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Each person is an individual and has a unique psychological profile, biochemistry, developmental and social history. As such, advice will not be given over the internet and recommendations and interventions within this website cannot be taken as a substitute for a thorough medical or allied health professional assessment or diagnosis.

Date Document Updated : March 2005

Learning Disabilities

Article QUICK LINKS :

DEFINITION

A Specific Learning Disability (usually abbreviated to LD) means a disorder in one of more of the basic psychological processes involved in understanding or in using language (spoken or written), which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations. It also includes directional confusion, sequencing difficulties, and short-term memory retention problems. These problems are NOT primarily due to visual, hearing or motor handicaps, NOR due to mental retardation, emotional disturbance, or because of environmental, cultural, or economic disadvantage. The individual is considered to have a LD if achievement is not commensurate with age and ability levels in one or more of the above specific areas when provided with learning experiences appropriate for age and ability levels.

INCIDENCE OF LEARNING DISABILITIES

Research in Europe and the USA suggest that up to 20% of children experience problems with their schooling at some stage and that approximately 5% suffer from disabilities severe enough to interfere with normal progress. Furthermore, most studies suggest that between 25 and 40 percent of individuals with learning disabilities have inherited this from their families. However, while the familial pattern appears to be clear, the genetic process is not yet clear. Current research with (SSVEP) scans (Levy and Hay 1995) and further work on Chromosome 6 may soon shed some light on this area.

AETIOLOGY

The causes of learning difficulties have not yet been determined. Most research suggests that for most LD individuals, something affected the brain during pregnancy. Minimal brain damage, maturational delay, genetics, biochemical factors, foetal development, medical factors such as allergies, recurrent ear infections, and other general factors such as culture, socio-economic level and education have been suggested as possible causes. There is probably no one cause. The current view is that there is a biological-neurological aetiology and how the disorder is manifested is influenced by psychological and social factors. Moreover, secondary social l(peer and family relationships) and emotional factors (poor self-concept) may further accentuate the learning difficulty, and failure at school or in life tends to be cumulative and progressive.

Data from brain imaging and QEEG studies, has shown the temporal and parietal lobes to be implicated in reading, spelling and comprehension difficulties, while the basal ganglia is implicated in co-ordination (Dyspraxia) difficulties such as handwriting, using scissors etc.. Retained Primitive Reflexes and Central Auditory Processing Disorders also contribute to learning disabilities, and may exhibit as behavioural problems which are often misdiagnosed leading to unnecessary medication.

THE LEARNING PROCESS

In order to talk more usefully about learning disabilities, an outline describing the human information processing system in the brain and the types of knowledge acquired through this system is necessary. In order for learning to take place all these individual components must function effectively and interactively with one another.

The main features of the human information processing system, sometimes called the system architecture can be described in the diagram below.

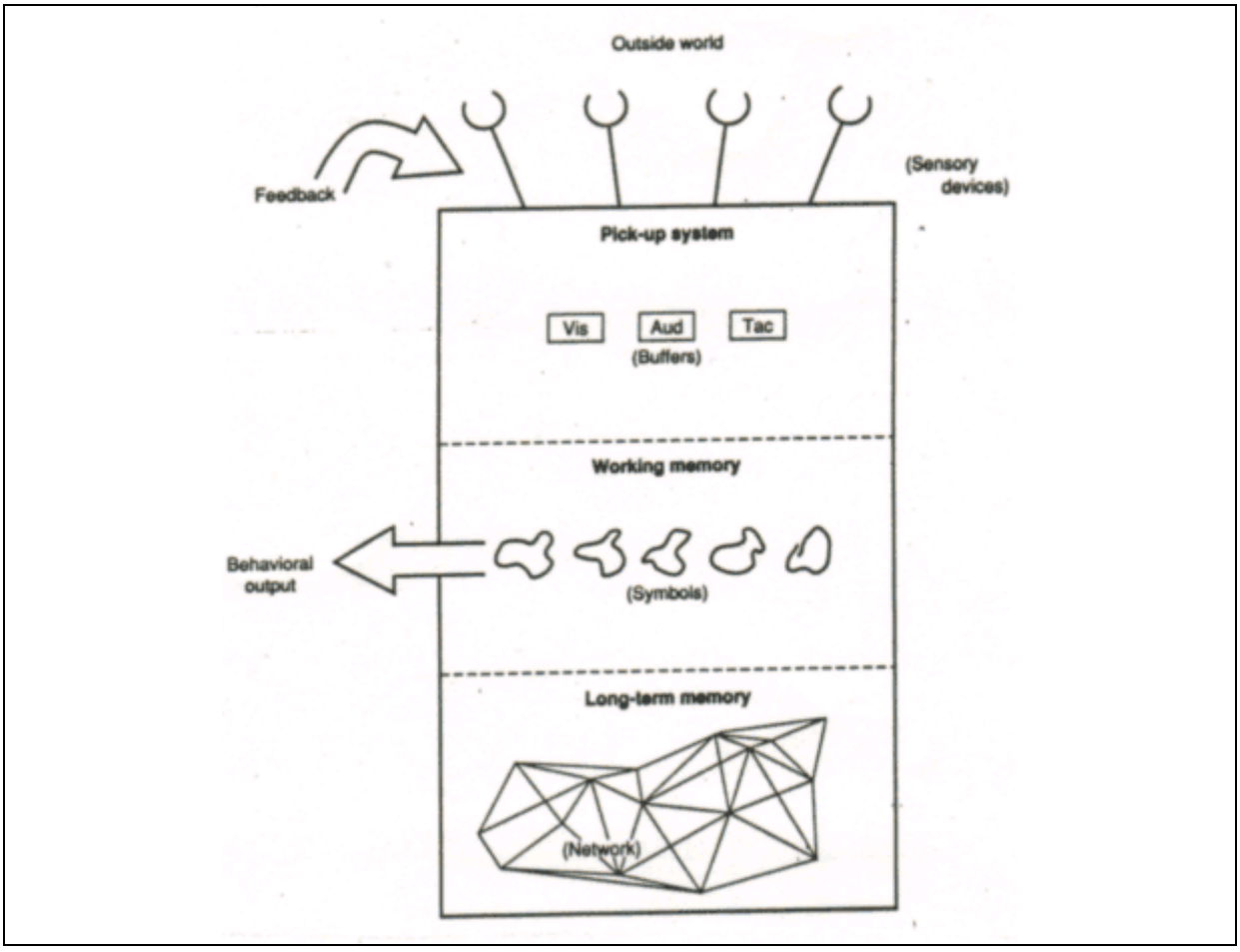


Diagram 1 : Architecture of the human information processing system
Source : Farnham-Diggory 1992, p 56

There are three main structures separated by dotted lines, which means the separation is not sharp; all three structures interact intensively.
At the top there is the **pick-up system**, which includes sensory devices (eyes, ears, hands, tactile devices and others). Incoming sensory information is held for very brief periods in **buffers**. A raw visual image, such as a face, is held for about 250 milliseconds in a visual buffer. Then it disappears, replaced by the next raw image. (In infants it is 2000 msec). The auditory buffer has a much longer retention capacity than the visual buffer - 4000 msec. Tactile buffers hold on to the "general feel" of things rather than to specific points of stimulation. The general feeling lasts about four or five seconds. Kinaesthetic (muscular systems) buffers also work in a similar way to auditory and tactile buffers. Anatomically, the buffers are the **primary projection areas** of the brain.

Working memory, the executive region of the mind, is in the central region of the system architecture. Working memory organises sensory information as well as information that is already "inside" long-term memory. This organisation is in the form of **working memory programs**, goal directed sequences of operations. Working memory programs are the governing forces behind **behavioural output**, shown at the left of the diagram.

The third major component of the human information processing system: **long-term memory** is at the base of the figure and depicted as a network.

A. THE PICK-UP SYSTEM (INPUT)

Normal minds continually scan the world and pick up information through the senses. We are not usually overwhelmed by sights, sounds, smells and muscular feelings because the information is held for a second or two in buffers.
During that brief period, working memory decides if the information is useful. If so it will "snatch" the information and bring it into working memory. If not useful, working memory will ignore it and the information will disappear. If it didn't, the mind would soon be flooded with more sensations than it could handle. This lack of filtering is what causes problems for ADHD and LD individuals.

B. WORKING MEMORY (INTEGRATION, STORAGE AND RETRIEVAL)

There are two main characteristics of working memory:

a) it has a **limited immediate workspan** and

b) it maintains program control of workspan contents.

The immediate workspan is the number of symbols that working memory can maintain at the same time. Originally it was thought that working memory could maintain about seven chunks of information (+/- 2) (Miller 1956) but more recent research concluded that "the reliable capacity of short-term memory, the amount of material that is available almost all the time, is closer to three or four" (Chase and Ericsson 1981, p 159).

If the above is true, then how does working memory maintain continuity from one instance to another? Why isn't life a series of disconnected "snapshots" composed of three or four items each? What holds the mind together?

The answer is that working memory assembles **mental programs** that guide activities. These programs persist over time. They provide continuity and are the threads that hold the mind together from one work span snapshot to the next.

A working memory program comes into existence whenever you set up a goal. The basic components of working memory programs are symbols for:

1. Goals;
2. Knowledge;
3. Sensory cues;
4. Behaviour and
5. Progress Checks.

Each program is organised around whatever goal is currently active. This is what brings continuity to human experience.

There are many working memory programs running simultaneously and higher order timesharing programs are constructed to manage them. Timesharing is a computer term which refers to distributing processing capacity among many different programs. Working memory does so in two main ways:

1. By placing some programs (or pieces of programs) "on hold" while it attends to others and
2. By running some programs (or pieces of them) automatically while others are being monitored.

Naturally, some working memories are better at timesharing than others. Disorganised people are those who lose track of where they are in various programs. To become better organised it is necessary to construct higher order working memory programs meta-goals or meta-plans that unconsciously guide working memory's selection of goals and procedures, for the specific task of managing other working memory programs. Busy people are often experts in constructing these higher-order programs.

The basic operations of working memory (central processes) include:

Dealing With The Pick-Up System

1. Scanning the sensory environment (major development 8-12 yrs)
2. Tuning
3. Encoding (major development 8-10 yrs)

Dealing with the Long-Term Memory System

4. Storing
5. Retrieving (major development 8-12 yrs)

Dealing with Its Own Symbols

6. Scanning
7. Rehearsing
8. Switching attention
9. Comparing (testing)
10. Triggering behaviour (Source: Farnham-Diggory 1992, p 70)

A lot of research has been done on the speed at which basic working memory operations occur (Sternberg 1969a,b; Posner & Mitchell, 1967; Clarke and Chase 1972, MacLeod, Hunt and Matthews, 1978). Working memory becomes more efficient in dealing with the pick-up system, with long-term memory and with itself. Timesharing abilities also improve with age. Thus speed and efficiency increase with age, making more processing capacity available for holding onto new information.

