

Introduction

The Learner's Co-operative Ltd has been developing mind maps for classroom use since the early 1990's. They are a particularly structured form of radiant memory map. There are extensive notes about the pedagogical practice of mind mapping on CD2 *Is there life?*, also available on-line at www.sycd.co.uk

Running the activity

This resource consists of an introduction and notes for guidance to using mind maps, followed by some starter maps that focus on implications of decisions. If you are new to mind maps, we recommend that you study the notes describing the use of mind maps on *Is there life?*.

Safety

Not applicable.

More ideas

Use the maps as starting points, add images to them, extend the branches to include more detailed information.

Learning outcomes

Developing pupils' thinking and decision-making skills in citizenship and science contexts.

Where the activity fits in

New to the National Curriculum for September 2002, these resources support citizenship teaching across the curriculum.

Skills

Thinking and decision-making.

Acknowledgements

Mind Maps are an original idea from Tony Buzan. Thank you to Paul Hamer and Jasmine Chapman of the Learner's Co-operative Ltd for these maps. More resources from the Learner's Co-operative can be found from their website www.learnersco-opltd.co.uk
Tel: 01752 226003

Teachers' Notes for Use

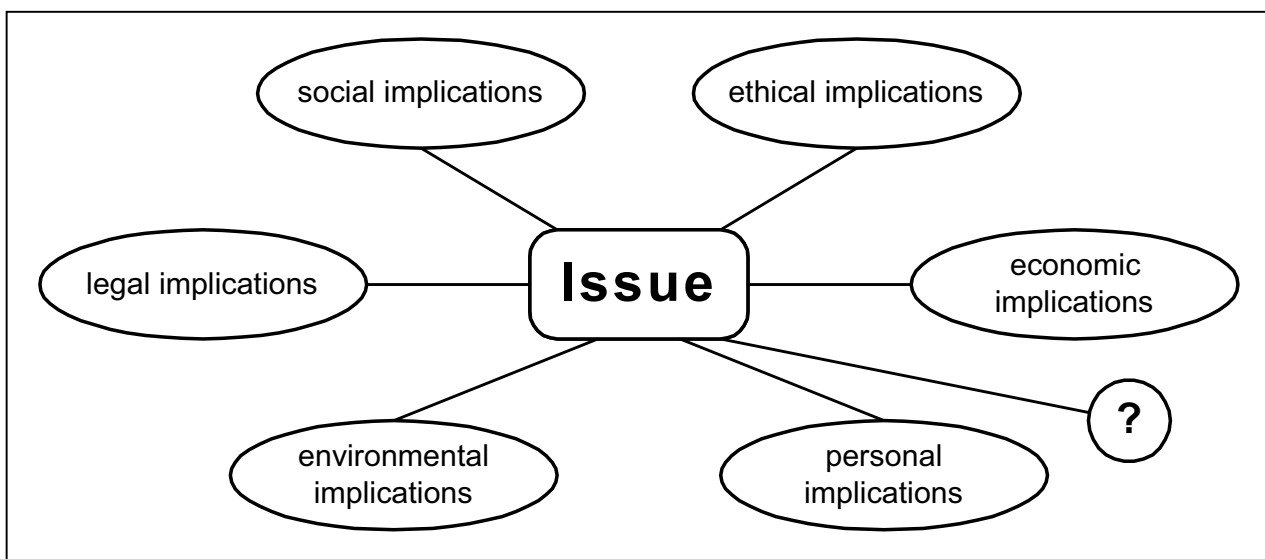
Consequence Maps

The nature of **Theme 3: Can We? Should We?** is such that something a little different from the first two sets of radiant maps (provided on the second CD Rom) is appropriate. Thus we are providing starters for issues discussion in the form of Consequence Maps. We first came across consequence maps in

Fullick, P. and Ratcliffe, M. (Eds) *Teaching Ethical Aspects of Science*, Southampton, Bassett Press

where the following structure is suggested (p22):

