeth Cohen et al, Stanford University), one particular feature is of note. Groups of about four learners were set tasks in Mathematics. All groups were told that they would have to report back, but ***they had no idea precisely who in the group would be called on to report back***.

The effect of this simple change in reporting back procedures produced dramatic results. All learners were highly motivated to *understand* – and *be able to explain* the results of the whole group. There was therefore a higher incidence of:

- learners asking questions of each other
- learners explaining to each other
- learners insisting on further clarification until they genuinely understood
- all learners taking a fair share of the work
- articulate explanations of results, and how these results were obtained.

It might be thought that the main beneficiaries would have been the struggling learners, but in fact *all* learners benefited, and the highest initial gains were among the 'more able and talented' in that subject area. Through metacognition, they were encouraged to articulate methods of working which were previously purely intuitive to these learners.

Suggested strategy for using random feedback

In whatever subject context where possible and appropriate:

- ❖ set a range of fairly challenging questions/problems/conundrums/puzzles
- ❖ have fairly 'mixed ability' groupings, with about four learners in each group
- ❖ explain to the class that you will be asking a named individual to report back, but you will not reveal in advance who this will be
- ❖ perhaps use a random name generator to select who will report back from each group
- ❖ ensure there is at least some reporting back from every single group.*

* Small group work can be undermined if learners find that they can avoid reporting back – they may then gradually lose the incentive and motivation to take the small group discussion task seriously. Using the element of *Complex Instruction* mentioned above, all learners come to expect that they may be called on, and all learners engage in the task in a more dedicated and committed manner.

Some teachers have reported benefits in motivation by retaining the 'random feedback' ideas throughout an activity, otherwise learners may feel that having been selected once, they are effectively 'immune' from further participation!

2.2.7 Dealing with issues

From the development programme, several issues were identified, these included:

- Some learners were initially lacking sufficient communication skills
- Some learners were:
    - not engaged
    - unwilling to share ideas
    - not sufficiently challenged
- Noise levels
- Classroom layout is fixed.

Underdeveloped communication skills

Providing learners with suggested sentence starters can increase the quality of the talk. Using phrases such as *I think*, *I agree, because, if...* is particularly powerful for developing the exploratory talk which is central to learning new ideas *(*Neil Mercer (*Words & Minds,* Routledge, 2000)*).* Teachers can devise speaking frames to match particular contexts, bearing in mind the power of words such as these. An example of a possible speaking frame:

What happens next?

I agree with ….
because….

What do you think, (named learner)?

Could you explain why you think that?

Do we all agree that….?

Does anyone feel they have not been able to express their opinion yet?

My reasons for saying this are….

I don’t think that is always true because….

What would happen if...?

I think ... because...

Many learners have plenty to say, but may well not have the patterns of talk appropriate to express their ideas fully. Extending from the ideas above, speaking frames can be used in a wide range of contexts.

It is very important that the following examples are seen as **speaking frames** and not **writing frames**. In many ways, speech can rehearse patterns of any future writing. It is less likely for learners to be fluent in writing if they have not practised similar language patterns orally. This is not to imply that all talk necessarily leads to writing, but that effective talk can very often help develop the concepts and language patterns necessary for understanding a particular topic.

Possible speaking 'bubbles' that can be selected and/or adapted to suit a particular context:

I think… because…

I disagree with … because…

I agree with … because…

If ... then...

Perhaps...

What if...?

Another possible way would be to…

Could we try…?

Do you think…?

Could you explain…?

My reason for saying this is…

How about…?

Why do you think that …?

What reasons could we give to support the idea that…?

I think the best explanation is… because…

I think the best reason is… because…

What alternative ways could we use to…?

I think the best method in this case is… because…

Strategies for noise reduction
If the level of noise from discussions becomes excessive, there are various strategies to try out:

- discuss the problem and possible solutions with the individual/ group/ class
- include *volume of speech* in success criteria for small group talk
- ensure all groups are strict with the rule that only one person speaks at a time
- plan the layout of groups and seating so that learners within one group are physically close to one another, and do not have to communicate across a wide table, for example
- give goals/ targets for reducing noise to individuals/ groups who are particularly loud; follow up these goals/ targets
- ask the group to give goals/ targets to persistent 'offenders'; ask the group to evaluate the effect of different types of goals/ targets
- have a system such as the teacher saying *3, 2, 1… silence* which is strictly observed; every time the noise level becomes excessive, stop all the talk and start again from silence!

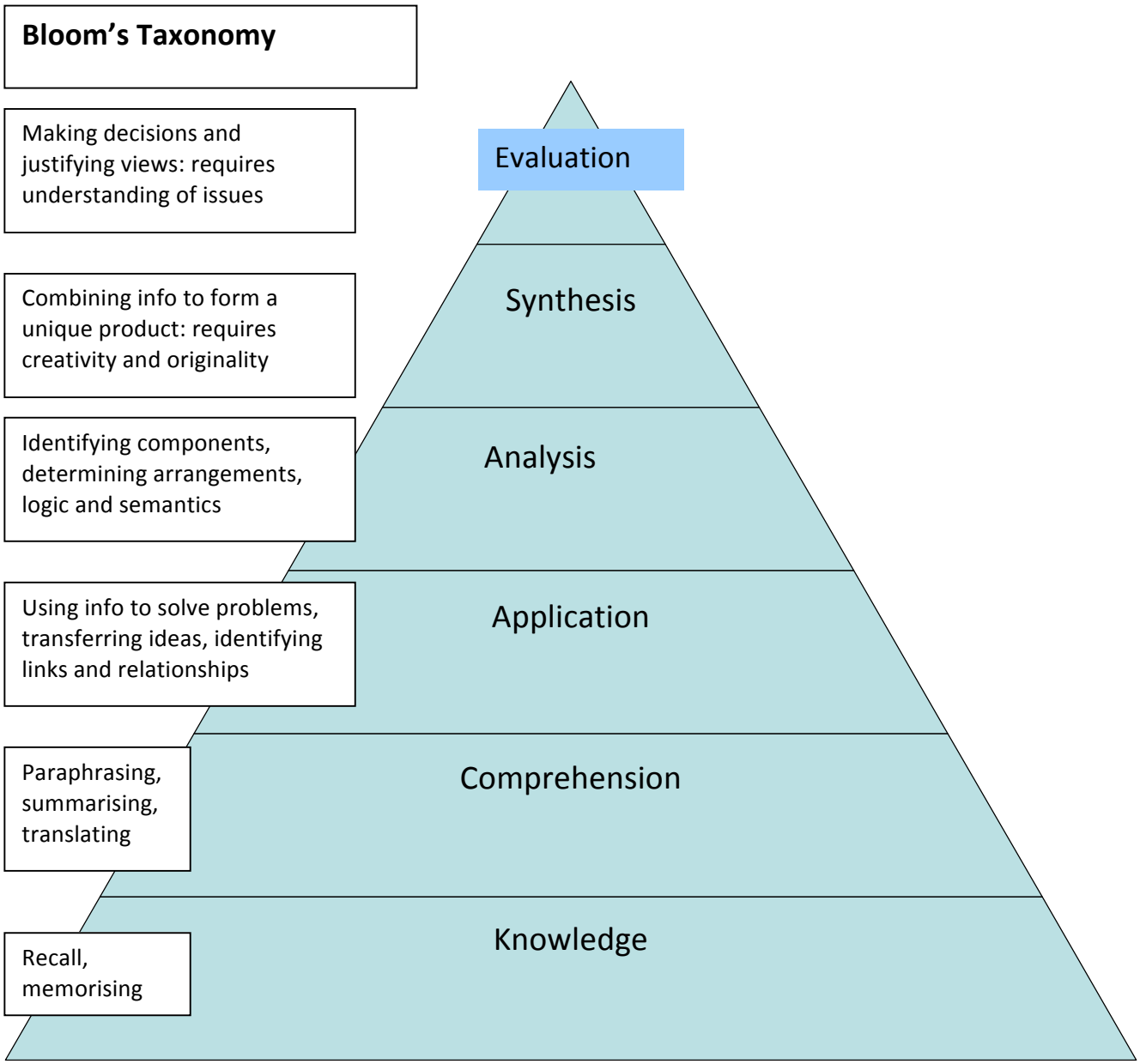
Annex 1 gives checklists, which may further help to ensure quality group work.

3. Questioning

Questioning is the driving force of developing thinking and assessment for learning in the classroom. High quality questions lead to high quality talk. Whether it is the teacher or the learner who poses the questions, they should be open-ended wherever possible, and lead to discussion. Many teachers start by determining success criteria for themselves in terms of *What makes a good question?* Crucially, learners also need to grow in confidence in understanding what makes a good question. Therefore asking learners to determine the success criteria for a good question is a good starting point.

For effective responses, both learners and teachers must understand the cognitive demands of the questions asked. For example, if learners recognise that the question calls for analysis skills and they understand what 'analysis' is, they will they be better prepared to respond more precisely to the question. Often, the purpose of asking questions can hold a 'hidden agenda' for many learners. If learners don't understand what is being asked, this will lead to, at best, learners giving inappropriate responses and, at worst, a breakdown in the learning cycle.

Many teachers will be aware of (and are likely to implicitly use) Bloom's Taxonomy to aid progression in questioning. This is shown on the following page. Although displayed as hierarchical, it is critical that teachers understand that this does not preclude younger learners from accessing evaluative questions simply because they 'are at a higher level in the pyramid'! As reflected in the skills framework, categories of questioning (like the principles in the framework) are not exclusive to one another and the level of challenge promoted by the question very much depends on the context used as well as the capability of the learner to interrogate the question.



Examples of useful question stems are given in the following tables. Teachers have reported great success in sharing these ideas with learners and modelling various types of questions with them. The questions are classified into types, from *Robert Fisher*, *Brunel University*, *1999*. See also **Question bubbles** in **Section 10**.

(a) Questions that seek clarification

Question frame	Type of question
Can you explain …..?	Explaining
What do you mean by…..?	Defining
Can you give an example of….?	Giving examples
How does that help…..?	Supporting
Does anyone have a question to ask…..?	Enquiring

(b) Questions that probe reason and evidence

Question frame	Type of question
Why do you think that…..?	Forming an argument
How do we know that…..?	Assumptions
What are your reasons….?	Reason
Do you have evidence…..?	Evidence
Can you give me an example/counter example….?	Counter example

(c) Questions that explore alternative views

Question frame	Type of question
Can you put it another way….?	Re-stating view
Is there a different point of view..?	Speculation
What if someone were to suggest that….?	Alternative views
What would someone who disagreed with you say….?	Counter argument
What is the difference between those views/ideas…..?	Distinctions

(d) Questions that test implications and consequences

Question frame	Type of question
From your ideas, can we work out if….?	Implications
Does it agree with what was said earlier….?	Consistency
What would be the consequences of that…?	Consequences
Is there a general rule for that…?	Generalising
How could you test to see if…?	Testing for truth

(e) Questions about the question/discussion

Question frame	Type of question
Do you have a question about…?	Questioning
What kind of question is this…?	Analysing
How does what was said help us to…?	Connecting
So where have we got to with this problem…?	Summarising
Are we any closer to answering the problem..?	Drawing conclusions

Frequently the less successful learner associates questioning with 'checking' by the teacher; either for attention or for recalling expected learned facts. A series of unsuccessful responses from a learner leads to a state of 'learned helplessness' because s/he feels that s/he is bound to fail again. For this reason, many learners in this situation refuse to volunteer answers to even the most open-ended question. A number of successful tools have been reported by teachers to help break this cycle – some of these are given in **Section 10**.

One of the most powerful means of encouraging discussion is through teacher modelling. Scaffolding types of questions and responses is important to allow learners to access and understand the expected levels of demand and become actively engaged. In this respect, it is appreciated that asking questions is not simply the domain of the teacher as part of 'checking', but becomes an acceptable vehicle for learners themselves to explore ideas put forward by peers also.

Some teachers have had success in actively developing the skills of learners in understanding what makes a 'high order' question. Learners can be invited to generate their own questions on the topic being studied, and then group the questions by category *(e.g. causes, effects, consequences)*, or decide which of the questions they have designed is the *highest order* question.

Another powerful strategy is to ask groups of learners to set each other questions on the topic being studied. If a question set is too 'easy', peer pressure will soon encourage them to design more interesting and challenging questions. If a question they set is too challenging, they can be asked to answer the question themselves! However, this needs to be linked to growing explicit awareness among learners about what makes a good question. See also: **Collaboration in formulating questions** in **Section 10**.

4. Managing metacognition

Developing thinking enables learners to gain a deeper understanding of topics, to be more critical about evidence, to think flexibly, and to make reasoned judgements and decisions rather than jumping to conclusions. These qualities in thinking are needed both in school and in the wider world. Learners need to develop a repertoire of thinking strategies to be drawn on when they encounter new situations. A central and crucial process in developing thinking is metacognition ('thinking about thinking').

Metacognition

Learners must reflect on their learning and intentionally apply the results of reflection to further their learning. This reflection needs to be across several areas such as:

- making sense of the task
- knowledge of strategies and methods, and how and when to use them
- knowledge and understanding of thinking processes
- monitoring and evaluating learning from the success (or otherwise) of chosen strategies or methods
- making connections across contexts.

Teaching metacognition, thinking about thinking, is arguably the most difficult aspect of developing thinking. Learners and teachers need a shared vocabulary to enable clear expression of their thinking processes.

A suggested 'thinking' vocabulary is listed below, indicating sequences and potential progression:

plan... develop...reflect...
thinking time... suggest ideas... brainstorm... generate options...
explore success criteria... improve... evaluate criteria...
sort... group... sequence... classify...
similarities and differences... compare... pros and cons... seeking patterns
cause and effect... reason... predict...
work it out... conclude... justify... evaluate...
guess... weigh up... imagine... estimate... make inferences... speculate... analyse...
question... decide... discuss solutions... summarise outcomes...
opinions... bias... reliability...
consider... choose... model... monitor... review... learning/thinking strategy... reflect...
...metacognition...
make links... make connections... relationship... bridging...

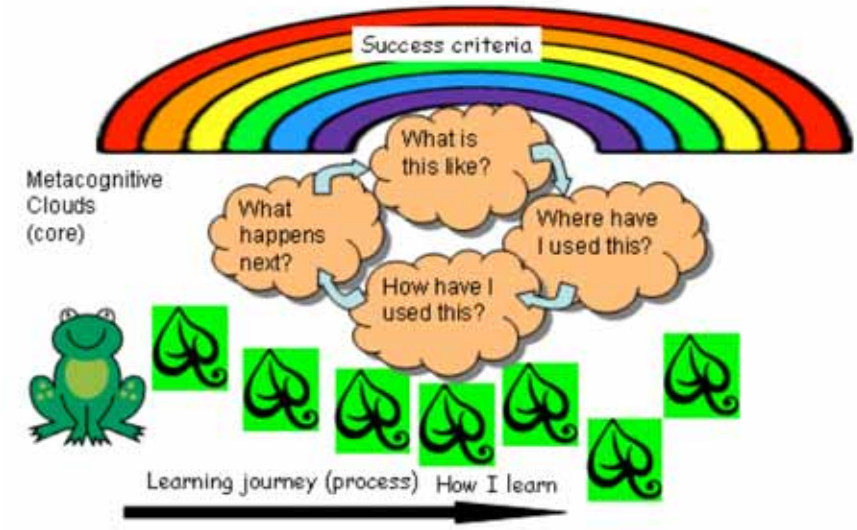
To help learners become more familiar with such terms, many teachers have developed thinking tools, such as word walls, mobiles or whiteboard materials.

Initially, learners need to structure their thoughts so that they can refer back to the thinking processes they have used. **Reflection triangles** and **Lily-pads** have also been used with success by a number of teachers to represent a journey in thinking visually, and as a framework for learners to develop metacognition. Some of these ideas have been included in the accompanying **Section 10** on 'tools and strategies'.

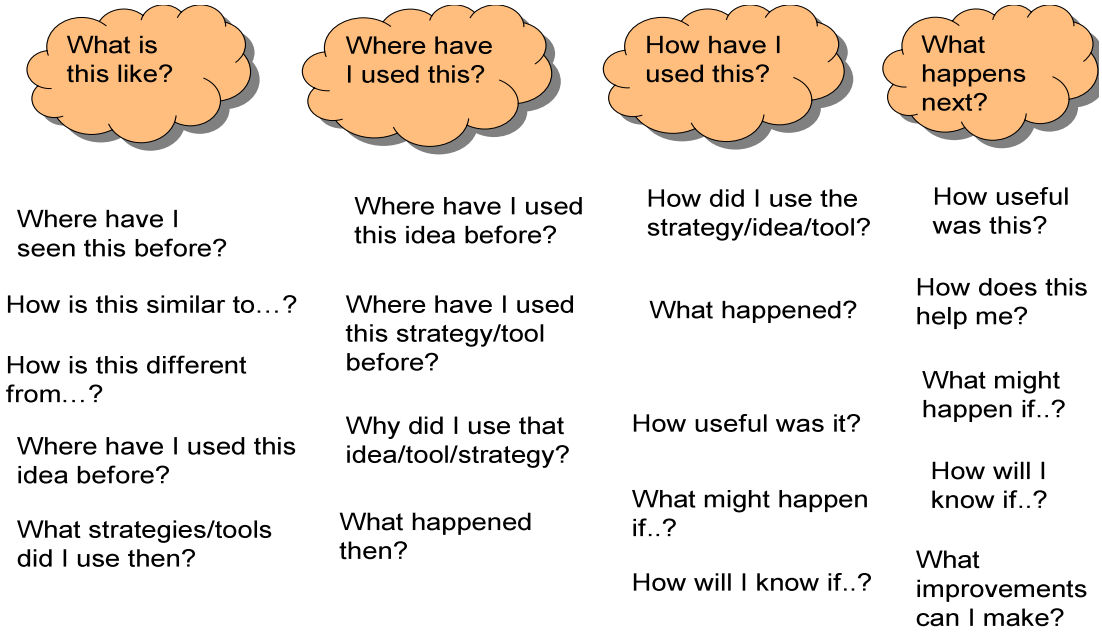
Learners need to be asked how they have arrived at a particular idea. In other words, what thought processes have occurred in order for them to have worked out a particular answer or idea? Once learners have articulated their thoughts and reflected on the process, the strategy they have used could well be taken into another context or lesson. In some cases, learners can be asked what strategies were used/ could have been used in that particular lesson, what each strategy achieved, and which particular strategy worked best for them individually. *Metacognition about strategies* is a powerful extra dimension to develop in learners. They can then decide which strategies could be used in other contexts. This transfer of strategies, or linking learning, is essential if learners are to make progress.

N.B. It is important to discriminate between 'thinking' strategies and vocabulary and 'learning to learn' strategies and vocabulary. Developing thinking inevitably leads to a development in learning, but concentrating solely on 'learning to learn' does not always have the reciprocal effect. Often 'learning to learn' is the starting point to establish attitudes and values towards learning. 'Learning to learn' strategies are most frequently generalised learning strategies which help to support the learner. Further deconstruction of these generalised strategies are required to unpick the finer details of how these work in order to move into specific 'thinking' strategies. Suggestions regarding scaffolding 'learning to learn' vocabulary in addition to 'thinking vocabulary' is outlined in the sections on 'teaching tools'. See **Reflection triangles**.

Managing metacognition is arguably the most difficult aspect in developing pedagogy to support thinking. The following diagram looks to bring together the aspects involved as a pictorial representation:



In this case, core metacognitive questions are used to scaffold the deconstruction of thinking processes used. As learners advance in their confidence and thinking, teachers could look to progress these questions further. Some suggestions are given below. However it is imperative to note that the type of question asked strongly depends on the context and challenge of the task as well as the capability of the learner.

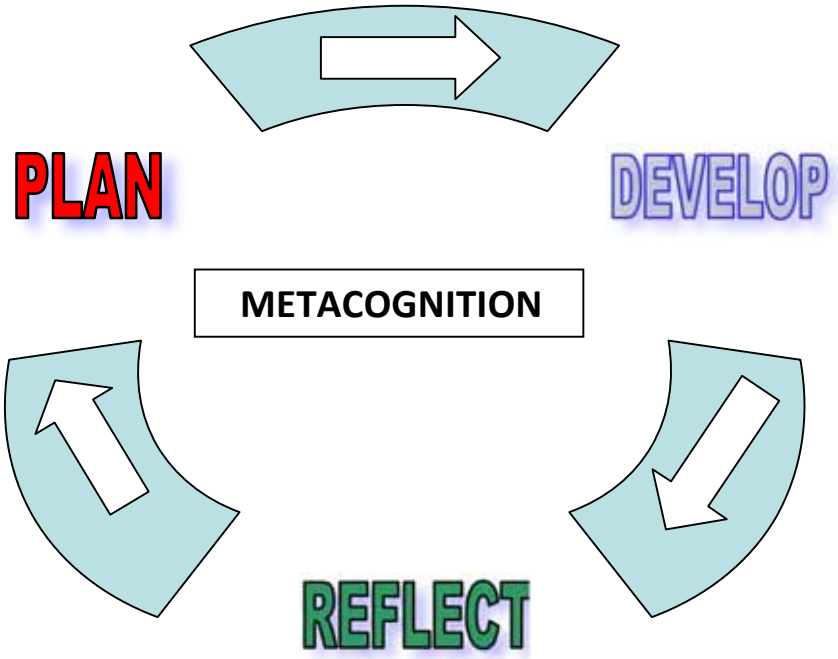


5. Developing thinking principles

There has been much research in the area of developing thinking. Many types of thinking have been identified and labelled. In an attempt to combine the wide range of research, DCELLS has developed a progression in developing thinking with three broad processes in mind: Planning, Developing and Reflecting. Several principles/types of thinking in each of these three areas have then been classified. The Developing thinking across the curriculum section of the skills framework, WAG, 2008, which shows progression can be found at **Annex 2**.