C. LONG-TERM MEMORY (STORAGE AND RETRIEVAL)

Arnold (1984) postulated that the human brain possibly maintains records of all the information it has ever processed. These records constitute long-term memory. Long-term memory has a network structure composed of underlying neural networks and the knowledge it stores is of five basic types (Anderson et al 1981, Baddeley 1986).

Knowledge

Knowledge networks are literally embodied as a network of neurons. A particular memory is a particular pattern of activation across millions, even trillions of neurons. Cognitive scientists are presently studying five qualitatively distinct forms of knowledge represented in Diagram 2. These are: declarative, procedural, conceptual (categorical, schematic, and script like), analogical and logical (including qualitative models). Knowledge about all these forms of knowledge is called metaknowledge (metadeclarative, metaprocedural and so on).

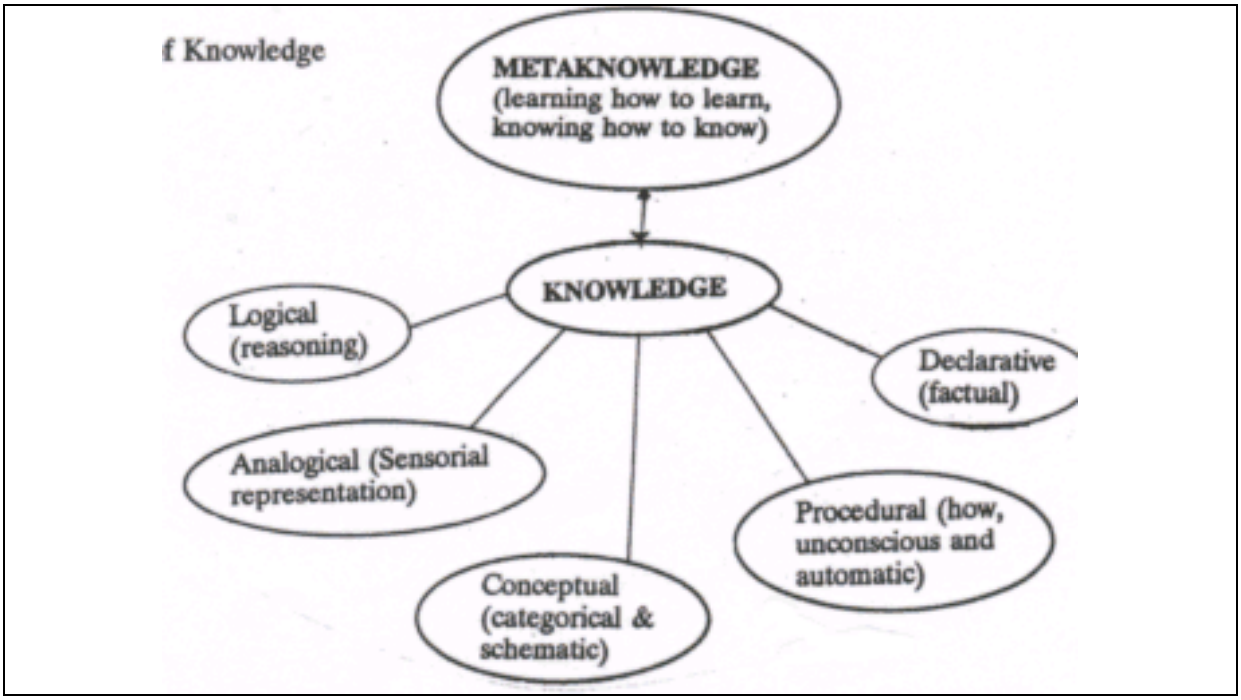


Diagram 2 : Types of Knowledge

Since these different types of knowledge are acquired in different ways, school instruction needs to be arranged accordingly to cater for the development of each type.

1. DECLARATIVE KNOWLEDGE

Declarative knowledge refers to the fact that the information can be transmitted symbolically in spoken or written words, mathematical notation, gestural language or some other symbology. This knowledge is usually acquired from reading books, listening to lectures and conversations, sign language, Braille and from other forms of verbal and visual exchange. Declarative language is usually transmitted in formal (schools, universities, churches) settings. It does not refer to meaning, merely to facts.

2. PROCEDURAL KNOWLEDGE

Procedural knowledge takes the form of a sequence of actions which are easily shown but are difficult to relate declaratively. Procedural knowledge is largely unconscious and automatic. It comes into existence as a result of extensive practice but originally the knowledge might have been in declarative form.

3. CONCEPTUAL KNOWLEDGE

Conceptual knowledge is of two types: (1) categorical and (2) schematic.

Conceptual Knowledge: Is the type of knowledge that is acquired inductively. For example, categorically, I knows about cars in general and the characteristics that differentiate them from bicycles or planes.

Schematic Knowledge: I know about the spatial layout of cars and I also have a general "script" for driving cars. Conceptual knowledge therefore is knowledge you construct for yourself from your own experiences.

4. ANALOGICAL KNOWLEDGE

Analogical knowledge is the type of knowledge that preserves specific correspondences between what is out there in the world and what is inside your head. For example, the knowledge about your mother's face is not general, categorical knowledge of "mothers". Nor is it declarative knowledge of how mothers are identified across cultures. Nor is it procedural knowledge of how your mother interacts with you. Analogical knowledge of your mother is the knowledge that captures and preserves your mother's uniqueness.

5. LOGICAL KNOWLEDGE

Logical knowledge differs from procedural knowledge because it arises from the exercise of one's own reasoning, not from automating a skill. Logical knowledge is characterised by a "feeling of necessity" as Jean Piaget termed it. Logical knowledge is also different from conceptual knowledge which may have no reasoning behind it. I can formulate a concept about anything, provided that I have experienced instances of it, without the exercise of logic.

Metaknowledge
Knowledge about all the above forms of knowledge is called metaknowledge. It has been termed "thinking about thinking", "knowing about knowing", "knowing how to know", and "learning how to learn" We think of metaknowledge or meta cognition as being on a higher level than ordinary knowledge. Therefore, metaknowledge is secondary to the existence of one or several of the five types of knowledge mentioned above. The absence of metaknowledge arises from a lack of knowledge rather than from lack of maturity (Cultice, Somerville and Wellman 1983). Some examples are given in Table 1 below.

TABLE 1. Examples of Metaknowledge

- Knowing that a fact is or is not in long-term memory.
  e.g. knowing that you won't know Charles Dicken's telephone number.

- Knowing you will recognise something when you see it.
  e.g. knowing you will recognise the correct spelling of a word.

- Knowing there are categories of tasks.
  e.g. knowing that multiple-choice tests are all alike in certain ways.

- Knowing that the results of one procedure should be consistent with the results of another. e.g. knowing that 3 + 4 should equal 4 + 3.

- Knowing that your own words are easier to recall than an author's words.
  e.g. Knowing it will be easier to say what this Table is about than to recite it word for word.

- Knowing how much study time will be needed.
  e.g. Knowing how to schedule homework.

- Knowing when a study strategy will be needed.
  e.g. Knowing when to hire a tutor.

- Knowing when memory aids will be needed.
  e.g. Knowing when to write down directions.

- Knowing which part of a task will need to be rehearsed.
  e.g. knowing that you should drill the names of the Australian Prime Ministers for a history test.

Source: Farnham-Diggory, 1992, p 81

D. BEHAVIOUR (OUTPUT)

The final stage in the learning process, the proof that we have learned something, is the output. Behaviour expresses what has been learned and is usually expressed either through language (spontaneous, demand, social), or through muscular activity - motor output such as writing, drawing, gesturing, sports, gymnastics, trade skills etc.

LEARNING DISABILITIES

A learning disability is a "short-circuit" or dysfunction in one or several of the components in the system architecture. Thus, a dysfunction in any step may interfere with subsequent steps in the learning process, and results in a discrepancy between the individual's potential ability and academic performance. Any learning task involves more than one process and any learning disability can involve more than one area of dysfunction (Silver 1992). As we have seen there are four stages in the learning process:

1. **INPUT** (sensory information is processed and interpreted)
2. **MEMORY** (information is used or stored for later retrieval)
3. **INTEGRATION** (connecting old to new information, drawing conclusions, planning)
4. **OUTPUT** (information must be sent out through language or motor activities)

1. DISABILITIES AT THE INPUT STAGE

A learning disability at the INPUT stage results when the information from the environment is misperceived. These misperceptions do not pertain to visual or auditory acuity. Thus, a person with perfect hearing or vision may still have auditory or visual perceptual disabilities. **"It's not what you see but how you perceive it."**

Sensory integrative disorders are also common at the input stage. Tactile (input from the skin), proprioception (input from the muscles) and vestibular (input from the inner ear) disorders interfere with awareness of the body and body movements. Depending on which sensory systems are involved, a person may have problems with tactile sensitivity, adaption to the position of the body in space and difficulty performing activities in a smooth, coordinated manner in the right sequence of activities.

Perceptual difficulties often leave the individual / child feeling confused, anxious and frustrated. Self doubts set in when one cannot trust one's perceptions. An individual or child whose perceptions are inaccurate, inconsistent and misleading lives in an unstable and unpredictable world. A tremendous amount of conscious effort is required to override distorted visual, auditory and tactile information. And it takes a great deal of persistence and intelligence to overcome them.

1.1 Visual Perceptual Disabilities

An individual with visual perceptual disabilities has difficulty organising the position and shape of what is seen. The individual may:

a) Reverse or rotate letters, numbers, words and even sentences when he/she is reading, copying or writing "E" is seen as "3", "w" as "m", "dog" as "god; "+" sign as a times sign; OR

b) Have difficulty with figure-ground (focusing on a significant figure instead the rest of the background) causing him or her to be unable to track left to right, line by line , or to skip words, read the same words twice, see two words as one, one word as two or skip lines. When doing maths worksheets, an

individual may place the answer under the wrong problem or add part of another problem to the one he or she is doing.

c) This individual may also misjudge distance or depth or position in space, bumping into things falling off the chair, or knocking things over when reaching for them. These children/adults are often labelled clumsy or uncoordinated when the real problem is one of visual perception.

1.2 Auditory Perceptual Disabilities

These difficulties include:

a) Difficulty distinguishing the subtle differences in sounds or phonemes, confusing words that sound alike (ball and bell, can and can't). Children may answer your question about how they are by giving you their age because they are unable to perceive the identity, number and order of sounds within words.

b) Trouble picking out sounds from the rest of the background (auditory figure-ground). A child or adult watching TV while others in the room are talking may not realise that your voice (the figure) is important from the other voices (the background). These individuals are often thought of as inattentive or poor listeners. Actually they are paying attention to too much!

c) Auditory Lag (inability to process sound inputs as fast as most others can) where individuals need to re-ask questions that have already been answered. They "stall" for time to think about and respond to what they have heard. Or they may be only be hearing part of what is being said.

