

# Learners with Down syndrome

A HANDBOOK FOR TEACHING PROFESSIONALS



**down syndrome**  
VICTORIA

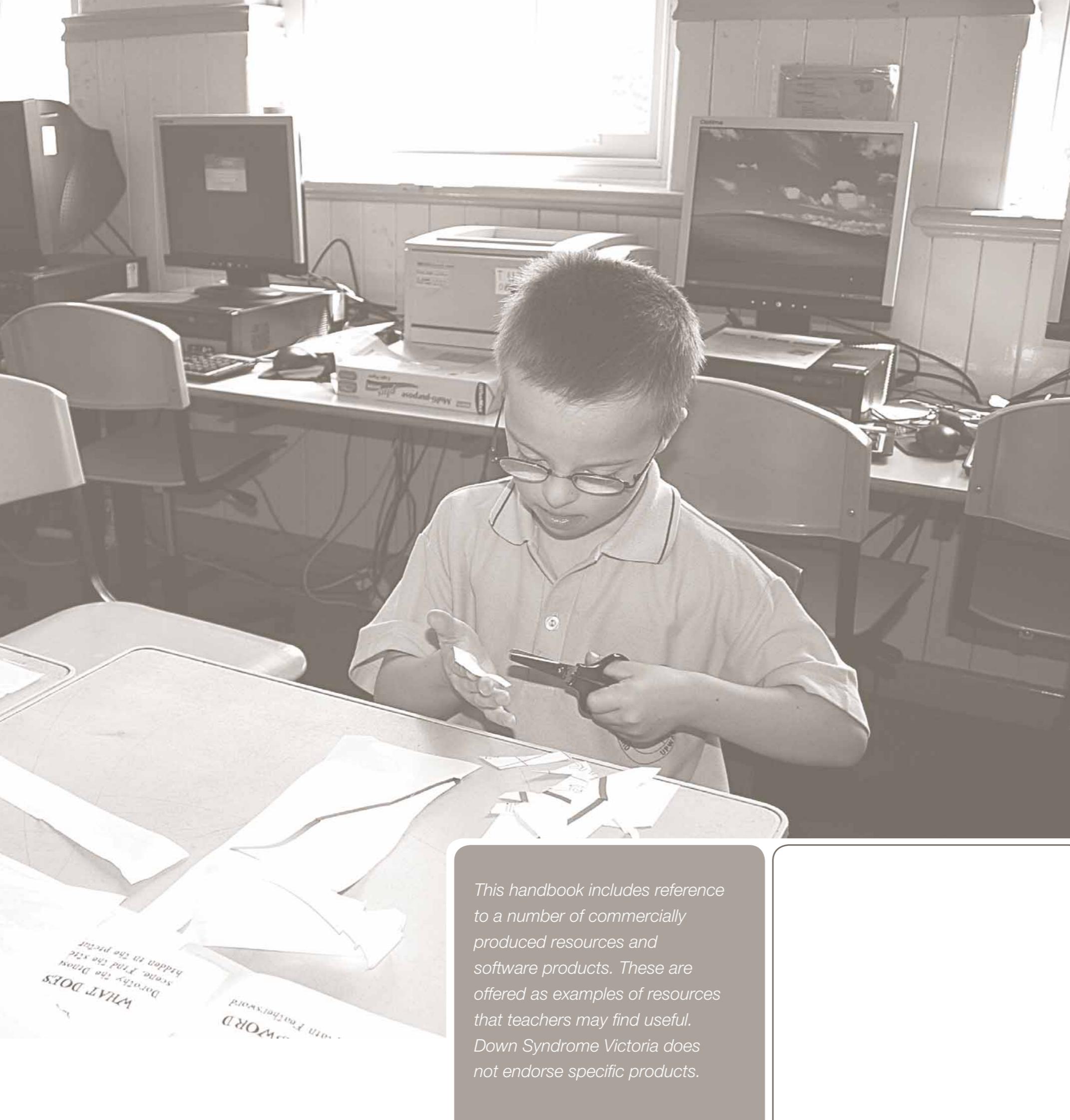
# Preface

This handbook is intended to provide a comprehensive introduction for teachers who have students with Down syndrome in their classes. The developmental profile for learners with Down syndrome developed by Professor Sue Buckley and colleagues at Down Syndrome Education International (<http://www.downsed.org>) has been used to provide an overview of learning skills, strengths and weaknesses which can be associated with Down syndrome. The handbook has been compiled from the work of a number of well known specialist educators around the world, as listed in the accompanying references.

We hope this handbook will help education professionals to understand learners with Down syndrome and successfully include them in the classroom. While it does not offer a blueprint for how to teach a learner with Down syndrome, we hope it will help and inspire teachers to develop their own strategies and techniques to support students who have Down syndrome – and along the way help meet the needs of other students in the class.

Down Syndrome Victoria, March 2009

*This handbook includes reference to a number of commercially produced resources and software products. These are offered as examples of resources that teachers may find useful. Down Syndrome Victoria does not endorse specific products.*





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# About Down syndrome

*Down syndrome is the world's most common chromosomal disorder and cause of intellectual disability. It is not an illness or disease, and occurs at conception. It occurs in one of every 700 to 900 births worldwide and affects people of all ethnic and social backgrounds. In Victoria, between 45 and 60 babies are born each year with Down syndrome.*

The human body is made up of millions of cells, and in each cell there are 23 pairs of chromosomes, or 46 chromosomes in each cell. Down syndrome is caused by the presence of an extra chromosome, chromosome 21 (Down syndrome is also known as trisomy 21). People with Down syndrome therefore have 47 chromosomes in their cells instead of 46. This results in a range of physical characteristics, health and development indications and some level of intellectual disability. Down syndrome is usually recognisable at birth and confirmed by a blood test.

