Chapter 1
Reading

Introduction

In school, the symptoms of reading difficulty are sometimes hard to identify. There are children with dyslexia whose fluent reading of words hides a serious lack of comprehension. There are those who read fast, evidently understand what they read and yet retain very little. At the other end of the scale are those who love books and take refuge between their covers, but who read to themselves slowly and avoid reading aloud at all costs. Such readers are nearly always behind with a class set book. They can appear lazy or reluctant, when in fact their response to the content, when they do manage to read, may be fitting and original. Frequently, there are those who read too slowly to build up any interest whatsoever in a concept, argument, character or story. These convince themselves that they hate books, when in fact what they hate is reading.

This dislike of reading is often strengthened, in a school context, by the dread of being asked to read aloud in class. Although children with dyslexia may really enjoy listening to others read, they should not themselves be asked to read aloud in public, nor should they be left wondering if they will be asked. They should, however, practise in private, because oral and aural channels will act to support their weak reading skills.

Their dislike of reading is also influenced by the size of a book, by how easy it is to hold open and by the appearance of its text – the background colour, the size and clarity of print, the length of line and layout on the page. Where one student tolerates magazine articles, another detests columns of newsprint. One will pore over technical manuals whereas another, despite labouring at every page, may still lose himself happily in the world of a long novel. Dyslexia is never more confusing than when it relates to reading.

Teachers' checklist

Teachers who wish to help poor readers in the subject they teach could start by identifying their students' specific difficulties. A checklist of warning signs is given in Figure 1.1 and ticks scattered or clustered on this list should prompt a discussion about the skills needed to read in that subject – the first step towards dealing with a reading difficulty.

Where dyslexia is the problem, pupils are likely to have difficulty (sometimes an acute difficulty) relating letter sounds to letter shapes: s = (s, z), qu = (kw), ph = (f), ch = (ch, k, sh). This skill is known as 'phonological processing'. It is the foundation step to synthesising letters into syllables, then words, and attaching meaning to them. It underpins all aspects of literacy, and most children develop a high-speed fluency in it. Definitions of dyslexia usually, however, emphasise a lack of fluency in this skill. Although poor phonological processing affects speaking and writing, it is most damaging to reading, hence dyslexia's early history as a 'reading difficulty'.

The fact that readers with dyslexia may have to work out even the simplest one-syllable words, letter by letter, often goes undetected in ordinary school life. Meanwhile their peers

Difficulties in reading – a checklist of warning signs for teachers
Do you teach students who...

In general:

- rarely read any book not required for school? ☐
- read comics and technical magazines but avoid books? ☐
- dread reading books with small print and tight binding? ☐

Speed:

- often fail to complete reading homework? ☐
- like to discuss characters and scenes but are too far behind in required reading to be able to join in class discussions? ☐

Comprehension and memory:

- have done the reading but understand very little of the content? ☐
- read fast, enjoy the book as they read, but remember little? ☐
- read unusually slowly but digest information and inference? ☐

Reading aloud:

- read aloud hesitantly or in a monotone or with odd emphasis? ☐
- read aloud fluently but cannot answer questions about content? ☐
- lose their place easily and omit or repeat words/lines? ☐
- cannot pronounce or remember names or unfamiliar words? ☐
- mispronounce familiar words (perfect/prefect)? ☐
- change tenses (add or omit 'ed')? ☐
- ignore or add 'not' and reverse the meaning? ☐
- substitute synonyms (house/home)? ☐
- disregard punctuation? ☐

Reading silently:

- yawn, fidget, rub eyes, cover one eye, lay head on arm? ☐
- mouth words? ☐
- use finger as guide? ☐
- daydream or give up? ☐

Extracting information:

- can't scan a book or magazine to find specific material in it? ☐
- can't extract information from notices or posters, or even find their own name on a posted list? ☐
- misread examination questions or overlook part of a question? ☐

Figure 1.1 Use this checklist to raise pupils' interest in their own reading skills.

are taking in the meaning of whole groups of words at a glance. The consequence of poor phonological processing is that sufferers devote their prime attention to working out or 'decoding' individual words, so they can pay only residual attention to syntax and to integrating the meaning of the text as a whole. This can be equally true when reading numbers and equations, the symbolic language of mathematics and chemistry or physics. In addition, the short-term memory and sequencing problems so typical of dyslexia make symbolic language an even more difficult medium to work in.

Good readers retain a lot of what they read and absorb it into their own experience of life without conscious effort. People with dyslexia will be preoccupied, consciously or unconsciously, with decoding and cannot guarantee to retain much of what they read. To achieve the same quality of assimilation as good readers, they may need to take a different, more conscious route. They will need to personalise text in some way in order to realise and retain its meaning – they need a method that is both creative and less dependent on words. The most effective method for this is to imagine, or visualise, the content as they read.

Visualising

What is visualising?

Visualising is the technique of representing ideas as mental images rather than words. It is a spontaneous speciality of the brain's right hemisphere. Once a reader has turned text into image, he probably won't be able to forget it. Sharma (1992), a respected writer and speaker on dyslexic difficulties in mathematics, maintains that 'Anything visualised goes straight into long-term memory'.

How is visualising relevant to secondary school reading?

Visualising – usually as a step towards drawing cartoons or posters – is popular with teachers. It is often set in school as an exercise to consolidate learning, but it is not used as a primary technique for reading. It would not be practicable to draw every time one read, and many teachers may not have discovered how useful making mental pictures can be. Although they do not ask pupils to imagine the content of their reading, they are quite likely, instead, to ask pupils to 'take notes' on it. Language, not imagery, is a secondary schoolteacher's tool.

Three points may account for this. First, teachers have learned successfully themselves, using words as their medium, and they would naturally wish to employ that successful medium to teach their pupils. Second, assessment at all levels is couched in words. As a result, secondary schoolteachers have rarely formed image-making habits when they become teachers and feel impatient (if not downright hostile) with such an apparently irrelevant medium. This is all the more understandable when they are focusing intently on the content of their course rather than on their teaching method, and when most of the class learns perfectly well using words anyway. Third, teachers might argue that, as reading is all about language, transposing words into images may involve the reader in misleading interpretation and enhancement. They might feel that this is particularly true in text where the words are carrying either precise technical meaning, as in a science textbook, or resonance from the writer's personal use of language, as in poetry.

However, some readers find words a serious barrier to realisation and memory (leaving aside any expectation of interest and pleasure). For them, visualising can be a powerful

alternative. Weak readers who think in images can create for themselves a sharp and, if Sharma is correct, lasting realisation of text. This realisation may be in the form of a single holistic image or of a visual sequence, like a film. It may have colour, movement, sound or smell associated with it, and the image maker may learn more thoroughly from this way of reading than do efficient readers who simply read. Visualising is valuable in any school subject and usually gives the image maker feelings of pleasure and success. These are two highly motivating emotions that readers with dyslexia rarely associate with their experience of conventional reading, but which teachers depend on for their best teaching.

How does visualising work?

Speaking at a conference on mathematics and dyslexia, Professor Sharma gave a light-hearted demonstration of how visualising works. He asked members of his lecture audience to write '69' on a scrap of paper that they were holding on their foreheads, and then he described the steps that they would be taking. Here is the gist of his description:

- Raise a mental picture, from long-term memory store, of how '69' normally looks to you.
- Relate this familiar image to the new problem of orientation and direction.
- Try to 'see in your mind' this new '69' as it should appear on the paper.
- Then attempt to realise a new image from the old; your mental screen will help to guide your hand and peg the new image in memory as you write it on your forehead.

Visualising is creative, personal and fast

When visualising, readers draw on their own unique store of experience to make visual links to the text. The process is creative and entirely personal; other people's connections and images do not work half so well. Raising familiar images prompted by new reading material helps the process of understanding and draws the new ideas, attached to these familiar images, into long-term memory. Thence the new ideas are easily retrieved, still hooked up to the familiar images with which they have been integrated.

It is well known that the funnier, the more vulgar or the more out of scale the integration between idea and image, the more likely it is to work as a mnemonic peg. This creative process in the imagination of the reader can take place at such speed that it seems instantaneous. Speed is important to dyslexic students, who will not want to add delaying business to their already slow reading.

Drawing as a way to explain visualising

The easiest way to explain visualising is to give examples, and the most direct way to do that is to draw what is visualised. Allowance has to be made for the fact that drawing is never as detailed and expressive as imagining. This first very simple example shows a 10-year-old boy visualising the making of shadows while quoting from his science textbook (Figure 1.2).

The next example (Figure 1.3) was drawn to represent information in a textbook's account of the battle in which the Romans defeated the Iceni under Boudicca in AD 61. A different reader would imagine the scene quite differently (how do you visualise a 'dense wood'?) and find his own images more memorable than these. In either case, colour (blue woad-covered faces, for instance) will enhance the initial realisation and the resultant memory.

To strengthen recall – re-visualise and talk

It is usually easier to recall images than words but, if words and images have been integrated, recalling images may evoke original phrases too, particularly if the images are recalled more than once. However, if words are a problem and examination success is the aim, students should re-visualise their reading in a way that reinforces the original link between words and images. First, they should recall the images and then take the further step of describing them

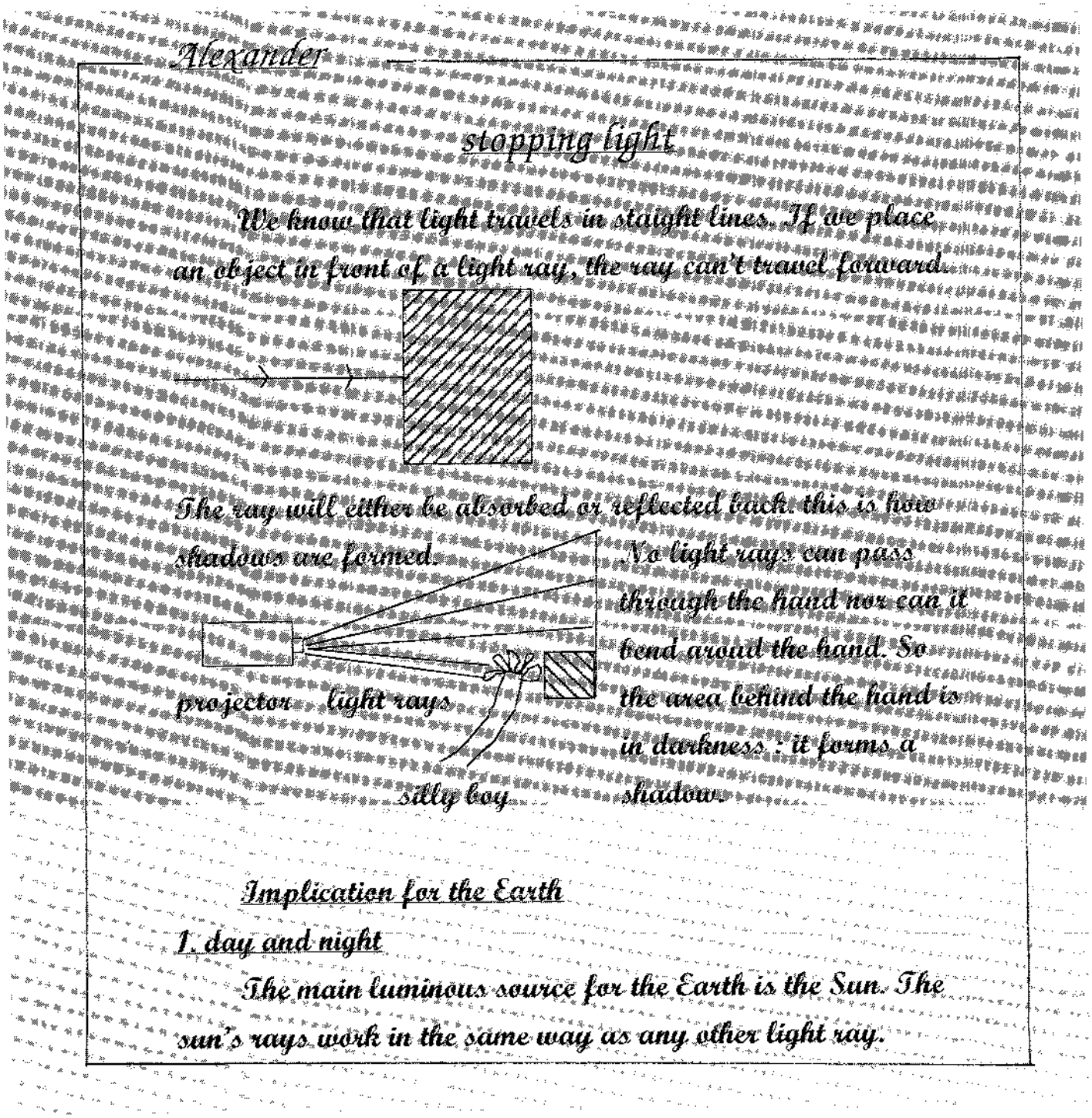

Figure 1.2 The computer gives time and scope for satisfying presentation – and jokes.