1.3 Sensory Integrative Disorders

These disorders manifest themselves in the following ways:

a) **Tactile Sensitivity:** From an early age these children may be tactually defensive and resist being held or cuddled. They may complain of the tag on their clothes, the belt being too tight or prefer to wear socks inside out, complaining that the seam bothers their feet. Others may crave body contact and might walk around the classroom touching other children to the annoyance of the children and the teacher.

b) **Proprioception Deprivation:** Causes confusion of the body in space and may also involve poor muscle tone, muscle planning and difficulty maintaining posture. Thus, a child may have difficulty keeping his / her balance or running, jumping, climbing, buttoning or tying shoelaces and knots.

c) **Vestibular Perception:** Which is necessary to tell where one's body is in space, to know how to handle gravity, and how fast he / she is moving may also be distorted. These children often run when they are supposed to walk or love spinning in chairs or on swings.

1.4 Social Perceptual Disabilities

People with a perceptual disability also misperceive social cues and body language . They may misinterpret gestures facial expressions, and tone of voice or they may not notice them at all. These are the children / adults who go too far and don't know when to stop at home, in the classroom or at work because they do not pick up when someone is annoyed with them.

2. MEMORY DISABILITIES

The next stage in the learning process is to take the information that has been received and integrate it or store it for later use i.e. we must remember what we have learned. As we already know there are two types of memory: working memory and long term memory.

Working memory has been defined as anywhere from a few minutes to 24 hours. In this process information is stored and held by the method of concentration and repetition. Long-term memory can be anywhere from a few minutes to over 24 hours and is the process by which information is stored after many repetitions for quick access upon thinking about it.

Individuals with LD's usually have adequate long-term memories. Once they have learned something they usually retain it, especially if the information is interesting and meaningful. They certainly have excellent long-term memories of their past failures!

In LD individuals, memory disabilities are more likely to be in the working memory category. It may take 10 to 15 repetitions throughout several days to retain what the average person retains after 3-5 repetitions on one occasion.

Working memory disabilities may occur with information received visually and or aurally. A child may understand his or her homework until it's time to do it at home or individually. Then he or she can't remember how to do it.
(Likewise, for an adult learning a new process at work). For example, repeated practice for a spelling test at home may still result in failure on the test at school the next day.

It is therefore no surprise that LD individuals with working memory problems are often tempted to give it up! Trying to retrieve information you know you know is very demanding on energy and also time consuming.

3. DISABILITIES AT THE INTEGRATION STAGE

The third step in the learning process is to understand the information received through the senses. This process of integrating the inputs, of understanding what the brain has recorded requires sequencing (organising information in an order that makes sense), abstraction(inferring meaning from the words of symbols) and organisation (information must be integrated with new incoming information, and it must also be related to previously learned information).

3.1 Sequencing Disabilities

Since information is received through two main pathways: visual and auditory. Some people might have a visual sequencing disability or an auditory disability.

An individual with a sequencing disability might have trouble recounting a story in order, or will spell words with all the correct letters, but in the wrong order. Or a child might see a maths problem as 16-3 = ? on the board, but write it as 61-3= ? on paper. While they may be able to memorise a sequence i.e. days of the week or months of the year, they may be unable to use the sequence.
For example they may be unable to tell you what comes after Tuesday, or 19, without going through the whole sequence.

3.2 Abstraction Disabilities

The inability to understand jokes or humour based on a play or words is an example of an abstraction disability. These individuals misinterpret the actions and intentions of others taking things literally, and have difficulty generalising. Often these individuals are thought to be rather "narrow minded" in their understanding of words, particularly those with more than one meaning.

3.3 Organisational Disabilities

Nearly all individuals with learning disabilities have organisational problems. While they may be able to take in information, such as a series of facts, they are unable to answer a question using those facts. These individuals have difficulty pulling together multiple parts of information into a full concept or "gestalt". Organisational disabilities are easily recognised when observing these individuals. Their desks, folders, reports, bedrooms, etc. are in constant disarray. Homework, books, pencils, reports, spectacles etc. are often left at school or work when they are needed at home and vice versa.
Time management is also a major issue with these individuals. They have a poor sense of time, both immediate and historic.

4. DISABILITIES AT THE OUTPUT STAGE

The final stage in the learning process is (the proof that we have learned something) the OUTPUT. It involves being able to express in some way what has been learned. Information is expressed either through language by means of words; or through muscular activity such as writing, drawing, gesturing or physical activity.

4.1 Language Disabilities

There are three forms of language used in communication:

a) **Spontaneous:** Where one initiates whatever is said and has the opportunity to select the subject, organise thoughts, and choose the correct words before saying them.

b) **Demand:** A language situation where the person is asked to respond to a question or is required to communicate. In this situation there is no time to organise thoughts or to find the right words. The person must simultaneously organise, find words and answer more or less appropriately. While LD's individuals usually have no difficulty with spontaneous language, they do have problems with demand language. For those with a language disability, it is like being in a pressure cooker.

c) **Social:** Used when carrying out a conversation with peers and others, or when asking for help or getting needs met, or communicating information to others.

Language is perhaps the most complex and difficult of all learning tasks and is the most difficult to remediate. Language disabilities place a person at risk of failure at school, work, and in social situations. Individuals with a "demand language" disability are able to talk on and on with a great deal of intelligence and expression about a wide range of topics, and then freeze when asked a question. They will often mumble, ask for the question to be repeated to gain time, or not answer at all. If forced to answer, the response may be so confusing and jumbled, or vague, that you are not able to understand it. It's hard to believe that this is the same person who was speaking so fluently a moment ago.

4.2 Motor Disabilities

If an individual has problems coordinating the use of large groups of muscles (arms, legs, trunk) this is known as a gross motor disability. Difficulty in performing tasks that require coordinating groups of small muscles (fingers, toes) is called a fine motor disability.

a) **Gross Motor Disabilities:** Children with gross motor difficulties may appear to be clumsy, fall, bump into things or have trouble with generalised physical activities such as running, climbing or riding a bike.

b) **Fine Motor Difficulties:** These are more complex and frustrating. They usually show up when a child begins to write and needs to get the muscles in the dominant hand to work together in a cooperative and coordinated manner. Some children have difficulty establishing a dominant hand and mixed dominance is a frequent occurrence in LD children. Their writing is slow and their hands tire easily because of an awkward pencil grip. The writing task requires a tremendous amount of energy and stamina. Additionally, everything about their handwriting is messy i.e. shape, size, spacing and positioning of letters and looks awful no matter how hard they try. It's almost as if the hand cannot write as fast as the head thinks.

   For those with a written language disability in addition to the mechanical aspects of writing, they have difficulty getting thoughts onto paper, making frequent spelling, grammar, and punctuation errors. LD individuals who can tell creative and detailed stories or create excellent verbal reports, often produce written work with incomplete sentences, words in the wrong order, or with key words omitted or misspelt.

c) **Visual-motor Problems:** Quite often a person with visual perceptual problems has motor problems as well. This is referred to as a visual-motor disability. If the brain receives information that has been misperceived, then incorrectly processes and records it, it may misinform the muscles that require eye-hand coordination. These are the children who cannot copy from the board fast enough and rarely finish class work or homework. In order to copy from the board, one has to first look at the word (visual perception) then retain it in visual working memory and finally write it on paper (fine motor activity). Thus, LD individuals with visual perception, visual working memory and fine motor disabilities may have to copy one word at a time, and it is no surprise that they never complete work.

A written language disability is very frustrating and can be very serious since most schools require students to put their thoughts down on paper for the purpose of grades, and employers require their employees to be able to communicate in writing.

Therefore, learning is a complex process. A learning disability can occur at any or several of these stages. If what you are seeing, hearing or feeling is confused or distorted, and you cannot trust your brain to understand or store the necessary information and then be able to express it, then it's little wonder that you might begin to doubt yourself or become frustrated! Many of the behavioural characteristics exhibited by LD children/adults are the results of the confusion and insecurity they feel because of their difficulties. These behaviours further exacerbate their learning problems. These disabilities manifest in the following behaviours summarised below.

TABLE 2. Common Characteristics in Individuals with Learning Disabilities

- Reading and spelling problems.
- Weak oral language including:
  - Inability to tell a joke
  - Inability to understand cause and effect.
- Unable to respond to explanations given in language i.e., they learn better when shown.
- Weak reading comprehension i.e. inability to recall what they have read.
- Need to re-ask questions that have already been answered.
- Unable to grasp the main idea or inferences from TV shows although they may get a few details.
- Inability to abstract i.e. missing the point and taking information literally.
- Weak expressive language including: inability to express themselves; lack the ability to gesture; may be verbal but their verbalisations are scattered and difficult to follow (ramble on without getting to the point).
- Weak writing skills - poor organisation, unfocused, sees only parts and not the whole.
- Messy handwriting or avoidance of written tasks.
- Delayed speech or language.
- Poor organisational skills in daily living.
- Loses attention quickly in conversations or lectures.
- Poor concentration, easily distracted or fatigued.

- Impulsivity
- Weak auditory memory and poor at following directions.
- Difficulty remembering multiplication tables or other rote memory tasks.
- Difficulties with mental arithmetic.
- Poor self-esteem / lack of confidence.
- Depression / mood changes.
- Weak sense of time both immediate and historic.
- Weak sense of direction.
- Confusion with right and left.
- Poor at judging size and distance.
- Behavioural problems i.e. acting out / withdrawing.
- Poor sequencing ability, has difficulty ordering information, not knowing where to start solving a problem and / or not knowing where, when or how to ask for help.
- Confusion when presented with multiple pieces of information.
- Misinterprets actions or intentions of others.
- Slow in processing information i.e. slow reaction time, takes a long time reading, writing, talking, thinking.
- Lack of changes in facial expression i.e. does not show emotion.
- Perseverates ie repetitive, resists changes in routines.
- Poor coordination both gross and fine motor.
- Poor peer relationships. Has difficulty relating in interpersonal relationships; has few friends; often in fights.
- Difficulty making decisions.

All individuals exhibit some of these behaviours at some stage. The presence of one or two may not be significant, but a cluster of these behaviours requires further assessment. No two LD individuals are the same and therefore should not be compared. Individuals with LD's are often of average or above average intelligence, yet they seem unable to learn or make sufficient progress in school, careers or business.

IMPACT OF LEARNING DISABILITIES

Learning Disabilities are life-long and pervasive. They affect academic, social and family life, self esteem and employment opportunities. The resultant stress they experience leaves them feeling tired, unmotivated and overwhelmed.