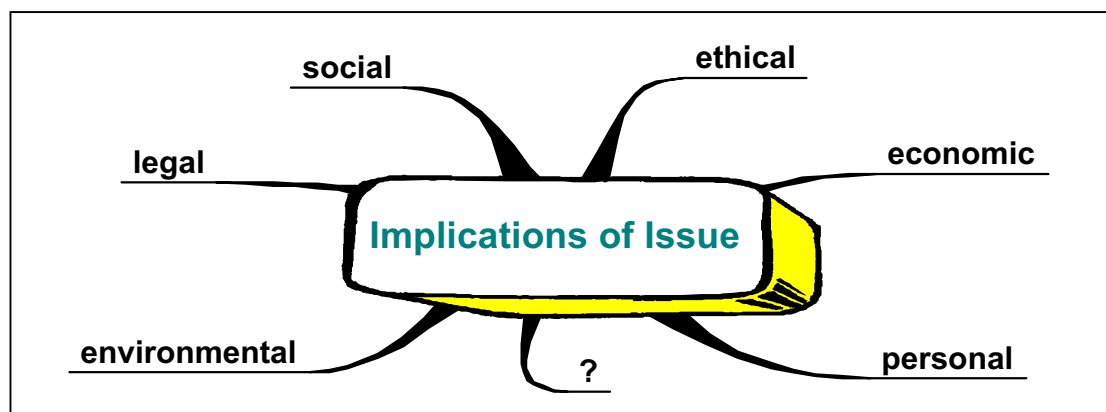
Fig. 1



The text gives a synoptic treatment of relevant theory and many useful tips on how to proceed in the classroom. A number of case studies pertinent to Theme 3 are also included.

In terms of the burrs and memory maps previously provided, the structure shown above can be translated into a burr:

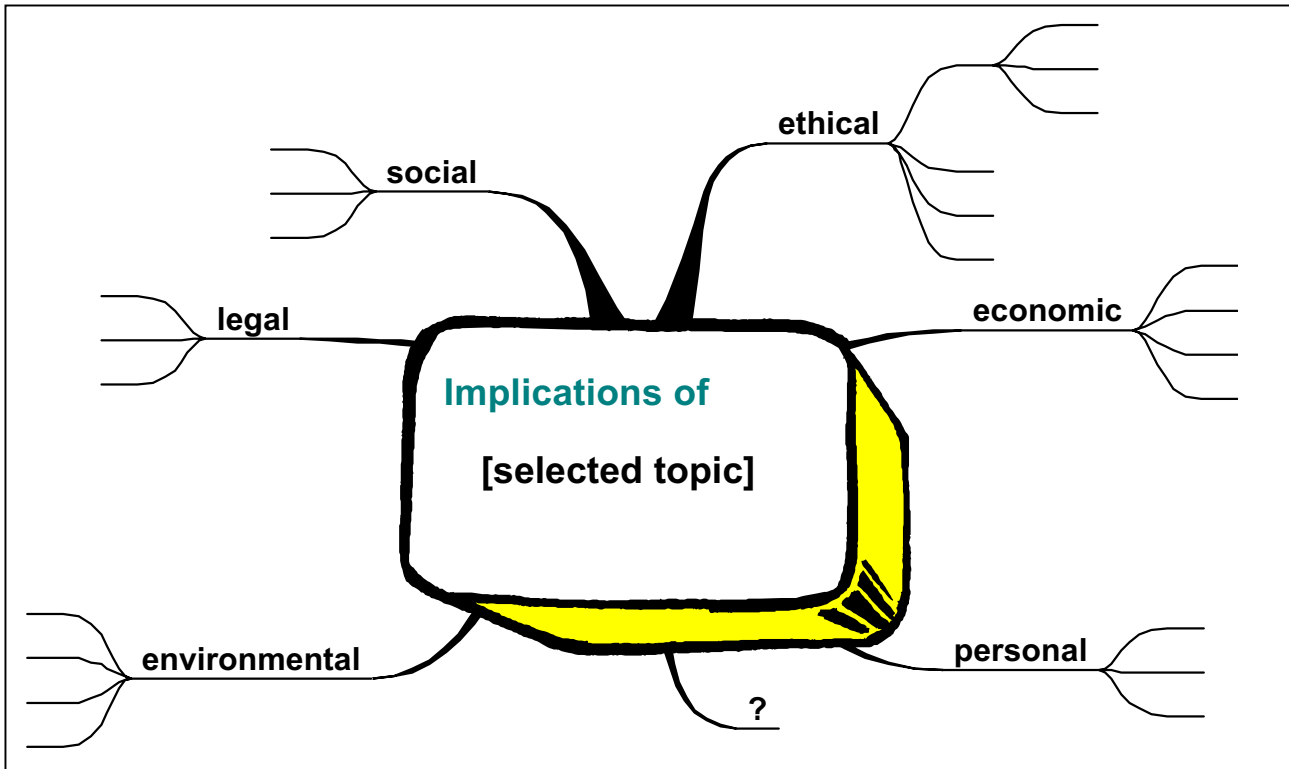
Fig. 2



which can then be used a starter for discussion and added to in the usual way (see fig. 3).

The ? branch indicates the openness of the discussion by suggesting that there may be further implications beyond those which are suggested by the provided branches (such as political implications).