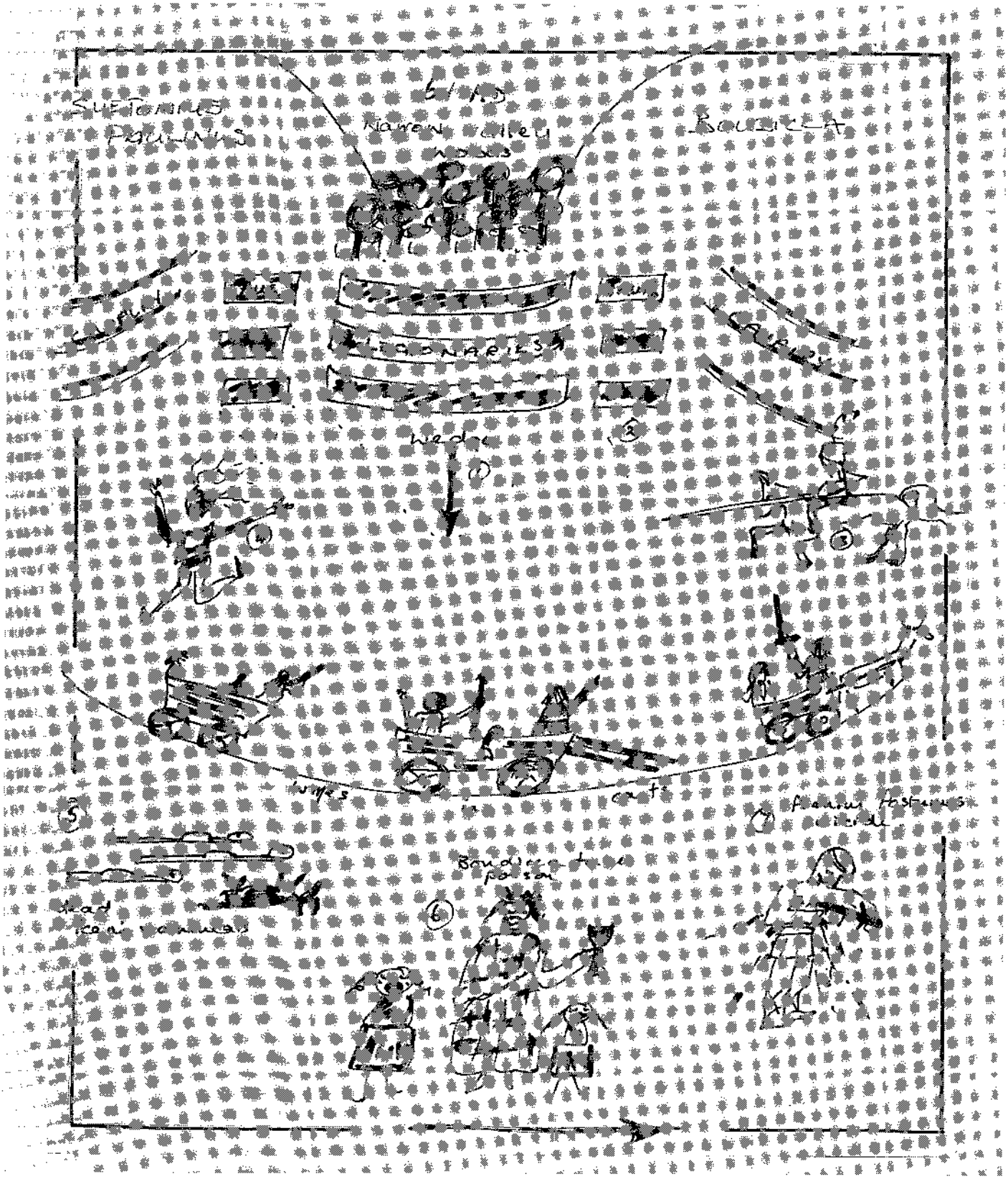

Figure 1.3 Boudicca's battle with the Romans – visualisations are more memorable than words. Numbering the images adds a checking device – 'I need to remember seven pictures to tell this story'.

in their own words, preferably out loud – not silently, in the mind, where it is possible to gloss over precise terms and syntax.

Following this method, the student who drew Figure 1.3 would put the picture aside and re-visualise it on his mental screen. He would talk through the image he 'sees' – telling the story his own way, but making a point of saying important names and terms as he speaks. Because there is a memory in the ear and the muscles of the lips and tongue, out loud is best. Such a version might sound like this:

> **Suetonius plans a swift and certain end to Boudicca's rebellion. He chooses his battlefield carefully with steep hills and a dense wood at his back. With his crack troops, the legionaries, in wedge formation in the centre, he reserves his precious cavalry on each wing. His auxiliaries, who are mostly impressed native tribesmen for whom the Romans cared little, are positioned in between. Boudicca's tribesmen, the Iceni, made reckless by previous success, bring their wives and families in carts and, mysteriously, their animals too and range them in a circle enclosing the battlefield to watch, as they imagine, their menfolk destroy the Roman army.**
>
> **The Romans advance, hurling javelins with ferocious accuracy. The Iceni, vivid in blue woad, cannot escape; they are trapped between the advancing Romans and their own families. There is tremendous slaughter. Boudicca and her daughters take poison. Poenius Postumus, disgraced as a coward, falls on his sword.**

Any student who has turned his textbook into images and words of his own and integrated the two together will remember far more in an examination, however many weeks later, than if he had simply read and reread the original description or taken notes.

Research shows that visualising improves comprehension and memory

In 1991 a research project investigated the proposal that 'poor comprehenders' could improve their reading comprehension and memory by thinking in images as they read (Oakhill and Yuill, 1991). In previous research, Oakhill and Yuill had shown that:

> **When poor comprehenders are not specifically instructed about what they should get out of a text, they are not usually aware of their comprehension problems.**

This is a useful warning to teachers that there may be members of their classes who, despite being quite self-aware in other areas of learning, still need specific instruction about what they are looking for when they read.

Oakhill and Yuill described a second characteristic of poor comprehension as an inability to draw inferences while reading. This, in part, led them to their research proposal. They thought that 'image training' would make the meaning of the text explicit in a picture. It might therefore both improve comprehension and, at the same time, train poor comprehenders to make inferences when reading. They found from the ensuing research that:

> **Poor comprehenders, given imagery training, showed a marked improvement in memory for the passages; they performed significantly better on the test questions than did the control group of poor comprehenders.**

Image training for research

The training consisted of imagining and discussing a sequence of cartoon pictures to represent events in a number of stories. In particular, the children were asked to make a single image in their heads to represent the main point of each text. The researchers found that deriving this final image did most to improve the children's understanding and recall. Their explanation was that, in creating an image for the main point of the story, the children had to relate parts to the whole in a way they would not normally do. The reason for this was, in the researchers' opinion, that dyslexic readers lack the skill of integrating meaning in a text while simultaneously decoding its words.

Oakhill and Yuill had also found, in previous research, that good comprehension was associated with strong short-term working memory. As a result, in this later research, they concluded that 'seeing' images, rather than 'hearing' a sequence of words, probably gave poor comprehenders, with their inefficient working memories, a 'different and more economical way of representing the information'.

Research method as teaching method

Teachers, seeing the relevance of this research to the pupils they teach, may wish them to learn the habit of visualising. The following way of teaching it mirrors the research format of Oakhill and Yuill's image training. The one major difference is that here, in Step 2, pupils draw their images. This is to make certain that they do actually visualise – that is transform the words they are reading into images – instead of trying to internalise the information in its original verbal form.

The role and limitations of drawing

There may well be two objections raised against drawing as part of the method: it takes too long, and very few people can draw to their own satisfaction. There are two counterbalancing arguments. The first is that it is pointless to spend any time at all on reading that fails to achieve its aim, and the second is that drawing is merely a provisional step on the way to visualising – that is making images in the head rather than on paper.

The role of drawing is like the part scaffolding plays in building. Just as builders remove scaffolding when it has served its purpose, so students can dispense with drawing once they trust themselves to transform text into images rather than clinging onto the words. Anyone unused to visualising could find relinquishing words in favour of images a big leap. For that reason, drawing (however poor) is a useful step on the way (Figure 1.4).

Use an image training format to practise visualising

The following give a format for learning to visualise. To that end, they involve readers in drawing their images, not just imagining them. The format mirrors Oakhill and Yuill's research – successful research procedures often make successful teaching methods too.

The text in Figure 1.5 comes from Chapter 14 of *Great Expectations*, a novel currently set for the MEG GCSE English literature paper. It shows Pip looking back to his time as Joe's apprentice and the selfish misery he felt as he looked from that point towards what seemed to him a mean and dreary future. It is a critical moment in the development of Pip's character, and a detailed memory of it would matter to anyone studying the book.

Three steps to teach visualising in the classroom
(use current curriculum texts of convenient length)

Step 1 Students are given a text and told they will be learning to think in pictures as they read

- Students read text to themselves.
- Teacher shows three or four pictures, in cartoon form, representing sequence of events in text.
- Teacher shows one picture illustrating main event or idea in text.
- Teacher and class discuss how pictures relate to text.
- After removing pictures, teacher asks students to imagine that the pictures are in their minds and that they are to use them to help them answer some questions about the text.
- Teacher presents a series of questions (factual, descriptive and inferential) to which students write answers: this is to encourage them to 'use' the images in their minds.

Step 2 Students are given a new text

- Students read text to themselves.
- They draw cartoon sequence with 3 or 4 frames to represent sequence of events in text.
- They draw one picture for main event.
- Teacher and students discuss drawings, in particular one of main event.
- Teacher removes drawings and presents questions for students to answer.
- Students re-visualise their drawings to help them answer questions.

Step 3 Students are given a new text

Students repeat the procedure, but this time they form mental pictures without drawing. Discussion and feedback about their images and how they might be improved are important. Finally, students re-visualise their own improved images to help them to answer questions on the text.

The research did not include drawing as in Step 2. However, secondary school students, dispirited by years of failure in conventional reading, may be unwilling to take risks. They may resist image-making and continue to try to remember words instead, if not obliged to draw (and therefore think up) some images. So Step 2 is a temporary, but helpful, stage in learning to visualise.

Figure 1.4 Follow this method to teach visualising to a class.

Visual imagery for comprehension and memory

- Draw three to four representational pictures in sequence like a cartoon.
- Draw one picture to represent the main idea of the passage.

Great Expectations Chapter Fourteen

Once, it had seemed to me that when I should at last roll up my shirt-sleeves and go into the forge, Joe's 'prentice, I should be distinguished and happy. Now the reality was in my hold, I only felt that I was dusty with the dust of the small coal, and that I had a weight upon my daily remembrance to which the anvil was a feather. There have been occasions in my later life (I suppose as in most lives) when I have felt for a time as if a thick curtain had fallen on all its interest and romance, to shut me out from anything save dull endurance any more. Never has that curtain dropped so heavy and blank, as when my way in life lay stretched out straight before me through the newly entered road of apprenticeship to Joe.

I remember that at a later period of my 'time', I used to stand about the churchyard on Sunday evenings, when night was falling, comparing my own perspective with the windy marsh view, and making out some likeness between them by thinking how flat and low both were, and how on both there came an unknown way and dark mist and then the sea. I was quite as dejected on the first working-day of my apprenticeship as in that after-time; but I am glad to know that I never breathed a murmur to Joe while my indentures lasted. It is about the only thing I am glad to know of myself in that connection.

1.
Pip, sleeves rolled, at anvil.
'Dusty with the dust of the small coal.'
Heavy weight 'to which the anvil was a feather'.
Looks wretched.

2.
Thick curtain 'dropped so heavy and blank'.
Shuts out romance.
'Life lay stretched out straight.'
Nothing but blacksmithing and 'dull endurance'.

3.
Sundays in churchyard, 'when night was falling'.
'Windy marsh view', flat, low, dark mist, the sea.
Compared to Pip's life.

4.
Pip pleased he managed never to betray his feelings to Joe –
'never breathed a murmur'.

Summary Picture:

Only dreary misery ahead for Pip.
Loss of dreams and hope.
Contempt for self.

Figure 1.5 Read the text and imagine the scene. Decide what ideas to draw.

Dickens describes Pip's feelings in a series of multisensory images – rolled shirtsleeves, coal dust, the anvil as a feather, the heavy curtain falling on romance, the featureless road stretching ahead, the darkening churchyard, wind and flat marsh, mist and sea. Each image thickens the emotional gloom, and the reader needs to weigh each one if he is to feel the full impact of Pip's bleak depression.

To follow the visualising format, think which ideas to draw – regardless of how difficult that might prove to be. Selecting phrases and thinking how to draw their meaning is the creative process that personalises Dickens' images and fixes them in long-term memory – however badly they may then be drawn. It is the inner not the outer eye that matters (see Figure 1.5).

While the reader either visualises or draws, he will process certain phrases from the text, perhaps these: 'roll up my shirt-sleeves', 'Never has that curtain dropped so heavy and blank', 'an unknown way and dark mist and then the sea'. As a result, he is likely to learn the actual words. Quoting these will strengthen his essays and he should practise doing so, whenever he recalls the images he made to represent them (Figures 1.6–1.8).

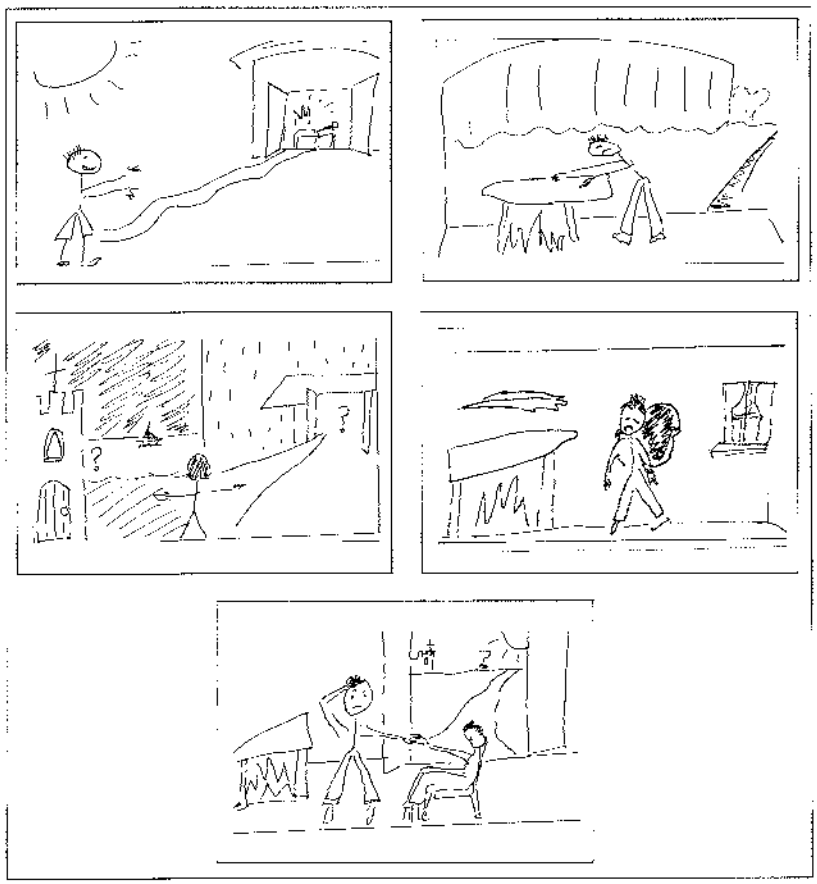

Figure 1.6

Figure 1.7

Figure 1.6 and 1.7 Pupil and teacher drawings: students need to see their teachers practise the visualising they recommend. The quality of drawing is irrelevant. Discussion about the content of each drawing will improve the readers' visualisation.