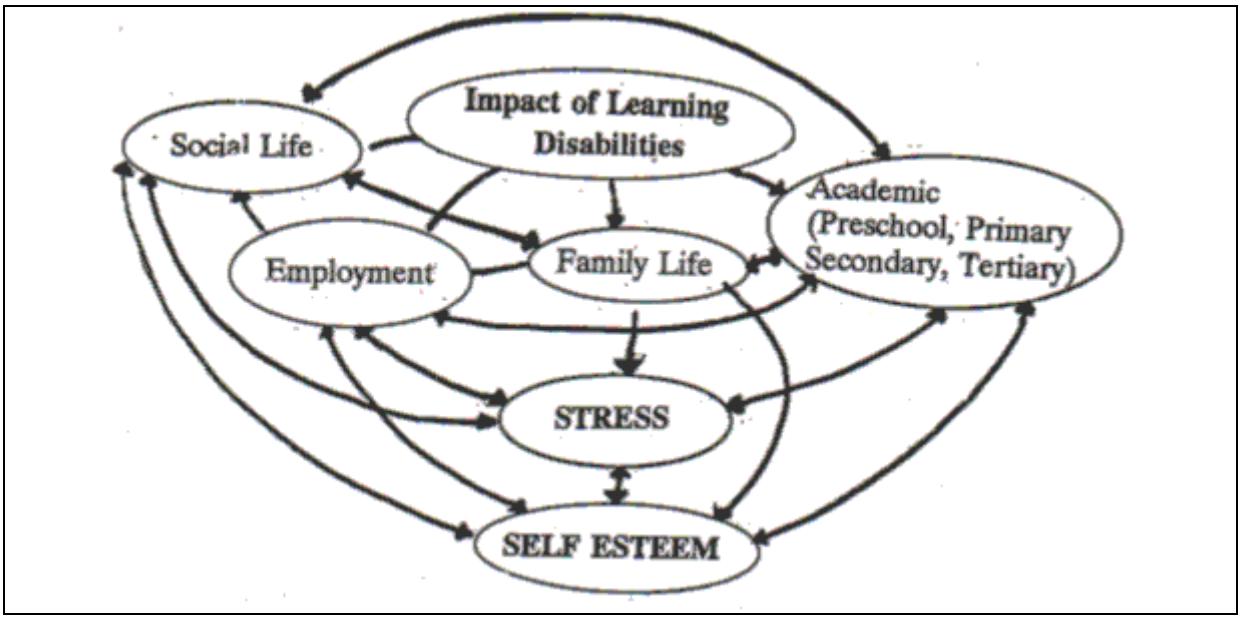


Diagram 3 : Impact of Learning Disabilities

1. ACADEMIC

Academic success for the LD child orindividual often depends on two vital factors

1. The acquisition of literacy and numeracy skills at a level that will enable him to access information efficiently and express himself in the written form and
2. The preservation of self esteem, motivation and confidence.

Many LD children who fail daily in academic settings understandably develop avoidance strategies. School phobia, truancy, aggressive and disruptive behaviour, withdrawn detachment, the creation of fantasy worlds, limitation of expectations and "dropping out" are all strategies to relieve anxiety and stress.

It is not uncommon for individuals with LD's to get stressed when they have failed and people say, "Never mind, you did your best". They don't want to fail when they know they have done their best. Therefore, if they think they are going to fail then they won't do their best so when they do fail they can think, "Well, I didn't try".

It is important to remember that "there is no positive reinforcement more effective than success" (Frostig and Maslow 1973).

Since literacy and numeracy skills dominate the school day at every level of education attention to these is vital as early as possible. LD individuals know they have to work harder than their peers to reach their potential. The enormous effort required of them has to be experienced to be appreciated. Homework is tedious as the amount of time to complete assignments is usually ten times as much as for normal children. "If it takes around 100 hours for a normal child to master a skill, it takes a LD child 1000 hours to reach the same level" (Fawcett 1995. p 26). It gets even worse as the number of hours for a normal child to learn a skill increases!

"Unless basic skills are taught before the child reaches secondary school, the gap between his level of ability and that of his peers will have widened to the extent that catching up will be an almost impossibly long and demoralising process" (Thomson 1995, p 46).

Therefore strategies and skills must be taught and practised early if they are to become automatic and lay the foundations for the work that underpins the more formal secondary curriculum. Failure to acquire the basic skills essential for academic progress usually leaves the brighter child more inclined to adverse emotional reactions, which further block his capacity to learn. The inability to capitalise on potential, to express ideas concisely, tell inventive stories plausibly, or to communicate original concepts is a major source of stress.

2. SOCIAL

Inadequate communication skills are as much a social as an academic disadvantage. Efficient and well developed listening and expressive language skills are the basis of effective communication. The LD individual struggling to keep up with the conversations of others, to frame his own interjections and to follow the train of thought, often fails to appreciate or even notice body language, facial expression or tone of voice. He fails to anticipate reactions, does not realise that he is inviting anger or criticism, and is aggrieved at the response he receives because he has not recognised the warning signs. Complaints about his inappropriate language and comments can lead to trouble or misunderstandings in all areas (school, home, work). Adolescents in particular, are inept at choosing appropriate clothing, mixing and matching colours and patterns, and the ridicule of their peers because of their odd appearance adds further stress. The key requirements are sensitivity and understanding. Combining realism and encouragement and responding to tense situations with a sense of humour are vital. Social skills are best learned from the peer group through games and role-plays.

3. FAMILY

Several factors create stress in these families. Five main sources identified by research (Saunders 1995) are:

1. The age of the person when LD's were first discovered (child or adult).
2. The facilities for educational remediation.
3. The "excess emotional baggage" which various members of the family have endured before the identification.
4. Sibling factors.
5. The state of the marital relationship and the amount of marital discord.

Parents are often frustrated by their inability to "find the answer" and are vulnerable to those who promote simple treatments which will make their child better. They are sometimes presented with a bewildering range of options for the treatment of learning difficulties. The most common complaint reported by parents is ignorance on the part of professionals as to the depth of the problems they experience. Lack of acknowledgment and an unwillingness to help means parents are left alone to battle and put the pieces back together in the child's life. The resultant stress in parents from feelings of isolation and guilt at being unable to stop the mental and emotional turmoil their children are experiencing leaves many parents feeling desperate, depressed and defeated and willing to try any treatment programme promising success. The entire family is caught up in the long slow battle for recognition. The LD Coalition of NSW is an excellent source of support for parents.

4. EMPLOYMENT

Almost all jobs require the completion of an application form. Given the organisational and sequencing problems faced by most LD individuals some find it so daunting that they do not manage to get past the point of looking at the form! To complete a form, a person must try to fit his knowledge into the "straight-jacket of someone else's structure" and this is very difficult for the individual with learning difficulties. At best it raises the level of stress or at worst it is never done.

The major reason for this is the amount of time to:

1. Conceptualise each entry in a manner that suits the form and
2. Ensure that the items being entered are accurately done with a pen.

Further, it is now recognised that a large percentage of LD individuals do not work well with a pen and the advent of computers has made this inability to use a pen even more widespread than before. However, you cannot put an application form into a printer especially since the whole purpose of the form is to create an impression!

Thus, the stress of finding suitable employment begins from the very beginning, filling out the application, the interview, the first days, coping with the job (or coping with trying to hide the problem!), right through to promotion. It isn't just application forms which cause stress. Forms of any description will do it i.e. order, expenses, internal requisitions, accident report, stock control forms. With promotion come even more sophisticated forms such as: performance reports, financial data, extracts from the customer database, planning projections, records of meeting to name but a few. Promotion usually involves further training, examinations and interviews and this in itself cause such intense anxiety many individuals do not bother going through the process. Hales (1995) suggests the following strategies for employers of individuals with LD and for LD employees.

Signs employers need to look for:

- Someone who is apparently much more anxious than the job warrants.
- Someone who avoids particular situations, such as never at staff meetings, or never writes memos.
- Any pattern of absenteeism.
- Refusals to take training.
- Unwillingness to consider promotion opportunities.
- A greater level of fatigue than seems to be likely.

Employees with learning disabilities should:

- Work out the implications of telling people about their difficulties.
- Plan beforehand how they will explain it and what they will suggest.
- Try to organise their working lives to minimise the most stressful situations.
- Arrange to "get-away" from time to time to consolidate data.
- Realise that stress is involved and learn something about managing it.
- Seek cooperation and help where necessary: don't be too proud.

Employers should do the following:

- Understand that Learning Disabilities have nothing to do with intelligence or ability
- Realise that some alterations of working practices may be necessary (although these will lead to improved performance)
- Allow time for short breaks to consolidate information
- Know that for many LD people life and work are a trade-off between speed and accuracy; both are usually not possible at the same time

(Source: Hales 1995 in "Dyslexia and Stress", p 87)

It is time that the community realised that this is not a minor problem that can be ignored, but rather something that exists in major proportions and affects a substantial part of the adult and working population. We need to remember that these individuals are not intellectually deficient, they are not odd and they are by no means inadequate workers. Employers need to adopt the slogan "Stress-free learning disabled workers are very good workers" (Hales 1993) since many of the strategies that could be interpreted as "work-skills" are often an extension of "life-skills", because the interaction of these skills is just the same as for everyone else.

5. SELF ESTEEM

Self esteem refers to the sense of self respect, confidence, identity, and purpose found in an individual. It distinguishes the highly productive person form the non-achiever or the "drop-out".

Individuals with LD's: lack this sense of self; are afraid to take risks for fear of failure, ridicule and repercussions; lack the ability to acknowledge their own strengths; respond to challenges by blaming others or excusing themselves; and lack the resources for achieving their goals.

As we are all aware, children value themselves to the degree that they have been valued. A positive identity hinges on positive life experiences. "The key to inner-peace and happy living is high self esteem, for it lies behind successful involvement with others" (Briggs 1975, p 26).

We can begin by looking in the mirror because we are the psychological mirrors which children use to build their identities and their whole lives are affected by the conclusions they draw. What do we expect from them and why?
"Children rarely question our expectations; instead, they question their personal adequacy" (Briggs 1975, p 49). However, this does not mean protecting them from difficult situations, accepting inferior quality responses or providing excuses when they get into trouble. It means building the foundations for a high self esteem by creating environments that impart a sense of security, identity, belonging, purpose and personal competence. We cannot allow LD children to be alienated by ridicule, to have their self confidence destroyed by sarcasm, and to be further demoralised with unsympathetic attitudes.

"We need to praise their **effort** and **direction** rather than demanding **perfection**" (ADHD Conference 1995). Readers are directed to Wells and Canfield's "One Hundred Ways to Enhance Self-Concept in the Classroom" and D. Corkille Briggs', "Your Child's Self-Esteem" for practical and heuristic strategies.

6. STRESS

The sheer amount of effort needed just to keep pace with life- continually running on a treadmill just to stay in one place in a range of skills that others acquire with ease- is a constant source of stress for individuals with learning difficulties. It is our task as parents, teachers and health professionals to prepare children for the stress and to show them how to cope with it. It is also important that levels of stress be monitored and controlled. Alleviation of stress at an early age through appropriate teaching and more resources allocated for primary school could well pre-empt the much more serious social problems from developing. The result of unresolved learning disabilities include juvenile delinquency, long-term unemployment and the vicious cycle of poverty. The greatest stress reducer comes after the awareness of the condition, when the child/adult, with the proper teaching, begins to learn how to learn.

