



Hydrocephalus Literacy & Thinking Skills - For Teachers



Introduction

Children and young adults with hydrocephalus may have difficulty in making associations between different ideas and between the same ideas in different contexts. Pressure from the swollen ventricles (cavities) in the brain can result in speech, vision and motor skills being affected to varying degrees, and short-term memory problems are common. (See SBHI 'What is Hydrocephalus').

Any one student's performance at any given age may be judged to lie somewhere along the continuum from severe (or profound, multiple) learning difficulties to above average ability level. In order to understand the implications of hydrocephalus for learning and development, 'working memory' (Baddeley, 1999; Baddeley, 1986; Baddeley and Hitch, 1974) is perhaps more useful a concept than 'ability' levels. Working memory refers not only to short-term memory, but also to the 'central executive' function which may control inhibition and attention-focusing; the selection of information and observation of patterns, association (cf Lombardi, 1997); and self-monitoring.

Within the average range, many students will appear to have more problems than their peers in:

- *Focusing on their work;*
- *Thinking and working independently;*
- *Assessing the standard of their own performance.*

These three problems may not be given sufficient attention when children's performance is within the severe to moderate learning difficulty range, as they are often presumed to be associated with these ability levels. Other difficulties with more obvious implications for literacy (cf Smith, 1996) may include:

- *hand-writing;*
- *copying from the blackboard;*
- *taking part in class discussions and listening to stories;*
- *inferential comprehension;*
- *giving personal observations;*
- *acquiring reading and spelling skills.*

The majority of students will be less street-wise than their peers. Very many will be lacking in self-confidence, although their apparent chattiness may disguise this.

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Working Memory

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Working memory is conceptualised as an integrated system comprising two separate slave systems (the 'phonological loop' and the 'visuo-spatial sketch-pad') and a control system (the 'central executive'). Baddeley's (1999) most recent book also refers to *auditory imagery*, the idea of a voice in the mind (p. 53).

The Phonological (or articulatory) Loop

In simplified terms, this refers to a store that is dedicated to speech sounds. If the capacity of this system is limited, less information can be retained at any one time and, if the attention capacity of the 'executive' is limited, this will multiply the difficulties. It may make it more difficult to *relate* incoming information to information heard, or read, a few moments ago, or to information store in long-term memory (*cf Oakhill et al, 1988, cited in Baddeley, 1999, p.68*).

Rapid Articulation

The number of items that can be retained in the short term is also related to the *speed of articulation* (Baddeley, 1999), ie it depends on how quickly they can be repeated.

The longer something takes to process, the more chance there will be that some of it will be lost.

Children can practise rapid articulation of familiar material, for example:

- the numbers one to 10;
- the alphabet;
- jingles (e.g. one line from 'Peter Piper');
- saying the alphabet, and counting, backwards.
- (This must be seen as fun.)

Rehearsing information

The store can also be boosted by repeating information under your breath (subvocal rehearsal). This subvocal rehearsal is thought to help us memorise printed information. Generally speaking, adults can read familiar or light reading material without sounding out the words, but more demanding texts may require some subvocalisation (*cf Baddeley, 1999, p. 53*).



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Working Memory

Children learning to read go through a process of reading aloud, then reading quietly, and then – by about the beginning of Key Stage 2 – the majority will have begun to read silently. This silent reading appears to be associated with the idea of ‘auditory imagery’ (Baddeley, 1999) when we can imagine a voice echoing the words in our heads.

Personal observation suggests that children with hydrocephalus may take longer to get to the stage of silent reading than other children. Some may need encouragement to rehearse information by:

- ‘whispering’ a sentence; then saying the same sentence aloud.

Some very young children (5-6 years) may need to be taught what whispering means, but this idea should not be forced upon them. As with other learning tasks, children will take more readily to it if it is seen as a fun activity, or a challenge.

The visuo-spatial sketch pad (a sort of mental note-pad for holding and manipulating images).

Many children with hydrocephalus will have perceptual difficulties, which will result, for example, in not being able to find a particular book if there are several to choose from; not being able to interpret a detailed picture or diagram. This may be related to the fact that many will not have had as broad a range of early physical experiences as other children, and so have not developed a good understanding of spatial relationships. It may be necessary to have strong internalised concepts of the 3D world before beginning to appreciate how to interpret 2D information.