Visual imagery for comprehension and memory

- Draw three to four representational pictures in sequence like a cartoon.
- Draw one picture to represent the main idea of the passage.

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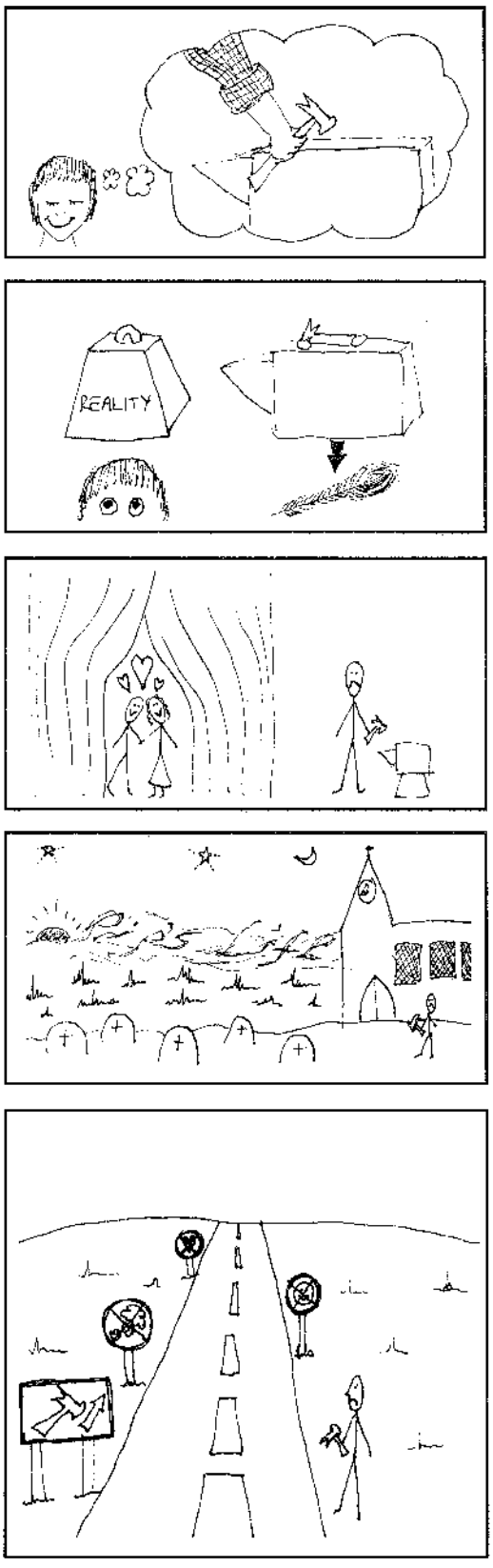


Figure 1.8 A GCSE candidate draws.

Poetry lends itself especially well to visualisation, because so much of it is conceived as imagery. A poem visualised is a poem learned, so visualisation can be the best way for some readers to familiarise themselves with their curriculum set texts. Short poems with strong visual impact also make good material for visualising exercises (Figure 1.9).

Sheets A, B and C in the Worksheet Section at the end of this book are formats that can be used for visualising practice.

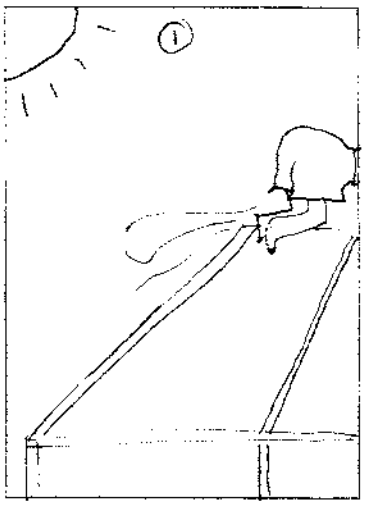
Visualising helps understanding and remembering

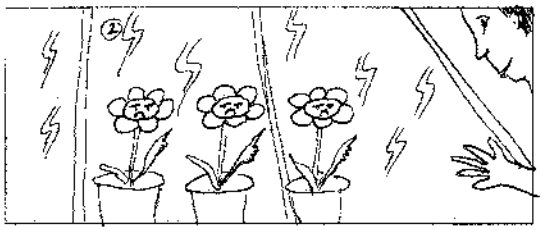
- Read the poem at least three times.
- Translate the words into pictures in your mind.

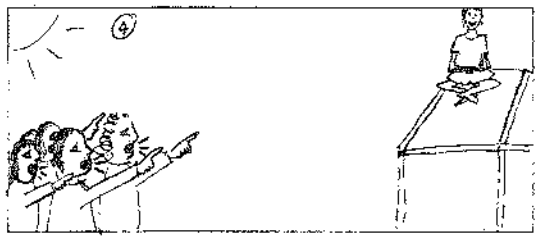
Now draw four representational pictures in sequence like a cartoon.

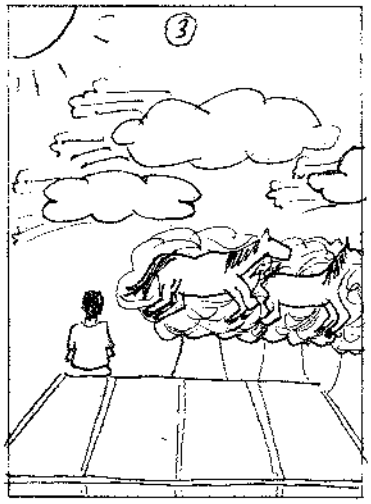
'Child on Top of a Greenhouse' Theodore Roethke

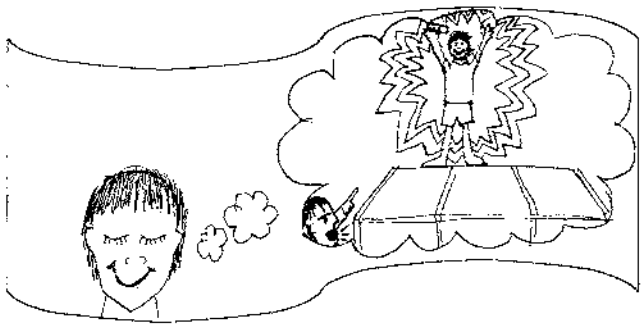
The wind billowing out the seat of my britches,
My feet crackling splinters of glass and dried putty,
The half-grown chrysanthemums staring up like accusers,
Up through the streaked glass, flashing with sunlight,
A few white clouds all rushing eastward,
A line of elms plunging and tossing like horses
And everyone, everyone pointing up and shouting!











Formulate one picture to represent the idea of the poem

Figure 1.9 Roethke's poem 'Child on Top of a Greenhouse' with drawings that represent one reader's mental images. The final picture is a matter of personal interpretation; in this set it conveys exhilaration. Another reader might draw images of terror.

Visualising in maths and science

Bearing in mind Sharmah's assertion, when speaking about learning maths, that 'anything visualised goes straight into long-term memory', a current secondary head of physics was asked to comment on an extract about visualising for maths in Adams' book *Straight A's in GCSE* (Adams, 1995) (Figure 1.10).

'Wherever possible, problems should be worked out from basic principles and processes linked to real life. Even at A-level I try to get students to abandon rules, to work from first principles, to make diagrams and mental images. Creating *understanding* is superior to learning *rules*. You will develop confidence and become far better at maths.

'VISUALISING
For good learning it is essential to be able to visualise an operation or principle in your mind. Transformations, in particular, need this treatment when trying to reflect or rotate a pattern; but you also learn better if you visualise algebraic operations. The clearer the mental picture, the easier it is to work out a problem or memorise a process.

'Close your eyes or stare at a blank space on a wall and try to create the picture in front of you. The best students are those who are the most capable at doing this. They are also the best at recognising patterns in problems and are efficient in dissecting convergent problems. Practice, therefore, in these elements is most effective if a conscious effort is made to visualise your mathematics; and setting down the elements of problems and sums very clearly in diagrammatic and picture form *reinforces* visualisation. Practice of this *conscious* type creates deep understanding, creating a memory to which it is easy to link further knowledge. Simply practising examples, without conscious (mental picturing) application, does not build a foundation on which more advanced work can be based.'

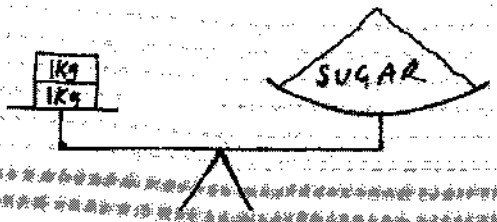
Mary,
Yes, absolutely – this is the way I do maths, and explain scientific models to myself. Further, I think that "if you can draw it, you can understand it."
MLAK

Figure 1.10 A head of physics endorses the value of visualising in maths.

The maths teacher writing in Figure 1.11 gives an instance where imagery would help to establish a basic principle and, in Figure 1.12, a student takes up the idea, drawing her own pictures for each step in solving an equation.

One of the most useful pictorial ideas applicable to any situation involving equations, formulae and, later, inequalities is that of simple kitchen scales or chemical balance:

Any mathematical statement involving the sign '=' inevitably must have a balance. The balance is maintained provided any change in weight (or number) on one side is also effected on the other.



Thus in an equation any number added to (+), subtracted from (−), divided into (÷) or multiplied by (×) one side will maintain a balance (still =) provided the same operation is done to both sides.

Figure 1.11 Weighing scales – a starter for Figure 1.12 below.

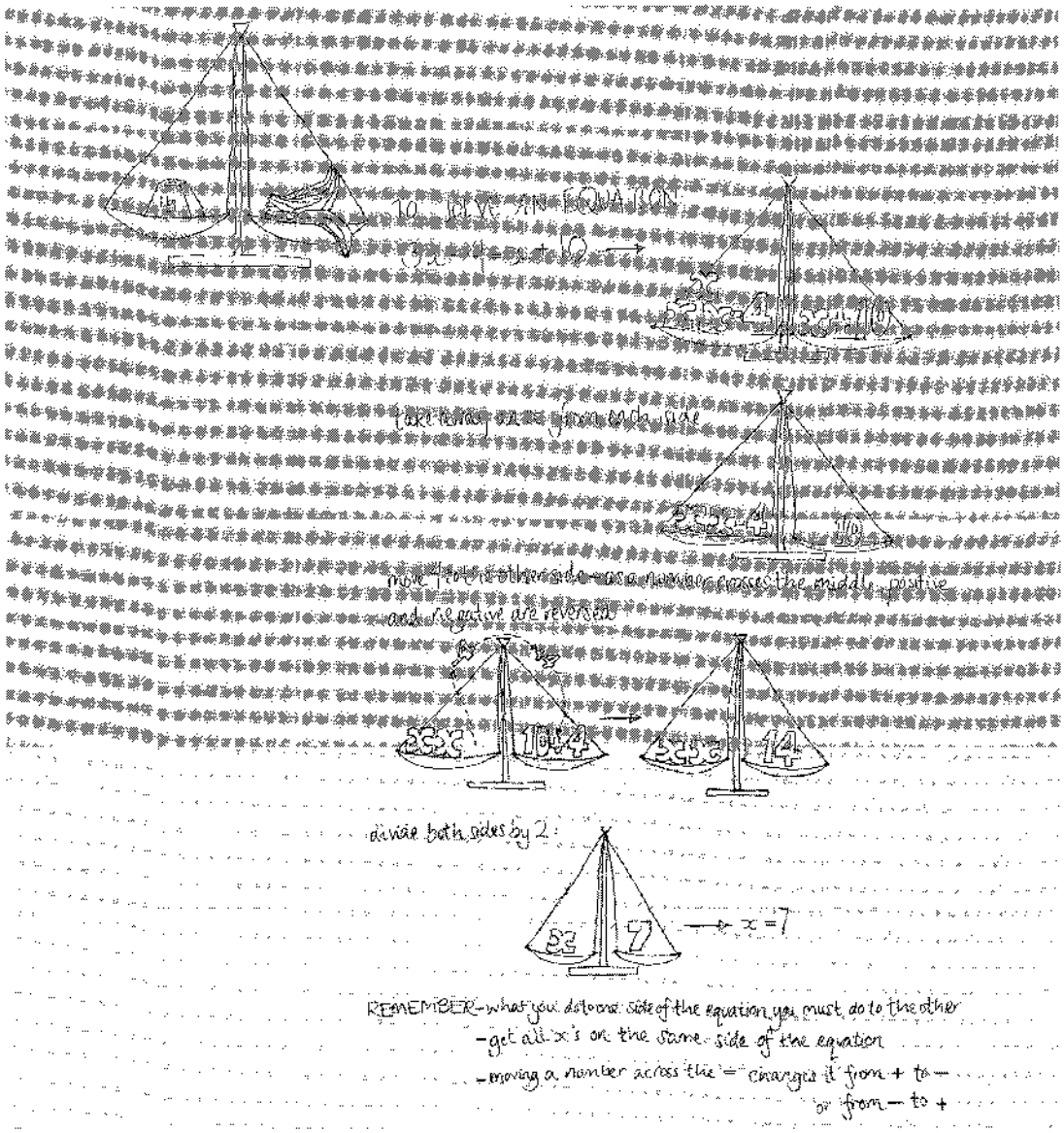
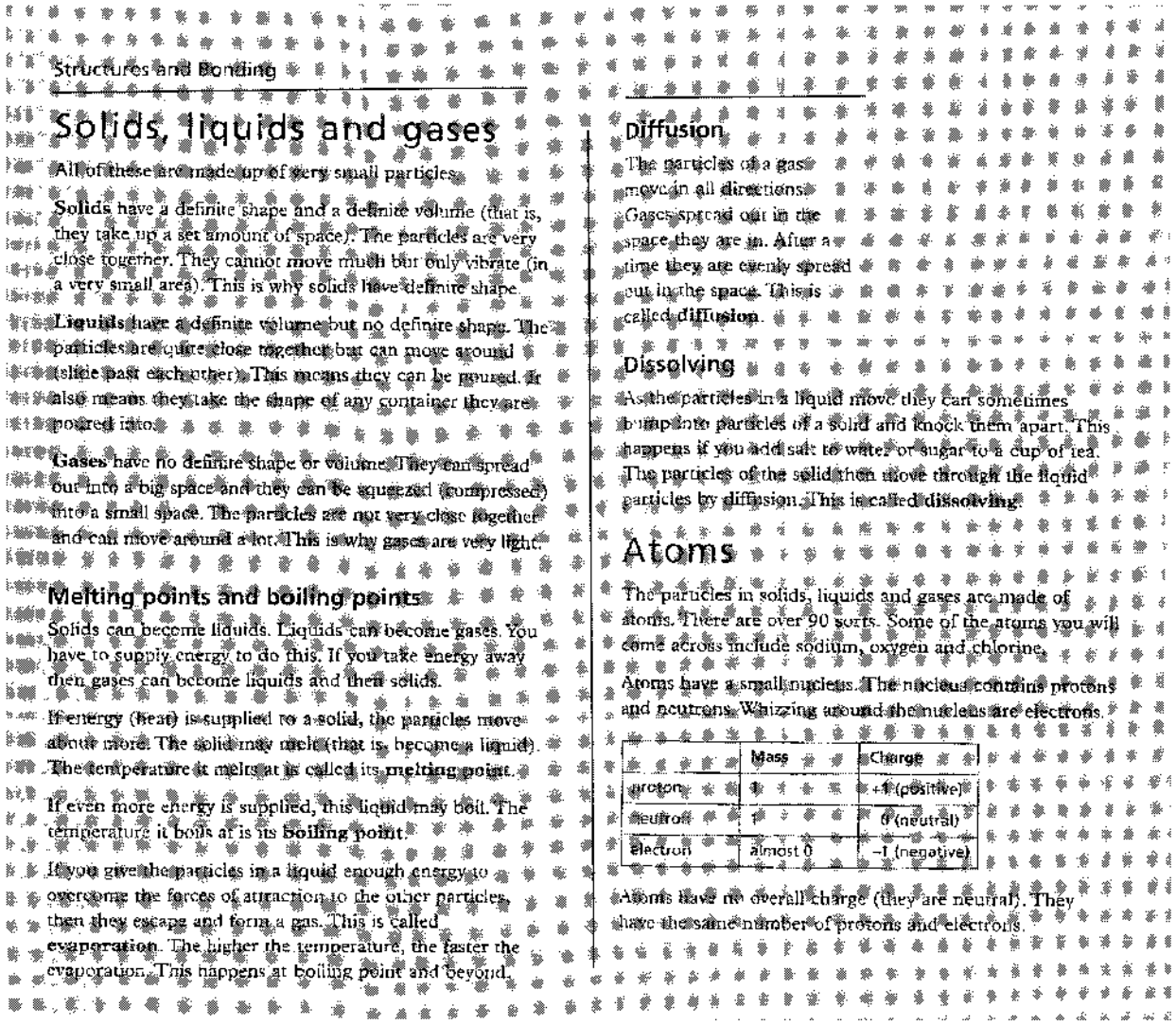