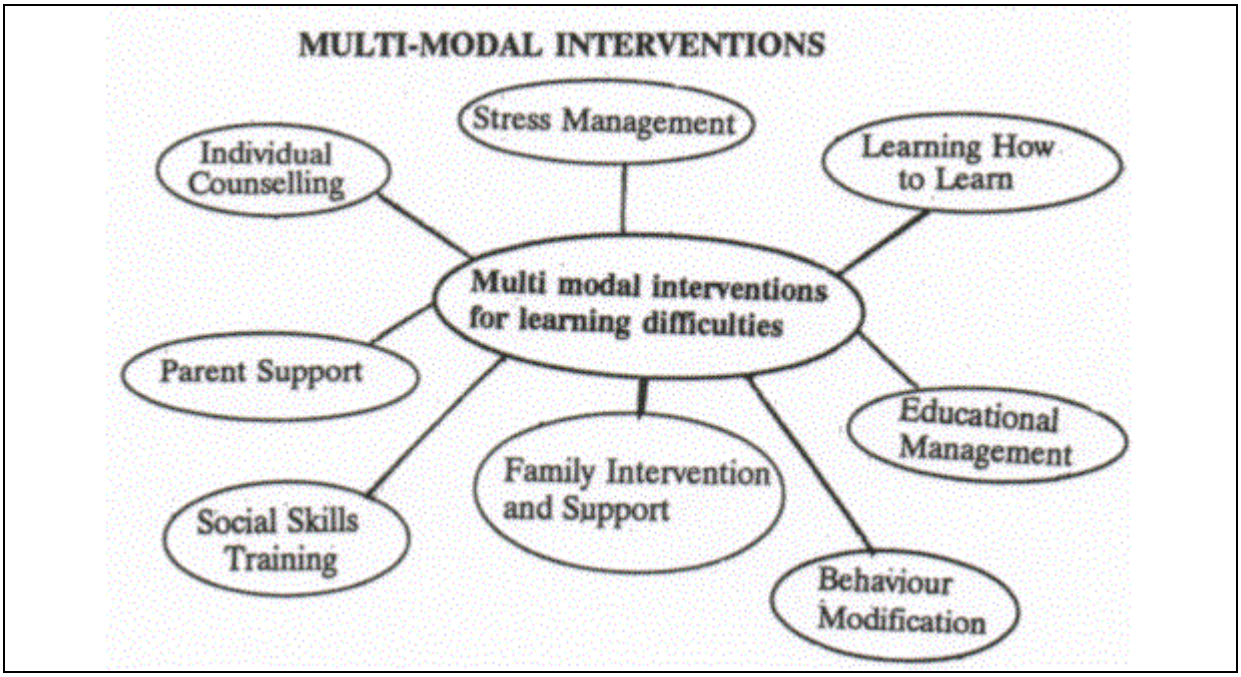
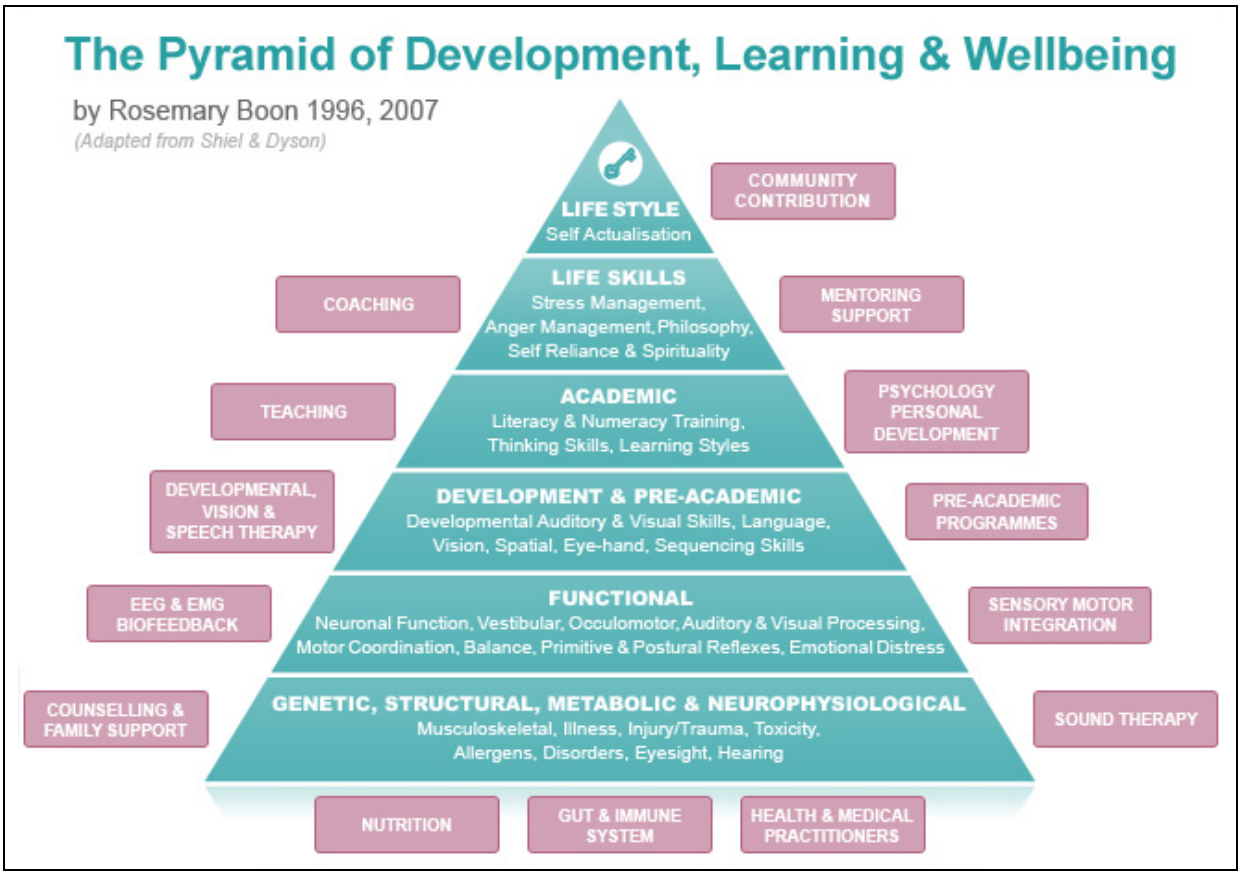


Diagram 4 : Multi – Modal Interventions

Diagram 5 : For further clarification see the "Learning Pyramid"



LEARNING HOW TO LEARN

Cognitive science is now confirming what teachers have always intuitively known: that working memory "is the gateway to long-term memory" and that nothing can get into long-term memory unless working memory puts it there. Likewise nothing can get out of long-term memory unless working memory gets it out.

The learning task is a dynamic activity and the storage and retrieval of information is of paramount importance. Some sort of working memory program must be constructed. Goals must be set, cues need to be picked up, relevant knowledge must be retrieved, movements or speech executed, and progress must be monitored. This is true of all learning (declarative, procedural, conceptual, analogical or logical) and regardless of the different types of learning task.

Therefore, the key to teaching students with LD's involves coaching them to develop improved working memory programs for the learning task at hand (Farnham-Diggory 1992, p 85). This is what is meant by the phrase "learning how to learn".

The acquisition of declarative knowledge i.e. learning from verbal discourse (lecture or text) is a dynamic and complex enterprise. It requires picking up information segments (clauses and sentences) and decomposing them into subjects, predicates and modifiers to represent (schematise) its meaning, building connections between them (deleting irrelevant information and constructing the main idea/macrostructure) and formulating a summary representation of the whole (Kintsch and van Dijk 1978). Modelling our own processes is the best way of teaching this kind of knowledge.

A major implication of the Kintsch and van Dijk model is that the macrostructure is the key to memory. To remember something, first summarise it to solidify the macrostructure. LD students have great difficulty producing a coherent summary, indicating this difficulty with building a coherent macrostructure. No wonder they do not remember what they read or hear. This fact has been repeatedly demonstrated experimentally and teachers and parents experience the frustration of constantly repeating instructions. Teaching individuals with LD's to summarise effectively using mind maps etc. is thus vital.

Skills acquisition or procedural knowledge includes three learning phases:

1. Analysis;
2. Practice to the point of automaticity and
3. Attention management.

In the process of learning a skill, you go in and out of these phases repeatedly. Each of these phases has its own logical requirement, and they are not interchangeable.

Task analysis is a means of clarifying and elaborating working memory programs.

Practice to the point of automaticity frees up working memory to attend to other features of the task (Shiffrin and Dumais 1981). Characteristics of an automatic routine are summarised in Table 3. It takes time to reach this point of "overlearning" and is the major reason why LD individuals are doomed to a life of illiteracy. They are seldom given the time to reach the point of automatic decoding before they are required to comprehend what they read. This lack of automaticity is also seen in their handwriting which is often illegible.

TABLE 3. Characteristics of an Automated Routine

Requires no working memory capacity, is not consciously monitored

- Must begin and end at fixed points
- Must run itself off to completion, difficult to start in the middle or to recover from interruption
- Extremely difficult to modify

(Source Shiffrin and Dumais 1981)

When an action becomes automated, chunking of perceptual information, motor actions and knowledge will have occurred. Knowledge is in packages, cues are in patterns and behaviour is in chains. Thus, a symbol in the immediate work span must control a large amount of information. Consider the highly automated activity of signing your name.

Once a routine is automatic, the immediate work span has room to attend to important aspects of the learning task such as comprehension. And, whenever learning is involved, the main thing to learn is how to manage attention and here is where EEG biofeedback is an effective learning strategy.

As we already know, attention is a multidimensional construct which refers to arousal, selectivity, sustained attention (vigilance), and distractibility among others. LD individuals can have difficulties with any of these types of attention. Attention management involves the construction of higher-order timesharing programs already discussed. It is easier to switch your attention to something, rather than switch it away from something. In effect, "When this-and-this happens, switch your attention here". When that-and-that happens, switch your attention there". Learning to construct attention management timesharing programs is a function of working memory and essential to skill development. Individuals with LD's need the explicit teaching of effective strategies in order to develop this knowledge.

Procedural learning therefore requires intense effort and no learning can take place without this effort. Each phase is essential. Analysis without practice, and/or blind practice without understanding and analysis makes learning ineffective. Effort alone will leave you wallowing in confusion if you don't gain control of your attention. However, the sheer effort involved in vast amounts of practice often leaves LD students mentally drained and physically exhausted. Shorter, more frequent revisions and practice are necessary for them to acquire automaticity.

Conceptual learning (categorical and schematic) is an inductive process - knowledge is formulated from examples and experience and not through declarative instruction. It is bottom-up learning and data driven. Conceptual knowledge is thought to be acquired by complex unconscious processes something like averaging. Categorical knowledge comes into existence as a result of everyday experience when objects or events are discovered:

a. to share common features;
b. to evoke common movements and
c. to be similar in shape (Roach 1978).

Schematic learning involves three processes and these are:

1. Accretion;
2. Structuring and
3. Tuning.

Accretion works by building on old events thus strengthening them and recording new events.

Structuring refers to the process of creating new schema from bits of old ones.

Tuning refers to higher-order schema (as many as three levels) that guide construction of specific schema as opposed to general schema. Formal education is transmitted in the declarative form and thus LD children have great difficulty with concept formation particularly in language and mathematics.