Down syndrome affects, but does not determine, development. People with Down syndrome are each unique, with their own talents, abilities, thoughts and interests. Everyone with Down syndrome will experience some delay in all areas of their development, and some degree of learning disability. This will however vary significantly from individual to individual. What happens after birth will be far more important in shaping the outlook for any individual with Down syndrome than the presence of an extra chromosome.

With appropriate health and education services, and with the support and opportunities available today, people with Down syndrome can look forward to long and fulfilling lives as valued contributing members of their families and the broader community.

Down syndrome affects but does not determine development.



# Learners with Down syndrome

The only feature all individuals with Down syndrome have in common is some degree of intellectual disability. Everyone with Down syndrome will experience some delay in their development, and some level of learning disability.

Most children with Down syndrome experience some delays in all areas of development, including:

- Gross and fine motor skills
- Personal and social development
- Language and speech development
- Cognitive development

The extent of delays are not the same across all areas, and there are significant differences between individuals. The development of individuals with Down syndrome is influenced by family, environment, cultural and social factors, in much the same way as for everyone else.

Every learner with Down syndrome will demonstrate individual abilities, strengths and weaknesses and have their own learning characteristics. For this reason, while we can outline a range of characteristics associated with learners who have Down syndrome, this material should act only as background information when dealing with individual students. The temptation to generalise on the basis of the label 'Down syndrome' should be resisted.

Learners with Down syndrome experience spurts in the acquisition of skills, and periods of consolidation, just as all learners do. Since development progresses at a slower rate, the gap intellectually and developmentally between learners with Down syndrome and their peers tends to widen with time (just as the gap between two cars travelling at different speeds increases with distance). Learners with Down syndrome do not usually 'catch up' with their age peers.