Please note that the progression is an attempt to give a comprehensive overview. It is not expected that any teacher/subject will use all of the progression, but that teachers can dip into the progression to suit the learners' and the subject's needs. It can also be used in planning, to see where learners currently are in their understanding, and what is required to move them on in their thinking.

The whole process of developing thinking can be viewed as cyclical/spiral, so that learning from reflection can be fed back into the next task. This can be viewed as the following diagram:



It should be noted that **metacognition** (thinking about thinking) is at the heart of all learning; learners need to 'unpack their thinking' in order to appreciate the strategies they have used to learn, to assimilate the learning that has taken place, and to link the learning to a new context. It is the vital ingredient which makes the learning approach spiral.

5.1 Challenge

Research has shown that 'do your best' goals have virtually no effect on learning, whereas 'hard goals' that challenge learners are far more effective. As stated earlier, the key to 'stretching' the learner is to know what is in that learner's ZPD - what comes next, for them; in other words their **next steps**. The common-sense idea which fits most closely with this model is that of 'stretching' learners.

Therefore, whether in terms of developing thinking or assessment for learning, the first essential is a rich, challenging task. If learners are not challenged in their thinking, they will not progress. This challenge is sometimes referred to as 'cognitive conflict'. It can be thought of as a deliberate disturbance to their existing understanding/ equilibrium: the new idea cannot be accommodated under the existing pattern of thinking, so the learner is likely to be forced to change the existing pattern of thinking. This in turn leads to a more powerful and effective way of thinking about the problem.

Some ways teachers can ensure an element of challenge include:

- designing a rich and challenging task
- **exploring wrong answers**
- using **Concept cartoons**
- encouraging debate before a consensus is reached
- using exemplars which have flaws *(see* **Exemplars***)*
- using **Two / Three stars and *a wish***
- asking 'Devil's Advocate' questions *(see* **Collaboration in formulating questions*)***
- deliberately introducing contrary/ awkward evidence
- the teacher maintaining a **Poker face**
- not giving solutions, but suggesting possible strategies to choose from
- not saying who will report back on a task until the time comes *(see 2.1.6).*

(Titles in bold refer to the alphabetical list in Section 10)

5.2 Developing thinking principles to trial

Ten principles of the 'developing thinking across the curriculum' progression have been selected for trial in this programme. They have been selected to allow for continuity in thinking and for subject-specific differences.

Plan	**Develop**	**Reflect**
	Thinking principles	
Activating prior skills, knowledge and understanding.	*Thinking about cause and effect and making inferences.*	*Reviewing outcomes and success criteria.*
Determining the process/ method and strategy.	*Thinking logically and seeking patterns.*	*Evaluate own learning and thinking.*
Determining success criteria.	*Considering evidence, information and ideas.*	*Linking and lateral thinking.*
	Forming opinions and making decisions.	

Associated with each thinking principle are suggested teaching tools and strategies (Section 10). This is by no means an exhaustive list, but more an introduction to the types of tools and strategies that may initially be experimented with in the classroom, and the list will consequently grow as teachers develop confidence and experience. ***Obviously, questioning strategies play a major role in this process; these are further dealt with in Section 3, above, and in the section on assessment for learning (6.1).***

5.3 Planning for opportunities to develop thinking

It is vital that teachers give as much consideration over **how** to teach as **what** to teach. The function of the teacher should not be just to control the delivery of knowledge, but to plan and manage a challenging learning experience for every learner, every lesson.

From the medium-term planning (i.e. scheme of work), teachers could choose a learning objective that would appear to be rich in opportunities to develop a particular thinking principle. They could then creatively work on a related classroom activity, bearing in mind the thinking principle and the underlying practices to develop thinking in these lessons.

6. Assessment for learning principles

The focus will be on three main areas for developing classroom strategies for assessment for learning:

- Questioning technique
- Providing feedback to learners
- Peer and self-assessment.

Evidence from assessment for learning practice can indicate to the teacher where more time is needed and where it can be saved, so that teachers do not become slaves to schemes of work. Summative tests should be seen to be a positive part of the learning process, if used formatively.

6.1 Questioning technique

It is important that we ask questions that are worth asking and answering! We need to be clear about the purpose of our question, and ensure that learners understand what type of thinking is being promoted. We can think of a ‘good’ question as being one: that promotes discussion; in which everyone can have an answer; which makes learners think; and has a purpose (i.e. is focused towards a learning objective). As Black and Wiliam (1998) state:

‘What is essential is that any dialogue should evoke thoughtful reflection in which all pupils can be encouraged to take part.’

The average wait-time of British teachers is 0.9 seconds. If we haven’t accepted an answer by then, we tend to modify the question or simply answer it ourselves! If we want learners to think about a question, we must provide time for this to happen, and develop an atmosphere in which everyone is expected to think. If the wait-time is increased to a mere 3 seconds, there is a huge increase in: the number of learners responding; the depth of the answers given; and in the range of language used in their answers. It is probably more helpful to call this *thinking time* rather than *wait-time*, as we need to promote active thinking rather than passive waiting.

Research has shown that using some of the tools and strategies from **Section 10** in the classroom has led to learners becoming more active participants in their own learning, and teachers changing their role from presenters of information to mediators of the exploration and development of ideas.

6.2 Providing feedback to learners

Research has shown that feedback as grades or marks has a negative effect on learning. However, comments will only become useful if they are used to guide further work or 'close the learning gap', and if the teacher checks that past 'next steps' have been met. It is the quality of the dialogue rather than the quantity that is critical when giving feedback on both written and oral work. Written or oral comments to learners also help learners to focus on the learning issues rather on trying to interpret a mark or a grade. To be effective, feedback should be as immediate as possible, should be clear, and should make the learner think. Opportunities for learners to follow up comments should be planned as part of the overall process. Written tasks, and/or oral questioning, should encourage learners to develop and show understanding of the key features of what they have learned.

It is critical that Assessment for learning techniques are used ***throughout*** learning. Assessment should not be 'end loaded' but should be frequent and is more effective when 'chunked'. As AfL supports learners in making improvements, then simply suggesting improvements in a summative manner is pointless as the opportunities to make progress and implement improvements in that particular context has passed. Teachers need to keep learners on track, and should aim to develop a wide range of strategies for use **during the lesson**, which encourage learners to make **ongoing** improvements. This might be a result of feedback from, for example:

- checking against the success criteria
- comparing own work with exemplars provided by the teacher
- class discussion of one learner's ongoing work displayed on the whiteboard using a visualiser/ webcam/ video camera
- questioning/ probing about ongoing work by the teacher
- teacher oral nudges and comments to individual/ small group
- the teacher raising an observed common problem with the whole class
- peer and self-assessment (see below – Section 6.3).

One improvement per learner per lesson would imply very slow progress. Instead, we should think in terms of increasing the opportunities for making improvements *all through* the lesson, with learners realising that they are making regular incremental improvements. Dylan Wiliam suggests that providing feedback should be a 'minute-to-minute process' rather than an end-loaded process, and strategies such as the above can begin to make this a reality.

6.3 Peer and self-assessment

Learners can only make steps towards achieving a learning intention if they understand that intention and can assess what they need to do. The learning intention may best be expressed by a carefully constructed open question. The criteria must be transparent to learners and is understood and used most effectively by learners when they have been involved in its construction. Concrete examples of success could be used to model success criteria. For peer and self assessment to be meaningful, learners must understand and have been involved in the construction of success criteria. Otherwise, they have no frame of reference to assess against and feedback is meaningless and low level!

Peer assessment is uniquely valuable because learners may accept from one another criticisms of their work which they would not take seriously if made by the teacher. Interchange will take place in a language that learners themselves would naturally use. If learners do not understand an explanation, they are more likely to interrupt a peer in situations when they would not interrupt a teacher. Peer assessment places the work in the hands of the learners. The teachers can then be free to observe and reflect on what is happening, and to frame helpful interventions. However, for peer assessment to work effectively, learners must be trained in the good practices of group work (see ***Why develop…*** booklet and also **Section 2** above), and this is not something that will happen overnight.

Self-assessment will only happen if teachers help learners, particularly the low attainers, to develop the skill. Like effective group work, this will take time and practice. Often, meaningful self-assessment is a direct by-product of effective peer assessment: learners need to be 'coached' in self evaluation, initially through modelling the kinds of questions and thinking which are helpful. Frequently teachers report that for learners to be effective at self-assessment, they must first be engaged with, and understand, peer-assessment. Similarly, to be effective at peer-assessment, teachers need to have modelled processes and strategies with learners. In this sense, the effectiveness of both peer and self assessment stem from behaviours modelled by the teacher. They are not techniques which learners can do well implicitly.

Engaging in peer- and self-assessment is much more than just checking for errors or weaknesses. It involves making explicit what is normally implicit, and thus requires learners to be active in their learning. When learners reflect on their levels of understanding, it can be used in informing future teaching. By actively involving learners in writing and marking assessments, learners can see that they are beneficiaries rather than victims of testing, because tests can help them improve their own learning.

6.3.1 Ensuring learners are aware of the criteria

Obviously learners need to be familiar with the success criteria if they are to assess accurately, effectively, and helpfully. We now know that if learners are to take responsibility for their own progress, they need to know the criteria by which they are assessed.

Teachers need to devise various strategies so that learners gradually come to internalise the criteria on which they are assessed by teachers (and examiners) so that they can use these criteria in peer and self assessment. Research in assessment for learning usually shows the most significant gains for the learners with low basic skills. This may be partly because traditionally they have not known explicitly what will make their work good.

Learners can begin to internalise and understand the criteria by, for example:

- generating success criteria on the basis of carefully chosen exemplars
- the teacher ensuring that specific skills required by the official criteria are included in the list of success criteria established by the group.

See also: **Exemplars** in Section 10.

6.3.2 Progression in the use of success criteria

Usually learners will produce better quality success criteria when working **collaboratively**. Learners can be asked to devise their own success criteria for a task, perhaps using **Think-pair-share**. A powerful strategy is to use **exemplars** to generate success criteria, as suggested above, particularly if learners see exemplars of differing qualities and have to work out why one of them is better: the better qualities form the basis of the success criteria for the learner's own work.

Teachers need not be concerned that learners' success criteria are sometimes different from their own. By following the processes below, learners will construct their own learning and learn through their errors. In fact it teaches learners the value of errors!

The text in red below is a direct lift from two principles in Developing thinking from the Skills framework, i.e. *Determining success criteria* (Plan) and *Reviewing outcomes and success criteria* (Reflect). However, at the higher levels *Monitoring progress* (Develop) also occurs as learners keep a constant eye on their success criteria.

- Identify, in response to questions, some basic success criteria for what is going to be done
  Begin to link outcomes to success criteria
  Mostly this will be teacher-generated questions and could be scaffolded by modelling. Modelling here would need two examples, one of which would be much higher quality than the other. Learners are asked to decide which is 'better', and by answering questions to decide on the 'best parts/features'. This list becomes their success criteria. Another approach is for the teacher to suggest some criteria (some of which may be erroneous!), invite learners to add to it and then ask learners in small groups to select what they consider to be the 'top 3' or 'top 5' criteria which they think should be included. Once the task is complete, learners should be asked if they think they have met their

success criteria, and if the success criteria were the most suitable (see Refine success criteria).

- Determine some success criteria
  Link outcomes to success criteria
  Learners should not require teachers to ask questions, but will still need quality to be modelled. This time the two examples need to be closer together in quality, with both having good and not so good features.
  Again, once the task is completed, learners should be asked if they think they have met their success criteria, and this time they should be able to link (or not if it's not been met) each success criterion with a feature in their own work.

- Determine success criteria and give some justification for choice
  Begin to evaluate outcomes against success criteria
  It still might be necessary here to model quality, especially if this is new to a learner, for example if they haven't drawn a line graph or written a letter before. The examples modelled should each demonstrate quality, but possibly in different aspects. Learners should be able to justify why they have selected some of their success criteria.
  At this point learners should be monitoring progress in meeting their success criteria as they carry out the task. After completing the task, learners need to think about 'How well have I…?' for each criterion. For younger learners this could be denoted by using faces (smiley, straight mouth, sad mouth) or traffic lights, and for older learners will probably be oral/text using some subject-specific and evaluative language. However, at this point the process is not likely to be systematic.

- Justify choice of success criteria
  Evaluate outcomes and how far success criteria fully reflect successful outcomes
  Only rarely will quality need to be modelled depending on the complexity and relative 'newness' of the task. Learners should be able to fully justify each of their success criteria. As the learner monitors progress, they should have the confidence to modify their success criteria. Furthermore, they should be able to systematically evaluate how well they have met each criterion, and this will necessitate the use of evaluative and subject-specific language.

- Refine success criteria in the light of experience for future occasions
  This hinges on thinking about redefining their success criteria after completing the task into such a form that they will be useful the next time they, for example, draw a graph or write a letter; hence the use of **Success books (Section 10)**.

6.4 Assessment for learning principles to trial

Questioning	**Feedback**	**Peer and self assessment**
Assessment for learning principles		
Improving quality of answers	*Target setting*	*On-going lesson assessment*
Peer discussion	*Immediacy of feedback*	*Uses of summative assessment*
Active involvement of all learners		

Associated with each assessment for learning process are suggested teaching tools and strategies, listed in **Section 10**. This is by no means an exhaustive list, but more an introduction to the types of tools and strategies that may initially be experimented with in the classroom, and the list will consequently grow as teachers develop confidence and experience.

6.5 Planning for opportunities to use assessment for learning

Assessment for learning tools can be used to find the learner's current position, move the learner on towards his/her **next step** (ZPD), act as checks on the journey to reaching the next step, and to discover if the **next steps** have been reached. The types of strategies used will depend on the subject area, the learner's age, the learner's current position, the learner's misconceptions, the learner's next step, and whether the learner is experienced in using these tools. Planning for these opportunities is an essential part of lesson preparation, and can reduce the burden of teaching all pupils exactly to the school scheme of work. Therefore it can reduce the time required by a scheme of work, and free up time to develop ideas and overcome misconceptions.

7. Planning for developing thinking and assessment for learning

In order to plan for effective learning, teachers need to ask themselves certain questions to ensure that the lesson/topic/task is used constructively. A suggested list of such questions is given below:

Suggested planning questions

- What are the learning intentions, both in subject matter and developing thinking?
- Should I share learning intentions with learners at the start of the lesson/topic?
- What 'big' questions can be posed that will require learners to think?
- How will learners be challenged?
- How will learners know what constitutes quality in this context/ how will learners be actively involved in generating the success criteria?
- Will the *subject matter* lend itself to developing thinking?
- How will the *task set* enable learners to develop their thinking? What types of thinking is this task rich in?
- What thinking strategies do the learners already have?
- Are rules for collaborative work already agreed with the learners?
- How can I build in peer and self-assessment?
- How will learners be enabled to reflect/ improve **throughout** the task?
- What links can learners make with prior knowledge, skills and understanding?
- How will learners have opportunities to articulate their learning of knowledge, skills and learning/thinking strategies?

8. Overview of principles to trial

Teachers should select **three principles** from the list below:

Developing thinking			**Assessment for learning**		
Plan	**Develop**	**Reflect**	**Quality of questions**	**Formative feedback**	**Peer and self assessment**
Activating prior skills, knowledge and understanding	Thinking about cause and effect, and making inferences	Reviewing outcomes and success criteria	Improving quality of answers	Target setting	Ongoing lesson assessment
Determining the process/ method and strategy	Thinking logically and seeking patterns	Reviewing the process/ method	Peer discussion	Immediacy of feedback	Uses of summative assessment
Determining success criteria	Considering evidence, information and ideas	Evaluate own learning and thinking	Active involvement of all learners		
	Forming opinions and making decisions	Linking and lateral thinking			

The full Developing Thinking section of the Skills framework can be seen at **Annex 2.**

9. Using the tools and strategies

9.1 Developing thinking

We will concentrate on developing better quality thinking across the three broad processes: Plan, Develop, Reflect. Ten thinking principles have been identified from the developing thinking progression. Associated with each principle are suggested tools and strategies. Teachers and advisory colleagues may have their own ideas as to tools and strategies that would work better in their classrooms, and could choose to use these instead. It is hoped that teachers will add their own ideas to this list as the programme goes on. ***Obviously questioning tools play a major role in this programme; these are further dealt with in Sections 3 and 6.1, with various relevant tools and strategies in Section 10.***

PLAN	
Thinking principle	**Suggested tool / strategy**
Activating prior skills, knowledge and understanding	Concept maps Concept cartoons KWL/QuADS grids Mindmapping Odd one out Dot voting
Determining the process/method and strategy	Mindmapping Placemat activities Sequencing Snowball challenge/Sticky note challenge
Determining success criteria	KWL/QuADS grids Think-pair-share Traffic lighting Dot voting

DEVELOP	
Thinking principle	**Suggested tool / strategy**
Thinking about cause and effect and making inferences	Concept cartoons Fishbone diagrams Fortune lines KWL/QuADS grids Living graphs Odd one out What happens next?

Thinking logically and seeking patterns	Fortune lines Memory diagram Mysteries/Multi-layer mysteries Patchwork thinking Who-what-when-where-why-how? Whole and part
Considering evidence, information and ideas	Double bubbles Jigsawing PMI PROs and CONs Thinking hats Venn diagrams
Forming opinions and making decisions	Diamond ranking Mindmapping Most likely to…. Mysteries/Multi-layer mysteries Placemat activities Priority pyramids Snowball challenge Thinking hats Dot voting

REFLECT	
Thinking principle	**Suggested tool / strategy**
Reviewing outcomes and success criteria *Reviewing the process/method*	Dot voting Hotseating KWL/QuADS grids PMI diagram Splat! Success book Taboo Traffic lighting Thinking hats
Reviewing the process/method *Evaluate own learning and thinking*	Caterpillar Concept map KWL/ KWHL/ QuADS grids Learning logs Lily-pads/Mr Frog/stepping stones/ footsteps PMI diagram Questionnaire Reflection triangle Thinking hats
Linking and lateral thinking	Concept cartoons Dynamic topic starters Just a minute KWL/ KWHL grids Mindmapping Odd one out

N.B. The allocation of tools to principles is at times arbitrary as many tools/strategies fulfil key roles for more than one principle. In addition, there is much overlap between principles.

9.2 Assessment for learning

We will concentrate on developing assessment for learning across the three broad areas: Quality of questions/ quality of talk, Formative feedback, and Peer and self-assessment. In the table below, some principles that enhance learning experiences have been identified. Associated with each principle are suggested tools and strategies. Teachers and advisory colleagues may have their own ideas as to tool and strategies that would work better in their classrooms and could choose to use these instead. It is hoped that teachers will add their own ideas to this list as the programme goes on.

Assessment for learning principle	Suggested tool / strategy
Improving quality of questions/ quality of talk	Ask the audience Basket ball not ping-pong Big questions Choice of answers Collaboration in formulating questions Ground rules for talk Group responses Increase thinking time Mini-whiteboards No hands up Phone a friend Poker face Random partners/random learner to answer question Think-pair-share Wrong answers collected and used
Formative feedback	Allow time - acting on it there and then 'Closing the gap' comments Exploring wrong answers Feedback using comments only MKO Ongoing feedback *(see below)* Peer marking Review of summative tests Temporary comments Three stars and a wish Tickled pink/green for growth Traffic lighting
Peer and self-assessment	Exemplars Learner to learner dialogue Peer marking Self-marking Talk partners Traffic lighting/Thumbs up, thumbs down

Developing Thinking and Assessment for Learning Tools and Strategies

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(A reference to Developing Thinking *or* Assessment for Learning *principles is given after each title in the main list, suggesting how this approach could fit in to the overall learning and teaching framework. However, this should not exclude other possibilities.)*

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1. Allow time – acting on feedback there and then

Potential for: Formative feedback
What is it? When work has been marked/ peer assessed etc., allow learners sufficient time to read and then make one focused improvement based on the improvement suggestion. In order for the feedback to be formative, the information must be used and acted on by the learners, preferably as soon as they receive it.