Fig. 3

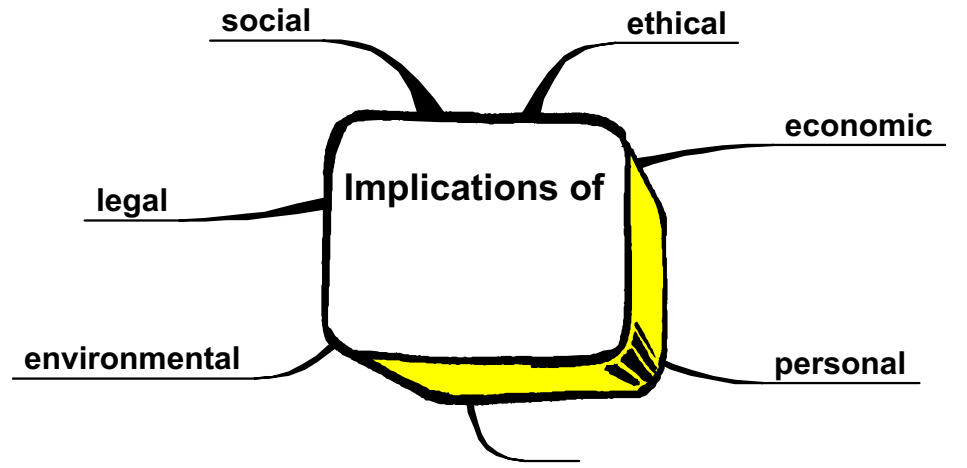
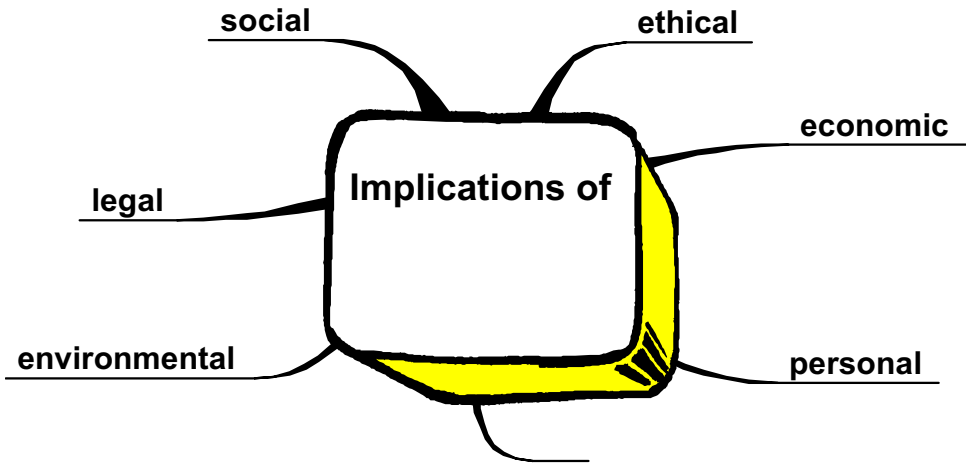
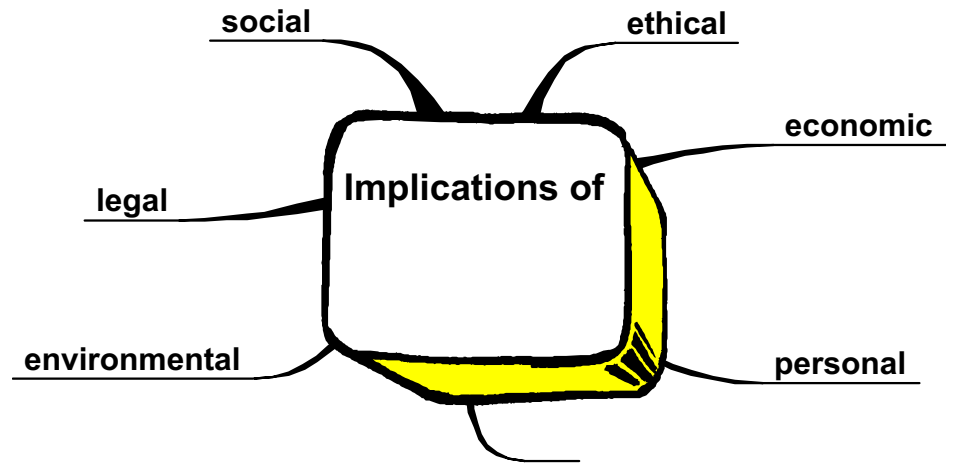
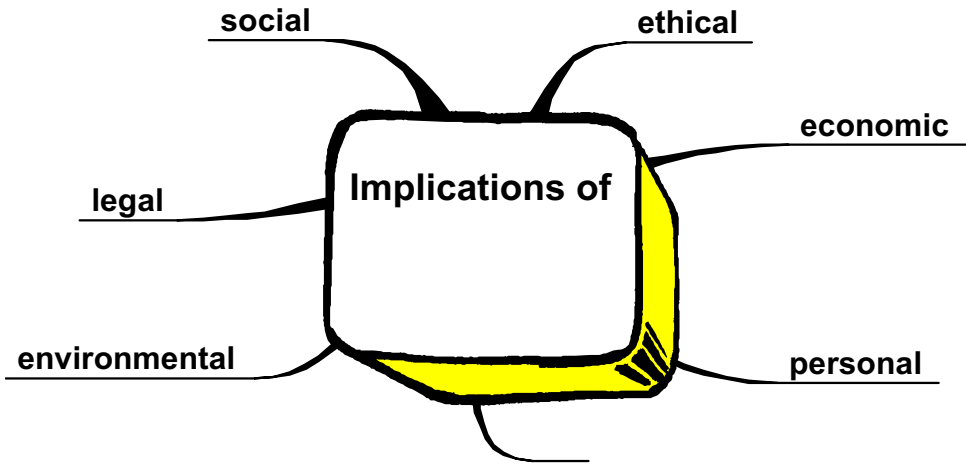