Figure 1.12 Thinking of images in the first place and then drawing them helps to separate and crystallise each step in the procedure. Eleanor drew this sequence, first to help with the original learning and, later, as a pictorial guide to solving other equations and as images in her mind to be re-visualised when necessary – in exams, for instance.

In Figures 1.13 (a) and 1.13 (b) Liam is visualising the three states of matter in his GCSE syllabus. He is interested in chemistry, but dyslexia prevents him from learning it well enough in lessons: 'We are doing this in chemistry and I can't remember about it.' Nor can he revise it by simply reading his textbook. He needs to make the text his own in some way. His favourite method is to hear the description read aloud while he visualises and draws. He prefers a mind-map format to a linear sequence of pictures, because the finished mind-map is itself an image; it plays to his visualising strength while reducing the problem of short-term sequential memory.



Structures and Bonding

Solids, liquids and gases

All of these are made up of very small particles.

Solids have a definite shape and a definite volume (that is, they take up a set amount of space). The particles are very close together. They cannot move much but only vibrate (in a very small area). This is why solids have definite shape.

Liquids have a definite volume but no definite shape. The particles are quite close together but can move around (slide past each other). This means they can be poured. It also means they take the shape of any container they are poured into.

Gases have no definite shape or volume. They can spread out into a big space and they can be squeezed (compressed) into a small space. The particles are not very close together and can move around a lot. This is why gases are very light.

Melting points and boiling points

Solids can become liquids. Liquids can become gases. You have to supply energy to do this. If you take energy away then gases can become liquids and then solids.

If energy (heat) is supplied to a solid, the particles move about more. The solid may melt (that is, become a liquid). The temperature it melts at is called its **melting point**.

If even more energy is supplied, this liquid may boil. The temperature it boils at is its **boiling point**.

If you give the particles in a liquid enough energy to overcome the forces of attraction to the other particles, then they escape and form a gas. This is called **evaporation**. The higher the temperature, the faster the evaporation. This happens at boiling point and beyond.

Diffusion

The particles of a gas move in all directions. Gases spread out in the space they are in. After a time they are evenly spread out in the space. This is called **diffusion**.

Dissolving

As the particles in a liquid move they can sometimes bump into particles of a solid and knock them apart. This happens if you add salt to water or sugar to a cup of tea. The particles of the solid then move through the liquid particles by diffusion. This is called **dissolving**.

Atoms

The particles in solids, liquids and gases are made of atoms. There are over 90 sorts. Some of the atoms you will come across include sodium, oxygen and chlorine.

Atoms have a small nucleus. The nucleus contains protons and neutrons. Whizzing around the nucleus are electrons.

	Mass	Charge
proton	1	+1 (positive)
neutron	1	0 (neutral)
electron	almost 0	−1 (negative)

Atoms have no overall charge (they are neutral). They have the same number of protons and electrons.

Figure 1.13 (a) If the text is read aloud or has been read on to tape, poor readers can visualise as they listen. If the material is taped, students can work independently, using their own best learning method, at their own pace.

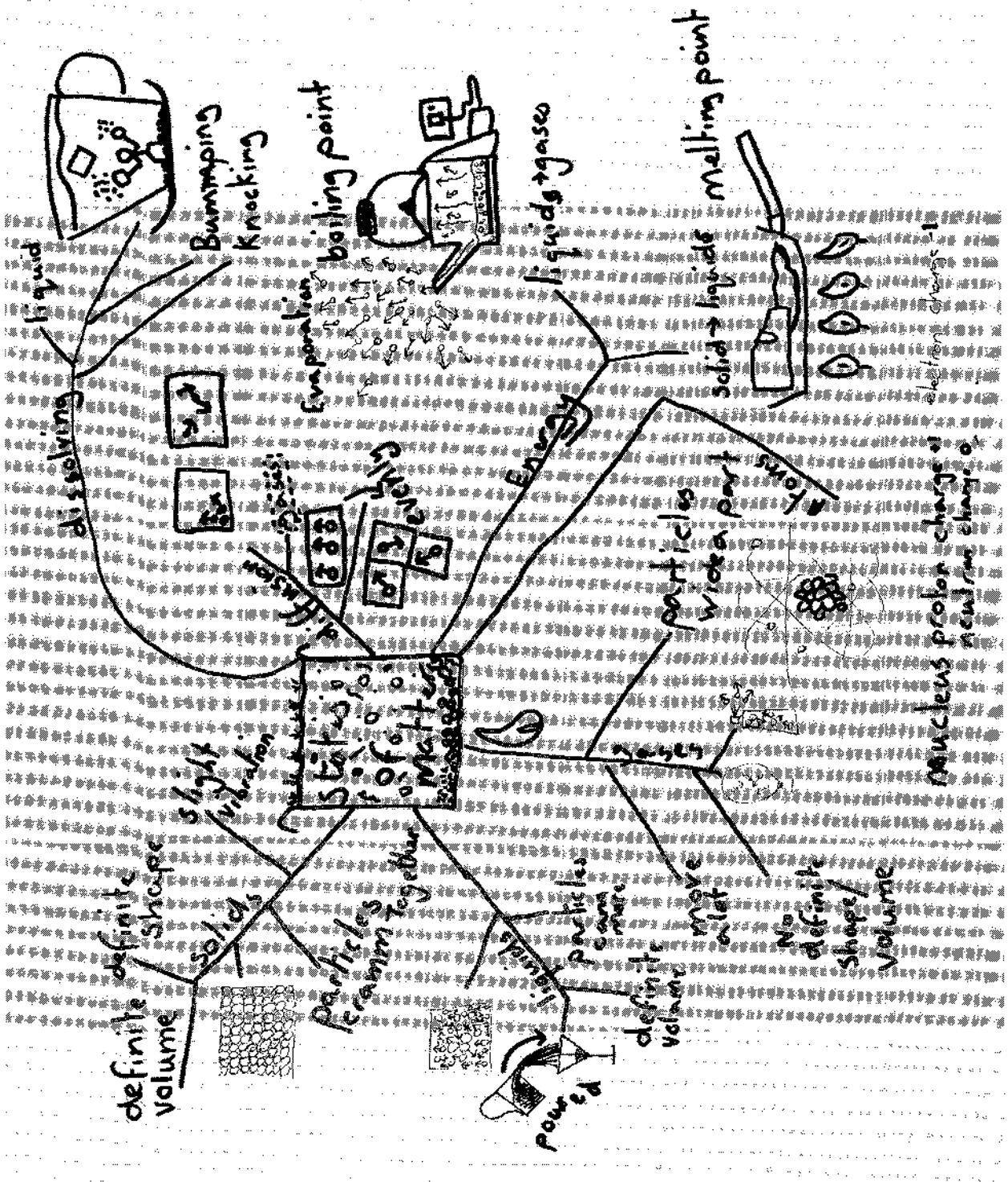


Figure 1.13 (b) Solids, liquids and gases: Liam compensates for his poor reading skills by processing text into images in the visual format of a mind-map. He keeps words on the map to a minimum, but, to revise for a test, he talks round the mind-map, putting his images back into words.

3 Electric Current

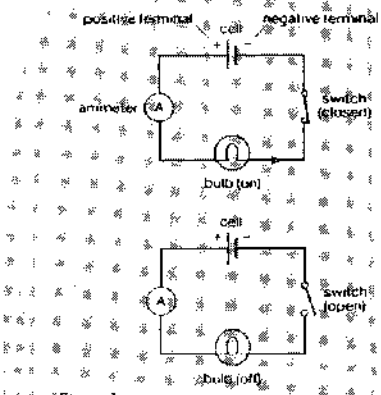


Figure 1
An electrical circuit

Circuits

Figure 1 shows an electrical circuit. The bulb is connected to an electric cell by copper wires. When the lamp lights we say there is a current. The ammeter measures the current. The needle on the meter moves to show how big the current is.

A current is a flow of charge. In copper some of the electrons are free to move. When a current goes through the wire, electrons are repelled from the negative terminal (Figure 2).

A current flows only when there is a complete circuit without any gaps. The same idea works when water flows around your central heating system. You must have a complete pathway (or circuit), so the water goes from the boiler out to the radiators, and back to the boiler to be warmed up again.

In Figure 1 there is a switch. The simplest switch can be made out of a spring piece of copper. When the switch is open there is no conducting path for the electrons to flow around. Then the bulb is off.

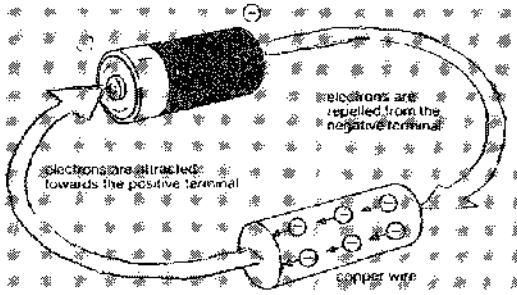


Figure 2
A current is a flow of charge

Which materials conduct?

The table (left) shows good and bad conductors, and insulators. The best conductors are metals; they contain electrons that are free to move. A current can also be carried by ions. The word ion is used to describe an atom (or molecule) that has lost or gained an electron. When an atom loses an electron it is a positive ion. When it gains an electron it is a negative ion.

Conductors	Insulators
Good	rubber
metals e.g.	plastics e.g.
copper	polythene
silver	PVC
mercury	perspex
aluminium	china
steel	air
Moderate	
carbon	
silicon	
germanium	
Poor	
water	
humans	

Your body is full of ions, so you conduct electricity. Electrical signals from your brain travel along nerves to give instructions to your muscles. Because you are a conductor, you can get a shock from the electricity mains supply.

Which way does current flow?

Figure 4 shows three examples of charge flowing. In all three cases the current is flowing to the right. The current is either carried by positive particles moving to the right, or negative particles moving to the left (or by both). It is easiest to say that current flows in the direction that positive charge moves in. So we say that current flows from the positive terminal of a cell to the negative terminal.

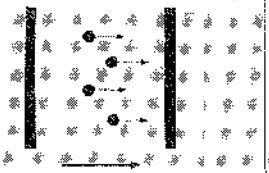
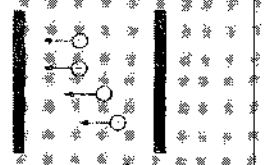
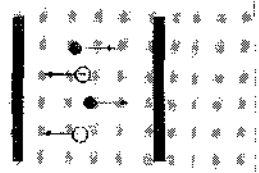


Figure 4
(a) Positive particles in a semiconductor



(b) Electrons in a metal



(c) Positive and negative ions in a solution

Measuring charge and current

We measure the current in a circuit using an ammeter. The unit of current is the ampere (A), though most of us call it an amp.