2. Ask the audience

Potential for: Improving the quality of questions/ quality of talk
What is it? If a learner is asked to answer a question and appears to be struggling, they/ the teacher can suggest 'asking the audience' or nominating a helper. This can take pressure away from a learner who might otherwise feel stressed, but allows the teacher to feel more confident about involving all learners in answering questions.

3. Basketball not ping-pong

Potential for: Improving the quality of questions/ quality of talk
What is it? Involving more than one learner in answering each question. If a teacher immediately evaluates one learner's answer, other learners have no incentive to listen or think. However, if a second learner is asked the same question, a third/ fourth can be asked to evaluate which answer they think is more effective, keeping all learners actively engaged.

The aim should be to extend the *thinking and learning sequences* in lessons, and to keep all learners actively engaged in thinking and learning.

4. Big questions

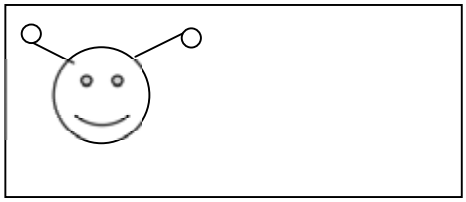
Potential for: Improving the quality of questions/ quality of talk
What is it? Posing 'big', open questions and problem-solving tasks, allowing plenty of time for thinking or researching either as individuals or as groups. This can lead to a greater depth of understanding and therefore a higher level response. For example '*How can we separate salt from water?', 'Why do you think George Orwell wrote Animal Farm?', 'How many ways can you think of to make ten?'* Even a seemingly closed question such as '*When did the Second World War start?'* can be a big question if the origins are probed.

5. Caterpillar

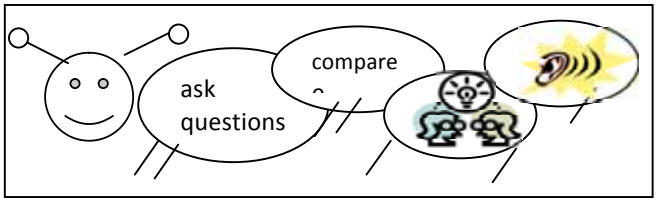
Potential for: Reflect – Metacognition
What is it? This is a visual representation of a 'thinking journey' made by a learner. It can be used to model metacognition on a whole-class basis, in group or paired-work, or in conversation with teacher or peers. Learners articulate their thinking processes 'along the journey' using agreed thinking vocabulary and pictures, verbally or in writing. Each circle of the caterpillar body represents a significant step in the thinking process. A learner must articulate to another why their caterpillar 'grows' (they start with just the head); it can be used to map the learning or thinking in a particular lesson, or across several lessons. In this manner, it shows learners bridging in a visual and concrete manner.

In this example, Year 3 pupils were undertaking an activity to recognise and compare shapes.

Start of 'learning journey'



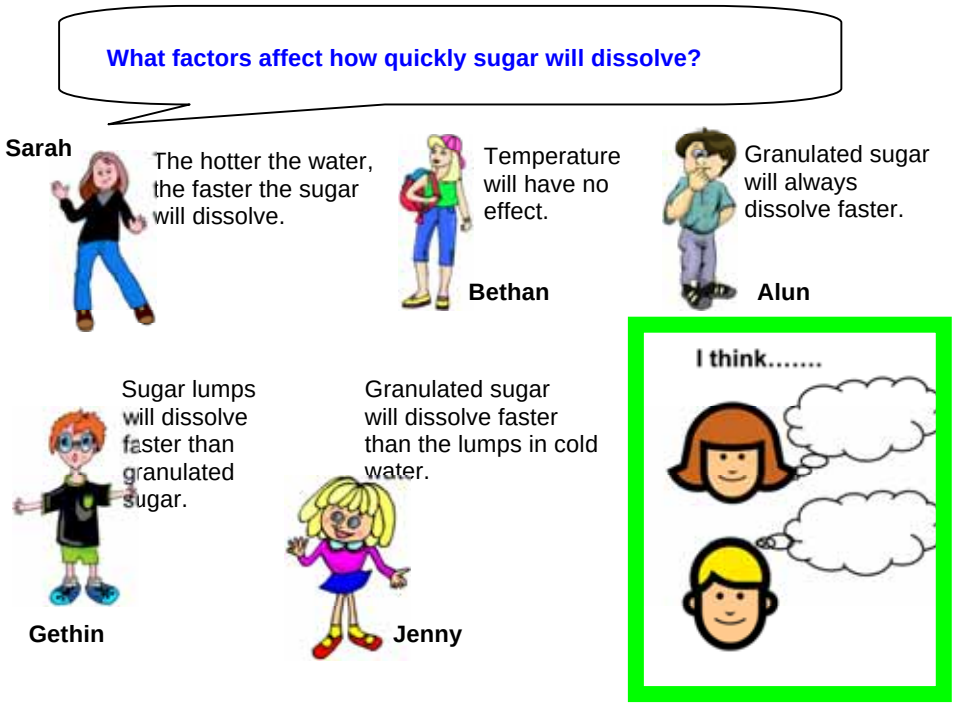
On-going reflection- Activity on shapes



Working in groups of four, learners were provided with a 'feely bag' containing four objects. They were also provided with ten picture cards of objects, four of which were contained in their 'feely bag'. One person – the 'tester' – was nominated to feel an object in the bag without looking at it. The three other members of the group had to devise a list of questions they could ask the 'tester', (using target vocabulary of various types of shapes) who could only answer 'yes' or 'no'. From the responses, the learners had to decide what the object was most likely to be in comparison with the picture cards. As part of the reflection process, the learners were invited to devise a 'group caterpillar' to explain to other groups the methods they had used to make their decisions. Some scaffolding was given in the form of text and pictures (using ideas for supporting language of learning and thinking – see **60. Reflection triangles**) but learners also had to justify and elaborate on the processes used.

6. Choice of answers

Potential for: Improving the quality of questions/ quality of talk
What is it? Give learners a choice between different possible answers and ask them to vote on the options. This is a very powerful tool as the fear of failure is removed because learners are agreeing with another person's ideas, therefore they do not have to formulate their own idea and risk fear of rejection by peers. This works especially well in the form of a **Concept Cartoon** where learners can select a cartoon character that they most agree with. An example of this is shown below:



Idea adapted from 'Concept Cartoons in Science education', Millgate House Publishers (2000)

An extension to this form of questioning is then to allow learners to formulate their own thinking in a character 'think bubble' – this may be a direct agreement with one of the other cartoon characters, or original thinking by the learner.

7. ‘Closing the gap’ comments

***Potential for**:* Formative feedback
What is it? Whatever the task, feedback should first focus on the learning objective of the task and the agreed success criteria. The emphasis when marking should be on both success against the learning objective and improvement needs against the success criteria. Focused comments are used to help the learner in ‘closing the gap’ between what they have achieved and what they could have achieved. The feedback provides a negotiated next step. Useful **‘closing the gap’** comments are:

- **Reminder prompt** *(‘How could you describe the building?’*)

- **Scaffolded prompt** *(‘What was Jane’s response to the argument?’; ‘She was so annoyed that….’; ‘Describe how Jane’s body language changed because of the argument.’)*

- **Example prompt** *(“Choose one of these or your own: He was so angry he was fit to burst/his face turned an angry red/ he was fuming.’)*

Idea adapted from: ‘Unlocking Formative Assessment’, Shirley Clarke, Hodder and Stoughton (2001)

Research in using Assessment for learning shows that, given the right conditions, many learners can achieve much higher results than expected. ‘Closing the gap’ should not imply that the teacher has a fixed concept of the ceiling of possible achievement – where the ‘gap’ ends. Teachers may prefer to use the term ‘Raising the bar’. The aim is for learners to feel the intrinsic reward of regular incremental improvement and success, even if each increment is small.

8. Collaboration in formulating questions

Potential for: Improving the quality of questions/ quality of talk
What is it? Teachers/ learners generate and use powerful questions to encourage deeper thought and exploration. Formulating ‘good’ questions that elicit thinking and how to word them is not always easy. ‘Good’ questions need to be an integral part of a lesson plan. Collaboration between teachers, either in the same subject area or across subject areas, saves everybody time and effort. A bank of ‘effective’ questions can be built up over time. It is important that both learners and teachers understand the type of question being asked and a suitable response structure.

Learners can be encouraged to think about what makes a high order question, for example by generating questions on a topic (e.g. using KWHL) and deciding which of their questions is the most powerful.

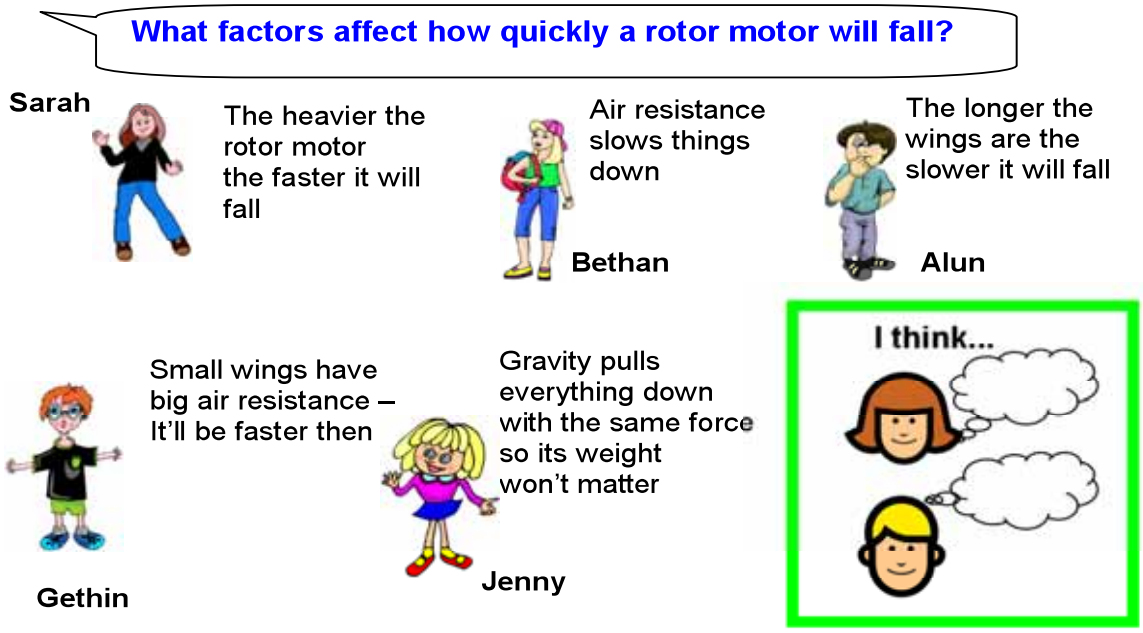
The following box gives some general questioning strategies which have been found to be very successful in promoting assessment for learning and extending learner thinking. If groups of learners have access to some of these strategies, small group talk can become significantly more effective.

Ask 'follow ups' *Why? Do you agree? Can you elaborate? Tell me more? Can you give an example?*
Withhold judgement *Respond to learners in a non-evaluative fashion. (See:* **Poker face.***)*
Ask for a summary to promote active listening *"Could you please summarise John's point?"*
Survey the class *How many people agree with the author's point of view?*
Allow for learner calling *Sarah, will you please call on someone else to respond?*
Play devil's advocate *Push learners to define their reasoning against different points of view.*
Ask learners to 'unpack their thinking' *Describe how you arrived at your answer.*
Call on learners randomly *Avoid the pattern of only calling on those learners with raised hands. (See:* **Random partners/random learner to answer question.)**
Encourage learner questioning *Allow learners to develop their own questions.*
Cue learner responses *There is not a single correct answer for this question. I'd like you to consider alternatives.*
Ask "Why?" *Why do you think that?, Why did you use that method?, Why might that be the case?*

9. Concept cartoons

Potential for: Plan – Activating prior skills, knowledge and understanding, Develop – Thinking about cause and effect and making inferences, developing cognitive conflict/ challenge

What is it? - explores learners' misconceptions in science, maths, English; commercially available; originally written by Stuart Naylor and Brenda Keogh. Each cartoon represents one 'solution' to a scientific or other problem. Learners choose/ discuss which cartoon most closely matches their own solution. Learners are usually intrigued by the different possibilities, and it takes away the 'fear of failure' for many reluctant learners. The teacher and class can then discuss and explore alternative opinions. A teacher-designed example used with a Year 7 science class is shown below:



Idea adapted from 'Concept Cartoons in Science Education', Millgate House Publishers (2000)

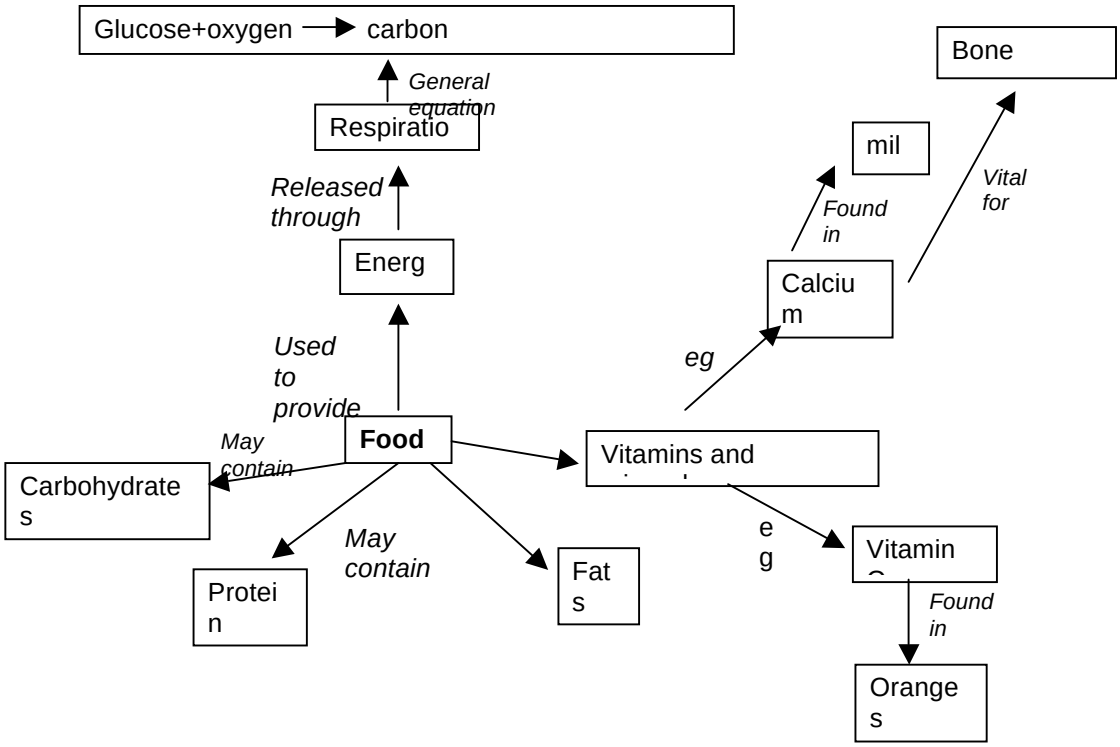
10. Concept map

Potential for: Plan – Activating prior skills, knowledge and understanding; Reflect – Linking and lateral thinking

What is it? A diagrammatic representation showing the relationships between ideas in a topic. It is an extremely valuable technique since learners do not easily make such connections of their own volition. Concept mapping stimulates learners to consider possible links between objects, and thus enhances their grasp of whole topics. There are two simple instructions:

1. Any **objects** that are related should be linked with a line with an arrow showing the direction of the link.
2. The reason for any **links** must be written on the link line.

Example:



11. Design swap

Potential for: Plan – Determining the process/ method and strategy

What is it? Learners in pairs are given the task of designing a process/ procedure for a given task. However, they do not carry out their own design, but someone else's, perhaps randomly chosen.

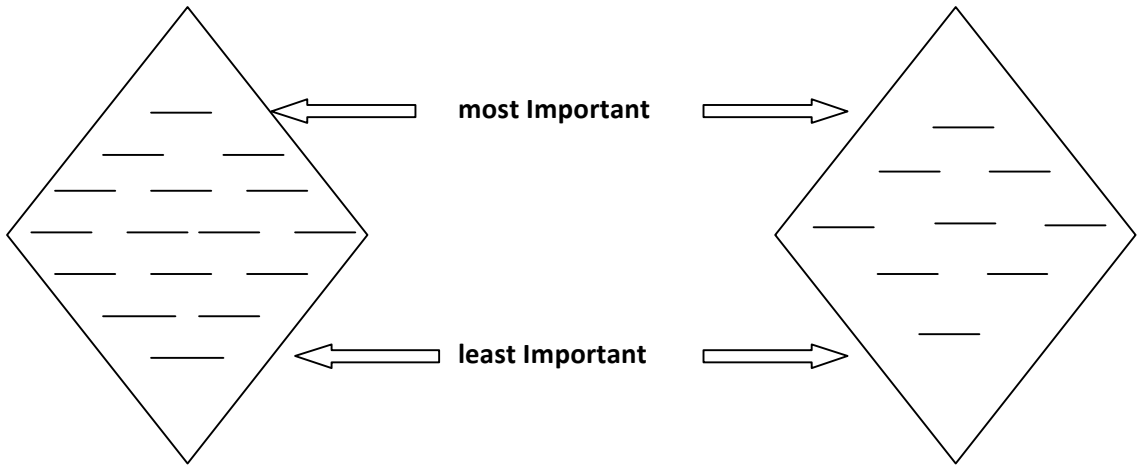
The pairs evaluate each other's plans in the light of their experience!

12. Diamond ranking

Potential for: Develop – Forming opinions and making decisions
What is it? – a tool that promotes discussion or reflection about the relative importance of a range of factors. **Diamond ranking**, as opposed to simple ranking, encourages a focus on the single most important factor – or the one you agree with most strongly – then the next two, next three, next two, the last one. Learners place them in a diamond shape as shown, and then **justify** their decisions. ***This tool should be used flexibly: if learners have extra ideas, the diamond should be redesigned to fit rather than vice versa!*** **Priority pyramid** provides a simpler version of the same idea.

Typical grids are shown below, along with an example:

16 Grid Diamond 9 Grid Diamond



Example

Adapted from 'Science Kaleidoscope', Heinemann Educational (1990)

13. Dot voting

Potential for: Plan – Determining success criteria, Develop – Forming opinions and making decisions, Reflect- Reviewing outcomes and success criteria

What is it? This strategy is closely linked to prioritising and can be used in conjunction with **Priority pyramid** and **Diamond ranking.** This technique is very useful in engaging learners with developing and using success criteria and also in promoting discussion. Learners are presented with a number of statements/issues/questions/success criteria (which could also have been generated by brainstorming and collation of ideas from a number of learners) which they have to assign 'votes' for consideration. Learners are told that they have up to 10 'votes' to assign according to how important they feel the issues/criteria are. For example, if learners decide that 10 statements are of equal importance they could assign one 'vote' to each whereas if they feel that one of the statements dominates, they could show this in the form of 'weighting the vote' (e.g. assign 4 votes to this statement and then look at how they would distribute the remaining 6). As in other prioritising strategies, learners must justify their reasons.

This strategy works particularly well in starting to develop and use success criteria as learners can review their choices throughout the task and apply these ideas to subsequent tasks.

14. Double bubbles

Potential for: Develop- Thinking logically and seeking patterns
What is it? Most learners are used to using spider diagrams to record their ideas or plan their work. A double bubble has two centres side by side, so that some of the lines can join. It allows learners to compare and contrast ideas. For example, one bubble could represent *leisure activities in an area*, the other *employment opportunities in the area*; one bubble could represent *gases* and the other *liquids*. Learners can explore where the two overlap, as well as exploring ideas which solely belong in one area.

15. Dynamic topic starters

Potential for: Plan – Activating prior skills, knowledge and understanding, Reflect - Linking and lateral thinking
What is it? Learners are asked in advance of a topic to find out one thing relevant to the topic to share with the class. These ideas are placed on a wall display, grouped in some logical way, with each learner justifying their choice of idea/ position on the display. The teacher also brings one idea to the wall, but in this case it is not immediately obvious what the link is to the main topic. In this respect, some cognitive conflict can also be generated as learners look to develop links/consistent arguments between items.

This strategy encourages learners to think 'outside the box' and be adventurous in their thinking about a new topic.