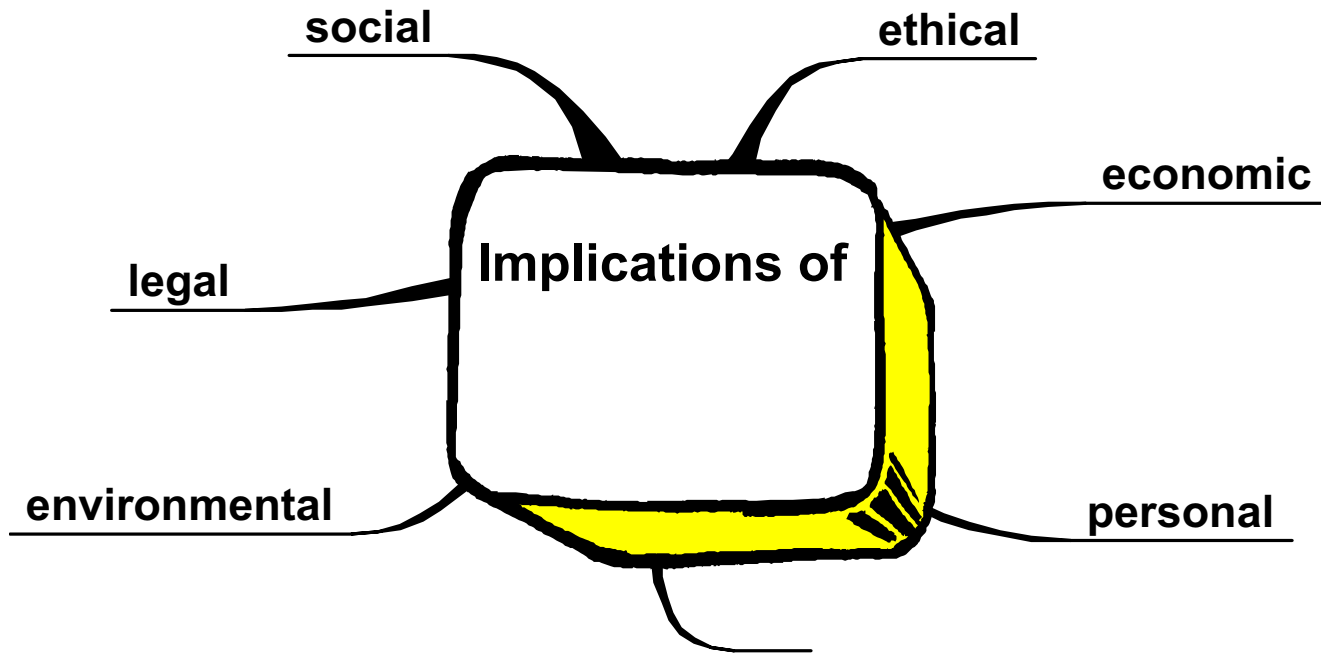
The teacher may, of course, instruct his/her students to concentrate on / ignore specific branches, either throughout, or at different stages within, the discussion. Branches on the provided copymasters can be whited out if required. The starter could, of course, be presented via black/white-board – or the image could be transferred from Word to PowerPoint.

A text box for the topic is positioned over the blank space in the centre of each burr.

A selection of possible topics for discussion is indicated below:

Sc2	Sc3	Sc4
Cloning	Chemical Industry and Pollution	Alternatives to fossil fuels
Gene therapy	Enzymes and biotechnology	Building in earthquake zones
Genetic engineering	Fertilisers	First Contact
Global warming	Internal combustion engine	High voltage transmission and health
Immunisation	Pharmacological use of natural resources	Mobile phone technology
Organic farming	Ore extraction	Nuclear Industry
Transplant surgery	Waste management	Space exploration and colonisation





Introduction

This resource consists of three pages of advice to students covering aspects of revision.

- Revision hints and tips
- How should I plan my revision?
- What's the best way to revise?

Safety

Not applicable.

Where the activity fits in

Before national tests.

Skills

Self-management, recall.