When the current is big (10 A), the charge moves round the circuit quickly. When the current is small (0.001 A) the charge moves round the circuit slowly. Current is the rate at which charge flows round a circuit.

$$\text{Current } (I) = \frac{\text{charge flowing } (Q)}{\text{time } (t)}$$

$$I = \frac{Q}{t}$$

We could measure charge by counting the number of electrons flowing. However, electrons have only a very small charge. Our unit of charge is the coulomb (C). 1 coulomb is equivalent to the charge on six million million million (6×10^{18}) electrons.

Figure 1.14 (a) Despite the diagrams provided, poor readers may need to process the content of their textbook in a more personal manner, in order to understand and remember.

Figures 1.14 (a) and (b) show a student trying to make sense of a textbook account of electric current. The drawing illustrates the use of personal imagery to peg unfamiliar and abstract information from the text. Images here include puns – a policeman's helmet to represent 'copper', a musical conductor, two words 'am meter' with the sketch of an ammeter, and amps as 'umps' on a camel's back. They include symbols associated with the reader's home in the country – horse riding, currents and bridges in a stream, cows/'cou' and lambs/'lomb' frisking in a nearby field.

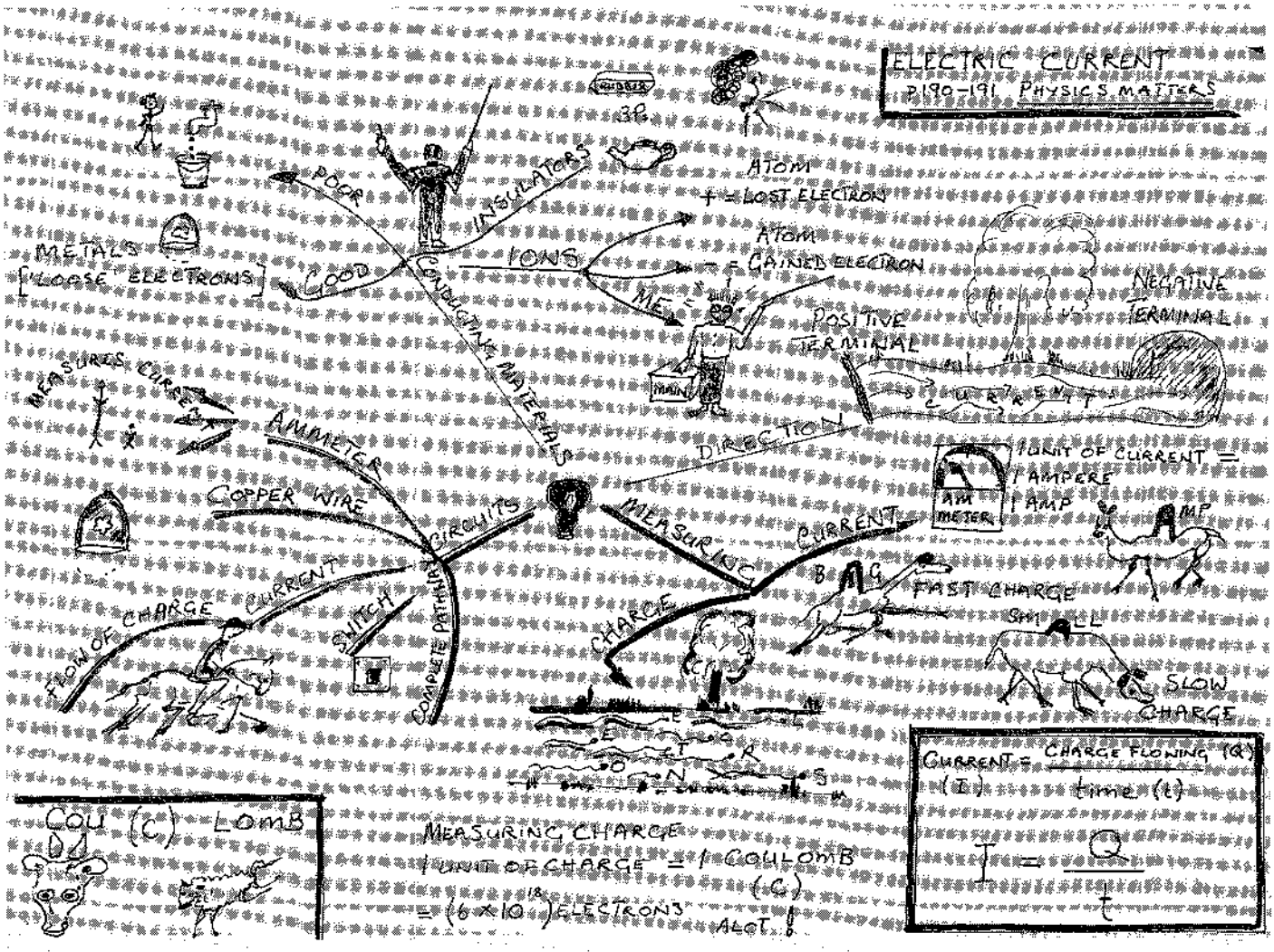


Figure 1.14 (b) The maker of this mind-map has processed the language of the text in (a) into personal imagery to help him understand and remember.

Arising out of the experience of one person, the images are uniquely meaningful to that person, though they may be barely comprehensible to a friend studying the same topic. It follows that each reader must draw or imagine his own pictures if they are to have maximum value for him as pegs on which to hang new ideas.

In Figure 1.15 the expressive faces on the water drops bring 'cohesiveness', 'high heat', 'evaporation' and 'ice floats' humorously alive.

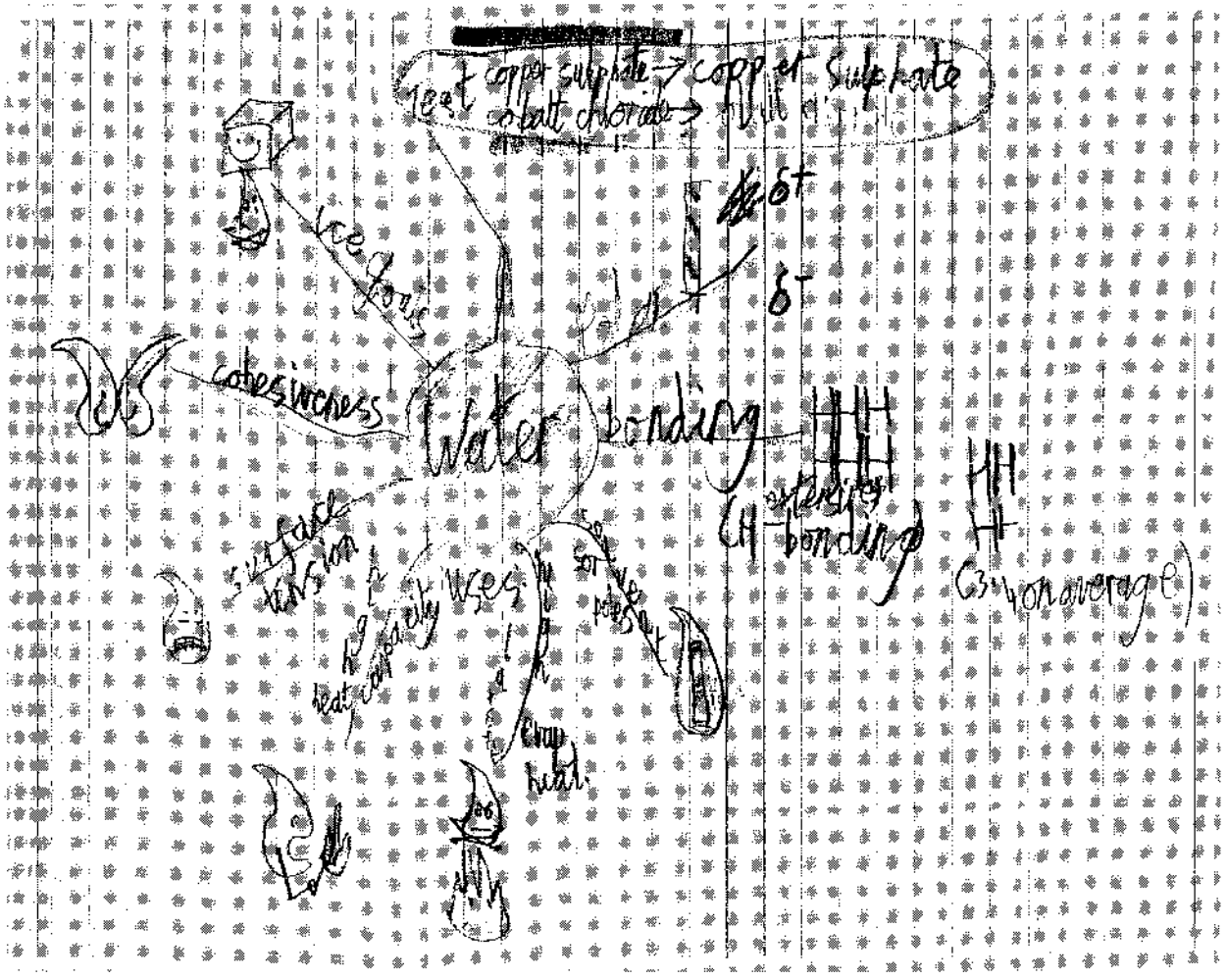


Figure 1.15 Greg is visualising the properties of water.

Teaching words

Teachers normally set reading as a way of enlarging pupils' understanding of their current topic. Visualising will achieve this goal, but dyslexic reader's will probably need help with language and individual words first – before they can pay much attention to meaning.

Why is this necessary?

Research has established that a lack of fluency in relating letter sounds to letter shapes underlies dyslexia. This 'coding' weakness makes it hard for dyslexic readers to focus on the

meaning of a sentence or paragraph when their attention is chiefly taken up with decoding each of its component words.

Single words are problematic to dyslexic readers for other reasons, in addition to this phonological devil in dyslexia (see 'Subject-specific vocabulary' in Chapter 5). Words may cause trouble because they are technical (circuit, hypotenuse, mediaeval) or because they are used figuratively ('Love-devouring Death,' 'Mind-forged manacles'). They may be archaic or in dialect. They could have several meanings ('plot' a murder, 'plot' a graph, buy a 'plot' of land). They could be homophones ('key', 'quay'), tongue-twisters ('quantitative', 'preliminary'), foreign or abstract ('plagioclimax ecosystem', 'terminal velocity'). These examples show a complex mixture of problems to do with decoding words and understanding their meaning in context. Dyslexic readers have more than usual difficulty with both these aspects of written language and need strategies and practice in order to reach the point where they read new words automatically.

Other difficulties typical of dyslexia, such as poor visual perception and an inefficient memory for names, details and the order of events, make it still harder for dyslexic students to take in meaning when they read. As a first step to comprehension, they must be able to say, read, write and understand keywords that they will meet on the page. They need to focus on individual important words that link the meaning of the text as a whole. They will probably need help to identify and learn these, even in the later years of secondary school.

Who should be responsible for teaching words?

Subject teachers may believe that this kind of language training is the province of the English or special needs department, but when children with dyslexia reach secondary school they usually feel they have neither the time nor the tolerance for literacy training as such. However, they will respond gratefully to being taught subject-specific language in the normal classroom, especially if this training is part of a subject teacher's programme for the class in general.

How might this work?

Two principles are useful here: the first is a school policy that expects every teacher to take responsibility for teaching his or her own subject-specific vocabulary, and the second is an understanding of the particular language difficulties that an individual student with dyslexia may have. The following classroom examples illustrate teaching approaches to various typically dyslexic difficulties with words:

1. An oral approach to remembering names

Dominic in Year 7 said he could not remember events in the Old Testament stories the class was reading because he could not 'get hold of the names'. Dominic's underlying difficulties were in visual perception and working memory. His teacher allowed for these difficulties by practising Old Testament names orally with the whole class and leaving a list of them on the classroom board to serve as pegs to hang the events on. The whole class benefited.

2. Visualising to peg technical language

> **Liam, doing GCSE physics, which he really enjoyed, found he couldn't guarantee to recall a technical word like 'evaporation', though he understood the process it stood for. Aware that 'naming' was a common problem for dyslexic individuals, his physics teacher suggested he should visualise the process and think of a mnemonic to peg the word. Liam imagined heated and fast-moving molecules breaking away from other slower molecules and 'evaping', instead of 'escaping' at the surface of a panful of water he was boiling to cook pasta. An interested cook, this image (set in his own kitchen at home) was clear in his mind's eye and, together with the silly new word, was enough to peg 'evaporation' so that he could consistently recall it. Sometimes classmates will suggest mnemonics and strengthen their own grasp of technical language at the same time.**

3. A semantic, analytical approach

> **Kate, so frightened by the look of the word 'prescriptivism', in her A-level English language textbook, was convinced it stood for an abstruse idea she would never be able to understand. Her English teacher, realising that the word probably appeared to her as a tongue-twisting line-up of too many similar letters, suggested the class should write and say its separate syllables – 'pre – scrip – tiv – ism' – before they worried about its meaning. Once Kate could say it, she saw that it stood for exaggeratedly formal English. The idea was straightforward and so, she found, was reading the rest of the chapter on it. Kate's confidence to admit her problem and her teacher's recognition meant that the solution took only a few seconds and usefully involved the whole class. It probably helped some of them too.**

Give time to read

Figure 1.16 (a) is taken from a Year 8 science exam. It illustrates the range of language hazards facing a dyslexic reader while, against the clock, he is trying to answer some questions on physics:

- technical words – 'bourdon gauge', 'ammeter'
- difficult spellings – 'beaker', 'measuring', 'heart', 'area'
- tongue-twister – 'irregularly'
- familiar, but probably not fully understood words – 'pressure', 'atmosphere'.

Although competent readers focus on the question in an exam, dyslexic readers struggle with the *language* of the question. Decoding will divert their attention from understanding, and they may do themselves justice only if they have enough time to process the words first, then the questions and, finally, the answers. Each step may need to be separate, each requiring conscious application and extra time. The additional stress caused by needing time to process words while others process questions can often be enough – under the added pressure of an

SCIENCE

Total time allowed: 75 minutes

The paper is divided into three sections, Biology, Chemistry and Physics.

The answers should be written on the question papers.

*Answer **all** the questions.*

Calculators may be used.