However these perceptual problems may also be associated with *executive* difficulties. Some children do not appear to project an image in their minds unless this process is made explicit for them. Their accounts of previous observations (for example, a video; an experiment in science) may be patchy. They may give a number of unconnected details with neither an overall grasp of the main ideas nor sufficient details to make sense.

They can be encouraged to practise both recalling an image and creating a visual image. In the Oxfordshire Skills Programme (1986), a useful activity is one where a particular shape, shown in the first frame, has to be found within what appears to be a random collection of stars in other frames. This necessitates holding the shape in mind and mapping it onto each frame, in different orientations, until a match is found. (Also see Feuerstein’s ‘Instrumental Enrichment’ programme, in Sharron, 1996.)

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Working Memory

The 'executive' and 'self-confidence'

There is still much to be learned about executive functions. The essential point seems to be that working memory is an integrated system and that, if the short-term memory is not working well, the self-monitoring and control functions may take longer to become established. If a child has a physical disability (and many children with hydrocephalus have problems with balance, grip and hand-eye co-ordination) the system will have less reliable information to work on. This will compound the difficulties, and it may take longer for the child to gain confidence in him or herself as an individual person. The ability to predict is also essential for self-confidence. This ability is dependent on the ability to recognise patterns in information, and to use the future tense, and these skills can be taught.

Self-confidence is an important outcome of learning, as it provides the boost for further exploration and self-testing. Personal experience of working with some of these children suggests that they can develop more confidence in themselves, and that this does have an effect on motivation and stickability.

Problems and Possibilities

Self-inhibition and attention-focusing

These are 'executive' functions. Children need to become aware that they can both consciously hold themselves back and shut out environmental distractions. Many will need to be taught explicitly to stop and check (*cf Feuerstein, in Sharron, 1996*), perhaps through target-setting to encourage self-monitoring. They may also need to learn what to focus their attention on, i.e. they may need help to develop strategies for thinking.

Some may not have developed the concept of pattern (i.e. the idea of deliberately looking for similarities and differences) in colours, shapes and sounds. Once the concept is established, this can then be applied to many different learning experiences at more and more sophisticated levels, e.g.:

- early work on letter recognition;
- spellings;

comparing the treatment of similar themes in different plays and novels.

Many children, however, will need to be reminded that the same thinking skill is being used, even though the context appears to be different.

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Problems and Possibilities

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Thinking and working independently

This is a more advanced level of executive functioning that relies on the development of self-confidence. It requires:

Training Time

If homework time can be arranged for tasks that are likely to help improve their memory and thinking skills, progress may be quicker. Other independence skills could also be useful as homework tasks, for example learning how to:

- write and consult checklists of equipment, assignments;
- organise their belongings for the following day;
- check that a pencil case, for example, is properly fastened/closed before putting it in a school bag;

becoming aware of pausing to check.

If the child has a learning support assistant, these skills can be reinforced at school.

Self-monitoring opportunities

(see, for example, Seach, 1998)

Working memory problems will mean that children may forget where they are in a task, and where they are going to. They can be helped if teachers:

- use task analysis to establish sub-tasks with achievable goals;
- provide task timetables and other visual cues (icons or words) to identify necessary equipment/materials.

Assessing the standard of their own performance

(see Malone and Smith, 1996, pp. 55-59)

This could be regarded as the highest level of executive functioning. Being able to assess how good their work is, in relation to what is expected, is important not only for school, but for further education and employment. They need to be able to see themselves as people with their own unique identities, skills, knowledge, and personal goals. By definition, this also requires a sense of others who may have different agendas.

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Problems and Possibilities

Helping children to achieve this level of thinking can begin with:

- spelling out what is expected for successful completion of the task, in 'student-speak';
- making explicit any sub-skills that are needed, and providing opportunities to practise these;
- teaching them how to prove that they understand a task by explaining how they will tackle it;
- providing a test when they (and the teacher) feel that they have mastered the necessary skill(s).

The above procedures sometimes entail creating an artificial distinction between practice work and test work.

However, it helps children to understand that some tasks are set to enable them to acquire specific skills, and that they are not going to be finally judged until they themselves feel confident enough to ask for an assessment.

(N.B. They should not be allowed to take a test until they have proven their ability to satisfy at least 90% of the criteria for a particular skill level without any help/prompting.)