Acknowledgements

These materials were written by James Williams of Brunel University for the Hodder Science Series.

REVISION

Revision hints and tips

How often have your teachers told you that you must revise for a test or an exam? Do you know the best way to revise, and are there any short cuts to revision? This page will help you to find the revision method that suits you best, and helps you to learn and understand what you need to pass your tests and exams.

Common myths about revision:

- If I just keep reading and re-reading I will eventually learn it!
- I can revise far better with the TV on in the background and my favourite music on.
- It's better for me to only revise the night before a test or exam as everything is fresh in my mind.
- I only need to revise from my notes in my exercise book.
- I revise better in bed late at night as the information sinks into my brain when I am sleeping.

None of the above statements is true, but some of them have a grain of truth in them.

- Simply reading about a subject is not revising. Revision is about learning facts but it is also about understanding the work that you have done.
- Having a TV on will actually distract you. TV is designed to attract your attention with words, pictures and music. There is some evidence that music can help you concentrate. The problem is that the type of music that works best is classical soothing music, and not the sort of music that you probably like best. If you have music on with lyrics then you will concentrate on singing the words and that could distract you.
- The best revision is done over a period of time leading up to the test or exam. Leaving it all until the last minute is not helpful. Often there will be too much information for you to learn and understand in one evening.
- Your exercise book contains a record of the work you have completed in class and of your homework. A good exercise book will help you a lot. Your teacher's comments will help you to understand things that you may have got wrong. But think carefully, will your exercise book contain everything that you need? You will have to use other sources of information such as textbooks, the library, the Internet, CD ROMs etc.
- Bedtime is for sleeping. When you go to bed your body and mind is preparing for sleep, not work. You are unlikely to revise well if you are sleepy.

How should I plan my revision?

Your revision should be planned so that if you have more than one subject or topic to revise you make sure that nothing gets missed. Try drawing up a timetable for revision. The bigger the test or exam and the longer it is, the more you will have to revise, so start early! Your timetable should also mean that you don't just revise things once, you should revisit them regularly.

When you plan your timetable, try to plan it so that you have regular breaks and that you don't exclude all of the fun things you enjoy, such as watching your favourite programme on TV or playing a game on your games console now and again. Plan to revise topics/subjects for no more than 1/2 and hour with a 10 minute break between each topic/subject. If you really don't like or understand a subject or topic, revise it between two things that you do like. This means that you have a good start to your revision and good end to it. The good things will help you get through the bad ones!

Rather than resent having to revise your science while your favourite TV programme is on, why not arrange your revision so that you do some work before the programme, take a break and watch the programme, then go back to work. As long as you don't sit in front of the TV all night you can still work and have some pleasure!

Where's the best place to revise?

Organise a space for you to do your revision, at a desk in your room or in a quiet room in the house. Make sure you have everything you need before you start, for example your exercise book, your textbook (if you have one), any revision guides you have been given or bought, some paper or file cards, pens (at least two different colours or perhaps a highlighter). Make sure you have good lighting and a clock.

Make sure the room is comfortable but not too warm. Warm stuffy rooms make you sleepy.

What's the best way to revise?

Different people use different methods. Three methods are listed below. Try each of them and see which ones work for you.

Method 1

Remember the concept maps you used in some of your class activities? Some people revise best by making concept maps. First of all read through your notes on a topic and read through any other information that you may have. Then write the name of the topic or concept (idea) that you are trying to learn and understand. Write as many words down on the paper around the idea that you can remember that are linked to that idea. Now join the words up, make connections between them and when you make a connection write down what the connection is along the connecting line. You could put these up on your bedroom wall and look at them. You could even number them and revise them using a rota.

Method 2

Select a topic to revise and read through the whole topic. Now break the topic up into sections and carefully re-read the section. Perhaps you can make short notes about each section in your own words, or use a highlighter to highlight important words or phrases or meanings (but don't use a highlighter or pens on library and school books!). Now re-read the whole topic again and then on a fresh piece of paper write down what you know about the topic without looking at your notes or the books. Keep the notes to revise from in the future.

Method 3

Use file cards (you can get them in lots of different sizes) to organise your revision. At the top of the file card write down the name of the topic and an important word or phrase about it. Underneath you could write down the meaning of the word or phrase and how it links with other words or phrases in the topic. You could also use little diagrams to help you remember that word or phrase and what you understand by it. Soon you will have lots of file cards that you could keep in a box with index cards to make it easier to locate words and phrases. You can build up lots of different boxes of file cards for all of the subjects and topics you study in school.

Remember, different people learn in different ways. Some people like to listen to their teacher talking and explaining about science. If you are one of these people you could record your notes on a cassette and listen to your notes on the way to and from school or when you have a free moment. Other people like to see how things work or like to learn about things using diagrams. If you are one of these people then you might like to use method 1 above, or learn by drawing little pictures and diagrams. Some people like to learn by doing things. If you are one of these people then you will probably remember activities you did in class so when you revise from your exercise book try and picture what happened in the class on that day.