PHYSICS

1.

ammeter	*barometer*	*beaker*
bourdon gauge	*measuring cylinder*	*metre rule*
spring balance	*stop watch*	*tape measure*
thermometer	*top-loading balance*	*voltmeter*

Choose from the above list the apparatus you would use to make the following measurements.
You may select a particular piece once, more than once or not at all.

(a) The mass of a book .....

(b) The temperature of a liquid .....

(c) The volume of some liquid .....

(d) The electric current in a circuit .....

(e) The pressure of the atmosphere .....

(f) The extension of a spring .....

(g) The force needed to extend a spring .....

(h) The volume of an irregularly shaped stone .....

(i) The area of the base of a pencil box .....

(j) The rate at which your heart beats .....

(10 marks)

Figure 1.16 (a) This page, taken at random from a Year 8 science exam, illustrates some of the technical difficulties that dyslexic students encounter when they read. The decoding problems have to be solved before the reader can absorb the content, much less answer questions on it.

exam – to wipe out the ability of a dyslexic reader to deal with content, even though, in practicals and discussion, he may be a confident scientist. Often the best thing a teacher can do for a dyslexic reader is the simplest – give him more time.

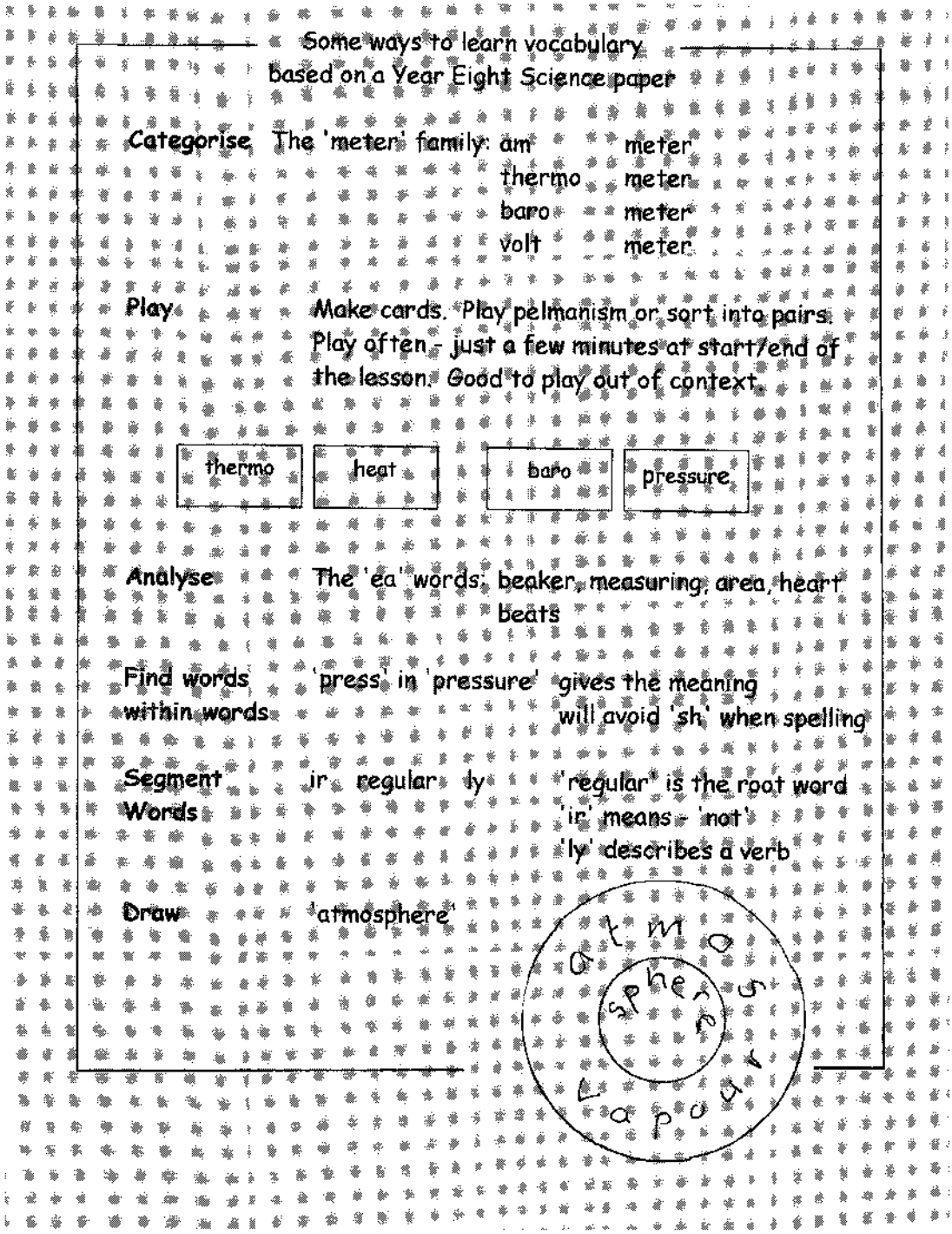


Figure 1.16 (b) Useful strategies for teaching subject-specific vocabulary.

There is, however, an additional complexity here. Research shows that readers, including those with dyslexia, may improve their reading comprehension if they are made to read faster than at their own self-paced rate of reading (Breznitz, 1991):

> **Dyslexic subjects gained from the experimental manipulation [that is the control and acceleration of reading rate]. Thus, they not only read about 20%**

faster but, at the same time, significantly increased their comprehension score (by about 0.5 of a question). This gain took place even though the number of mistakes made (in reading aloud) did not alter.

One explanation given is that faster reading rate increases focus on the task and so there is less danger from distraction. Another explanation is that faster reading reduces the load on verbal working memory and makes it possible for people with dyslexia to build the meaning of sentences as well as process individual words, some of which, if read more slowly, will already have been forgotten before a whole sentence has been decoded.

To make sense in the classroom of the conflict between the need for extra processing time and the value of reading faster, teachers should bear in mind that reading speeds are relative. Teachers can encourage poor readers to quicken their natural pace without assuming that they will therefore read as fast or as efficiently as their classmates. It also makes sense for teachers to explain to a poor reader the value of increased reading speed as carefully as the reasons for extra reading time. Both may have a place in solving reading problems.

Use multisensory methods to teach words

Using the physics questions in Figure 1.16 (a) as illustration, Figure 1.16 (b) shows activities using eye, voice, ear and hand (simultaneously where possible) to pick out patterns of meaning, spelling and word structure in individual words. This multisensory way of categorising important words can become habitual and take very few minutes. Without the habit, many students may never manage to read, say, remember or write the keywords that carry the topic they are studying. Ultimately, dyslexic readers should act for themselves, but teachers can be very helpful if they see that the difficulty is with the language not with the topic – although that may also be difficult for other reasons.

Reading with a pencil

Familiarity with common patterns in the construction of English words is important to all dyslexic readers. It enables them to break strings of letters into meaningful units and then to synthesise them with greater accuracy and understanding. Figure 1.17 shows how to code word patterns with a pencil.

By no means all readers who are dyslexic need this basic approach, but some may. Teachers may not realise who is in this group unless they hear them read aloud. Practice using a pencil to code will train a child with dyslexia in the habit of mentally coding difficult words as he reads.

Readability

Teachers are often years adrift in estimating the reading age of a particular text or book. (Try gauging the reading age of the different sections of a Sunday paper, then check your accuracy using an established index.) Yet a mismatch between text level and an individual's level of reading skill may seriously interfere with his understanding and pleasure.

In the case of a reader with dyslexia, getting the reading age right may mean aiming off to allow for a legacy of past reading failure, with the selection of a text at a level lower than

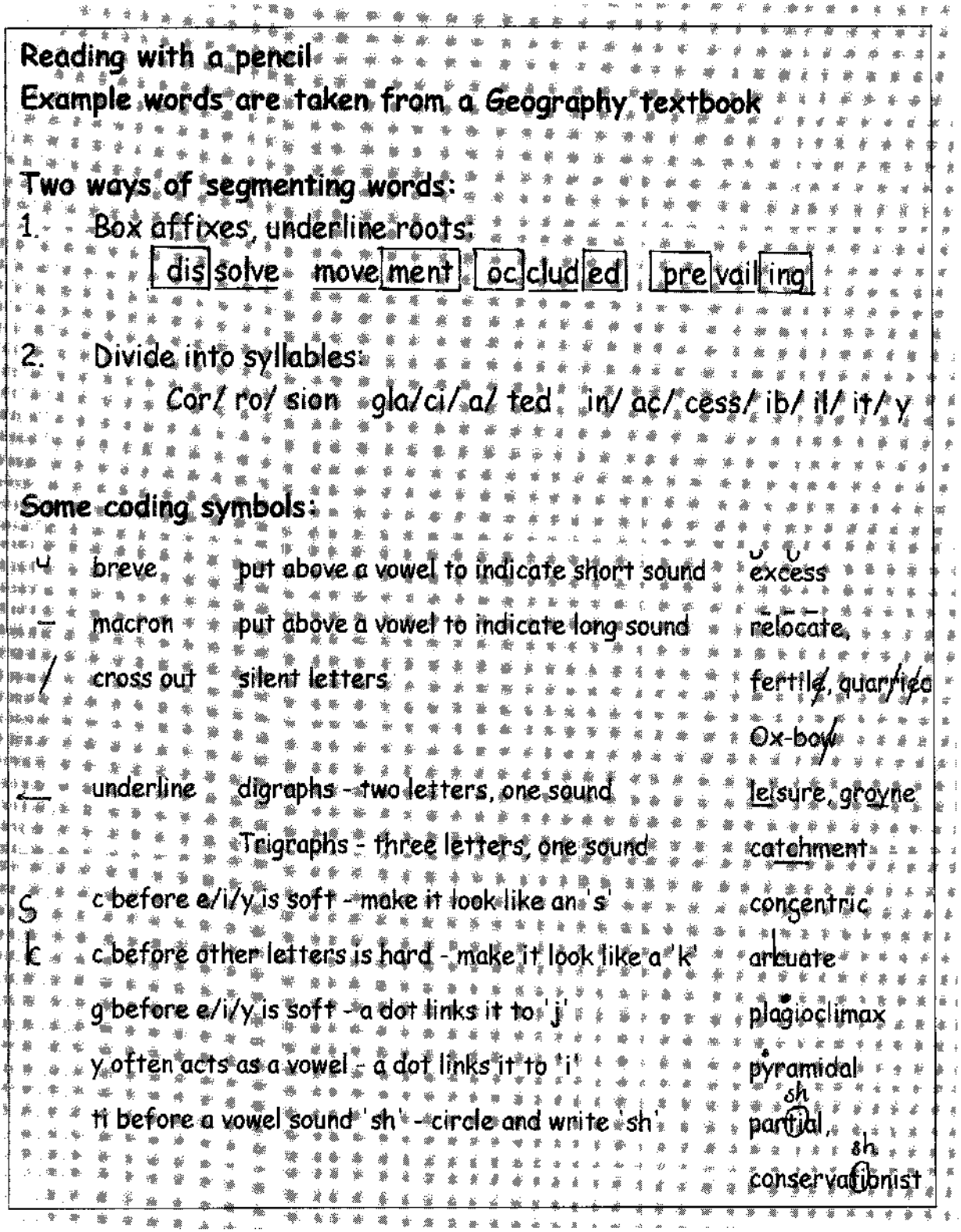


Figure 1.17 Using a pencil to code new or difficult words when reading introduces an element of play, cultivates the habit of phonological analysis and gives a weak reader increased confidence in his ability to crack the code of unfamiliar words.

his actual reading capability. Size and clarity of font, the placing of text in space on the , the quality and position of illustrations and the use of colour, subheadings, summaries, questions and contents list may all contribute to or detract from a text's readability for these disadvantaged readers.

What is a dyslexic student's reading level?

It is helpful for teachers to know of any large discrepancy between the reading ages of their students. However, knowing what sort of reading age and therefore what sort of reading assessment to look for is not straightforward. Exam boards require evidence from tests of single, unrelated words, read aloud, to grant the concession of extra time in public exams. Teachers, on the other hand, will be looking at how well their students can take in and remember information when they are reading continuous text silently to themselves.

There are few satisfactory formal tests for this at secondary school level, but teachers wishing to discover if their students can cope as might be expected with reading in their subject could do their own informal assessment, using current curriculum material. The model for this assessment might be:

- A passage of roughly 1000 words. This will give a reading task lasting about 4/5 minutes; one source suggests that the average reading speed for the general reading public is 230–250 words per minute (De Leeuw and De Leeuw, 1965).
- Ten multiple-choice questions to be answered immediately after reading the passage, but without looking back at it.
- Ten differently worded questions, covering the same points, to be asked a few days later and without warning.

Students who are already familiar with the topic in the test material will have an obvious advantage over others in the class who are not. Often dyslexic readers will have avoided previous reading assignments and will have learned less than their peers from taking notes in class. They are therefore likely to have less knowledge than others with which to associate any new reading; this makes a secondary reason for poor reading results in general, as well as in a reading assessment exercise.

Where reading assessment reveals a qualitative discrepancy between the reading of a dyslexic student and that of the rest of the class, teachers will need to gauge how disabling it is likely to be. A dyslexic student who has reading skills below the level of his class might cope, for instance, with the reading required to study A-level chemistry, biology or geography, whereas he might quail at reading *Middlemarch* for an English literature paper. He could probably build up the necessary vocabulary for science or geography through multisensory methods and repetition but would find the length of the novel, the working memory load and the subtleties of George Eliot's language and syntax overwhelming, without additional tactics and aids. Following the text while listening to an audiotape might answer this particular problem. If dyslexic readers can use tapes as a multisensory way of accessing text, then there may be no further barrier to their appreciation and pleasure in a great novel, however long and complex.

What is the reading level of a text?

The readability level of a given text is usually calculated on the number of complete sentences and words of three or more syllables in a sample of 100 words. The readability level will sometimes vary through the text of a book – from UK reading age (RA) 8 to 17 years in the case of Dickens' *Little Dorrit* – so a fair impression calls for several samples. The scale in mind for this chapter is the Flesch Kincaid Grade Level found at the end of the Spelling and Grammar Check in Microsoft Word 98, with 5 added to the American Grade Level to give a UK RA.