16. Exam Question analysis

Potential for: Peer and Self assessment
What is it? Many learners do not know clearly enough what exam questions are asking for. There are clue words that we know and try to teach them to respond to, but 'Explain' often gets a description as an answer! Some learners don't realise the number of marks or the size of the space gives them information about their response. Discussion about these issues before and after doing practice questions can really help learners to understand the way that their work will be marked, and help them in peer and self assessment. This technique is most powerful when modelled and used with **exemplars** (see **17** below).

17. Exemplars

Potential for: Peer and Self assessment, Plan – Determining success criteria, Reflect – Reviewing outcomes and success criteria
What is it? Do learners know what a good piece of work looks like before they start? To fully understand what makes for quality in a given context, learners need more than verbal statements of the relevant criteria: they need actual examples of work to look at. Often it will work best if learners are given two pieces to compare – the qualities of the better one can form the basis of agreed success criteria for the task. As learners become more skilful at making judgements, the difference between the exemplars can be narrowed, allowing for more subtle distinctions in

terms of quality. This is a particularly effective way of supporting learners in developing and using success criteria.

Using a range of work ensures that learners can tell the difference between an average piece of work and an excellent one. When their work has been peer/ teacher assessed, using only comments, learners read the comments and make an improvement there and then, also setting next steps for their next piece of work. They can also interpret the teacher/ peer comments to make judgements about the success criteria they have achieved. This can be collaborative and involve peer as well as self assessment. It takes longer, but has a dramatic effect on the quality of the work.

18. Exploring wrong answers

Potential for: Formative feedback
What is it? If wrong answers are explored, misconceptions can be removed. If misconceptions are *not* removed, learners may well retain their wrong answers simultaneously with any correct new ideas they have 'learned'. It is very worthwhile for teachers to collect examples of typical errors, as exploring wrong answers is an invaluable part of the process of learning.

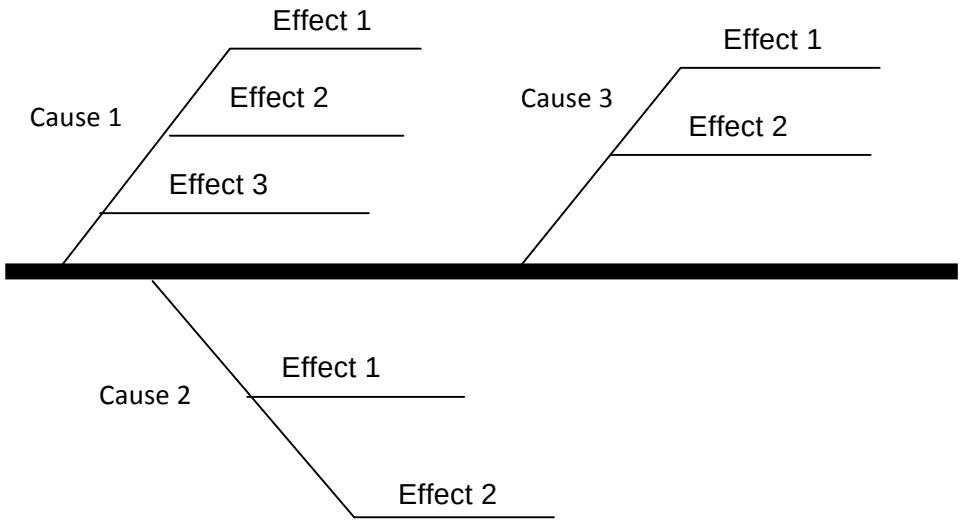
The sometimes used slogan *'No Wrong Answers'* is misleading. Many answers are simply wrong, and for real learning to take place the learners need to know *exactly where in their thinking process* the error was made. (*See also:* **Wrong answers collected and used**.)

19. Feedback using comments only

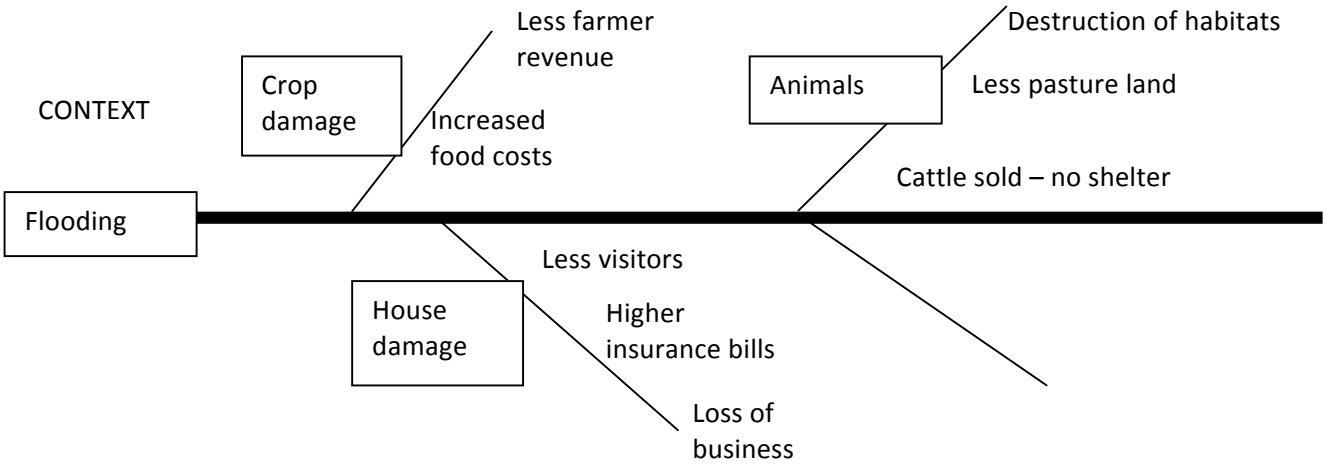
Potential for: Formative feedback
What is it? The only type of marking that has any effect on learning is 'comment only', as discussed earlier (6.2). The addition of a mark or level or grade destroys any benefit from the comment. Learning happens when the learner has strengths and weaknesses identified, and is given clear advice on how to improve. The feedback can be provided by the teacher or a peer. Learners need to act on the feedback there and then: the feedback only becomes formative when it is acted upon.

20. Fishbone diagram

Potential for: Develop – Thinking about cause and effect and making inferences
What is it? This graphical organiser allows learners to visually build links between variables. It is especially useful to consider 'cause and effect'.



Example: Year 9 students were studying rivers and were asked to consider the effects of flooding on the environment in preparation for a presentation to the rest of the class. Many chose to use Boscastle and Tywyn as case studies.



21. Fortune lines

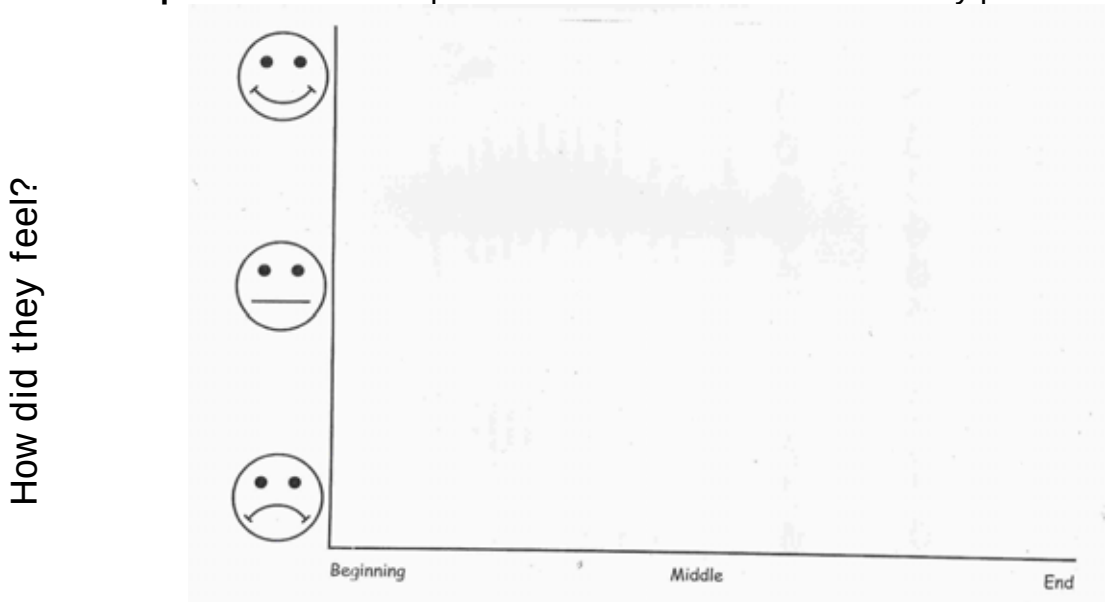
Potential for: Develop – Thinking about cause and effect and making inferences
What is it? For complete explanation, see **Living graphs/Living maps**.
The main skills addressed in this tool are sequencing, which usually provides one of the organising features of the fortune line, and interpreting information, where learners have to interpret statements and place them on the graph. Fortune lines are particularly powerful for supporting humanities subjects such as history, geography and R.E., as well as being appropriate for developing essential literacy and numeracy skills. A fortune line is usually focused on the experiences or fortunes of a central character or characters. This character can be real or fictional, the only requirement being that they undergo changes in their fortune over time.

Example: Goldilocks and the three bears
For further discussion on using this resource, see **Sequencing**.
Sentences and story pictures

The Three Bears went for a walk in the wood.
Baby bear saw his chair was broken.
Baby bear chased Goldilocks out of the house.
Goldilocks ate up all the porridge.
Goldilocks was very pleased to see her Mum.
Goldilocks saw Daddy Bear's chair.

'extras' to generate cognitive conflict:
"What big eyes you've got Granny", said Little Red Riding Hood

Fortune Graph – Learners complete with sentence level work or story pictures/both.



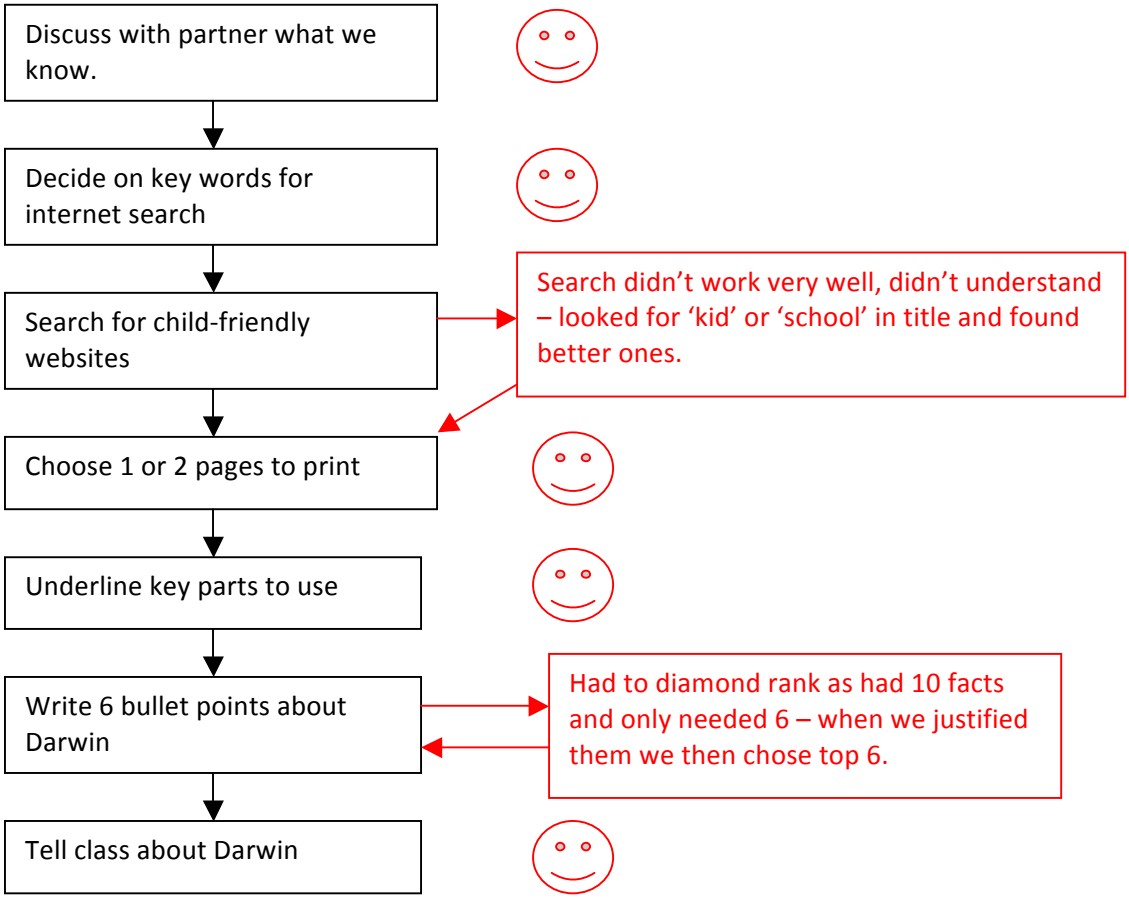
Idea adapted from 'Thinking Through Primary Teaching', Chris Kington Publishing (2002).

22. Graphic organiser to monitor progress

Potential for: Develop – monitoring progress
What is it? This is essentially a flowchart that gives a flexible structure for planning – by using as many boxes as learners need. As learners progress through the task they monitor what they are doing and make changes to their original plan in a different colour. They could also evaluate their progress by using faces or traffic lights to show how well each step worked and/or give reasons for the changes they make to the plan. Once the task is completed, the resulting organiser shows their plan, amendments made, and the processes that worked. This is the first step to using metacognitive tools, such as a caterpillar, and importantly teaches learners to value their errors and unexpected outcomes.

An example is shown below. The original plan is in black, and amendments are in red.

Who was Darwin? – prepare to tell the class in 1 minute



23. Ground rules for talk

Potential for: Peer discussion
What is it? Small group discussions, which are at the heart of developing thinking and assessment for learning strategies, tend to be far more successful if learners have helped to generate 'ground rules' for talk. These will include rules for sharing

ideas, disagreeing, bringing in quieter members of the group and coming to a consensus. This is based on the work of Neil Mercer. See **Section 2: Group Work** and the **Annex 1**.

24. Group responses

Potential for: Peer discussion; active involvement of all learners
What is it? Ask learners to make group responses to answers. A nominated spokesperson gives the agreed negotiated response of the whole group. This tool can be combined with many others, and reduces learners' fear of failure. See also Section 2.1.6 **Random feedback**.

25. Group work on big copies of exam questions

Potential for: Formative use of summative tests
What is it? Each group of three or four gets a super-size laminated exam question. They have to discuss their suggested answer before writing it on in felt-tip pen. They are more prepared to take risks knowing that they can rub it out and work collaboratively. After this they can mark their joint effort using a previously agreed markscheme or success criteria, and then traffic light the appropriate section of their notes.

26. Hot seating

Potential for: Develop – Thinking about cause and effect and making inferences
What is it? This tool has a number of variations. In the first of these, a learner is selected to act as an 'expert witness', or to assume the role of a character. They may either be given information beforehand, or be required to solve queries using knowledge of the subject as a result of a sequence of lessons. The rest of the class are put into groups, and they must devise a list of questions to put to the 'expert witness'. A small panel of 'enquirers' are chosen from these groups. The teacher may act as 'judge' to rule out any inappropriate questions! Dressing up for role play is optional, but some learners prefer it so that they can be more in character. This works extremely well for emotive ideas when linked with prior research.

Example: Carrie's War
Learners had been studying the above text and were exploring how emotions can be conveyed in creative writing. Questions put to 'Carrie' included: *How did you feel about being evacuated? Were you lonely? What belongings did you choose to take with you to Wales?* etc…

27. Increase thinking time

Potential for: Improving quality of questions/ quality of talk
What is it? Increasing 'thinking time' for learner response to ***at least five seconds***. This allows learners to answer open questions and not those simply based on recalled facts. Other techniques include: learners recording their ideas on **mini-whiteboards** or paper before displaying their answers; **Poker face**; **Think-pair-share**. There may be a perceived tension between *pace* and *allowing time for thought*. Giving pairs two minutes to come up with five good ideas on a mini-whiteboard can allow for both pace and time to think.

28. Instant feedback

Potential for: Formative feedback
What is it? Feedback should be as immediate to the task as possible. It should also be related to the learning intention and any associated generated success criteria, otherwise learners' expectations will be that the learning intention is of secondary importance to other issues, e.g. spelling, presentation etc. The use of peer and self-assessment can help to make feedback immediate.

However, there will be some occasions when spelling and presentation are included in the success criteria. The idea of ongoing 'maintenance criteria' to cover punctuation, spelling, grammar etc alongside task specific criteria is effective in supporting learners' understanding of quality.

29. Jigsawing

Potential for: Develop – Generating and developing ideas
What is it? The class is divided into groups, and each group presented with a different task. The findings of the groups, once amalgamated, are required by the whole class to solve a problem. During a set time-limit, the groups must fully research their task and devise a way of clearly communicating this information to another group/the class. Groups share their findings, and further discussion is promoted on how best to use this collective information to solve the original problem. (Links well on a large-scale with **Placemat activities.**)

Example: **Problem**: How did the lives of the poor and rich compare in the Middle Ages in Britain?

Group tasks
Group 1: Schooling for the rich
Group 2: Schooling for the poor
Group 3: Clothing of the rich
Group 4: Clothing of the poor etc.

Groups share information, discuss what it means, and decide the best way to present their information. From here, learners may be encouraged to use another developing thinking tool e.g. **Venn diagrams**.

30. Just a minute

Potential for: Reflect – Linking and lateral thinking; developing cognitive conflict/ challenge
What is it? – a *group work* exercise. Learners are asked to talk for one minute on a particular topic such as 'light'; if they say anything incorrect, the opposing team can step in and take over, winning the point.

31. KWL/KWHL grids

Potential for: any part of Plan, Develop, Reflect but especially Plan – Activating prior skills, knowledge and understanding
What is it? Often used as a 'learning log', it allows learners and teachers to activate and explore prior learning. Learners can generate their own questions on the topic, which are likely to be questions they are motivated to find the answers to. *However, it is vitally important that initially teachers encourage learners to discuss and evaluate what makes a good question.*

Learners can prioritise or select their method of enquiry, success is obvious, monitoring of the learning is easy, as is evaluation of learning that has taken place. (Teachers may choose to fill in the '**W**' column with a few questions linked to the learning intention, and allow learners to select further questions also.)

Example:

What do I **K**now?	What do I **W**ant to know?	What have I **L**earnt?

An example of a KWHL grid is given below. This promotes metacognition when learners reflect on how they tackled the task. Learners should move on to using this grid at the earliest opportunity.

What do I **K**now	What do I **W**ant to know?	**H**ow am I going to find out? **H**ow did I learn it?	What have I **L**earnt?

32. Learning logs

Potential for: Peer and self-assessment
What is it? These are often used as an extension of KWL/KWHL grids in that they allow learners to express a journey in learning. They may be used for individual, paired or group reflection. Entries may be in the form of text, pictures, or diagrams (e.g. flowchart); essentially it can be a scrapbook of thinking, so that learners can retrace their steps in decision making and begin to formulate strategies which allow skills to be transferred to other unfamiliar contexts.

For very young learners, some teachers have found success in developing 'thinking boxes', where learners can 'post' examples of useful decisions or strategies. Often the learners will consult their 'thinking journal' or 'thinking box' to see if there is a useful tool that could be transferred to a new context – this obviously requires some skill and very careful initiation to allow learners easy access and understanding of someone else's thought processes!

This method can be a useful way of beginning to explore metacognition, and in preparation for self and peer assessment and other *assessment for learning* principles.

33. Learners set questions

Potential for: Improving quality of questions/ Quality of talk
What is it? Setting questions is a high level skill. It involves learners in deciding the task, but also highlights misconceptions quickly. Learners often set impossible questions, or do not provide sufficient information for the task to be done. Any mark schemes or success criteria they create are often not directly related to the questions they set. By practising this skill, they learn how to interpret questions and work out what sort of answer is being sought by the questioner. This exercise takes time as they find it hard.