The assessment of literacy often involves subjective judgements (e.g. on style and originality) and, if standards cannot be made explicit, or if it is likely that different people will make the work differently, the self-assessment should be confined to aspects of the work that can be measured. This could include:

- punctuation;
- lay-out (e.g. for letters);
- the number of different bits of information found on a given subject;
- the use of different connectives and different openings;
- whether or not two different points of view are given;
- the use of evidence, in quotation from texts;
- attempts to link ideas from texts with evidence from personal experiences etc.

Handwriting

The majority of children have a weakness in at least one hand, and their physical difficulties are similar to those of children with dyspraxia. Some, aged between four and eight years, have been given Multilink (plastic, coloured, fully interlocking cubes) for mathematics work at home, and many of these children have shown improvement in colouring in and handwriting skills.

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Problems and Possibilities

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Some children may need:

- large freely flowing implements e.g. felt tips, very soft pencils;
- touch screens;
- keyboards with large keys;
- brightly coloured stickers for keys.

Touch-typing programs are available as computer software, both for two-handed and one-handed typing.

Copying from the blackboard

This is related to visual working memory, but phonological working memory may also be implicated. As their working memory improves, children will be more able to scan from one place to another, and remember where they left off. There has been a very noticeable improvement in this respect for some of the children whose parents have involved them in certain learning activities at home (see below).

Remembering Instructions

This is related to problems with phonological working memory and auditory imagery. A visual back-up for the information helps, e.g. checklists, timetables, and diaries.

Both children and young adults can also be helped by being reminded to repeat the instruction to themselves.

In some cases, it may appear that a child is ignoring whole-class instructions. The same approach can be used for this, making sure that the child understands how to recognise what a whole-class instruction is, and then learns to repeat that instruction and carry it out.

Participating in class discussions, listening to stories

This is also related to phonological working memory problems and auditory imagery. Children with hydrocephalus of all ability levels will find it almost impossible to contribute to a quick-moving discussion, as this entails not only following the sounds of the speech, but switching rapidly between different ideas and identifying associations. Similarly, very many will find it difficult to hold in mind each part of a story and simultaneously relate it to their own experience, and to what has gone before in the plot.

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Problems and Possibilities

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Pausing every now and then to recap the conversation or story and identify links between different contributions, or different episodes/characters, can help. This is especially useful if it is accompanied by some form of visual representation, e.g. 'modelling' the debate or story in linked icons, or listing of key words and ideas, on a flip chart or OHP.

Inferential comprehension

The problems with inferential comprehension may be related to the fact that children with hydrocephalus are slow to develop concept of time, and so have difficulty conceptualising cause and effect. It may also be related to emotional and behavioural development (see leaflet '*Hydrocephalus and Behaviour*')

It is important that young children are helped to develop a concept of time, firstly through associating different significant daily events with particular times of day; through realising that things can happen concurrently, and that time can be measured in this way (e.g. the length of time there is to play, while mum is cooking the dinner); and also to read the time on a 12 hour clock.

Inferential comprehension can involve concepts about: the physical world (e.g. 'what will happen if I go out and leave the bath tap running and the plug in?') the social world.

The latter is perhaps the most difficult are to understand, as it involves both emotional development, and development of working memory (*cf Harter and Whitesell, 1989*).

Links between the event being read about, and possible events the child has experienced, need to be made explicit. Some children may need help in describing different emotions, developing an understanding of the ways in which different emotions are displayed, and the circumstances that can produce those emotions.

This then allows the introduction of the idea that different people may experience similar emotions given similar circumstances. When this *relational* skill has developed to a degree, it may be possible to introduce the idea of *variability* within any given set. This may lead to the possibility of generalisation, with help, i.e. the idea that certain events may provoke a range of different reactions and, if a certain reaction is observed, it might be assumed that the 'actor' is interpreting that situation in a particular way.



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Problems and Possibilities

Giving their own observations

Many children will seem to be very articulate but, when asked to express a personal observation, to describe something from memory, or to give explanations, they can be extremely reticent.

It is important to help them gain confidence in expressing their own observations in a formal way (i.e. in sentences), beginning at a very simple level. Bruner (1990) uses the phrase 'discourse units' to describe the fragmented quality of informal speech. Very often phrases suffice, and the listener fills in the gaps. Whole conversations can be conducted just by pulling in a phrase to fit the context.

Formal speech is more demanding, and the speaker must first of all be aware of what s/he wants to say, and then work out how to say it. This may also help to train the memory so that more information can be held and processed at the one time.

Reading and Spelling

Reading involves both phonological and visual working memory skills.