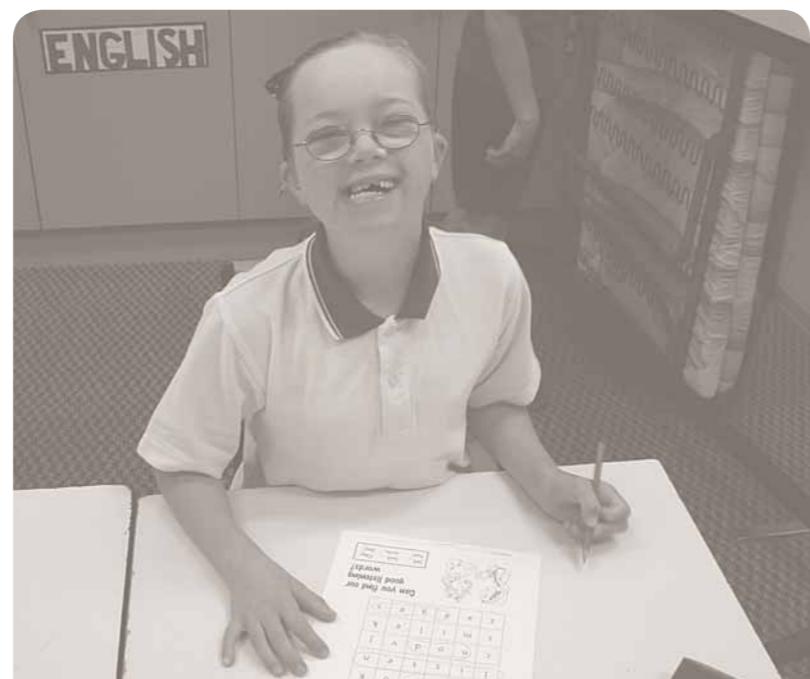
Contrary to what has been believed in the past, young people with Down syndrome do not stop or 'plateau' in their learning during teenage years, or indeed at any other time. If provided with the opportunity to do so, people with Down syndrome will continue to learn and make progress throughout their lives.

Maintaining high expectations of both academic achievement and behaviour will help ensure a student has the opportunity to reach his or her full potential. Like all of us, people with Down syndrome tend to conform to the expectations of those around them, and if there is no expectation of success, they are unlikely to be successful.

It is important too that teachers embrace an inclusive classroom culture and expect to meet the learning needs of the student with Down syndrome alongside those of other students in the class. A positive attitude to inclusion in a teacher is one of the most reliable predictors of successful inclusion and is more significant than either specialist training or extra resources.

## IN GENERAL, LEARNERS WITH DOWN SYNDROME CAN BE EXPECTED TO:

- *adhere to the same behavioural and social norms that are expected of their peers*
- *participate in all the same learning activities as their peers, with appropriate modification of the material and appropriate additional support*
- *take longer to learn new things and to complete work than other learners*
- *require learning to be broken into smaller units and scaffolded to a greater degree than is needed for other learners of their age group*
- *benefit from visual cues and reinforcement in all areas of learning*
- *benefit significantly from errorless learning techniques*
- *require explicit teaching of skills which others learners might assimilate informally*
- *require significantly more repetition and consolidation to retain new information*
- *understand considerably more than their verbal abilities might suggest*



## A SPECIFIC DEVELOPMENTAL PROFILE ASSOCIATED WITH DOWN SYNDROME

*A specific profile of developmental strengths and weaknesses has been developed in relation to children with Down syndrome, and is documented in detail in the work of Professor Sue Buckley and colleagues at Down Syndrome Education International [<http://www.downsed.org>].*

*This profile provides a useful tool to assist with classroom planning and teaching strategies.*

## THE SPECIFIC DEVELOPMENTAL PROFILE ASSOCIATED WITH DOWN SYNDROME

Sue Buckley & Ben Sacks (2001) *An overview of the development of children with Down syndrome (5-11 years)* Down Syndrome Issues and Information series

Sue Buckley & Ben Sacks (2002) *An overview of the development of teenagers with Down syndrome (11-16 years)* Down Syndrome Issues and Information series