Analogical knowledge is knowledge that preserves the physical pattern of what is known, as an image does. Strictly speaking, analogical knowledge isn't learned. It is acquired instantly and automatically through the activation of the senses. It is the capacity to register sensory patterns that have one-to-one correspondence with real world patterns. These are generally images. Learning to use imagery is of special importance in the fields of technology and art. A main advantage of analogical knowledge is that it incorporates details you didn't realise you had acquired. "In your mind's eye", or "map in your head", are sayings that refer to this type of knowledge and are vital for language comprehension. LD and ADHD individuals do not realise what they know. Extracting that knowledge by using the Visualising and Verbalising Program teaches them to utilise it effectively to make the connections necessary for understanding events.

Logical knowledge is a causally interrelated system of beliefs. According to Piaget it is acquired from the challenges of being in the world. From birth, we must figure out how the world works and this compels us to organise whole systems of ideas. New logical knowledge is acquired when the total system is challenged or perturbed and the total system must then be reconstructed. Curricula that purport to "teach reasoning" fail to realise that their students have been reasoning since the day they were born! What they are referring to is the complex logic of maths, science, economics etc. and they assume such instruction begins from scratch.

The course of long term memory development is different for the five different types of knowledge. Procedural knowledge is acquired from birth. Declarative knowledge does not begin to grow until about 1-2 years of age. Conceptual knowledge is present as early as it can be measured and increases hierarchically with experience. Analogical knowledge can be acquired from birth, but the ability to utilise it increases with age. Logical knowledge is present in infancy but comes into existence gradually.

Metaknowledge can occur at any age as a function of familiarity and experience. For individuals with learning disabilities to acquire metacognitive skills (self appraisal and self management) the teacher needs to model the skills, coach her students as to when and how to use them and employ scaffolding techniques until they are mastered. This allows students to gain conscious access to and control of their own cognitive strategies and leads to articulation and reflection whilst encouraging learner autonomy.

EDUCATIONAL MANAGEMENT PRINCIPLES

The suffering that is endured by learning disabled individuals in the current school system and the attendant psychological scarring is hard to quantify, but it impacts on their motivation, their emotional well-being and possibly their behavioural stability. To break this destructive cycle we need a better theoretical understanding which will defuse the guilt and blame, and allow the individual, the parents and the teachers to concentrate on the more important task of improving the skills and thereby improving their self concept. There is no magic cure for learning disabilities, there is only the hard work of remediation and hard work on the part of the individual, the parent and the teacher and the use of effective programs and strategies.

Every child has the right to learn no matter how different they are. Every child has the ability to learn, we just need to find the right keys. These keys include the right educational environment and the right teacher. Teachers who continue to "pound away" at teaching strategies that have failed in the past because they are inappropriate, are guilty of what Saunder's terms "academic abuse".
It shows poor judgement and is a waste of student and teacher time.
Schools that are aware of the difficulties but fail to adapt to accommodate these students are also guilty as Margaret Rawson (Editor Emeritus of Annals of Dyslexia, published by the Orton dyslexia society) says, "diagnosis without treatment is criminal".

The educational management of children with LD's is a whole school responsibility and is a collaborative venture between teachers, parents, students, psychologists, speech therapists and medical professionals. It begins with being aware of the need to change in order to support these individuals in their classrooms. The support of the principal is vital in order to facilitate the creation of a trusting and caring climate within the school. The commitment of teachers to educate themselves to become aware of recent research in the field and to then base their teaching strategies on that research is essential. Consultation with LD students is the best guide to tailoring a program that best suits their needs. Involving parents and maximising school and community resources is of paramount importance.

Katherine Spencer (1994), as part of her Certificate of Integration Studies at the University of NSW has published a booklet through the LD Coalition, "Helping Students With Learning Difficulties Through Adaptations and Accommodations: A Guide for Teachers". It is highly recommended for those wishing to make a difference to these students. Current research into the effectiveness of these strategies is being conducted by Dr Loretta Giorcelli (UNSW) in 1995 Sydney schools. Preliminary data is encouraging. The principles on which the study is based are summarised in the diagram below.

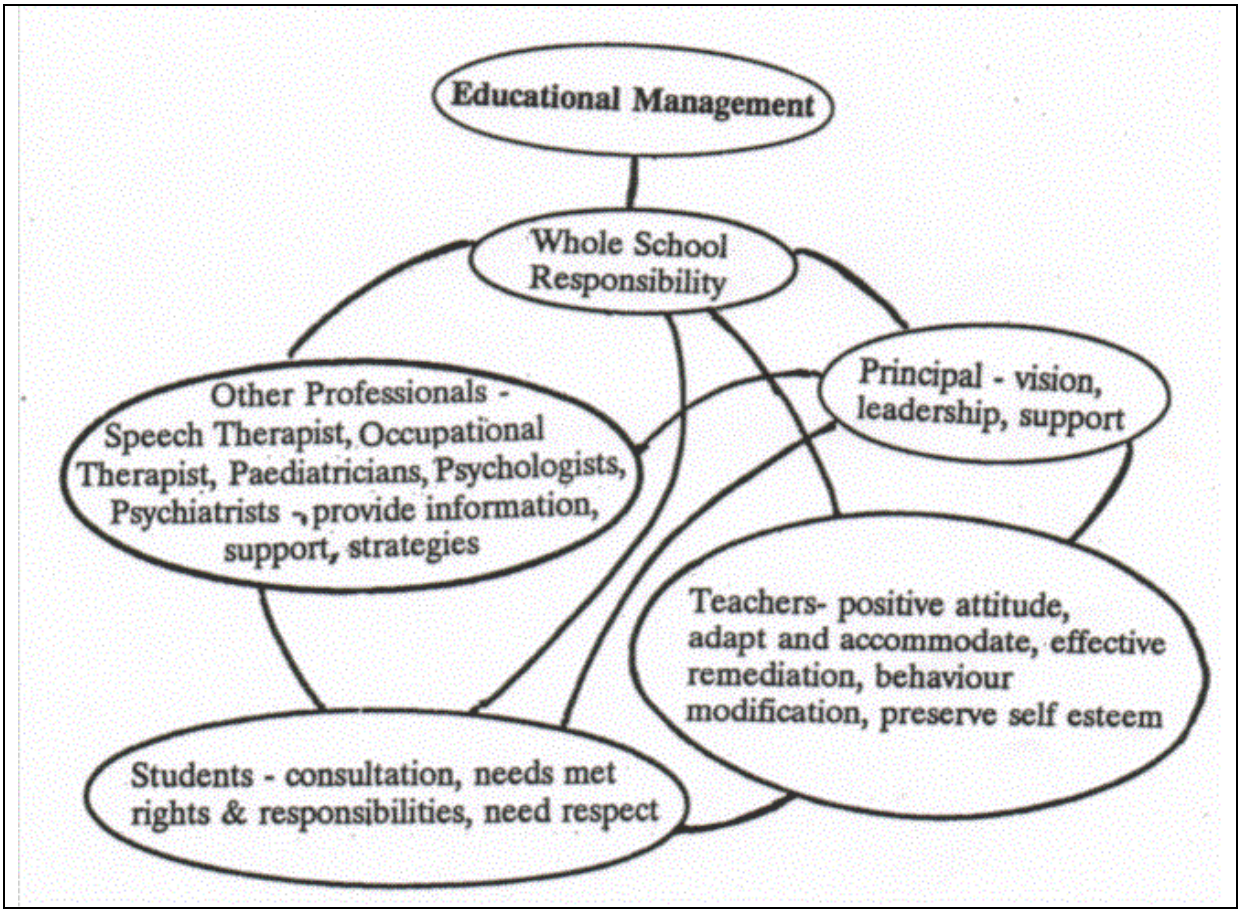


Diagram 6 : Educational Management

Whole School Responsibility:

- Principal (vision, leadership)
- Teachers (flexible learning environments, effective teaching strategies, behaviour policies, support structures)
- Parents (consultation, collaboration, support)
- Students (active participant, responsibility for own learning)
- Other Professionals (collaboration, expertise)

Therefore teachers need to:

- Have access to clear, concise, practical and up-to-date information.
- Change their attitude.
- Alter their style of teaching to become more effective.
- Change the presentation of curricula.
- Adjust the pace and frequency of instruction.
- Use different materials and resources (multi-sensorial).
- Employ effective behaviour management strategies.
- Be given the time to consult with peers, other professionals and attend inservices.
- Look at the issues of in-class grouping, grading, homework, assessments, testing, reporting to parents (Source: Spencer 1994, Giorcelli 1995).
- Preserve the dignity of students.

Parents need to be:

- Invited to inform the teacher of the child's history, special needs.
- Supported by the school community.
- Encouraged to become involved.

Students need to be:

- Consulted regarding their learning needs.
- Taught effectively, their learning needs must be met.
- Aware of the school rules.
- Aware of their rights and responsibilities.
- Treated with dignity so their self esteem is not destroyed.

The best way to adapt and accommodate to individuals with learning disabilities is to consult them about their own learning needs. When students (Yrs 2-6) with learning difficulties were asked (Spencer 1994) why they didn't complete tasks the reasons they gave were:

- They forgot what to do.
- They didn't hear or understand the instruction.
- The teacher talked too fast.
- Other people were talking when the teacher gave the instruction.
- The teacher wouldn't repeat the instruction.
- They didn't know what they had to do.
- No one would tell them what they had to do.

- They lost their books and notes.
- They didn't get time to copy it off the board.
- They didn't get enough time.

Due to repeated failures, misunderstandings, mislabelling and all other emotional mishaps, individuals with LD's usually develop problems with their self-esteem and self-confidence. They are called lazy, stupid, dumb, "space cadets" and are the subject of many parent-teacher conferences. For many LD adults school was a place where their spirits were broken and who therefore never got a chance to achieve their potential.

Adapting the curriculum and accommodating the needs of students with learning difficulties requires radical rethinking and benefits all students. This was illustrated at a recent conference by Pauline Crawford (Teacher at St Therese's School). The benefits were:

- A greater tolerance of all children in the class towards LD students.
- A heightened awareness among all students of their roles and responsibilities.
- A happier, more positive tone in the classroom.
- A higher level of consultation with all students.
- The empowerment of students to help each other.
- The self-identification of learning needs.
- An increased ability in students with learning disabilities to request help.

Learning disabled students need simple, clear and direct instruction. Structured environments where the pace of material is adequate to the student's needs is the best for these individuals. Additionally, LD students need to be encouraged through the learning materials to become active participants in the learning process. Materials that contain an element of self-correction and self monitoring built into them are therefore most appropriate. Ample time for practice to the point of automaticity, frequent feedback and genuine encouragement are also requirements for the success of these students.
The following difficulties need to be remembered when planning adaptions and accommodations.