Introduction

The Learner's Co-operative Ltd has been developing resources for classroom use since the early 1990's.

Running the activity

The resources consist of a set of pedagogical notes for teachers and a series of worksheets for pupils to use to find their most suitable ways of revising.

- Student self assessment – What skills have I got? (3 sheets for pupils)
- Managing your own learning – Staying positive! (1 sheet for pupils)
- Review of learning styles and revision methods for teachers
- Bibliography for teachers

Safety

Not applicable.

Learning outcomes

Improved revision techniques.

Where the activity fits in

Before national tests.

Skills

Thinking and revising.

Acknowledgements

Thank you to Paul Hamer and Jasmine Chapman of the Learner's Co-operative Ltd for this. More resources from the Learner's Co-operative can be found from their website www.learnersco-opltd.co.uk

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What skills have I got?

Planning – tick relevant box

Skills	Very strong	Some strength	A bit weak	Very weak
Planning how to study				
Goal setting				
Breaking down tasks				
Varying work patterns				
Setting up a timetable				

Information skills – tick relevant box

Skill	Very strong	Some strength	A bit weak	Very weak
Reading text books				
Use of an index				
Using the Internet				
Using reading strategies like SQ3R				
Listening effectively				
Expressing relevant ideas				
Recognise if information is relevant				
Asking relevant questions				
Using a word processor				
Using a library				
Organising and grouping information				
Reading for pleasure				



What skills have I got?

Note making - tick relevant box

Skills	Very strong	Some strength	A bit weak	Very weak
Using keywords				
Making rough notes from books				
Using colour				
Using icons				
Using memory maps				
Making rough notes from video				

Self – tick relevant box

Skill	Very strong	Some strength	A bit weak	Very weak
Organising resources				
Analysing personal study				
Revision skills				
Taking responsibility for my actions				
Learning from mistakes				
Asking for help when it is needed				
Meeting deadlines				
Motivating myself				
Improving on previous attempts				
Doing as I am told by teachers				
Working independently without being told what to do				



What skills have I got?

Co-operation – tick relevant box

Skill	Very strong	Some strength	A bit weak	Very weak
Listening to others in group				
Taking a role in a group				
Valuing others' contributions				
Motivating others				
Getting help from others in group				
Criticising ideas, not people				
Checking for group understanding				
Using quiet voices				
Sharing resources				
Involving quieter members of group				
On task group discussion				
Comparing work				
Staying with the group				
Not using put-downs				
Not interrupting				
Waiting your turn				
Testing each other				



**Having the will to work when it would be far easier to make a phone call / go out with mates / watch a video / play a game / surf the net / whatever –
that's difficult!**

Many students struggle to find the self discipline to do what they should do, rather than what they ought to be doing. Self discipline is, however, easier when you are motivated. Fortunately, motivation can be built up from small beginnings.

Keeping positive – improving motivation.

Remind yourself why you are reviewing e.g. "I want to be a car mechanic."

"I want to help my family." "I want to do my best."

Blu-tac cards to the wall to remind yourself of broad goals.

When you are tired and feel like giving up, look at the card(s).

Take planned breaks to "get away from it all."

This will help you to feel refreshed and ready to start again.

Reward yourself for progress made. If you intended to do an hour but did 45 minutes review and that is more than you have done before, then reward is due. Rewards can be: chocolate, a TV programme, a hot bath with bubbles, a small gift like earrings or a CD, a (short) game on the play station, time with mates, a trip to the football. Try to make the size of the reward appropriate to the progress!

Think and talk to yourself in positive terms. Instead of telling yourself you can't do it; say: "I can review, I will review." Try statements like: "I want, I will, I need to, I like to, I'm going to", rather than: "I must, I should, I ought, They told me to, I have to."

If you can talk to someone sensible (friend, family member or teacher) when things are worrying you this can be a source of support.

Be kind but firm with yourself. Remember: exams are just a measure of where you are in a subject not what you are as a person. There are many helpful and pleasant people who cannot tell you much about science!