- Social understanding and sensitivity and social interactive skills are relative strengths (but may be hampered by less well developed language skills.) Students with Down syndrome enjoy interacting and learning with others.
- Speech and language development is often the area of most significant delay, and does not keep pace with abilities in non-verbal understanding and reasoning. Students with Down syndrome can usually understand considerably more than they can express verbally (use of signing and gesture to communicate is an area of strength). Speech intelligibility can also be an issue. A high incidence of hearing difficulties contributes to this.
- Working memory (short term or verbal memory) development is usually relatively poor. This directly affects learning spoken language, makes learning from listening difficult and affects abilities in thinking, reasoning and problem solving.
- Visual memory and visual processing are relative strengths. Children with Down syndrome should generally be considered visual learners and will benefit significantly from visual reinforcement, visual cues and concrete materials wherever appropriate.
- Reading ability is often a strength from an early age (early decoding ability is common, probably due to reliance on visual memory skills). Reading skills can be used to support development and improvement of spoken language skills and improvement of working memory skills.
- Number is area of relative difficulty (other areas of mathematics may present less difficulties). Teaching should incorporate maximum use of visual supports and concrete materials.
- Motor development is usually delayed and may delay progress in other academic and self-help skills, eg handwriting, physical education and sport activities, handling equipment.
- Social behaviour is a strength in young people with Down syndrome – if encouraged and expected to do so, young people with Down syndrome generally develop age-appropriate social behaviour.



**CLASSROOM STRATEGIES**

Avoid relying on spoken language for communication: use sign and/or visual supports for children with Down syndrome wherever possible.

Use ICT to support learning and diminish reliance on verbal communication to demonstrate understanding.

Teach the whole class the keyword signs, PECS or AAC system in use, so that everyone can communicate.

Teaching reading will support the development of speech and language skills.

# Supporting learners with Down syndrome in the classroom

## Social understanding and social interactive skills

Most children with Down syndrome develop appropriate social interactive skills and social sensitivity, including understanding of non-verbal emotional cues (eg facial expression, voice tone, body language). Social interaction may, however, be impeded by difficulties with speech and language. Students with Down syndrome usually enjoy, and learn a great deal from, interacting with other children and adults. Peer interaction offers great learning opportunities, including role models for speech and language skills and behaviour.

Because of the benefits derived from interaction with their age-peers, and because of self esteem considerations, it is important that students with Down syndrome remain with their peer group and are not held back to repeat a school year.

*Students with Down syndrome will benefit greatly from appropriately structured, small-group learning situations.*

*Seat the student near others who will stay on-task and model good practice and appropriate classroom behaviour.*

*Use the classroom aide for one-on-one support selectively and to facilitate inclusion in the classroom and accessing the curriculum – ensure that the aide does not become an effective barrier to inclusion by being continuously ‘attached’ to the student.*

*If possible, organise a regular ‘facilitated’ recess or lunchtime playground game, which the student enjoys or is good at, to support social inclusion.*

## CLASSROOM STRATEGIES

## USEFUL RESOURCES

Buckley, Sue and Gillian Bird (2001) Speech and language development for children with Down syndrome (5-11 years)

Buckley, Sue and Gillian Bird (2001) Speech and language development for teenagers with Down syndrome (11-16 years)

Down Syndrome Association of Queensland 'English' in Where do we go from here? Information and ideas for regular primary schools about including a child with Down syndrome pp92-103

Kumin, Libby (2001) Classroom language skills for children with Down syndrome: A guide for parents and teachers (Topics in Down Syndrome series)

Makaton Australia  
<http://www.newcastle.edu.au/centre/sed/makaton>

## Speech and language skills

People with Down syndrome generally understand a lot more than they can express verbally and their abilities are sometimes under-estimated because of a relative difficulty with expressive language. Speech and language skills are frequently the area of most significant delay – receptive language ability (what is understood) can be two or three years ahead of expressive language ability (what can be said). Almost all children with Down syndrome will experience difficulty acquiring expressive language and will benefit from regular speech therapy.