There is nothing very precise about readability levels. They are useful to predict rather than to measure a text's difficulty, and there are several factors to take into account when thinking about them. A higher readability level is acceptable if there is a teacher available to explain the more advanced words where necessary. If a student is determined to read a text with too high a readability level, he should be helped to do so. Scientific texts may be given an exaggerated level of difficulty because certain multisyllable words, such as chloroplast, holophytic, chlorophyll in a section on photosynthesis, recur often in the selection. Conversely, a passage of physics may be easy to read but hard to understand because the content is too concentrated and abstract to take in without study or interpretation.

Two approximate guides to estimating the suitability of a text

Readability tolerance levels:

A reader working independently may tolerate 1% error.
A reader with instruction available may tolerate 5%.
Anything beyond 10% error will cause frustration.

The 'Five-finger Test', despite its age, still helps to predict the unsuitability of a text for independent reading.

Five-finger test:

1. Select a of text from the middle of a book.
2. Start reading from the top of the page.
3. When you come to a word you don't know, put a finger on it.
4. Put your next finger on the second word you don't recognise.
5. Use one hand only.

If you run out of fingers before the end of the , the text is probably too difficult for you to read with confidence or pleasure.

Sometimes there can be no alternative text with higher or lower readability level than the one given. Set texts and original sources are such cases, as is this extract, for instance, which, with a UK RA of 17 years, appeared on a Year 8 history paper.

'Witchcraft' – An extract from a law passed in 1563

If any person practises or uses any invocations of evil or wicked spirits, or uses any witchcraft, enchantment, charm or sorcery whereby any person shall be killed, being of these offences lawfully convicted shall suffer pains of death. And if any person shall practise witchcraft, enchantment, charm or sorcery whereby any person shall be damaged in his or her body, or whereby any good shall be damaged or destroyed, being of these offences lawfully convicted shall for the first offence suffer imprisonment for one year; and for the second offence suffer the pains of death.

Faced with unfamiliar language, latinate sentence structure and no modernised version to hand, it is not only the dyslexic student who might need to use some conscious strategy in following the sense of this passage.

Make questions to help with understanding and remembering

To meet such a reading challenge, students, dyslexic or otherwise, need to find a way of interacting with the text. One way, in the case of the above text, would be to reread each sentence out loud, forming questions to which parts of the sentence are answers. For the first sentence the reader might ask himself:

- What types of people are to die?

  Answer: those calling up evil spirits or using witchcraft, spells or magic.

- What two conditions would lead to their execution?

  Answer: they would have to cause their victim's death. They would have to be found guilty of this in a law court.

Questioning helps to identify the separate points apparently moulded into one by syntax.

Textbooks

Difficulties

Students are often set reading tasks for homework – to give further explanation for topics that have been covered in class, to give background to the subject that they are studying or in preparation for a class discussion or test. This is the most demanding sort of reading for a dyslexic person because:

- interest level in the subject matter may not be very great
- the material may be at too high a reading level
- the subject may be unfamiliar and therefore hard to visualise
- if the chapter is photocopied, it may be poorly reproduced and the print too small
- textbooks are unlikely to be on tape

As a result of these difficulties, the student with dyslexia often has to read the material twice to get at the meaning, so it takes him longer to read it than his peers. And at the back of his mind he knows that, unless it is followed up by some supporting activity, he is very likely to forget what he has read. It is not surprising that many students who are dyslexic hope that they can get by without doing their reading homework.

Getting to know the textbook

However, some time spent on exploring the class textbook, and showing the pupils how to use it, is particularly helpful to the dyslexic people in the class. Showing how the textbook works, which bits are the most valuable and which the least, will give the pupils confidence. To develop their critical faculties and become familiar with what may (or may not) be a valuable resource, the children could answer the following questions for homework:

- Do you like the look of the book? Why?
- Is it too difficult for you to read?
- Is there a useful table of contents?
- Are there paragraph, or chapter headings?
- Is there a glossary?
- Do the pictures or diagrams help your understanding?
- Are there questions at the end of the chapters or sections?
- Is there a summary at the end of the chapter?
- Why could it be a good idea to read the questions or summary before you start reading the chapter?

If the book is too difficult for some pupils, they may need a different one or some help with how to use the one they have.

Reading to understand and remember

A class lesson in reading techniques, on a relevant chapter, would give poor readers very useful guidance on how to get beyond simply decoding the words. One of the most effective approaches to reading for understanding and memory involves a sequence of activities: previewing, questioning, reading, summarising, testing (PQRST).

Previewing

Previewing involves the student's looking over the text before he reads it, noting the titles and subtitles, the first and last sentences of each section, the pictures and diagrams, and any summary or questions there might be at the end of the chapter.

In this way he establishes a framework for his reading – he finds out what the chapter is about and how the subject is handled, the pictures should give relevance to the theory, and the summary should provide an overview so that the detail can be read in context.

Questioning

This second activity is the one that can make the difference between active and passive reading: while previewing a passage, the reader writes down a brief list of the questions that he hopes or expects the passage to answer.

Reading

The reading should now have more relevance and the reader should feel more actively engaged with the text. The topic is familiar, he knows where it's going and he is looking for answers to his own questions and any questions that the author may have posed at the end of the passage.

If the reading material is difficult, the dyslexic student might find it helpful to read the text aloud onto tape or enlist a parent or friend to do this for him. Some students find it easier to understand when they listen rather than read the words from the page. Committing the chapter to tape also provides a resource for future study and revision.

Summarising

Pausing at the end of each paragraph and asking 'What was that about?' and then summarising it in his own words, either aloud or on paper, is a very thorough way of reading for meaning. The processing involved in this will make it much more likely that he will remember the piece, as well as provide a useful summary when he comes to revise the subject.

Testing

Answering the questions he generated on previewing, answering any questions there might be at the end of the chapter, creating his own questions (see 135), summarising the whole piece, being tested by his teacher, creating a mind-map of the topic – all these activities will benefit the pupil who tends to forget what he has read. The forgetting curve (see 238) needs to be taken into account, particularly with students who are dyslexic, if the reading assignment is to be a valuable element in study.

An example

Figure 1.18 is an extract from a GCSE history textbook – *Modern World History* by McAleavy. Below are examples of how a student might preview, question, read, summarise and test a part of the chapter entitled 'Hitler's War'.

Previewing

Previewing involves some internal talking about the text while the student scans it for the first time:

> **It's a factual summary of the events of the Second World War. The main headings are 'Blitzkrieg in Poland', 'The phoney war', 'The fall of France', 'Hitler turns east', 'America joins the war', 'The attack on Pearl Harbour', 'The tide turns', 'The holocaust', 'The end game'.**
>
> **There are pictures of Hitler under the Eiffel Tower in 1940 after the defeat of France, Hitler's forces in the Ukraine in 1941, the Japanese attack on Pearl Harbour, a terrible picture of Jewish victims of the Holocaust.**

Questions

The reader then writes down some questions he expects to be answered in the chapter:

The Second World War

Blitzkrieg in Poland

The Second World War began when Germany invaded Poland on 1 September 1939. Britain and France had pledged to defend Poland. On 3 September the French and the British governments declared war on Germany. The French and the British could do very little to stop a German victory in Poland. By the end of the month Polish resistance had collapsed. On 17 September Soviet forces crossed the Polish frontier and took control of part of eastern Poland. This was part of the deal Hitler had struck with Stalin before the war in the Nazi–Soviet Pact. Stalin also moved his troops into the Baltic states of Latvia, Lithuania and Estonia.

In Poland and each of the following campaigns Hitler's methods became known as a 'Blitzkrieg' or lightning war. Blitzkrieg involved the use of overwhelming force, in as short a time as possible, in order to crush the enemy. Extensive use was made of tanks and other armoured vehicles. The Germans had much success with this technique.

The phoney war

Having succeeded in the east, Hitler's thoughts turned west. He began to make plans for an attack on France. Meanwhile the British and the French tried to weaken Germany by stopping German trade by sea. In particular they tried to cut off the supply of iron ore from Scandinavia. From October 1939 to April 1940 there was little fighting between Britain, France and Germany. This period became known as the 'phoney war'. Fighting did take place in the winter of 1939–40 between the USSR and the small Baltic state of Finland. The Finnish army fought with great skill and ferocity and it took from October 1939 to March 1940 for the USSR to defeat her small neighbour. Eventually Finland was defeated and forced to give territory and a naval base to the USSR. The Soviet struggle to defeat Finland convinced Hitler that the Red Army could easily be beaten by Germany. His secret long-term plan was to turn against the Soviet Union and set up a new German empire in the east.

In April 1940 the French and the British started mining Norwegian waters to stop the trade in iron ore. Germany responded by invading Norway and Denmark. The fall of Finland, Norway and Denmark led to a political crisis in Britain and France. Both prime ministers were forced to resign. In Britain Winston Churchill came to power in May 1940.

The fall of France

After months of waiting Hitler struck west in May 1940. The Netherlands, Belgium and France were invaded and rapidly defeated by German forces. A British army was forced to flee from the Continent back to Britain from the port of Dunkirk. Germany took direct control of much of France, leaving part of the south and south-east of the country under a puppet French government, with its capital in the town of Vichy. At this point it seemed that Hitler had virtually won the war. France was beaten and much of Europe was occupied. Only Britain remained to fight Germany. Sensing that the war was nearly over, Mussolini joined forces with Germany in 1940. He wanted Italy to get some of the rewards of victory.

Having defeated France, Hitler prepared for a German invasion of Britain. The German air force, the Luftwaffe, set out to win control of the air over Britain. This was the first stage of the invasion plan. German planes bombed military sites, factories and the capital city, London, in August and September 1940. The British air force, the RAF, fought back and the clash of the two air forces became known as the 'Battle of Britain'. Although there were heavy losses on both sides, the RAF got the upper hand in the Battle of Britain and, as a result, Hitler was forced to put off his plans for an invasion of Britain.

An Italian attempt to share in Hitler's victory went disastrously wrong. An Italian army was defeated by Britain in North Africa, and Greece successfully stopped an Italian attempt to invade. Hitler was obliged to send German forces to North Africa and to Greece in order to help his ally.

Figure 1.18 Extract from *Modern World History, Tony McAleavy, C.U.P 1996.*

In what ways was Germany successful between 1939 and 1941?
Why was the attack on Pearl Harbour important?
What happened in the Holocaust?
How did the Second World War end?

I would also like to know:
What is 'blitzkrieg'?
What is a phoney war?
Why did Britain get involved?
What went wrong with the Nazi Soviet pact?
Which countries did Hitler defeat?
Where are the Baltic states?
What happened at Pearl Harbour?
What part did the Americans take in the war?
How was the Holocaust allowed to happen?

Three ways of summarising

a) Summarising with words

The student reads each paragraph and summarises it. Here is the first:

France and Britain declared war on Germany when she invaded Poland on 1 September 1939. By 17 September Soviet troops had occupied Eastern Poland, and Stalin, who had signed the Nazi–Soviet Pact with Hitler, moved his troops into Latvia, Lithuania and Estonia. Germany achieved her successes by a series of lightning strikes using overwhelming force with armoured vehicles.

b) Mind-map summary

Some students might prefer to build up a mind-map summary of the chapter they are reading. It is the visualising and the thought processing behind drawing a mind-map summary, as well as the advantage of a spatial representation of the information, that helps the person with dyslexia give substance to words and remember better what he has read (Figure 1.19).

Again, an internal dialogue:

Blitzkrieg – How shall I remember that Germany invaded Poland in September? – Mum's birthday – a birthday cake.
I'll do a flash of lightning for blitzkrieg and a tank to represent how the Germans won their victories. A swastika and the hammer and sickle will symbolise the Nazi–Soviet Pact.
Phoney War – I'll draw an iron on a boat to help me remember iron ore. And a mine to show Britain and France intercepting the German trade with Scandinavia.

And so on.

This is quite hard work, but more interesting than just reading or writing notes. It involves a great deal of processing and makes the leap from words to visualising and on to involvement in what was really going on at the time.

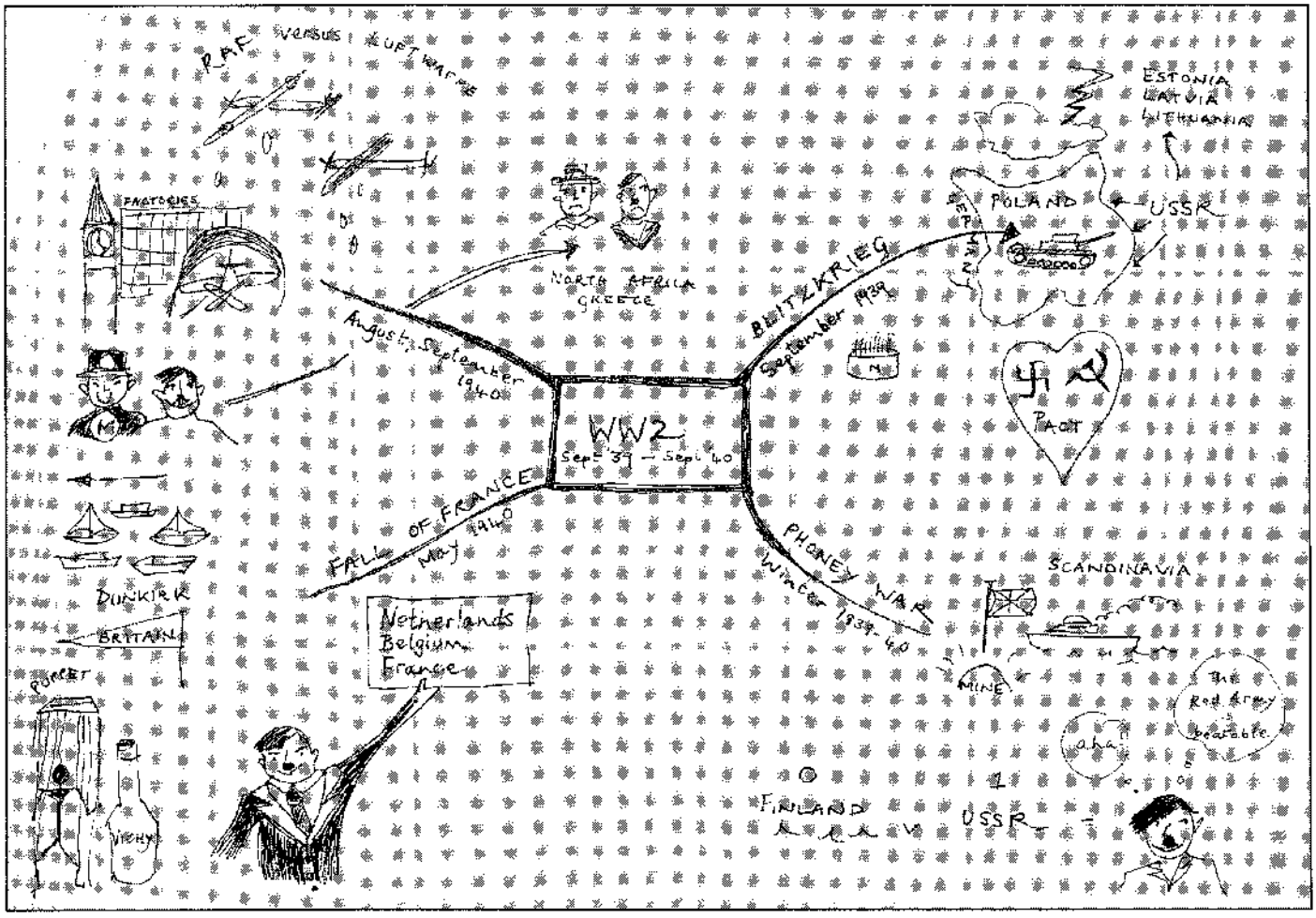


Figure 1.19 This student has clearly *enjoyed* mapping the topic, which is a good start to study. The map itself is most useful as a stimulus for him to talk through, explaining the symbols, giving more details and enlarging on the issues.