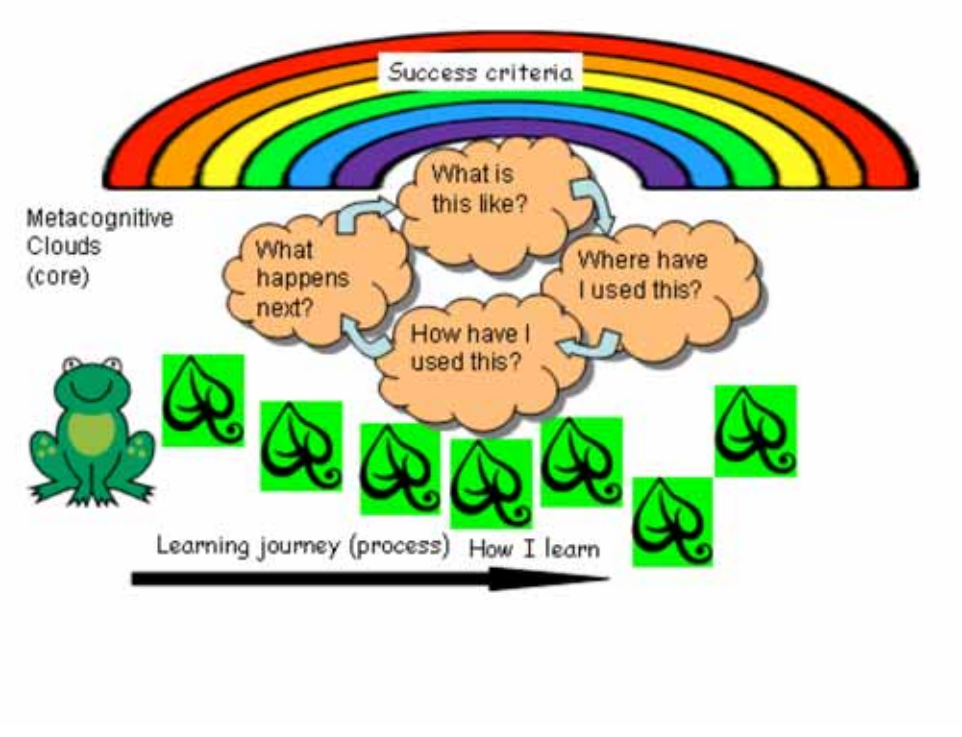
It can be done by asking pairs to write three questions, with a mark scheme/success criteria on the back of each one. When they've finished, they pass their questions on to another pair. Finding faults with each other's questions generates good discussion between pairs.

If pairs/ groups set questions for another pair/ group, there is a strong motivation to ask good questions which really challenge the other learners. However, if the challenge is too hard, they can be asked to answer their own question!

Research in assessment for learning shows that, at the end of a teaching cycle, if half the class answer last year's paper, and half the class set next year's paper, the latter will be more successful in a subsequent test. Learners have to 'think like the examiner' and reach a higher level understanding of the kinds of questions that are likely to be asked.

34. Lily-pads/Mr Frog/stepping stones/footsteps

Potential for: Metacognition; ***Reflect*** – Reviewing the process/method; reviewing outcomes and success criteria; evaluate own thinking and learning
What is it? Similar to **Caterpillar**, it is a method of scaffolding metacognition to allow learners to unpack their thinking in a visual manner. It can be used both for labelling/identifying strategies as they are used and for reviewing the strategies at the end of the task.



The idea of learning being a journey is compared with helping the frog on his way across a river, which is too wide for him to cross with one jump; the stepping stones or lily-pads represent tools/strategies that the learners used to help them learn. Learners can verbalise their thinking processes and practise 'thinking vocabulary' in selecting a lily-pad for the frog. (In some cases, lily-pads may have pictures or written descriptions about tools/strategies used, or can be blank and verbalised by the learner). This is a collaborative exercise, with other learners adding their own 'lily-pads' to the process. Some examples of very simple core questions are shown above. These can be extended and rephrased according to ability, challenge and purpose. Some examples are given in **Managing Metacognition, Section 4.**It is a powerful visual tool for developing metacognition, allowing the learner to see 'how far they have travelled' (even if a particular problem has not been entirely solved). It also helps with bridging useful strategies, as certain 'lily-pads' may be used in different contexts. Some ideas for pictorial representation or written suggestions are shown in the section on **Reflection triangles**.

For more sophisticated learners, lily-pads can be referred to as **Metacognitive stepping stones**.

35. Living graphs/maps

Potential for: Develop – Thinking about cause and effect and making inferences
What is it? – closely related to **Fortune lines**. These activities encourage learners to interpret information from segmented text and organise it using a visual graphical structure. They promote effective listening and negotiating skills, as well as inference and reasoning. Learners must make decisions about the relevance and weight they give to different pieces of information; they have to manage at least two aspects of the data at the same time, one of which is usually chronological, and the other dependent on the context chosen for the activity.

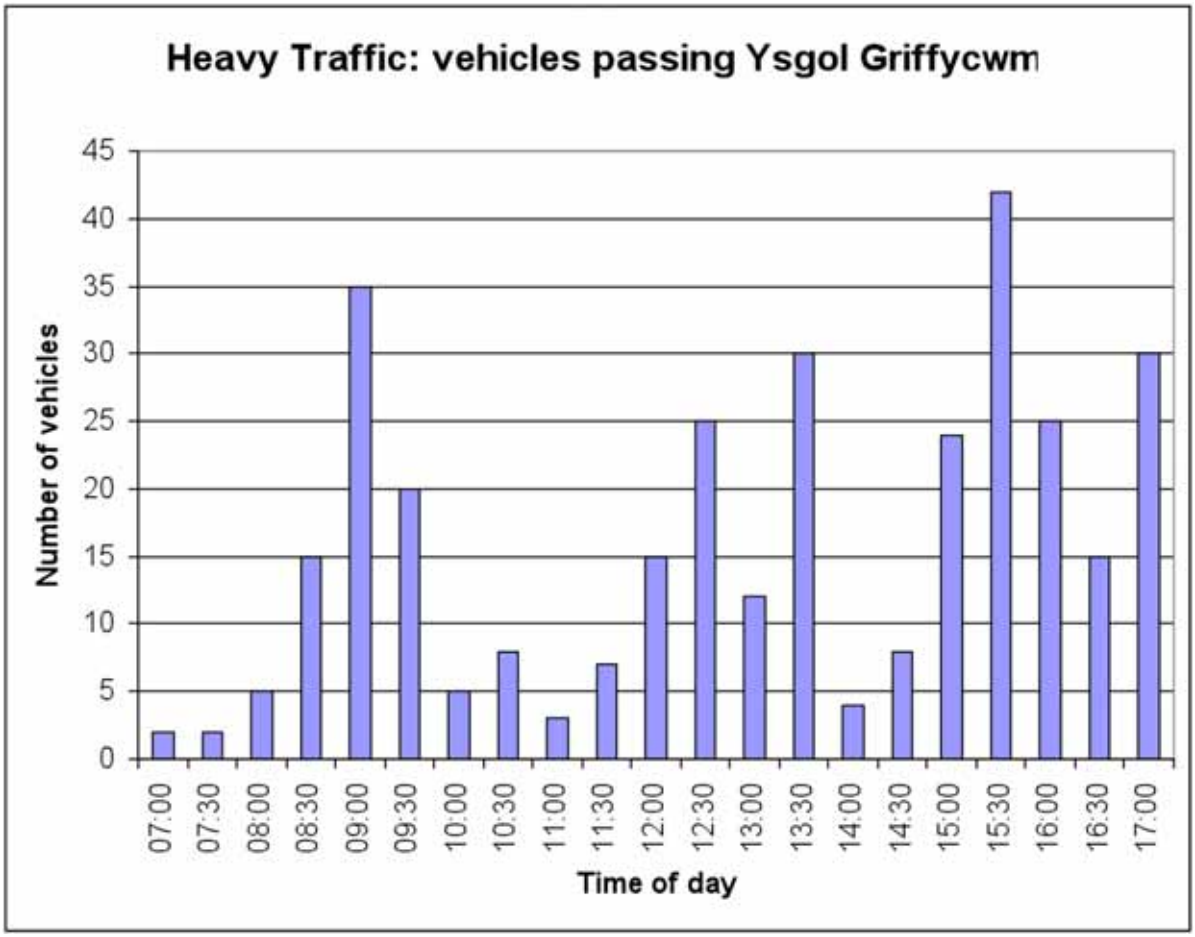
In a living graph, learners must **justify** the position of statements on the graph provided. As ambiguous statements are also included, the graph can be a line graph or bar chart, depending on the data. What is important is that learners need to be able to interpret the numerical information or the overall shape of the graph.

In this example learners can be told the horizontal axis refers to the time of day, but they should be left to add in appropriate times to match the given data. In other cases learners can be encouraged to work out appropriate axes themselves.

Example: Heavy traffic!

Statements for Heavy traffic

Mrs Price, the headteacher, drives into the school car park.
Mr Lewis says goodbye to Eleri and Rhys at the school gate.
Nurse Anna Davies drives home from nightshift at the hospital.
A bus stops just outside the school. It is full of people going to work.
At 2 o'clock, a lorry driver delivers some furniture to the school.
Stanley, the caretaker's dog chases a cat across the road.
Mr Jenkins, the lollipop man, stops the traffic to help the children cross the road safely.
Mrs Abdulla, the teaching assistant, walks to the car park to go home.
At hometime, Jac is waiting outside the gate for his mum to collect him.
Dr Sharma calls to see Mr Harris who is ill.
Karim, the bank manager, drives home for his tea.



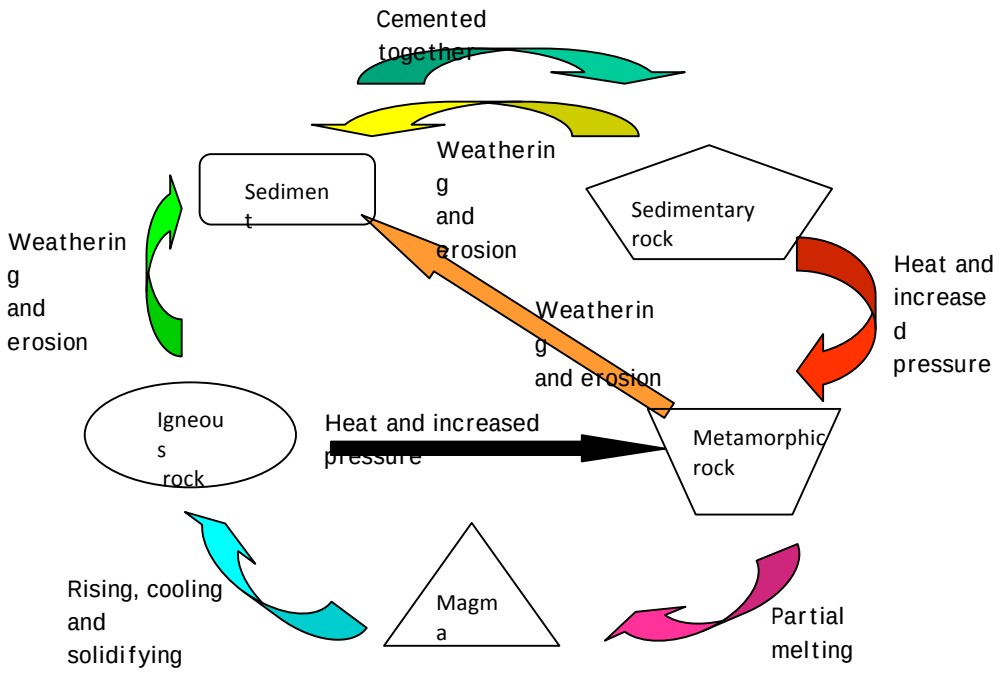
Adapted from 'Thinking through Primary Teaching', Chris Kington Publishing (2002)

36. Memory diagram

Potential for: Develop – thinking logically and seeking patterns
What is it? Learners work in groups. Each group either has an unlabelled diagram/map, or a blank sheet of paper. Hidden from general view around the room are copies of the labelled diagram/map. One member of the group is given ten seconds to look at the completed version and then must return to their group, draw what they remember, and instruct the next group member in what they should look for. The whole group is involved in developing a strategy that will allow them to complete the task accurately and in the shortest amount of time. Questions may be given after completion to test understanding of the construction of the diagram.

Example given on next page:

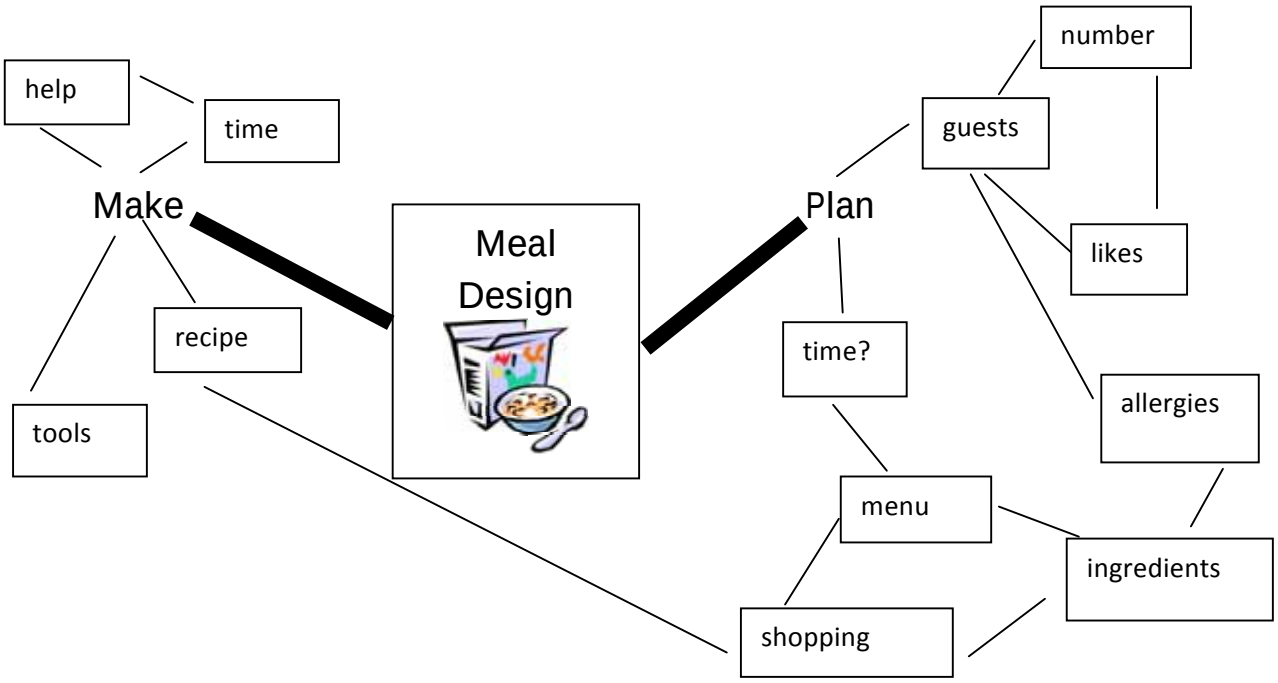
The Rock Cycle



A variation on this strategy is to **Text-to-Picture/ Picture-to-text**.
In these cases, groups are required to study a short piece of text and represent this as a diagram, or vice versa. (This activity tends to work best with very specific text.)

37. Mindmapping

Potential for: Most principles in Plan, Develop, Reflect but especially Plan – Activating prior skills, knowledge and understanding
What is it? First commercially produced by Tony Buzan, Mindmapping© is a system for recording information in a way which is more compatible with the way the brain works than linear text. The main concept is positioned centrally with lines radiating outwards, with a single word on them to represent each connected main idea. Smaller branches radiate out from the main branches with subsidiary ideas and examples. Learners can use colours, pictures, text and lines to link related ideas on different branches. A simple example is shown overleaf:



38. Mini-whiteboards

Potential for: Formative feedback
What is it? The use of mini write on/ wipe off whiteboards – either as individuals or as groups so that learners can display their answers; allows all learners to make a contribution. The teacher can select a few to read aloud, or quickly identify a wrong answer which it would be useful to explore.

Some teachers use laminated A4 card, perhaps with red one side and green the other side. If learners are confident of their answer, they write on the green side; if they are in some doubt, they write on the red side. This lowers any stress they feel about getting the answer wrong. *Tentative talk* is often necessary when learners are feeling their way into a new understanding, and this is a good way to encourage learners to explore their tentative ideas.

39. MKO (More Knowledgeable Other)

Potential for: Formative feedback
What is it? The teacher or a learner selects a classmate who is good at explaining a particular topic. This MKO (More Knowledgeable Other) acts as a peer tutor, helping their partner work through problems by giving hints and instructions (scaffolding). Over time, pupils can discover which MKO in the class (or elsewhere) is most helpful for a particular skill area. Links well with **Ask the audience/Phone a friend** (Can be used if a pupil shows red when **Traffic lighting**.)

Ideally teachers should try to ensure that all learners are seen by their peers as the expert communicator in at least one skill area.

40. Most likely to (closely related to 'Who-what-when-where-why-how?')

Potential for: Develop – thinking logically and seeking patterns
What is it? Learners work in groups and are usually presented with some visual/audio evidence (possibly pictures/video/music). They use this evidence to justify ideas in response to questions posed by the teacher e.g. Who is likely to live there?/ personality of people/ feelings evoked etc.

Example 1
Learners are shown video clip with soundtrack removed – groups are asked to describe the mood of the place, who is most likely to live there etc. A selection of three pieces of music is played. The groups have to justify which piece of music they would use as the soundtrack. A comparison with the actual soundtrack can lead to valuable discussion and exploration of initial ideas.

Example 2
Learners are shown a selection of photographs (e.g. urban, city, coastal etc…). They are asked to discuss a series of questions in groups and justify their answers e.g. *"Where would you be most likely to see a fox?" "Which area would be most likely to benefit from tourism?"* ….etc.

Example 3
Learners are given photographs of a number of places of worship and asked to identify, with justification, which picture is most likely to match a particular criterion: e.g. "*Which is most likely to be a Roman Catholic Church?", "How do you know?", "Which is most likely to be found in Asia?"* …etc.

41. Mysteries/Multi-layer mysteries

Potential for: Develop - Thinking about cause and effect and making inferences
What is it? This is a problem-solving activity based around central question(s), which learners must investigate and attempt to answer. The information or 'clues' are presented on separate slips of card, which learners must sift through in order to reach their conclusions. Mysteries are very versatile teaching and assessment aids that can be used to promote a wide range of cognitive skills. Mysteries tend to have a strong narrative thread – they are about people to whom things happen or who initiate events. This helps to engage the attention of learners of all levels. These people, places and circumstances do not have to be real: they can be an amalgam that represents important relationships and generalisations, but closeness to reality is preferred! Good sources of material for developing mysteries are newspaper articles. Most mysteries lend themselves to sequencing activities, which can help learners develop their own narrative for the event. But the focus is on interrogating the evidence and encouraging learners to extrapolate, rather than simply sequencing.

Example: Why did the fire get out of control and destroy so much of London?
There are a number of ways to run this activity. Some teachers present a 'big question', others ask learners to develop a series of questions to solve after studying the cards. Learners and teachers can discuss effective sorting methods, timelines, strength of evidence etc. Follow up work may involve learners in presenting their evidence in a number of different ways.

Statement cards

Thomas Farrinor was Baker to King Charles II.	It was reported that the first person to perish was the Baker's maid.
The Baker was convinced he had put out his oven, but it seems glowing embers from the fire set light to nearby firewood.	Most of the houses and buildings were wood construction and many had thatched roofs.
The people battled to put the fire out with buckets of water.	Pudding Lane was known to be home to rats.
Many people spent time saving their belongings instead of trying to stop the fire spreading.	On Wednesday night the wind dropped and the fire burned more gently.
Wood and leather were used to make the buckets.	About four-fifths of the city was destroyed.

The Baker forgot to turn off his oven.	The Baker lived in Pudding Lane.
It is reported that the fire started in Pudding Lane.	The buildings ignited very easily.
Sparks from the Baker's burning house fell on dried hay and straw at the Star Inn.	Riverfront warehouses contained oil, tallow and other combustible goods.
The flames were fanned by a strong easterly wind.	The fire began at night.
It is estimated that the fire destroyed about 13,200 houses, nearly 90 parish churches, and nearly 50 livery company halls.	Houses were demolished to try to halt the spread of the fire, but then wood and rubbish were left lying in the street.

Adapted from 'Thinking through Primary Teaching', Chris Kington Publishing (2002)

N.B. Some statement cards, such as *The fire started in Pudding Lane.* are not an answer to the question: *Why did the fire get out of control and destroy so much of London?* The activity can help learners focus on answering the actual question set!

42. Next steps showing how to improve

Potential for: Formative feedback
What is it? Learners are given a next step by the teacher or a peer, but more importantly are shown **how** to reach the next step. Teachers/ learners then check that the next steps have been reached. The next step could be the 'wish' of **Two/three stars and a wish**. The feedback becomes *formative* when the next step has been reached.