The following diagram depicts inhibitory factors to a child's learning capabilities:

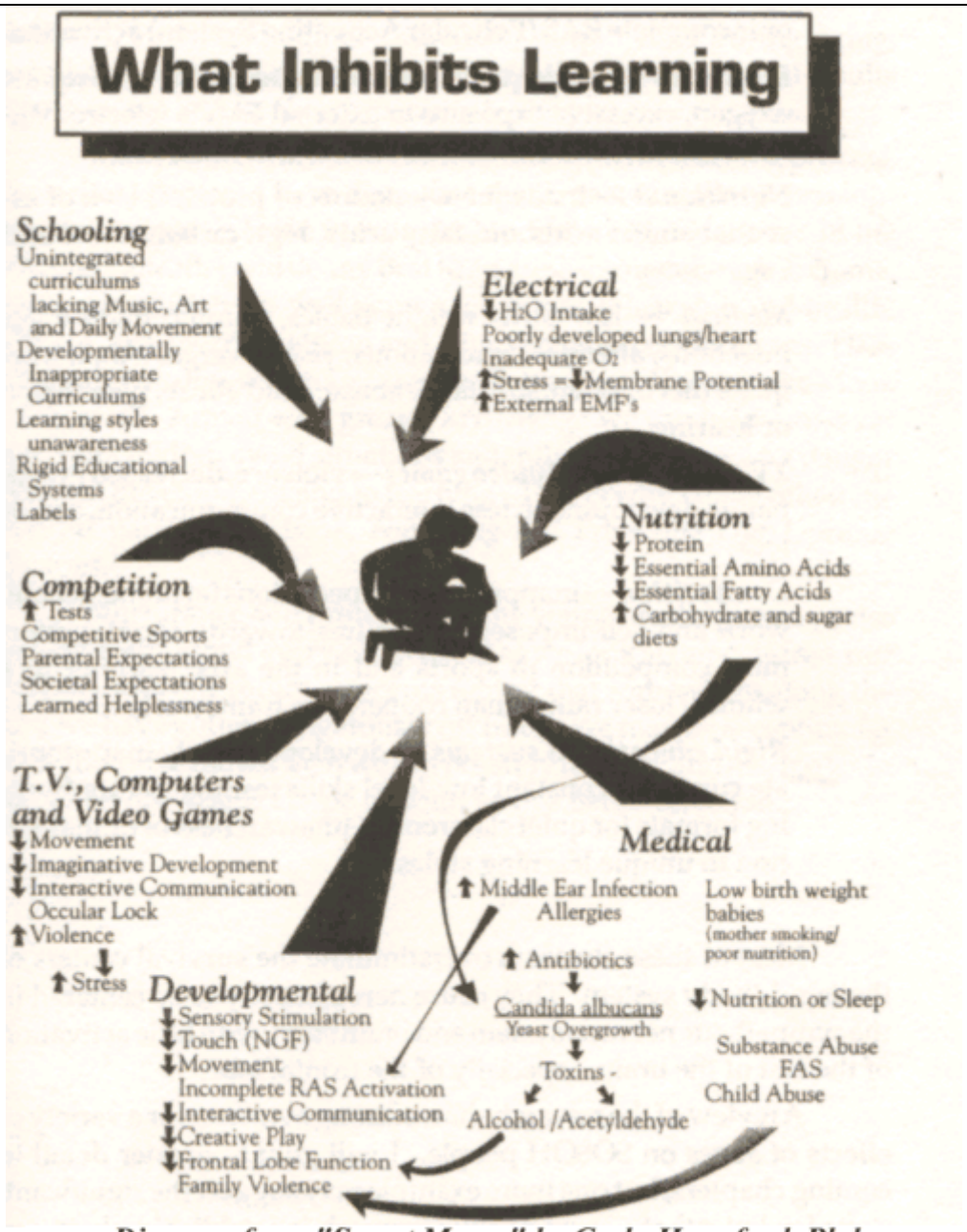


Diagram from "Smart Moves" by Carla Hanaford, Phd - Great Ocean Publishers - 1995 - pp135

Diagram 7 : What Inhibits Learning

REMEDIATION OF LITERACY AND NUMERACY SKILLS

This paper would not be complete without a brief mention about specific and effective strategies used in the remediation of literacy skills.

Oral and written language skills are essential to the communication of ideas. These skills pervade every aspect of our lives. To function effectively as participating members of the work force and society individuals with learning difficulties need adequate reading, spelling, writing and comprehension skills. See article which outlines the relationship between these skills.

Research has established that "the most critical factor beneath fluent word reading is the ability to recognise letters, spelling patterns, and whole words effortlessly, automatically and visually. Moreover the goal of all reading instruction - comprehension - depends on it" (Adams 1990, p 14). Furthermore, the level of phonemic awareness (the explicit ability to separate and manipulate sounds in words) on entering school is the single most powerful predictor of progress (success or failure) in learning to read (Mutter 1994, Dockerell and McShane 1993, Ehri 1992, Torgerson et al 1991, Adams 1990, Andrews 1989, Stanovich 1986, Bradley and Bryant 1985). About one third of the general population has difficulties with phonological processing.
(Lindamood and Lindamood 1975)

Dockrell and McShane (1993) attribute this lack of development of phonemic awareness to poor working memory programs which are responsible for storing verbal information. Significantly they go on to say: "If a printed word cannot be converted into sounds then its sounds cannot be stored; if conversion is slow, then previous sounds may be lost before further processing can occur; if the store is reduced in capacity, then the information cannot be retained; if the stored sounds cannot be blended than a pronounceable form of the word cannot be obtained".

This vicious cycle needs to be broken because not only is the relationship between phonemic awareness and learning to read a causal one, it is also reciprocal (Stanovich 1986, Perfetti et al 1987, Bradely and Bryant 1985). The child who learns to read is constantly exercising his memory and the poor memory of unsuccessful readers may well be a result of the failure in learning to read.

Programmes such as Lindamood and Spalding are extremely are extremely effective in teaching individuals with learning difficulties to read, write and spell because they are multisensorial. These programs work because they stress the different channels of the brain, vision, hearing, touch, and movement, all at the same time. This allows reading disabled students to form very explicit connections between the different activities involved in reading and spelling.

One of the main difficulties of poor readers is the disconnection between reading and spelling and between the visual and auditory sides of learning to read and spell. "Multi-sensory methods are par excellence tools for forging links between these things" (Bradley and Bryant 1985, p 126). Additionally, they teach students to THINK about reading and spelling thus developing vital metacognitive skills.

Any literacy program that assumes adequate auditory processing skills, ignores the phonological processing difficulties experienced by students with learning difficulties or fails to teach metacognitive strategies, will be ineffective in developing independent, self-correcting and self-monitoring readers and spellers.

However, clinical experience has shown that as effective as these programmes are, unless brain function has been addressed via neurofeedback, sound therapy and diet, progress will be slow and frustrating, and success may well be limited.

"Language comprehension is the ability to connect to and interpret both oral and written language. It is the ability to recall facts, get the main idea, make an inference, draw a conclusion, predict/extend and evaluate. It is the ability to reason from language that is heard and read. It is cognition" (Bell 1986).

Individuals with learning disabilities who exhibit a Specific Language Comprehension Disorder in both oral and written language do so because of deficits based in the sensory system. These individuals have a weakness in creating a gestalt" (Bell 1986). A gestalt is a complex organised unit or whole that is more than the sum of its parts. The attributes of the whole are not deducible from the analysis of the parts in isolation. For individuals with language comprehension disorder, there is a weakness in creating an imaged gestalt - "whole" - which interferes with the connection to and interpretation of incoming language. These individuals only process "parts", bits and pieces, facts and details, dates and names, but cannot process the entire concept.

Most of the literature suggests that imaging is a right hemisphere function. According to Bell (1991) there are two types of imaging. "Concept imagery" which processes parts into "wholes" and is critical for thinking and comprehension; and "symbol imagery" which processes single letters, and segments a whole into separate parts and is vital for decoding and encoding letter symbols. The literature implies that reading and thus symbol imagery is a left hemisphere function while concept imagery is a right hemisphere function.

The Visualizing / Verbalizing (V / V) process develops the interaction of both hemispheres so that "we have a single brain that generates a single mental self" (Levy 1985). In the words of Paivio (1986) "concrete descriptive tasks require a high degree of referential exchange between the verbal and imagery systems". Stimulating visualising (imagery) may activate one critical aspect of cognition while stimulating verbalisation (semantic coding) may activate the other critical aspect of cognition.

The Visualising / Verbalising programme successfully develops concept imagery resulting in significant growth in language comprehension. Visualizing incoming information allows us to remember the information in a sequence and "see" how different parts relate to each other. Verbalising requires the organisation of language and imposes a logical structure or framework on thoughts and images. "It is impossible to think without a mental picture" (Aristotle 348 BC). Man's mind cannot understand thoughts without images of them (Thomas Aquinas). "The static meaning of concrete words consists of sensory images awakened" (James 1890)

The V / V process is very powerful. Once developed it allows the individual to:

1. Image parts and gestalts from oral or written language.
2. Recall and relate the imaged gestalts and
3. Reorganise and verbalise concepts using the imaged gestalt as a reasoning foundation.

Although comprehension skills are initially taught in the subject of English, it is required in all subjects and for life. It is therefore the responsibility of all educators. As we are only too aware, illiteracy is an individual and national tragedy. Thus, improving comprehension and critical thinking by teaching students to visualise and verbalise is vital in order to stop the words "going in one ear and out the other".

It is now recognised that mathematical difficulties and language difficulties are likely to occur concurrently (Miles 1992, Chinn and Ashroft, 1993). Mathematics has its own language and symbols and requires the organisation of patterns, of abstract ideas and concepts. The wording for mathematics problems tends to be precise and so needs accurate reading (with a certain amount of speed and interpretation). If key words or perhaps small words such as "not" are missed the individual is disadvantaged. Factors that commonly exacerbate the problem include slow reading rate, poor reading accuracy, poor working memory, poor spatial awareness, visual perceptual difficulties, directional confusion, sequencing and comprehension problems, and learning styles.

Concept formation is also aided by the range and extent of experience an individual receives. Individuals with Learning difficulties manage less practice because they are slow at processing information. With a smaller variety of experiences they will be less likely to see the patterns and generalising and concept formation will be more difficult. This has the effect of compounding difficulties and retarding progress as mathematics is a sequential subject where one learns the parts; the parts build on each other to make the whole and knowing the whole enables one to reflect with more understanding on the parts which in turn strengthens the whole.

Without adequate reading, spelling, writing, comprehension and maths skills individuals with learning difficulties will require government benefits paid for by taxpayers. Illiteracy is an individual and national tragedy. The outcomes of unresolved literacy problems are: juvenile delinquency, long term unemployment and the vicious cycle of poverty.

ASSESSMENT

An appropriate model for assessment according to the National Health and Medical Council is as follows:

1. Full medical, developmental and family history, particularly in the areas of physical and mental health, early developmental milestones, parent educational status and family functioning.
2. Full neurological examination, including screening of vision and hearing.
3. Assessment of child's developmental status, with particular emphasis on eliciting subtle weaknesses in development (gross or fine motor, visual motor integration, visual and auditory short term memory, receptive and expressive language, attention and related behaviours).
4. Comprehensive educational assessment, including academic reports and observation of learning styles and preferred input modalities.
5. Psychometric assessment by a trained psychologist may be necessary to ascertain the level of cognitive abilities and guide appropriate intervention and expectations of teachers and parents.
6. Other professional assessments may be needed for some children. These include:
    a. Comprehensive audio logical assessment.
    b. Neuropsychology assessment for those who appear to be developmentally intact and or who exhibit a very specific disability in learning.
    c. Speech pathology assessment for children with primary language problems, especially in younger children.
    d. Occupational therapy assessment. Especially for younger children who have spatial and body awareness difficulties and motor problems.
    e. Physiotherapy assessment for those with gross motor dysfunction.
    f. Assessment for career opportunities or for developing work preparation skills.
    g. Other disciplines including social work and psychiatry may be involved as appropriate.