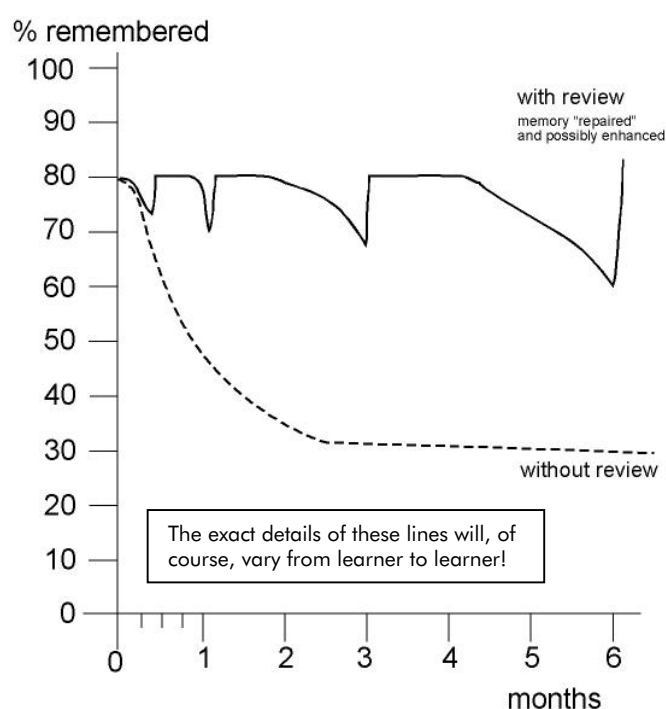
Review

Rose & Goll (1992) define review as "an active attempt to register information in your long term memory." They go on to suggest that the ideal time for review is when you return to a subject after a break. Grimshaw & Ohlson (1990) give a timetable for review as:

- same day
- next day / 24 hour
- one week
- one month
- [three months]
- six months
- one year [and annually] [our additions].

We have found that the idea can be introduced to students as a way of not allowing yourself to forget.

The graph below, adapted from Grimshaw & Ohlson, shows the effect of review on retention of information:



A **review cycle** can be used to integrate review into your teaching programme with a given class &/or to plan homeworks which sustain the students' revision of past work. The copiable review resources provided in this Manual should serve to illustrate possible activities.

Review activities can be based on products generated by students using many of the strategies outlined below. In developing this approach with our own students we are encouraging them to build up review portfolios of cognitive maps / flash cards / other formats that they summarise a unit of work in.

The use of planned review ensures that learners are repeatedly exposed to concepts. Each new exposure will occur in different contexts, promoting comprehension and providing different links to a concept.

“Read through my notes”

J. Doe

Is a too frequent response to “how do you plan to / did you revise for ... ?” The notes in question may well consist largely of (copied) linear text which is tiring to read and difficult to annotate or add to. Such notes are often embedded in several workbooks along with practical work, practice investigations, homeworks, quizzes etc. Assuming that no books have been lost, the student’s first task is to work out the sequence of books and identify which pages are useful for revision. Making sense of what was written on the page eighteen months ago may not be easy.

PASSIVE COPYING ... LONG INTERVAL BEFORE REVISION ... LACK OF STRATEGIES ... CONFUSION

It’s easy to see how any teenager, equipped with only this strategy, might find it easy to be distracted or become “bored” with the revision – especially if their circumstances are the same in several subjects.

On the other hand, if a student has responsibility for generating their own revision materials as an outcome of making notes, they could well be redrafting those notes during the early stages of the review process. This will give them time to reflect and correct and will facilitate reorganisation of their own “mental map” as well as their physical notes. Redrafting also means things don’t have to be perfect first time, reducing stress and providing opportunity to assimilate new understanding. The learner has ownership of the activity, which should result from informed choice on their part or informed guidance on the part of the teacher, and therefore has more reason to become engaged and to remain involved.

We have been exploring the use of a **6 Stage Model of Learning** in planning our own teaching over the last few years. Experience convinces us that this model can not only assist our proposed integration of revision but simultaneously facilitate:

- ❖ response to individual needs whilst still being required to teach a content rich curriculum;
- ❖ development of increasing independence in learning;
- ❖ strategic rather than “scattergun” deployment of varied activities and formats;
- ❖ equitable alternatives for any students with special needs;
- ❖ decisions such as:
 - balancing teacher-centred episodes and student-centred episodes;
 - when to differentiate for approaches to learning;
 - which strategy/ies to use when differentiating;
 - when, and for whom, to use (which bit of) ICT;
- ❖ integration of recommended good practice such as:
 - development of key skills, particularly:
 - improving own learning and performance,
 - communication,
 - working with others and
 - problem solving;
 - using accelerated learning techniques such as cognitive maps;
 - incorporating creative activities and
 - providing opportunities to learn through discussion.

6 Stages of Learning

The six stages, based on brain research over the last two decades, were written primarily for adult, independent learners (Rose & Goll '92). We have found that, with some modification, the model is both relevant and applicable to students learning in a classroom.

We see revision as a process which:

- begins when the learner takes ownership of the taught material when processing it during Stage 3 (below);
- can provide opportunities for developing communication skills due to the variety of formats which can be used;
- can be motivating for students, who can see their own development reflected in their personal revision portfolio (see Stage 4, below) as they refine and develop it.