For some dyslexic people this is a far more effective way of making notes or summarising. There is little detail, so, because the symbols are just pegs for memory, it is important for the student to look at the map again and talk it through, supplying the detail. Travelling round the map in a clockwise direction, from one o'clock, the position of the symbols on the map will show and reinforce the sequence of events as they occurred.

c) Summarising by drawing a map

> **I don't know exactly where Poland or the Balkan states are, so I'll copy a map. I don't remember maps unless I've drawn or illustrated them myself.**

The geography of Europe helps to explain a great deal of what happened in the Second World War (or any war) – working with a map is ideal for people with a strong spatial sense. Their own input into the map with pictures, arrows, colours and dates will help with both understanding and memory (Figure 1.20).

Figure 1.20 Map of Europe: enlarged onto A3, coloured, and with personal pictures and symbols added, this map will become memorable for the individual who worked on it.

Testing

a) Testing on the questions

At the end of his reading session, the pupil should answer the questions he formulated during his preview. In this way, he will consolidate his memory and practise expressing historical information in his own words. The questions will be available for further testing later.

b) Testing on the mind-map

When he has finished reading the chapter and making the mind-map, the student should cover it, re-visualise it and talk his way round it from memory, explaining the symbols and expanding on main points. Repeating this operation later will further strengthen his memory.

c) Testing on the map

The dyslexic student needs to redraw the map from memory more than once to make sure that it is fixed in his long-term memory. Ideally, he should talk about the events described in the chapter all the time he is drawing.

Books on tape

Some teachers, and even students, feel that it is cheating to listen to a book rather than read it. This is probably a hangover from the days when it was only the elite who had access to book learning – they could afford education and books, and so cultural norms became established that have been reinforced by the education and exam system – if you can't read, you can't be very intelligent. If you can't learn in the way we teach, you can't be worth educating. This was a policy of exclusion.

We now know that, because of dyslexia, about 10% of the population have mild or severe difficulties with accessing education and literature through the written word. The individuals with dyslexia in a classroom may be among the least literate – but they could be the most literary. Fortunately, our fuller understanding of the difficulties and potential of people with dyslexia has come at a time when technology offers many solutions for those who were previously disadvantaged.

Books on tape create a level playing field on the reading front. There is nothing inferior about receiving information or a story aurally rather than reading the words on the page. Some would argue that, because the author thinks in the spoken word with tone of voice, timing and expression being part of his message, the written word must be a secondary medium, a translation of his original conception – capital letters, paragraphing and punctuation marks being substitutes for what the human voice can supply naturally.

Anything that gets in the way of 'hearing' the voice of the author – and there are many purely technical problems with print for the dyslexic reader that do just that – can be eliminated by actually *hearing* the written word read aloud. For someone with dyslexia, listening to books on tape has many advantages.

Visualising for comprehension and memory

Research shows that readers who visualise (see page 7) – whether it is fact or fiction that they are reading – will be able to comprehend and remember more effectively than those who do not visualise. A dyslexic individual who is struggling to decode the words and punctuation is much less likely to be able to visualise – so comprehension, memory and, of course, enjoyment all suffer. As a listener, he not only has the advantage of being free to visualise, but is also helped by tone of voice, accent, emphasis, timing and speed.

Remembering the sequence

Anyone who has listened to the tape of a play or novel on a journey will know that external landmarks of their journey can, rather incongruously, map the sequence of the story.

> **'The balcony scene in *Romeo and Juliet* was when we were on the M4/M5 interchange.'**

It is also striking to remember how clearly the visual images of the story remain in the

memory when one was relaxed and listening. Listening to a tape on a familiar walk can provide even clearer pegs to mark the sequence and help a student to remember the order of events in the book he is studying.

Slow readers need not lag behind the class

In classes at school, college or university, the slow reader will lag behind other students and, while they are discussing, say, Chapter 8 of the textbook or novel, he will still be on Chapter 5. Not only does he not benefit from the teaching around Chapter 8, he also loses the chance to join in the discussion – which is often the best way of learning for the person with dyslexia. Listening to the tape before the lessons will put him in a much stronger position.

Listening to books helps with writing style

Children with dyslexia are often reluctant writers as well as reluctant readers. Much of this can be put down to spelling, handwriting and short-term memory difficulties. However, if these children have not read much either, they will have missed out on the conventions of story-telling, familiarity with formal written structures and perhaps a more extensive use of vocabulary than they are used to in their everyday conversations. Their own ability to express themselves on paper will be affected. Listening to books on tape can fill this gap.

Following the text while listening

Listening to tapes can actually improve the reading skills of a dyslexic reader. If he follows the text while listening, he will both increase his reading speed and, by seeing the letters and words while he hears the sounds, improve his spelling and his word recognition. Using text and tape together, the pupil will experience the pleasure and satisfaction, perhaps for the first time, of being able to read the printed word fluently.

Full, unabridged texts are essential for students, particularly if they want to follow the text while listening. Another reason for avoiding abridged versions is that often they leave out the descriptive passages – and for the visualiser these may be essential for him to be able to imagine how the characters look and where and when the action is taking place.

Some readers may find the pace of a reading too slow to follow the text while listening. For them, just listening or just reading is the obvious solution.

You've heard the tape – now read the book

Booksellers will confirm that once a novel or play has been filmed, or serialised on the radio or television, sales of the book will rocket. Not all the buyers will have dyslexia, but many of them will be reluctant or new readers who are usually diffident about investing time and effort in a book unless they know in advance that they are going to enjoy it. For people with dyslexia there is also enormous advantage in being familiar with the setting, the characters and the plot before they start the novel. Having the framework in place, they can really enjoy everything the book has to offer.

Dialect and conversation

Much fiction contains large portions of conversation written in dialect – for example the novels of Walter Scott, Mark Twain, Harper Lee and Irvine Welsh. The author's attempts to

Huckleberry Finn (an extract)

Well, when it come dark I tuck out up de river road, en went 'bout two mile er more to whah dey warn't no houses. I'd made up my mine 'bout what I's a-gwyne to do. You see ef I kep' on tryin' to git away afoot, de dogs 'ud track me; ef I stole a skift to cross over, dey'd miss dat skift, you see, en dey'd know 'bout whah I'd lan' on de yuther side en whah to pick up my track. So I says, a raff is what I's arter; it doan' *make* no track.

I see a light a-comin' roun' de p'int, bymeby, so I wade' in en shove' a log ahead o'me, en swum more'n half-way acrost de river, en got in 'mongst de drift-wood, en kep' my head down low, en kinder swum agin de current tell the raff come along. Den I swum to de stern uv it, en tuck aholt. It clouded up en 'uz pooty dark for a little while. So I clumb up en laid down on de planks. De men 'uz all 'way yonder in de middle, whah de lantern wuz. De river wuz a-risin' en dey wuz a good current; so I reck'n'd 'at by fo' in de mawnin' I'd be twenty-five mile down de river, en den I'd slip in, jis' b'fo' daylight, en swim asho' en take to de woods on de Illinoi side.

Figure 1.21 *Huckleberry Finn* is a wonderful book – but the passages in dialect are quite hard going if you haven't got automatic phonological skills. If you have dyslexia and this is your set text, you will enjoy the book much more if you listen to the tape.

make the language come alive by spelling the words in the way they sound (a novel concept in English!) are a great barrier to people with dyslexia, whose phonological skills are not automatic (Figure 1.21).

Textbooks on tape

Dyslexic pupils are entitled to the same access to the syllabus as the rest of the class, but providing this is not easy. Sometimes a textbook or handout that is appropriate for the class as a whole is unsuitable for those in the class with dyslexia: the content level may be right, but the reading age too high or the layout confusing ('I have to read it two or three times to get at the meaning').

Unfortunately, children with dyslexia are the very ones who really need the back-up of a textbook – their note-taking or copying may be poor and they need reinforcement of what they have learnt in class. If the rest of the class needs an appropriate textbook, then they do too. And more so.

There are alternatives: the teacher could try to find a comparable textbook or handout at the right content and reading level, or he could have the textbook read aloud onto tape for those children who need that help. The latter option is the best – the tape can be used with the book that everyone else is using, and the tape can be copied for several members of the class. The teacher could even edit the text or interpolate his own comments and guidance while recording.

A main objection to this idea is that it is time-consuming and needs extra planning and organisation. Once done, however, it is a resource that can be used again and again and is a real help to that underachieving group of every class whose literacy skills hold them back in every subject. The hard-pressed subject teachers need not do the reading themselves – a parent, a pupil in the school, another teacher who enjoys reading, any of these could supply the need.

Sources for tapes

Books on tape or CD are available from public libraries – a note from a dyslexia therapist or educational psychologist would enable anyone with dyslexia to borrow tapes free. Lists of audio books are available from the library. There are now many sources for obtaining unabridged recorded books – surf the web to find who publishes and stocks the title you want.

Listening Books provides a postal audio-book library service to anyone who has difficulty reading in the ordinary way. For an annual fee you can borrow as many titles as you can listen to during a year. You will be sent catalogues that contain a wide range of (abridged and unabridged) fiction and non-fiction titles, as well as audio books which support the National Curriculum (see Reading and Resources, page 329).

Shakespeare's plays on tape

For most schoolchildren the unfamiliarity of Shakespeare's language can prevent understanding of the plot and appreciation of the poetry. Many have difficulties with the subtleties of the verse forms. For dyslexic students the problems are compounded because of their poor short-term memory and sequencing, and their slow and inaccurate reading.

One of the earliest indicators of dyslexia in young children may be their inability to recognise rhyme and rhythm. It is a skill that can be learnt (W. B. Yeats taught himself) and one of the best ways of appreciating stress and metre is to hear it *while looking at* the verse on the – seeing where the line ends, seeing where the stress falls, recognising sound patterns visually while listening.

Reading aloud round the class is a less satisfactory introduction to a play than reading the text while listening to good actors reading on tape. The cast of a BBC recording of *Hamlet*, for example, is as follows:

Hamlet	Kenneth Branagh
Claudius	Derek Jacobi
Gertrude	Judi Dench
Polonius	Richard Briars
Horatio	Michael Williams
Ophelia	Sophie Thompson
Laertes	James Wilby
First Gravedigger	Michael Elphick
Player King	Michael Hordern
Player Queen	Emma Thompson
The Ghost	John Gielgud

Few classrooms can boast such talent!

Until the children are already familiar with the language, with the characters whose words they are reading and with what the play is about, too much is lost to make reading round the class a good use of time. For those with dyslexia too, the fear of being asked to read is enough to put them off Shakespeare for life ('I can't hear what I'm saying when I'm reading aloud' is a common complaint). Reading the play at a very slow rate, lesson by lesson with weekends in between can mean that details are forgotten and the momentum is lost. When they know the play, pupils will enjoy taking the parts themselves, and it will be a much more enriching experience. Shakespeare is operating on so many levels that, as with other complex tasks where there is overload, it is a good idea for students with dyslexia to break the study down into small steps.

An ideal classroom approach for them might be to make pupils familiar with the characters and the plot (the teacher telling the story, *Lamb's Tales*, etc.), drawing them, describing them, mind-mapping acts or characters, and then watching a performance on video and retelling in their own words. When this framework is established, they will be ready to listen to the tape as they study the text – either at home or in the classroom – and will appreciate the play much more, perhaps 'hearing' the poetry for the first time. This is not a way of avoiding serious study – but of encouraging and enhancing it.

Tapes make literature accessible to all

There are some problems of prejudice with suggesting multisensory learning – drawing pictures, listening rather than reading and mind-mapping are sometimes perceived as childish, rather a cop-out, methods to be used only in emergencies with the less bright pupils. There is no evidence to suggest that people who are dyslexic are less intelligent, responsive

or creative than others – only that, for them, the written rather than the spoken word often makes literature inaccessible.

There may well be other children in the class whose weak reading skills are the main obstacle to academic success. They will find listening to a book easier and more enjoyable than reading it off the page. Introducing them to books on tape might give them their best access to the world of ideas and the imagination, and could make the crucial difference for those who avoid subjects where there is a big reading component.

Conclusion

Teachers who understand the skills required to read for their particular subject are in a good position to help those in the class whose reading ability does not match the task. This is all the more true when teachers also have a clear picture of the specific skills, or lack of them, that individual pupils bring to their reading.