Assessment provides a basis for decisions to help the student and from an educational viewpoint can be accomplished through:

1. **Placement:** Deciding what type of educational environment would best suit the student's needs.
2. **Programme Development:** Anticipating the student's specific needs by developing or adapting the curriculum, and by providing appropriate personnel and material resources to implement it.
3. **Comparison:** Monitoring the student's development to discover what change has occurred. The examination of change reveals the development of the learner, the teacher and the curriculum. Once the assessment has been conducted, the need for specific and effective intervention is paramount.

CONCLUSION

Learning how to learn is what life is all about. Teaching students how to learn means teaching them to develop improved working memory programs for the learning tasks at hand. If learning is to be deep and lasting, information must be widely interconnected with ideas that the learner already has.

Multi-modal intervention will depend on the child's particular difficulties and the factors that contribute to the problem and the resources of the school and community. It is important for professionals to keep up with the advances in their fields and realise that parents and students need clear information about the student's progress and the results of assessments of learning difficulties. Failure to communicate this information clearly, may result in compounding the difficulties.

We need to treat individuals with learning difficulties with sensitivity and understanding. It is important to combine realism with encouragement as progress if often slow. Personal counselling should be aimed at supporting the whole person, and should ideally be part of every study skills programme at every level of education. To eliminate the stress, these individuals need to be taught the use of effective strategies that enable coping.

Learning difficulties are life-long problems and they will require on going multi- modal management and support. Individuals with Learning Difficulties represent a heterogeneous, complex group who are not always easy to assess and for whom appropriate interventions are time consuming but cost-effective in the long-term. Parents need to be aware of cost effective, drug-free, research based interventions which are now available in Australia.

Professionals need to ensure that students in general are not over-tested and under-taught and that students with learning difficulties in particular are not over-assessed and under-remediated. Our task is therefore to create more windows of opportunity where they have the chance to shine, to relax and redeem their self respect. Our role is therefore to identify and remediate their needs (as early as possible), discover and nurture their talents, advocate on their behalf, give them strategies to cope with stress and above all preserve their dignity in the process.

FURTHER READING SUGGESTIONS

- Quantitative Electroencephalography - QEEG
- Dyspraxia
- Neurodevelopmental Therapy - Inhibition of Primitive Reflexes
- Auditory Processing Disorder - CAPD
- The Relationship between Spelling, Writing, Reading and Comprehension
- Neurofeedback - EEG Biofeedback - a Drug-Free Strategy for ADHD, Learning Disorders and Other Conditions
- Samonas Sound Therapy
- Dietary Supplements

For more information or to make an appointment please contact us on (02) 9637 9998 during business hours.

REFERENCES

1. Adams, M.J. (1990): Beginning to Read: Thinking and Learning about Print. MAT Press.

2. Andrews, S. (1989): "Psycholinguistics and reading acquisition: The argument for decoding". NSW Journal of Special Education, 10, 15-20.

3. Alexander, A.W; Anderson, H.G.; Hillman, P.C.; Volley, K.S.; Torgersen,.J.K. (1991): "Phonological awareness training and remediation of analytic decoding deficits in a group of severe dyslexics". Annals of Dyslexia, Vol 41, 193-206.

4. Anderson, J.R. Greeno, J.G., Kline, P.J.and Neves, D.M.(1981)."Acquisition of problem-solving skills ". In J.R.Anderson (Ed) Cognitive Skills and their Acquisition. Hillsdale:Erlbaum.

5. Arnold, M. B. (1984): Memory and the Brain. Hillsdale: Erlbaum.

6. Baddeley, A.D.(1986): Working Memory. New York: Oxford University Press.

7. Bellermann, P. (1991): L.D does not mean Learning Dumb. Inservice notes. The Maniet Bellermann Foundation.

8. Bell, Nanci (1986): Visualizing & Verbalizing for Language Comprehension and Thinking. Reading Academy.

9. Bell, Nanci (1991): "Gestalt imagery: A critical factor in language comprehension. Annals of Dyslexia, Vol 41, 246-260.

10. Bereiter, C. & Bird, M. (1985): "Use of thinking aloud in identification and teaching of reading comprehension strategies". Cognition and Instruction, 2, 131-156.

11. Bleasdale, F (1983). "Paivio's dual-coding model of meaning revisited". In J.C. Yuille (Ed) Imagery, Memory and Cognition: Essays in Honour of Allan Paivio. Lawrence Erlbaum Associates, New Jersey.

12. Bradley, J. & Bryant, P. (1983): "Categorising Sounds and Learning to Read - A causal connection".Nature, 301, 419-421.

13. Bradley, J. & Bryant, P. (1985): Children's Reading Problems. Oxford: Blackwell

14. Brewer, W.F.(1980): "Literacy through rhetoric and stylistics: Implications for psychology". In R.J. Spiro, B.C.Bruch, and W.F. Brewer (Eds), Theoretical Issues in Reading Comprehension. Hillsdale: Erlbaum.

15. Briggs, D.C. (1975): Your Child's Self-Esteem. Dolphin Books.

16. Canfield. J., & Wells, H.C. (1976): One Hundred Ways to Enhance Self-Concept in the Classroom: A Handbook for Teachers and Parents. Prentice Hall.

17. Chase, W.G., & Ericsson, K.A. (1981): "Skilled memory'. In J.R. ANderson (Ed). Cognitive Skills and their Acquisition. Hillsdale: Erlbaum.

18. Chin, S.J., & Ashcroft,J.R.,(1993):Mathematics for Dyslexics: A Teaching Handbook. London:Whurr.

19. Chin, S. & Grossman, M (1995): "Stress factors in the adolescent". In Dyslexia and Stress. T.R. Miles & V.P. Varma (Eds). London: Whurr.

20. Collins, A., & Smith, E.E. (1982). Teaching the Process of Reading Comprehension. In D.K. Detterman and R.J. Sternberg(eds), How Much and How Can Intelligence be Increased? Norwood: Ablex.

21. Cultice,J.C.,Somerville,S.C. & Wellman, H.M.(1983): "Preschoolers' memory monitoring: feeling-of-knowing judgements." Child Development.54, 1480-1486.

22. Dockerell, J. & McShane J. (1993): Children's Learning Difficulties. Oxford: Blackwell.

23. Ehri, L.C, and Robbins, C. (1992): "Beginners need some decoding skill to read words by analogy". Reading Research Quarterly, 27/1, 13-26.

24. Farnham-Diggory, S. (1992): Cognitive Processes in Education. Harper Collins

25. Fawcett, A.J. (1995): "Case studies and some recent research". In Dyslexia and Stress T.R. Miles & V.P. Varma (Eds). London: Whurr.

26. Frostig, M. & Maslow, P. (1973): Learning Problems in the Classroom. New York, Grune and Stratton.

27. Hales, G. (1995): "Stress factors in the workplace". In Dyslexia and Stress T.R. Miles and V.P. Varma (Eds). London: Whurr.

28. Kintsch, W. & van Dijk, T.A.(1978): " Toward a model of text comprehension and production". Psychological Review, 85, 363-394.

29. Kosslyn, S. M. (1983): Ghosts in the Mind Machine. Norton, New York.

30. MacLeod, C.M. Hunt, E.B., and Matthews,N.M.(1978): "Individual differences in the verification of sentence-pictures relationships". Journal of Verbal Learning and Verbal Behaviour, 17,493-508.

31. Miles,E.(1992): "Reading and writing in mathematics". In T.R. Miles and E. Miles, (Eds), Dyslexia and Mathematics. London:Routledge.

32. Mutter, V. (1994): "Influence of phonological awareness and letter knowledge on beginning reading and spelling development". In C. Hume & M. Snowling (Eds) Reading Development and Dyslexia. London: Whurr.

33. National Health and Medical Research Council (1990): Learning Difficulties in Children and Adolescents. AGPS Press Canberra.

34. Paivio, A. (1986) Mental Representations: A Dual Coding Approach. Oxford University Press. New York

35. Palincsar, A.S.and Brown, A.L. (1984): "Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities". Cognition and Instruction, 1, 117-175

36. Perfetti, C. (1992): "Challenging Myths about Reading". Keynote address to the NSW LD Conference, June.

37. Perfetti, C.; Beck, I.; Bell, L.; & Hughes, C. (1987): "Phonemic knowledge and learning to read are reciprocal: A longitudinal study of first grade children. Merrill-Palmer Quarterly, July, Vol 33, No. 3, 283-319.

38. Posner,M.I., & Mitchell, R.E.,(1967): " Chronometric analysis of classification". Psychological Review, 74-392-409.

39. Pressley, G.M. (1976): "Mental imagery helps eight-year olds to remember what they read". Journal of Educational Psychology, 68, 355-359.

40. Pribram, K. (1971) Languages of the Brain: Experimental Paradoxes and Principles in Neuropsychology. Brandon House Inc. New York.

41. Roach,E.(1978): "Principles of categorisation." In R.Roach and N.B. Lloyd (eds), Cognition and categorisation, Hillsdale:Erlbaum.

42. Saunders, R. (1995): "Stress factors within the family".In Dyslexia and Stress T.R. Miles & V.P. Varma (Eds). London: Whurr.

43. Shiffrin, R.M., and Dumais, S.T. (1981): "The development of automatism'. In J.R. Anderson (Ed), Cognitive Skills and their Acquisition. Hillsdale: Erlbaum.

44. Silver, L.B. (1992): The Misunderstood Child: A Guide for Parents of Children with Learning Disabilities. McGraw Hill: TAB Books.

45. Spalding, R. (1990): The Writing Road to Reading. Quill: William Morrow.

46. Spencer, K. (1994): Helping Students with Learning Difficulties through Adaptions and Accommodations: A Guide for Teachers. Learning Difficulties Coalition of NSW.

47. Stanovich, K. (1986): "Matthew Effects in reading: Some consequences of individual differences in the acquisition of literacy". Reading Research Quarterly, 21, 360-407.

48. Sternberg,R.J.(1969a): "Memory-scanning":Mental Processes revealed by reaction-time experiments. American Scientist. 57,421-457.

49. Sternberg, R.J.(1969b): "The discovery of processing stages: Extensions of Donders' method. Acts Psychologia, 30, 276-315

50. Thompson, P. (1995): "Stress factors in early education". In Dyslexia and Stress T.R. Miles & V.P. Varma (Eds). London: Whurr.

51. Truch, S. (1992): The Missing Parts of Whole Language. Foothills Educational Materials, Canada.