A Six Stage Model of Learning:

Stage	Activities
1 Right Frame of Mind <i>Reception</i>	Establishing prior knowledge (formative assessment), connecting the learning, giving the big picture and setting targets; getting learners relaxed, confident, motivated and unstressed
2 Getting the Facts <i>Perception</i>	With more dependent pupils: multi-sensory input to accommodate learners' perception preferences; With more independent students: learners choose information sources and acquisition steps
3 Exploration <i>Processing</i>	Individual / pair / small group activities differentiated by preferred processing mode (multiple intelligences); checking and correcting; MAKING notes in chosen form – meaningful reorganisation of information; formative assessment [Planning and carrying out Investigations]
4 Memorising <i>Encoding</i>	Review, using notes (= aide-memoire / revision portfolio) to transfer learning from short-term to long-term memory
5 Show You Know <i>Recall</i>	Opportunities for learners to demonstrate new knowledge and understanding through group and class activities such as talks, tests and quizzes; further reflection; formative assessment
6 Evaluation of Learning <i>Metacognition</i>	Learners reflect, and discuss with peers and teacher, "What went well?" "What could have gone better?" in terms of the learning – metacognitive reflection; diagnostic self assessment

(developed from Rose and Goll, 1992: 24-209 with reference to Smith, 1998: 24-27).

Bibliography

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Lazear, D.	1994	Seven Pathways of Learning Teaching Students and Parents About Multiple Intelligences	Zephyr Press
Orlich, D.C. et al	1990	Teaching Strategies	Heath
Rose, C. & Goll, L.	1992	Accelerate Your Learning	Accelerated Learning Systems
Smith, A.	1996	Accelerated Learning in the Classroom	Network Educational Press

Introduction

This is a statement sequencing activity in to produce sentences containing scientific facts.

Running the activity

The resource sheets consist of 20 beginnings, middles and ends to sentences. Print out the different sections on different coloured card, for example, white for beginnings, green for middles, blue for ends. Cut them into individual cards.

Pupils lay the white section out in a column and find the green middles and blue ends to go with each white starter. Do the activity against the clock. It is useful if pupils work in groups of two or three. This gives a co-operative dynamic to the activity.

Safety

Not applicable.

Learning outcomes

Reviewing pupil knowledge of biology topics.

Where the activity fits in

Biology revision
QCA SoW 8A, 8B, 8C and 8D

Skills

Knowledge, recall, sequencing.

Acknowledgements

Please send your fun size games to nigel.heslop@scienceyear.com for inclusion on future CD ROMs.

Beginnings

Normal body temperature is	Antibiotics are used
Digestion is used	Our bodies produce
Proteins are needed	Chemical energy is transferred by
Fats are	Respiration
To keep healthy	The heart

Arteries	Three micro-organisms are
Veins	Three products using micro-organisms are
The blood	When yeast is alive it produces
Oxygen	Alveoli
Carbon dioxide	The air we breathe out

Middles

proteins called antibodies	to fight
to break down carbohydrates	for growth
is a pump	is when oxygen is used
we need vitamins	our muscle cells
the food group we use	37°C

carbon dioxide and alcohol	is carried inside red blood cells
contains less oxygen	bread
carries materials round the body	carry oxygenated blood
carry deoxygenated blood	is dissolved in
are microscopic air sacs	bacteria

Ends

into movement energy	to store a lot of energy
to release glucose	in the core of our body
and minerals in our diet	that make us immune to a disease
bacteria that cause disease	and repair of body tissues
that pushes blood around the body	release energy from glucose in our cells

from sugar	including oxygen, carbon dioxide and glucose
viruses and fungi	cheese and yoghurt
the blood plasma	joined to haemoglobin
to the organs	at the ends of the tubes in the lungs
and more carbon dioxide and water vapour	back to the heart

Answers

Normal body temperature is	37°C	in the core of our body
Digestion is used	to break down carbohydrates	to release glucose
Proteins are needed	for growth	and repair of body tissues
Fats are	the food group we use	to store a lot of energy
To keep healthy	we need vitamins	and minerals in our diet
Antibiotics are used	to fight	bacteria that cause diseases
Our bodies produce	proteins called antibodies	that make us immune to a disease
Glucose and oxygen are used by	our muscle cells	into movement energy
Respiration	is when oxygen is used	release energy from glucose in our cells
The heart	is a pump	that pushes blood around the body

Arteries	carry oxygenated blood	to the organs
Veins	carry deoxygenated blood	back to the heart
The blood	carries several materials round the body	including oxygen, carbon dioxide and glucose
Oxygen	is carried inside red blood cells	joined to haemoglobin
Carbon dioxide	is dissolved in	the blood plasma
Three micro-organisms are	bacteria	viruses and fungi
Three products using micro-organisms are	bread	cheese and yoghurt
When yeast is alive it produces	carbon dioxide and alcohol	from sugar
Alveoli	are little air sacs	at the ends of the tubes in the lungs
The air we breathe out	contains less oxygen	and more carbon dioxide and water vapour