Hydrocephalus and Dyslexia

The difficulties that some children experience in reading and spelling are essentially the same as for children with other specific learning difficulties, for example dyslexia. For children with hydrocephalus, the difficulties may stem from problems both with phonological working memory and auditory imagery; and visuospatial working memory.

Difficulties relating to dyslexia, and specific approaches that can be used, are dealt with in detail in many current publications (e.g. *Smith, 1996*), and these will also be useful approaches for children with hydrocephalus. In all work relating to reading and spelling, it is important to remember that these children need to learn to listen to their own voices and use skills relating both to pattern recognition and the linking of ideas in different contexts.

Observing patterns and making links between contexts (phonological emphasis)

There is a positive association between early rhyming ability and later reading ability (*Bradley and Bryant, 1983*). Children who are familiar with 'Letter-land' and who are also familiar with nursery rhymes find the transition to phonological awareness much easier. After they are familiar with the sounds of most of the letters of the alphabet – especially the short vowel sounds – an early emphasis on onset and rhyme (e.g. *first 'a-t', then 'at', 'c-at'; 'at', 'm-at'*) is helpful.

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Problems and Possibilities

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Phonological working memory and auditory imagery may be helped by encouraging children to whisper to themselves then read aloud, one sentence at a time, from familiar reading material. This can help to make their reading sound much more fluent, and may also help them to remember more of what they read.

Some children can guess how to read a word by spelling it aloud, letter by letter, but spelling is usually more demanding than reading. When children have spelling problems, they may be encountering two difficulties:

The number of items that can be held in short-term storage;

The integration of the phonological and visual codes.

It helps when they understand that words can be split up, as for reading, often with an emphasis on the ending (e.g. 'ter', 'as-ter', 'm-as-ter'). This enables them to 'chunk' information, and the number of 'chunks' that can be remembered is equivalent to the number of individual items that can be remembered.

It also helps when they realise that they can listen to a word and identify the units they *think* they can hear – treating the word a bit like a phonological puzzle. The child is asked to:

1. say the word and guess how long it is, i.e. how much space is needed to write it;
2. say it again, and listen carefully to the sounds;
3. pick one of the sounds that seems familiar, say the sound (not the letter), then guess the letter(s);
4. say the whole word again, work out where that sound comes in the word, and place it;

try another sound.... (steps 2 – 4)

By continually going back and forth from what they have written, to the spoken word, they may be more able to integrate the two and check their spelling. This provides the opportunity to introduce some of the more irregular spellings in a way that gives the child credit for knowing how they should be spelt, and allows them to experience a small measure of superiority in that the accepted spelling does not always make sense. It also allows the teacher to give incremental praise by giving credit for the bits that are correct.

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Summary

Knowledge and skills that are normally taken for granted may need to be made explicit, and taught. Children need to become aware of what others expect of them, i.e. explicit performance standards; they also need help to become aware of what they know and can do; and they need help to experience success. The skills that need to be developed are complex, involve different dimensions of thinking, and can be imagined as different levels of abstraction. They may include learning how to:

Level 1

- inhibit an impetuous response (and for young children this may begin with learning to wait, if someone is talking to someone else, by being praised for doing this);

Level 2

- search for information by visual scanning (in text, facial expressions, body language, the environment);
- search for information by phonological scanning (phonemes, words, their own voices, other people's voices);

Level 3

- identify patterns in information (with help, explicit teaching);

Level 4

- generate general categories for the information required, i.e. 'what sort of things am I looking for?' e.g. 'words beginning with....', 'words that mean....', 'paragraphs that describe how a person felt about....', 'articles about ...');
- generate ideas for likely sources of information (e.g. labels on packages, contents pages, signs on doors; chapter headings; library shelves; web sites; people in the community etc.);
- identify specific links between different items of information (e.g. 'what do these things have in common?'; 'does 'a' always go with 'b'?').

Level 5

- explain how the information found is relevant (i.e. 'what was I asked to do?'; 'how does this match up with what was expected of me?')

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Summary

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Different children will experience different degrees of difficulty in different areas. Very few will be able to follow discussions, stories or long instructions without some form of visual back-up. All children will cope better if they are:

- helped to develop strategies for remembering and organising information;
- given positive feed-back on their efforts;
- taught compensatory methods e.g. written check-lists, diary-keeping.

Training in the use of these strategies and memory-aids will continue to be an advantage for them in further education and employment.