It is usually helpful if the next step comment starts with an imperative such as: *Add, Change, Explain, Include, Leave out, Move, Place, Show, Tell*... , and goes on to give very specific advice – although not usually giving the 'answer' directly. See also: **'Closing the gap' comments.**

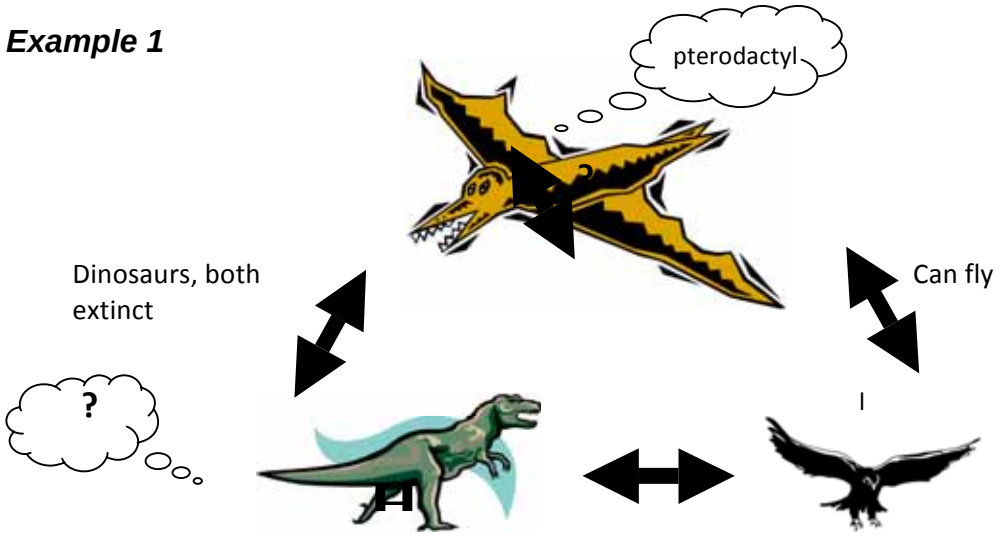
43. No hands up

Potential for: Improving quality of questions/ Quality of talk
What is it? Some teachers have used 'no hands up' strategies with good success. All learners are expected to contribute, and all answers are valued. The teacher may select anyone in the class to answer questions. Therefore all pupils need to frame an answer to the question in their head.

44. Odd one out

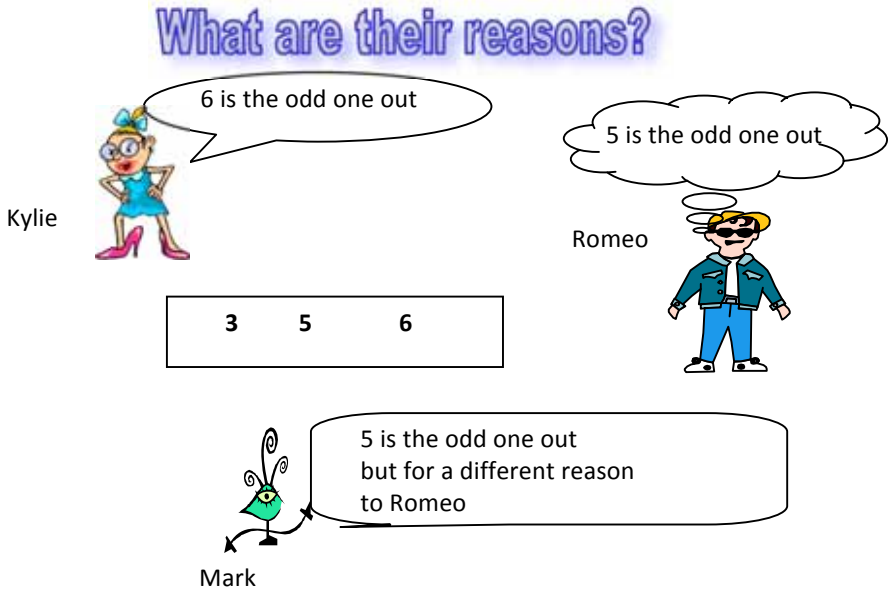
Potential for: Develop – thinking logically and seeking patterns
What is it? This is a versatile tool and can easily be applied and developed in different subjects and with different ages of learners. It helps learners to develop an understanding of key concepts and vocabulary. This supports skills such as classification, and defining attributes. It also helps learners to understand features/properties of things. Learners could be asked to identify a similarity that distinguishes two items from a third, and can be a basis for whole class work as well as paired or group work.

Example 1



Adapted from 'Thinking Through Primary Teaching', Chris Kington Publishing (2002).

Example 2



45. Patchwork thinking

Potential for: Develop - Thinking logically and seeking patterns
What is it? Squares of different materials, sewn together, are used in making patchwork quilts. Each square is different. However, it is possible to identify connections: neighbouring squares may include the same colour or the same pattern or the same feature.

Learners can be given a set of cards with labels such as *heart, lungs, arteries, pump blood...* In groups, they create a patchwork of linked cards: there is no one answer, but they need to be able to justify the connections they choose to make.

Alternatively, at the end of a sequence of lessons, learners can be invited to create a patchwork in a similar way to **Mindmapping**.

46. Peer marking

Potential for: Peer-assessment; Formative feedback
What is it? Learners mark or comment on others' work. Can be very effective after group or individual presentations, especially if the success criteria are clear and have been discussed before the work begins.

Teachers use a variety of approaches, including *pairs of learners* writing some text, for example, and *another pair* peer-assessing it against agreed and shared success criteria. The two pairs then explain their evaluations, and suggest one specific improvement. The original pair then make at least one specific improvement.

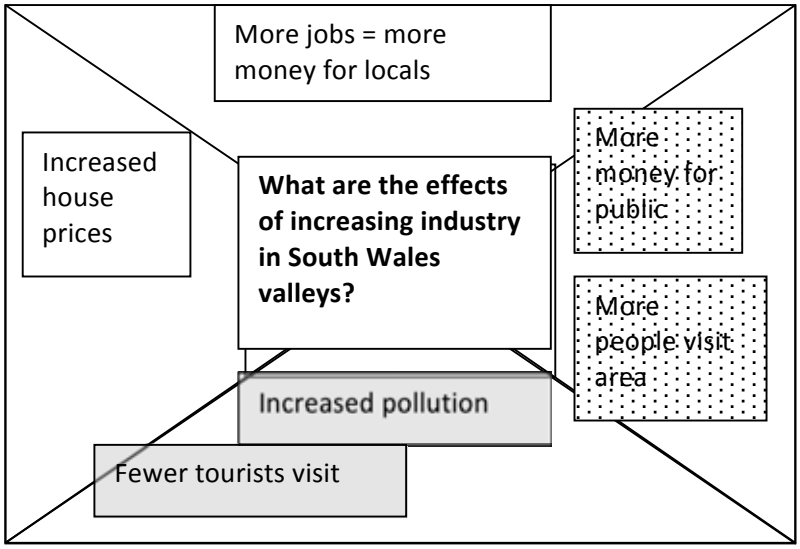
47. Phone a friend

Potential for: Improve quality of questions/ quality of talk
What is it? Ask learners to generate questions. For example learners are arranged in groups and asked to write five questions they do not know the answers to about a particular topic being taught. Each group selects one question from their list. This is read out and given to the next group. The next group reads out their question, which is given to another group until all groups have a question. The groups are then given a set amount of time to find out, discuss and then present their answer to the whole class. The teacher leads discussion where and when appropriate. **Ask the audience** can also work very well with younger learners.

48. Placemat activities

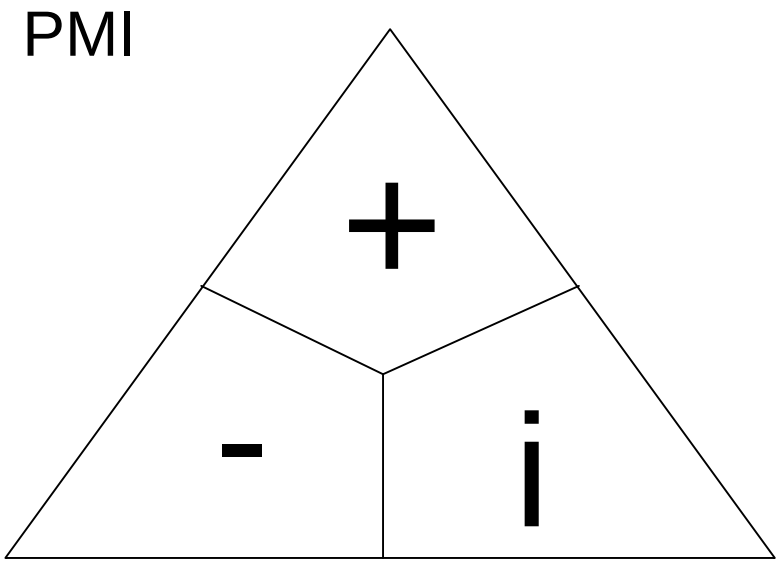
Potential for: Much of Plan, Develop, Reflect
What is it? This tool encourages all members of a group of four to share ideas in a constructive and visual manner. Learners are given a large A3 laminated 'placemat', as shown below, along with some sticky notes. Each group member individually compiles their own ideas on a particular problem, and writes them on sticky notes. He/she then sticks the sticky notes on their section of their group's placemat. This provides a more concrete basis for learners to question other members of their group about ideas. Each group then compiles a collaborative answer by moving selected sticky notes: agreed powerful factors are moved close to the centre, less powerful factors are placed further out. The group's ideas are then shared with other groups. This is a very powerful strategy in 'training' learners in managing metacognition and devising strategies, as they can physically follow the path of their decision making.

Example:



49. PMI diagram (Edward de Bono)

Potential for: Reflect – reviewing outcomes and success criteria; reviewing the process/method; evaluate own learning and thinking
What is it? Learners categorise their ideas or learning into: '+' Plus (i.e. worked/ may work); '**–**' Minus (i.e. did not work/ may not work); and 'I' (Interesting). It encourages learners to classify ideas according to their merits, or identify what has worked and not worked for their learning. A grid can be used like the one below.



50. Poker face

Potential for: Improving quality of questions / quality of talk
What is it? The teacher attempts to keep a straight face so that learners cannot work out if any answer they give is the 'correct' one. If learners are trying to guess what is in the teacher's head, they will almost certainly not give the answer they really believe in.

There is no value in **Basketball not ping-pong** if learners can work out the answer the teacher values more highly from body language or other subtle clues.

51a. Post-it challenge 1

Potential for: Plan – activating prior skills, knowledge and understanding
What is it? – a combination of **Placemat activities** and **Snowball challenge**. Learners are given a two-minute time limit to write on a sticky note three things they remember (or believe) about a topic/idea/issue. These are collated on the board at the front of the class. Learners and the teachers discuss their relevance, and could summarise in chart form or concept map etc.

51b. Post-it challenge 2

Potential for: Self and peer assessment
What is it? Groups, pairs, individuals evaluate their learning. For example one of the questions: *"What have I learned?", "How did I learn this?", "What I found easy/ difficult?", "What I need to do next?"* is answered on a sticky note and then shared with another group or the rest of the class. This technique focuses on thinking about learning, and encourages learners to think towards their next steps.

52. Priority pyramid

Potential for: Plan - determining the process/ method and strategy
What is it? Learners draw a pyramid to organize their planning. They place post-its for their top priorities at the peak of the pyramid, and less urgent priorities lower down. The base of the pyramid is used for the non-urgent tasks. This can be used in place of **Diamond ranking** if more appropriate.

53. PROs and CONs

Potential for: Plan: determining the process/ method and strategy
What is it? Learners are asked to say/ write down the good and bad points about a particular idea or strategy. If writing, this is most easily presented in two columns. A further development would be to use **PMI**.

54. QuADS grids

Potential for: Plan – asking questions, gathering information
What is it? Similar to **KWL/KWHL grids**, QuADS grids allow more focused research of a particular question to be undertaken. An example is shown below:

Question	**A**nswer	**D**etails	**S**ource

A question, or series of questions, may be posed to learners (or they may be invited to write some of their own). An activity is then used that allows learners to research possible answers. Learners must summarise any information discovered, and produce a clear and succinct answer. Any details that they think support their answer, or that they feel are of interest to the discussion, can be recorded in the Details column. Finally, learners must provide accurate details of their research sources for use by other learners.

55. Quescussion

Potential for: Plan – asking questions
What is it? A discussion in which learners are only allowed to ask questions and not to make statements. It was developed by Prof. Paul Bidwell of the English Department at the University of Saskatchewan. The teacher chooses a topic, perhaps a controversial one. Any learner can pose a question, but they cannot pose another question until at least, for example, four others have posed questions. If a learner makes a statement, or a statement masquerading as a question, the class calls out STATEMENT! Initially there may be silences as learners attempt to put their ideas in the form of a question, but it is usually worth persevering. This strategy is useful for supporting and developing question sequences and their importance in gathering information effectively.

The next step could be for learners to group the best questions in some logical way, in effect into paragraphs. This can then be the basis for writing about the topic as they answer the questions.

56. Question bubbles

Potential for: Support for most of Plan, Develop, Reflect; Improving quality of questions
What is it? A prompt for teachers/LSAs and learners to ask appropriate and high order questions, avoiding concentration on recall questions. The prompts are organised into:
Questions we could use

- *to clarify*
- *to justify*
- *to explore alternative views*
- *to explore implications and consequences*
- *in metacognition – unpacking process and monitoring progress.*

Questions we could use to clarify

What do you understand about....?

Could you explain that.....?

What do you mean by....?

What needs to be done to...?

How does that help you to....?

What would be the advantage/ disadvantage of....?

What questions could you ask in order to....?

Can you give me an example of...?

Questions we could use to justify

Why do you agree/disagree that...?

Why do you think that.....?

How do you know that....?

What are your reasons....?

How is this an example of....?

What evidence do you have....?

How does this support/challenge...?

Questions we could use to explore alternative views

How could you put it another way.....?

To what extent to do you disagree ....?

What if someone were to suggest....?

How are these views/ideas different from....?

What would happen if....?

How else could we look at...?

Questions we could use to explore implications and consequences

What might be the consequences of.....?

How does this agree with....?

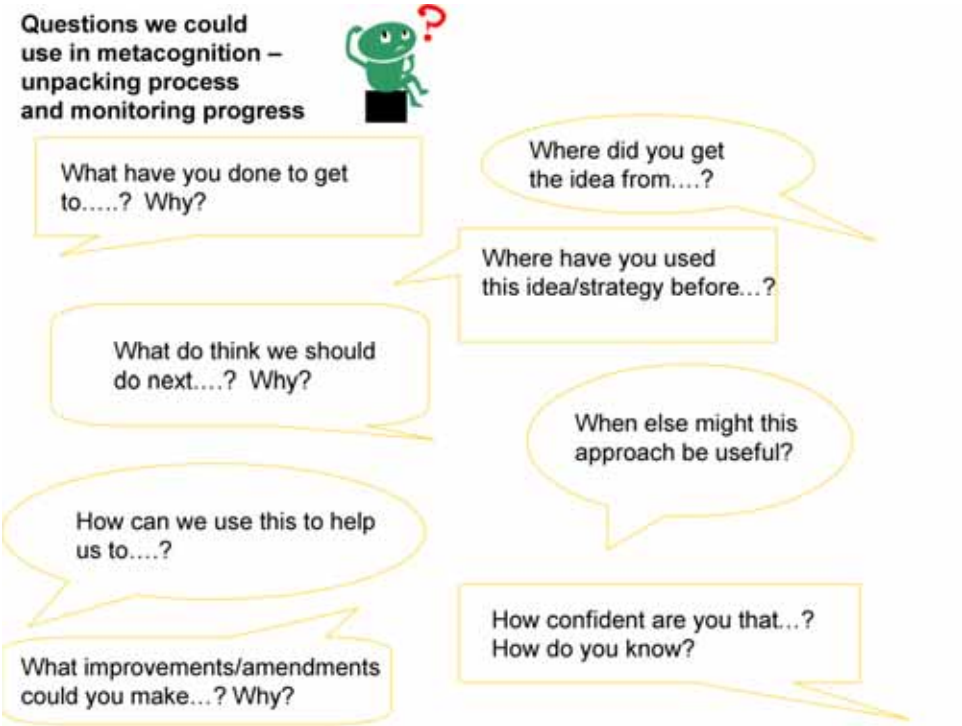
How could you use this to predict if...?

How could you test if....?

Why would you test if....?

Does it follow that....?

How will I know if...?



57. Question walls/Question trees

Potential for: Improving quality of questions
What is it? Often used in conjunction with other strategies such as **KWL**, **Sticky note challenge**, **Who-what-when-where-why-how** etc. Learners are invited to write down/ say out loud the one question they would most like answered about the current topic/ wider issues. These questions, for example on sticky notes, are placed on the question wall in logical groupings, and form the basis of at least some part of the class's ongoing enquiry into that topic. Some teachers extend this by awarding a learner with the Question of the Week Award for the most intriguing/ searching/ useful/ powerful question. They can also be used as a starting point to look at the effectiveness of question sequences.

58. Questionnaire

Potential for: Metacognition, Reflect- Evaluate own thinking and learning
What is it? - a useful tool that allows learners to reflect on their own learning both individually or collaboratively. Groups could devise a questionnaire for other groups to develop feedback techniques.

For example:
* This is not true/ this does not apply to me
**** This is true/ this strongly applies to me

	Statement	*	**	***	****
1	I understood something more clearly after discussion with a peer this lesson.				
2	I explained something to a peer this lesson which helped them understand.				
3	I explained something to a peer this lesson which helped me understand.				
4	I used more than one strategy to solve the problem this lesson.				
5	I know which strategy was most effective for me this lesson.				

59. Random partners/random learner to answer question

Potential for: Improving quality of answers; peer discussion
What is it? The names of all learners in the class can be placed on a Powerpoint slide show, one learner per slide, and the time between slides set at zero. The first two names to appear form the first pair, and so on. As each learner name comes up, that slide is temporarily deleted when choosing partners. When using the strategy for random 'answerers', teachers have found it more effective to retain the possibility that a learner may be selected again – this limits the potential 'opt out' scenario if a learner has already been selected to answer! Other teachers have had success in using one named lollipop stick for each learner, and the sticks are picked out at random.

Learners are not distracted by trying to work out why they have been paired with a particular pupil, and everyone can see the process is fair. Many teachers report that this approach leads to higher quality and more focused talk, provided the task set is a rich one.

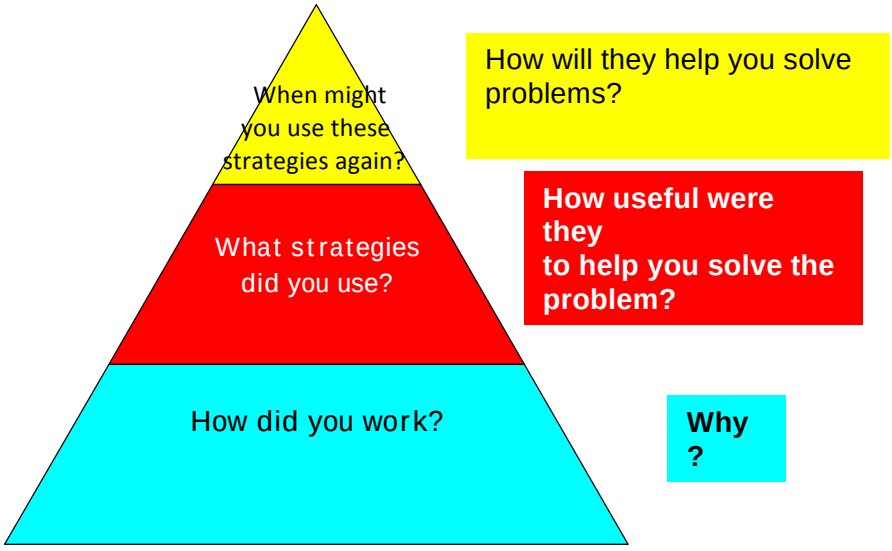
The process can also be used very effectively for '**no hands up'** to decide who will answer the question just asked, but in this case no name should be deleted so that everyone has to stay alert even if they have answered a question already.
The process can also be used for random reporting back, so that no one in the group knows who will report back to the whole class until the moment arrives! This ensures all learners have to fully understand the ideas/ solutions discussed.

60. Reflection triangles

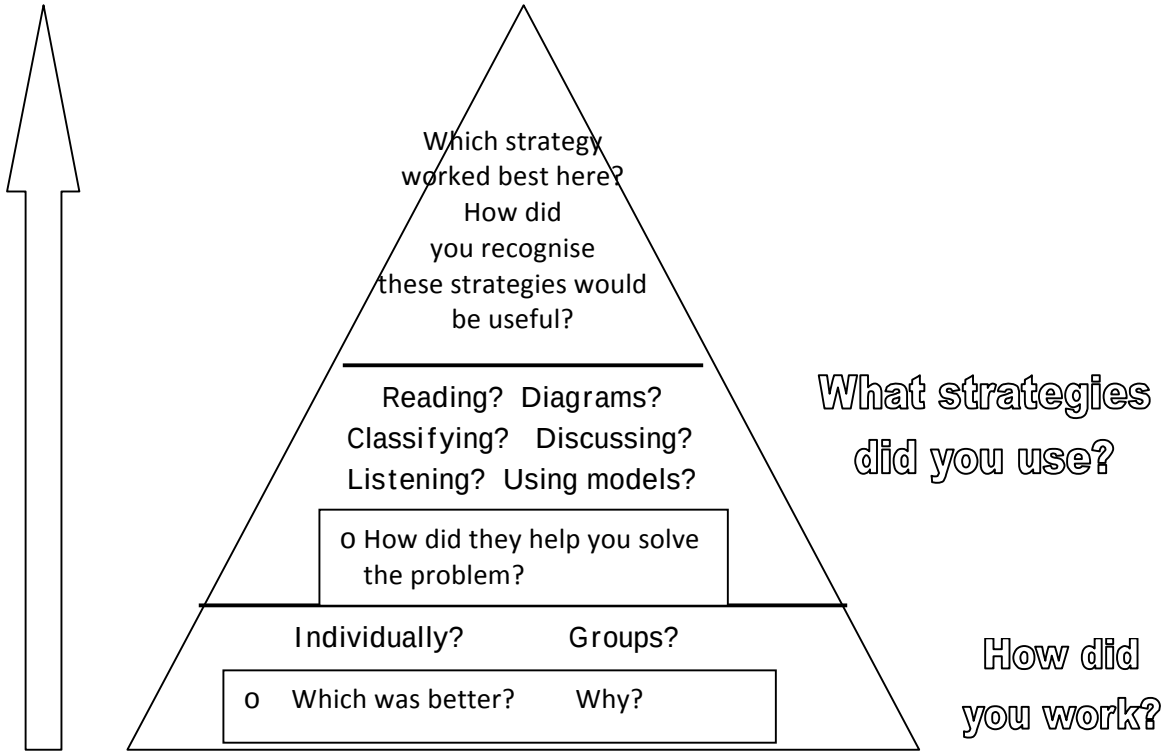
Potential for: Reflect – reviewing the process/ method; evaluating own learning and thinking

What is it? This is a popular and valuable visual prompt for structuring metacognition, and linking strategies to other curriculum areas. It can be used from the Foundation Phase to Key Stage 5 (with obvious modifications!). It is also a useful tool as it encourages learners to assess and monitor their individual progress, and track types of thinking.

Some examples that could be used for younger learners are shown below. As learners become more confident, the scaffolding can be withdrawn to allow learners to describe strategies themselves.



Older or more sophisticated learners could use the following chart:



Using the Reflection triangle
It can be used to introduce ideas of metacognition with learners in terms of the strategies/tools they have used. In the simplest terms, it can be used to exemplify the language of learning (i.e. learning how to learn).

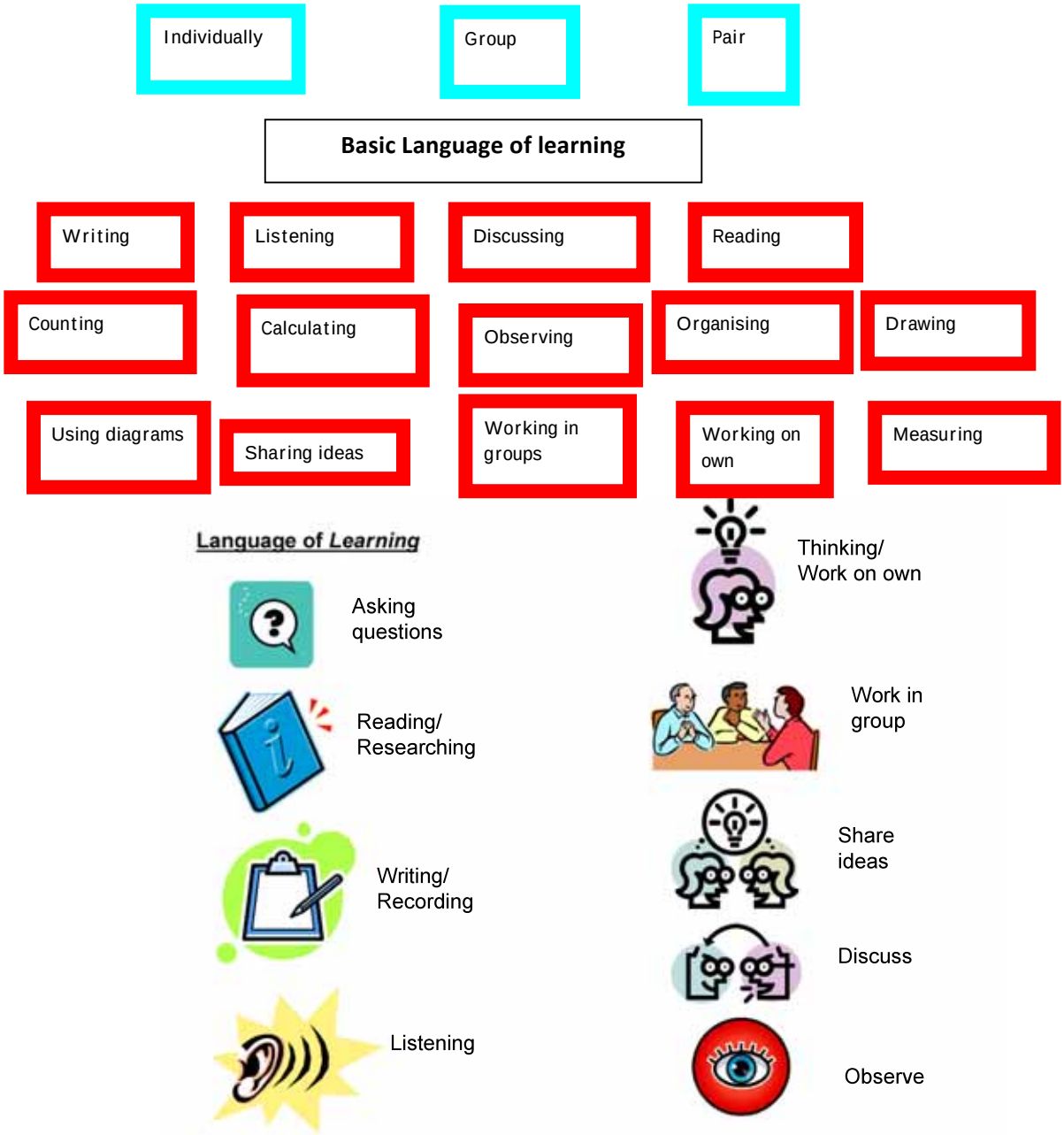
As learners become more acquainted with developing thinking, specific TYPES of THINKING (as opposed to strategies) can be discussed. These can also be linked/ bridged to other contexts.

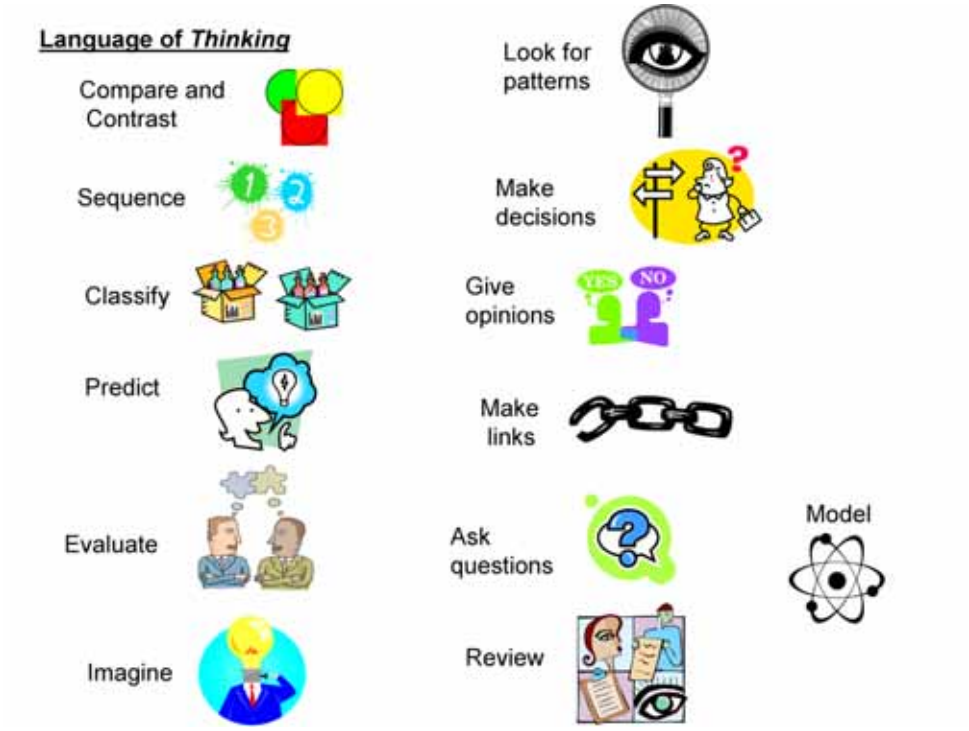
For practical use, key phrases can be cut out to match with the sections on the reflection triangle. For very young learners, or those with difficulties, pictures could be used. Learners select from these, and then explain their choices. Examples of scaffolding in terms of text and pictures have been included overleaf. Some very basic learning strategies have been included which would be added to as the pupils' experiences grow. Subject specific strategies (e.g. 'jump forward, hop back' for subtraction) could be included, as well as general thinking processes.

It is anticipated that learners would be expected to elaborate on their choice of strategies, how they were used, and to what effect etc. The aim of the triangle is to support metacognition – but learners need to verbalise their ideas and expand on this simple chart.

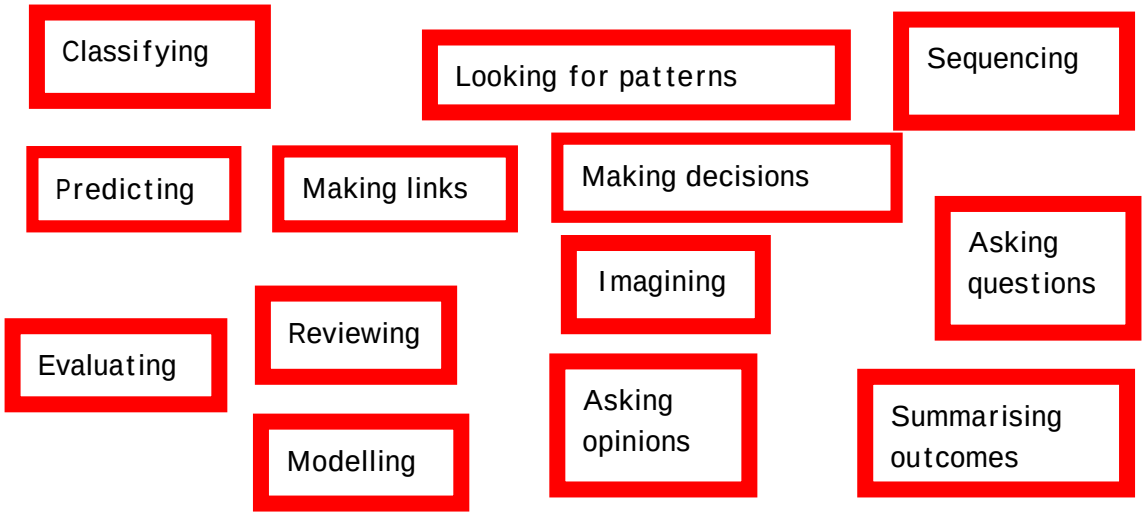
For the final stage, teacher modelling is vital to bridge to recent learning (either in the same subject or in a cross-curricular sense) – although, with experience, learners should become more adept at feeding back and generating ideas.

Scaffolding of ‘Learning to learn’ and ‘Thinking’ vocabulary for use with **Reflection Triangle/ Caterpillar/ Lily-pads**





Language of *Thinking*



61. Review of summative tests

Potential for: Formative use of summative tests
What is it? When a test has been marked by the teacher, learner or peers, the teacher then puts the learners into groups of four or five to look for ways to improve. The task could be *'Find ten more marks'*. Individuals can discover ways to approach tasks more effectively, as others in the group may well be able to provide practical suggestions. Practice suggests that this approach works best grouping high with mid attainers, and mid with lower attainers, as all can then contribute.

62. Self-marking

Potential for: Self-assessment; Formative feedback
What is it? Learners mark their own work using their own success criteria or mark schemes. It is most effective if learners have had a hand in the development of the success criteria or even developed their own markscheme and compared this with the published version. This allows learners to understand the assessment procedure and look for ways to improve the existing and future work. At its simplest level, learners can be asked to indicate precisely which part of their work they are most proud of. (Additionally, self assessment of 'effort' can be done **by learners** before they hand work in. Dylan Wiliam suggests that *teachers* have no way of really knowing how much effort learners put in to their work.)

63. Sequencing

Potential for: Thinking about cause and effect and making inferences
What is it? This tool is frequently used at KS1, although its merits extend through all key stages. Learners may be asked, on the simplest level, to sequence numbers, letters or pictures according to pre-set criteria or learner-led criteria. In later key stages, the criteria for sequencing are most likely to be learner-led. In both cases, however, the key issue is that learners must justify to others their reasons for selecting their chosen sequence. A number of examples are shown below.

***Example 1*:** KS1 from '*Let's Think!*', NFER Nelson.
Learners work in groups of six and are each given a card from the story 'The Cat and the Snail'. They must work together to sequence the pictures to tell the story – but avoid the 'Red Herring' picture, which does not fit the sequence!

Example 2: KS1/2 Goldilocks and the Three Bears
Learners read the story of Goldilocks and the Three Bears, and then work in groups to reconstruct the story: firstly using pictures alone, then using sentence strips, and finally matching the two together. Resources are outlined under the section for **Fortune lines**. For further challenge, pictures that do not fit the story may be added – this stretches learners to decide whether to include or exclude the information, with justification.

64. Snowball challenge

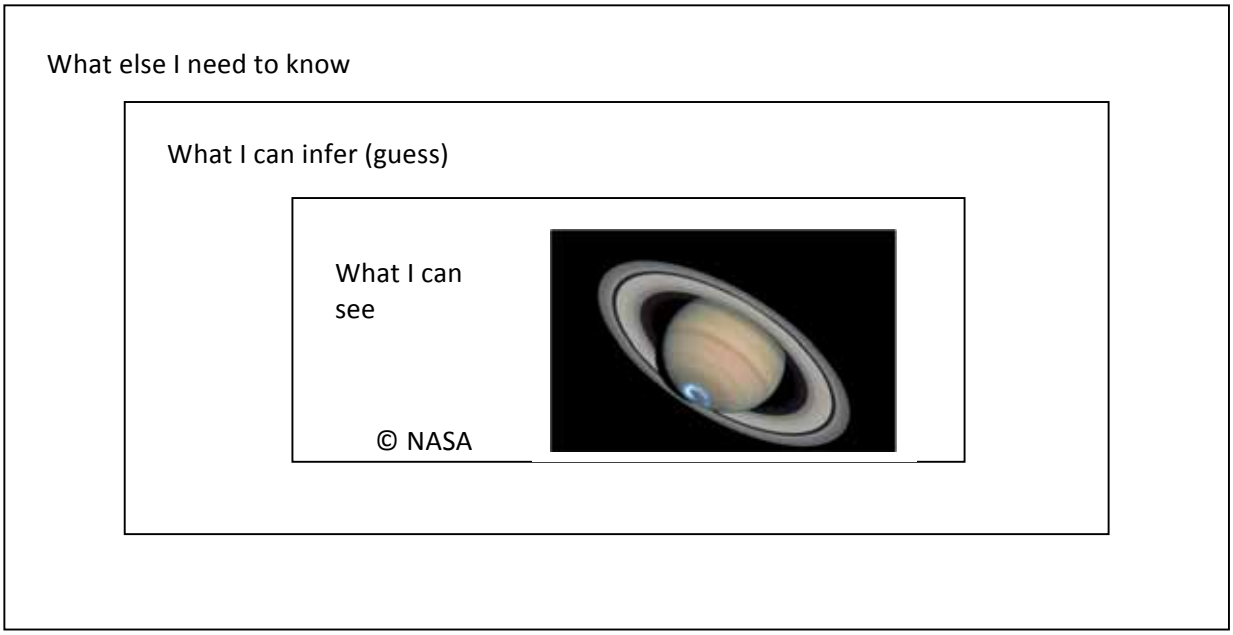
Potential for: Plan – activating prior knowledge and understanding
What is it? Learners are arranged in teams of five and are asked to remember ONE thing about a topic and write it down in ten seconds. On bell/whistle, they cover their answer and pass to the next team member who records their idea etc. The 'snowball' is passed to the next person so that the 'facts' grow in size. Once all learners have been involved, they open their 'snowball' and share their results with the rest of the class, comparing and contrasting the nature of their results. Learners may reflect on what the frequency of specific ideas emerging might tell them. They may discuss whether there appears to be specific emphasis on any particular area or quality of idea.

65. Source square

Potential for: Plan – Asking questions, Develop- Thinking about cause and effect and making inferences

What is it? A way of helping learners ask a series of probing questions. The teacher chooses a picture or image which is placed in the centre of the square. Learners write answers to the questions on the relevant parts of the diagram/ use sticky notes. Typical questions could be: *What can I see? What can I infer (guess) What else do I need to know? How am I going to find it out?*

Example:
Here, learners work in pairs to interrogate a source square with different images of the solar system included



66. Splat!

Potential for: Plan – Activating prior skills, knowledge and understanding
What is it? This is a developing thinking group-version of bingo. Teams of up to seven learners are selected and they each elect a 'splatter'. The 'splatters' are sent out of the room for five minutes while the remaining team write definitions for the key words contained on the grid. To play the game, one group is selected to read a definition of their choice – 'splatters' must listen to the definitions and quickly 'splat' their hand across the word on the grid. Two points are awarded for the fastest 'splat' (providing the answer is correct), BUT the splatter must justify their reason, citing evidence in the definition. For a correct 'splat' but insufficient/incorrect justification, a mark is taken off. The teams alternate to give another definition, and the process repeats. The first team to amass ten points is the winner.

***Example*:** Glaciation

erosion	freeze-thaw	deposition	corrie / cwm
Transportation	fjord	tarn	moraine
pyramidal peak	drumlin	hanging valley	striation

Adapted from 'Framework Science', Oxford University Press (2003).

67. Success book

Potential for: Self assessment
What is it? A small exercise book that can be used to record and build upon generic success criteria. The learner determines success criteria for a task, for example *'What makes a good poem?'* As the task progresses, the learner maintains a focus on his/her success criteria and modifies them or adds new ones. Learners can share their success criteria at any point with other learners to help them refine them. Their own success criteria can also be used by others to assess the learner's poem, and the learner can then review the success criteria again. If learners maintain a selection of generic success criteria in the book, they could cover a wide variety of tasks from writing poems to letters to writing up a scientific enquiry, to drawing a graph etc. When the learner next writes a poem, s/he has a ready-made list of success criteria as a starting point. In some variations, groups or classes have maintained success books, adding to these as appropriate so that in some cases a variety of criteria may be shown for the same task. This allows learners to enter into discussion regarding the appropriateness/usefulness of some of the criteria listed.

68. Taboo

Potential for: Reflect – Reviewing outcomes and success criteria, reviewing the process/method; also developing cognitive conflict/ challenge
What is it? A person is given a word and he/she has to describe the word using **single words only** for their team to guess. However, they must not use the word itself or a selection of other words (also given to the learner) as part of the description! Works well for all subjects – Welsh second language or MFL especially. An example is shown below:

Example: Anifeiliaid yn Gymraeg

1. Ci	2. Ceffyl	3. Mochyn
Taboo	**Taboo**	**Taboo**
Dog	Horse	Pig
Woof!	Neigh!	Oink!

69. Talk partners

Potential for: Evaluating own learning and thinking
What is it? Learners share with a partner three new things they have learned, what they found easy or difficult, what they need to improve, something they would like to learn next, etc. Learners explaining thoughts and ideas to each other is often an essential part of the learning process. This tool allows an overview of the learning that has taken place, and allows the teacher to change the teaching focus if necessary.

Many teachers use talk partners as a regular feature at various stages in the lesson, not just for reviewing what they have learned. It supports learners' self confidence and makes it more likely that they actively contribute and share ideas as it removes the fear of being isolated. See also: **Random partners**.

70. Temporary comments

Potential for: Formative feedback
What is it? Some learners are very sensitive about written comments 'spoiling' their work. Teachers may decide to ensure that corrections to work and comments about the work are temporary. Pencil or sticky notes can be used, for learners to remove once they have acted upon the comments.

However, tracking back how improvements have been made can be an important part of metacognition, so in some circumstances teachers may wish to encourage learners to keep track of their learning progress, identifying the *kind of advice that is most helpful in their individual progress*.

71. Think-pair-share

Potential for: Improving quality of questions/ quality of talk
What is it? Learners are posed a question: given time to think individually; then time to discuss ideas with a partner; and finally the pair share their ideas with a larger group or the rest of the class. This helps to extend thinking time, and allows learners to develop more sophisticated answers than they could in a typical 'ping-pong' questioning session. It also supports reluctant/learners with low self confidence to actively contribute. See also: **Basketball not ping-pong**

72. Thinking hats

Potential for: Develop – Generating and developing ideas, Considering evidence, information and ideas, Forming opinions and making decisions; Reflect - Reviewing outcomes and success criteria, Reviewing the process/method. Evaluate own learning and thinking
What is it? This strategy is often used to engage learners in considering a range of viewpoints within a discussion. Frequently, learners are exposed to different viewpoints (which may also be conflicting!) regarding an issue to be discussed. They may be required to analyse the type of 'hat' thinking being expressed, according to the following common classifications:

White (Facts and information)
Yellow (Advantages/Benefits)
Black (Problems/Disadvantages)
Red (Emotions/Feelings)
Green (Creative, new ideas)
Blue (Thinking about thinking)

Alternatively, they may be assigned a particular 'hat' and have to present an argument on the issue in the style of that particular type of thinking. In the majority of cases, Thinking hats are used by learners to develop balanced arguments when considering others' views to inform their own opinions and decisions which may then be presented and justified. This has been found to be particularly useful in supporting extended writing in examinations and has been used as a means of supporting effective examination technique.

Some examples of how this strategy has been developed and adapted for learners with additional needs are included in the DCELLS document 'Thinking for all learners'.

73. Thumbs up, thumbs down

Potential for: Self-assessment; Formative feedback
What is it? Similar principles to **Traffic lighting**, and avoids the trials of writing self-assessments. Is very useful for younger learners who may struggle with the concept of 'amber'; instead they hold their thumb to the side.

74. Two or three stars and a wish

Potential for: Formative feedback
What is it? Learners need to know the aspects of their work which are successful, and what they need to improve. The ratio of three to one is based on research which shows we are more likely to take advice if there is at least three times as much encouragement as criticism. The teacher or peer identifies three specific aspects of the work which are effective (the stars), and identifies one specific detail which needs to be improved (the wish). The learner acts on the 'wish' as soon as the comment is received. Younger / less experienced learners might find it easier to use two rather than three stars.

It is very important that each 'star' is not vague/ generalised praise, but specific identification of a skill that is being/ has been mastered and therefore linked to developed success criteria. It is also vital that the learner acts on the 'wish' if the feedback is to become formative.

75. Tickled pink/green for growth

Potential for: Self- and peer-assessment; Formative feedback
What is it? For younger children, teachers can highlight in pink the two/three 'stars' of two/three stars and a wish, and highlight in green the 'wish' – a skill that needs to grow. This also provides a strategy for highly focused but quick marking/ feedback. Using a highlighter pen on three precise words/ phrases/ sentences, with an arrow to explain what is good, provides quick and efficient feedback. Highlighting in green a specific word/ phrase/ sentence for improvement, again with an annotation suggesting the way it might be improved, also helps to make the marking quicker and more focused. All the feedback should match with the agreed success criteria. Older / more experienced learners can also use this strategy for self and peer assessment. Using a visualiser gives instant feedback and can model effective formative assessment.

76. Traffic lighting

Potential for: Self-assessment; Formative feedback
What is it? Traditionally a well used and successful tool for both developing skilful thinking and assessment for learning. Before or after a section of work, before or after a test, or as part of a major revision programme, learners traffic-light key words, key concepts, confidence levels, or even parts of exam papers. This allows them to prioritise their future efforts towards the things they don't yet understand or cannot yet do. They need help in sub-dividing the content or skills before they can use the colours, but can then focus on trying to turn reds to amber and ambers to green.

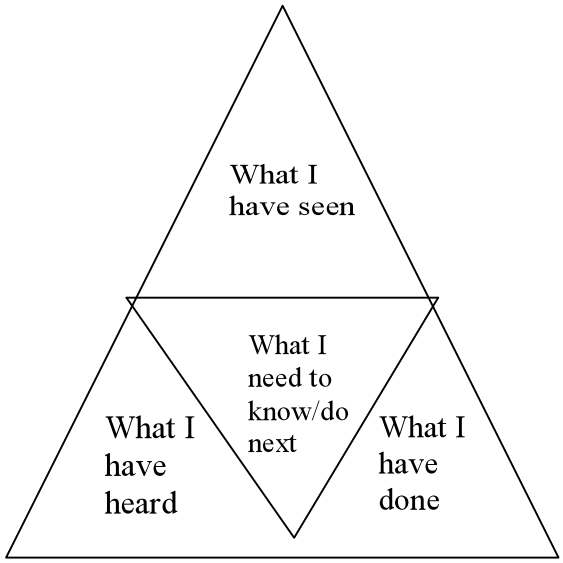
Red: can't do it yet **Amber:** not sure **Green:** can do this

An extension of this strategy would then be to pair up 'Amber' and 'Green' learners to share ideas, whilst the teacher may group the 'Reds' together and work with them as a discrete group. Alternatively, this interdependence may be fostered through whole-class discussion, and 'Red answers' may form the basis of future learning intentions. Some teachers suggest self-help strategies for learners who self-assess themselves as amber or red, for example: *ask a friend, have a go, find a resource...* (Relevant to learning to learn.)

Younger learners may find it easier to use thumbs up / thumbs down / thumbs sideways: **Thumbs up/ Thumbs down.**

77. Triangles

Potential for: Develop – monitoring progress
What is it? Learners place knowledge and feelings in different areas as shown.
They allow the learner to interconnect senses and emotions.



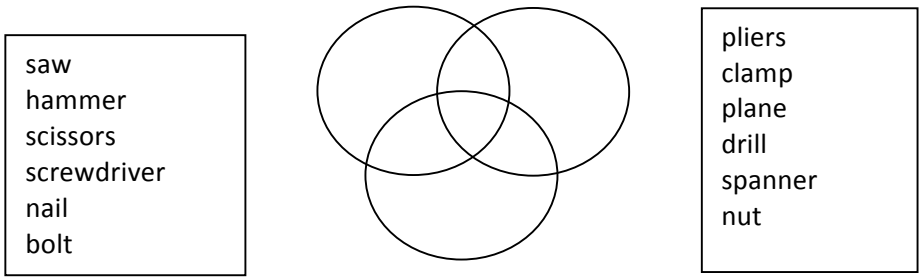
78. Venn diagrams

Potential for: Develop – thinking logically and seeking patterns
What is it? This is a useful tool for helping learners to classify factors relating to a particular topic, and to see relationships between these factors. Teachers may present the categories to the learners when working at very simple levels, and progress to learners categorising with justification as experience increases. Another variation is to identify each 'circle' and present an overarching problem, and allow learners to research ideas and present their results using Venn diagrams. Also to increase the level of cognitive challenge and promote further discussion, ambiguous statements or items may be included.

For younger learners, hoops on the floor can help to make the whole task more visual. Learners may place objects in different hoops, or even stand in different hoops, depending on the nature of the task.

An example from *Let's Think* involves grouping plastic animals by colour and by animal type. For example, an animal which is both green and a mammoth, could belong in either hoop. Some learners then realise that if the hoops overlap, the problem is resolved.

***Example*:** Machines



79. What happens next?

Potential for: Develop - Thinking about cause and effect and making inferences
What is it? A video or DVD is shown, for example of a process in Science or Geography, or part of a narrative in English/ Welsh. Learners are asked to say what happens next, justifying their decisions on the basis of evidence in the video/ DVD.

80. Who-what-when-where-why-how?

***Potential for**:* Develop – Thinking about cause and effect and making inferences
What is it? This tool has been used extensively in the Humanities and Arts. Typically it uses a visual or auditory stimulus (possibly a selection of photographs or diagrams or different pieces of music), and learners are asked to identify, with justification, which resource best matches the answer to a particular question.

Example: Year 9 Geography
Learners were shown various photographs of a city centre, taken at different times of the year, times of day, decades etc. Learners were asked a series of questions such as:

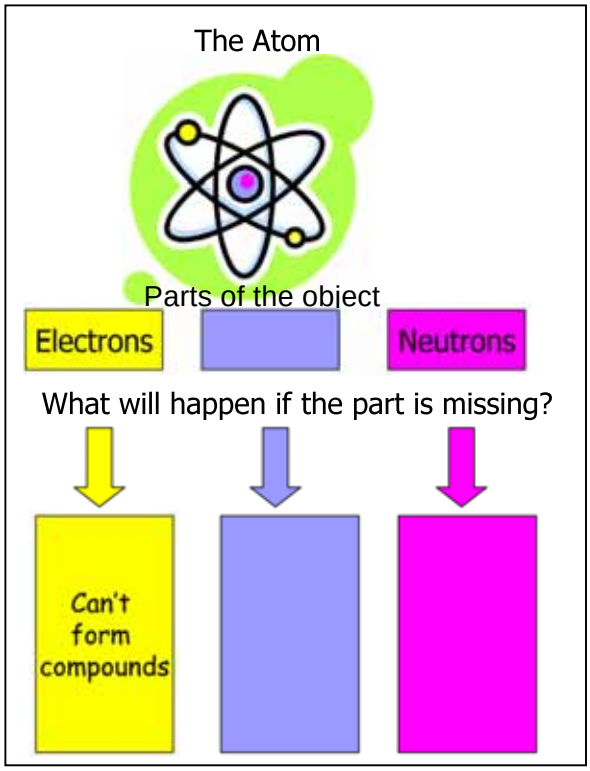
- which photograph was taken in mid-summer?
- which photograph was taken in 1950s? etc.

Can be extended into '**most likely to'** situations as outlined earlier.

81. Whole and part

Potential for: Develop - Thinking logically and seeking patterns
What is it? This tool uses a visual framework (or graphic organiser) to guide the learner's thinking. It encourages learners to identify functional and systemic relationships between objects or systems. It can be used as an individual or small group activity as it provides excellent discussion material.

***Example*:** Atom



Idea adapted from 'Active Assessment', David Fulton Publishers (2004)

82. Writing journals

Potential for: Metacognition, Reflect – Reviewing the process/method, Reviewing outcomes and success criteria; Evaluate own learning and thinking, Linking and lateral thinking
What is it? These are often used as an extension of KWL/KWHL grids in that they allow learners to express a journey in learning. They may be used for individual, paired or group reflection. Entries may be in the form of text, pictures, or diagrams (e.g. flowchart); essentially it can be a scrapbook of thinking, so that learners can retrace their steps in decision making and begin to formulate strategies, which allow skills to be transferred to other unfamiliar contexts (bridging).

For very young learners, some teachers have found success in developing 'thinking boxes' where learners can 'post' examples of useful decisions or strategies. Often the learners will consult their 'thinking journal' or 'thinking box' to see if there is a useful tool that could be transferred to a new context – this obviously requires some skill and very careful initiation to allow learners easy access and understanding of someone else's thought processes!

This method can be a useful way of beginning to explore metacognition, and in preparation for self and peer assessment and other assessment for learning principles. But teachers need to ensure that learners understand how to use the journals for genuine reflection – it takes time to develop their expertise!

83. Wrong answers collected and used

Potential for: Formative feedback, developing cognitive conflict
What is it? Wrong answers are interesting in that they allow us to identify and challenge a learner's misconceptions. In a lesson where every learner gets every question right, is anyone learning? We need to develop an atmosphere in which wrong answers are valued as a significant contribution to the learning of the class.

Having a store of typical and useful wrong answers can be a powerful learning strategy. For example: *Countries in Africa are poor because of the climate*. The teacher can present the wrong answer and ask: *Is this answer incorrect? How do you know it is likely to be incorrect? How could it be corrected/ improved? etc.* These questions, and ones like them, could also be used for **exploring wrong answers** or could be used to provide conflicting viewpoints in **Concept Cartoons.**

Annex 1: Teachers' checklists for group work

How?

- be explicit with learners about the quality of group work you want to achieve
- develop a checklist with learners; display it, large, in the classroom
- make spot checks, or stop the lesson and ask learners to carry out spot checks, on the quality of group work
- every now and again spend a few minutes before the end of a lesson asking how much group working progress has been made.

When a group is working well …

- the group sits so that each group member can see and hear all the others easily
- one person at a time speaks during discussion
- everyone turns to face the person who is speaking
- individual group members remind others if they break agreed ground rules
- any member at any time is able to explain:
    - what s/he is doing
    - how this contributes to the group task
    - what other group members are doing and why
    - what the next step will be.
- the group always works to agreed and explicit deadlines. Each member should be able to answer the question 'When will this be finished?'
- a group member who finishes a task early offers to help others, or negotiates the next step with the group manager
- everyone contributes equally to looking after resources, to clearing up, and to moving furniture.

If group work isn't going well, check that …

- time has been given to creating ground rules and clarifying expectations of individuals' behaviour within a group
- there is a designated leader, or manager, for each group
- the manager is the main channel of communication between the teacher and the group
- over a long period of group work (a technology project, for example) there are group meetings, chaired by the manager, at which agreements are made about division of labour, deadlines and use of resources
- apart from very short term tasks, notes are kept of who should be doing what by when
- the teacher is unbending about the maintenance of agreed ground rules
- the group has procedures for making decisions and solving problems.

Still problems? Check ...

- **classroom layout** – is the furniture arrangement conducive to group work?
- **resources** – are they appropriate for the task (content, readability), are they sufficient for the numbers, and are they easily obtained by learners?
- **time** – has enough time been invested in setting up group work properly in the belief that it will be recouped later?
- **trust** – is it believed that learners will, in the end, handle group work well and use it to achieve great things?

- **safety** – are safety requirements, where they exist, built into the ground rules?
- **tasks** – have the tasks been designed and structured for group work – in other words, so that they cannot be achieved by any individual alone?
- **ground rules** – do they need re-visiting, or even re-creating?
- **skills** – do you need to learn how to operate differently as a teacher/ manipulator of learning?

Annex 2: Developing thinking section of the skills framework

Progression

Learners' progression in developing thinking is described as you read across the columns from left to right. Progression is cumulative; skills identified in each stage of progression will have been demonstrated – at least at a simple level – by learners before they move to the next stage.

Progression can be seen in terms of the refinement of these skills and by their application to tasks that move from: concrete to abstract; simple to complex; personal to the 'big picture'; familiar to unfamiliar.

Learners progress from needing support to more independent working. They move from listening and interacting with others in a general way to a situation where they choose to work with others as a deliberate strategy for reaching understanding. In these ways they become both independent and interdependent learners.

The arrows within the columns indicate that the skills described previously continue to apply to learners at subsequent stages and that more challenging tasks would enable further progression.

Plan						
Asking questions	Ask why, what, how, where, when, etc.	Ask questions related to context and listen before asking further questions.	Ask relevant questions and begin to link questions into sequences. Give reasons for choice of questions.	Ask questions that build on responses to earlier questions.	Ask more probing questions.	Identify the problem and set the questions to resolve it.
Activating prior skills, knowledge and understanding	Show awareness of personal needs and skills.	Identify and make links with prior skills and knowledge related to context.	Identify gaps and begin to build on existing skills, knowledge and understanding required for the task.	Build on existing skills, knowledge and understanding required for the task.	→	→
Gathering information	Choose from given options where to find information and ideas.	Suggest where to find information and ideas related to context.	Suggest how to find relevant information and ideas.	Suggest a range of options as to where and how to find relevant information and ideas.	Evaluate options.	→
Determining the process/method and strategy	Choose from given options what to do and how to do it.	Plan, with support, the process/method to be used.	Plan the process/method to be used.	Suggest alternative processes/methods; identify the learning/thinking strategy to be used.	Explain why the process/method and strategy have been selected and identify possible problems.	Take account of possible problems when justifying why the strategy(ies) is to be used.
Determining success criteria	Identify, in response to questions, some basic success criteria for what is going to be done.	Determine some success criteria.	Determine success criteria and give some justification for choice.	Justify choice of success criteria.	→	→

Develop						
Generating and developing ideas	Show curiosity and explore everyday stimuli.	Generate imaginative ideas and possibilities.	Develop and begin to combine a variety of imaginative ideas, possibilities and alternatives, including those of others.	Develop and combine a variety of imaginative ideas, possibilities and alternatives.	→	→
Valuing errors and unexpected outcomes	Show surprise at unexpected outcomes.	Describe errors and unexpected outcomes.	Begin to make use of errors and unexpected outcomes.	Make use of errors and unexpected outcomes.	Value errors and unexpected outcomes and see the opportunities they present.	Build on unexpected outcomes as well as successes to re-evaluate.
Entrepreneurial thinking	Favour the familiar when presented with new ideas.	Begin to experiment with own and others' ideas.	Experiment confidently with own and others' ideas.	Begin to take risks with ideas, going beyond the conventional.	Take calculated risks with ideas, weighing up potential pros and cons.	→
Thinking about cause and effect and making inferences	See simple links between cause and effect in everyday routines; make and try out simple predictions.	Identify links between cause and effect; give reasons for inferences/ predictions.	Use some prior knowledge to explain links between cause and effect or justify inferences/ predictions.	Use prior knowledge to explain links between cause and effect and justify inferences/ predictions.	→	→
Thinking logically and seeking patterns	Identify obvious observed differences.	Identify and describe similarities and differences by making simple comparisons.	Identify, describe and begin to explain patterns and relationships.	Explain patterns and relationships and identify uncertainties.	Analyse patterns and explore uncertainties.	→
Considering evidence, information and ideas	Begin to understand that some things are 'fact'.	Consider evidence, information and ideas to begin to distinguish between 'facts', beliefs and opinions.	Consider different interpretations and distinguish between 'facts', beliefs and opinions, giving reasons. Begin to recognise bias and reliability.	Identify and assess bias and reliability.	Evaluate in order to gauge bias, reliability and validity.	→

Forming opinions and making decisions	Begin to express own opinions and make decisions in everyday routines.	Form opinions and make decisions by weighing up some pros and cons.	Form considered opinions and make informed decisions.	Consider others' views to inform opinions and decisions.	Take different perspectives to inform opinions and decisions.	→
Monitoring progress	With support, follow the chosen process/method.	Follow the planned process/method.	Follow the planned process/method, making some amendments where necessary.	Regularly check progress, making ongoing revisions to process/method where necessary.	Justify any amendments.	→

Reflect						
Reviewing outcomes and success criteria	Begin to link outcomes to success criteria.	Link outcomes to success criteria.	Begin to evaluate outcomes against success criteria.	Evaluate outcomes and how far success criteria fully reflect successful outcomes.	Refine success criteria in the light of experience for future occasions.	→
Reviewing the process/method	Show or describe some of what has been done; identify, in response to questions, what worked and what didn't.	Identify what worked and what didn't; begin to suggest how the process/method could be improved.	Decide whether the process/method was successful; describe any amendments made; suggest how the process/method could be improved.	Justify amendments/ improvements.	→	
Evaluate own learning and thinking	Show, in response to questions, some of what has been learned/found out.	Describe what has been learned/found out.	Describe how they have learned, and identify the ways that worked the best.	Identify the learning/thinking strategies they have used.	Justify the learning/thinking strategies used and suggest other strategies that might have worked.	Evaluate and refine learning and thinking strategies for future occasions.
Linking and lateral thinking	Make links between everyday routines in different contexts.	Link the learning, with support, to other situations.	Link the learning to similar situations, within and outside school.	Link the learning to dissimilar but familiar situations, within and outside school.	Link the learning to unfamiliar or more abstract situations.	Integrate the learning and link it to more abstract situations.

Annex 3: Useful references

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Complex Instruction
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Fortune lines
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education@thinkbuzan.com

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See page 42, *Analytical and discursive writing at Key Stage 3*, London: Historical Association 1997 for a full description of Christine Counsell's 'Great Fire of London' exercise.

Odd one out
Higgins, S. (2001) *Thinking through Primary Teaching* Cambridge: Chris Kington Publishing

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Robert Fisher
Fisher, R. (2005) *Teaching Children to Think* (2nd ed.) Cheltenham: Nelson Thornes
rfcreative@btconnect.com

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Adey, P. et al *Let's Think* London: G.L. Assessment

Splat!
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Dinosaur activity
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Adey, P. et al *Let's Think* London: G.L. Assessment

Whole and part
Naylor, S. and Keogh, B. (2000) *Active Assessment* Sandbach: Millgate House Education Ltd. ISBN 0 9527506-2-7

Supporting DCELLS documents
The following DCELLS documents are also likely to prove useful as they include further references to specific commercial programmes as well as supporting academic educational research:

DCELLS (2010) *Why develop thinking and assessment for learning in the classroom?*

DCELLS (2010) *Thinking for all learners*

Annex 4: Acknowledgements

DCELLS would like to thank all the schools and local authorities involved in this programme for their willingness to trial these materials. We would also like to acknowledge the writers and publishers referenced in these materials, whose ideas teachers in Wales have modified and adapted.