Children with Down syndrome can learn to sign from an early age and using a system of keyword signs, such as Makaton®, will help the majority of children to communicate and show their understanding before they are able to speak. Picture exchange communication systems (PECS), augmentative and alternative communication technologies (AAC) and cued articulation may also be useful for individual children.

By supporting non-verbal communication in this way, delayed onset of speech does not need to significantly hamper learning in other areas. It also reduces frustration associated with not being able to communicate and mitigates the potential for disruptive behaviours. Visual supports can continue to assist children while their developing speech is still difficult to understand, and in cases where intermittent and fluctuating hearing loss interferes with verbal communication.

Supplementing with visual supports and signing only enhances, and does not hamper, speech and language development.

## USEFUL RESOURCES

McGrath, Helen and Shona Francey (1993 reprinted 2003) Friendly kids, friendly classrooms. Teaching social skills and confidence in the classroom

McGrath, Helen and Toni Noble (1993 reprinted 2003) Different kids, same classroom. Making mixed ability classes really work

Staub, Debbie 'Friendships in the classroom: supports and strategies' in Delicate threads. Friendships between children with and without special needs in inclusive settings (1998, Woodbine) pp183-205

### **Difficulties with short-term memory skills and auditory processing**

People with Down syndrome have specific difficulties with short-term or working memory, especially in relation to verbal information. This impacts on their ability to process auditory (heard) information, which in turn affects many aspects of development (in particular speech and language development), learning and everyday living skills.

Short-term (working) memory is our ability to retain visual and verbal information long enough to use it immediately (we then forget the information, commit it to longer term memory or use another strategy, such as writing it down, to remember it). People with Down syndrome experience specific difficulty with the auditory area of short-term memory (ie difficulty retaining verbal and other auditory information in the head long enough to use it). Classroom learning generally places heavy reliance on listening and on processing auditory information – this is particularly true as students progress through school – which creates particular difficulties for learners with Down syndrome.

Learning from listening creates particular difficulties for learners with Down syndrome

Learners with Down syndrome are likely to experience difficulty in processing significant amounts of verbal language or instructions, or in any situation relying on auditory skills. They have difficulty retaining words and sounds and the memory quickly becomes overloaded. This difficulty in processing information is often interpreted as 'has difficulty listening' or 'limited concentration and attention span'. The student may switch off, zone out or become disruptive in situations with lots of listening (eg in circle time or assembly, whole class discussions, presentations, whole class instructions). In spoken instructions or guidance the student may only retain part of what is said (often the beginning or ending) and will often not realise that they have not heard or understood part of the message. Difficulty following rapid verbal exchanges and formulating responses can also detract from playground interaction with peers.

### **USEFUL RESOURCES**

Buckley, Sue and Gillian Bird (2001) Memory development for individuals with Down syndrome *Down syndrome issues and information series*, Down Syndrome Education International

Laws, Glynis (1996) Memory Training for Children with Down Syndrome [www.down-syndrome.info](http://www.down-syndrome.info)

### **CLASSROOM STRATEGIES**

**Strategies to support listening skills in the classroom:**

**Position the student close to the action and minimise distractions.**

**Ensure you have the student's attention and they are focused on the topic before starting.**

**Prepare the student for listening.**

**Face the student when speaking directly to them, make frequent eye contact.**

**Use gesture/signs/visual cues to reinforce verbal information.**

**Use simple language and instructions: 2 or 3 elements, given slowly and supported by visuals.**

**Ask the student to listen for specific (simple) information.**

**WAIT! Allowing several extra seconds may give the student time to process and/or formulate a response.**

**Intervene with positive reinforcement and praise good listening (eg thumbs up, 'good listening', eye contact) before the student starts to lose concentration.**



## EFFECT OF DIFFICULTIES WITH AUDITORY PROCESSING

Sandy Alton, *Short-term auditory memory*  
DSA (UK) Journal, issue 95, 2001

**The student may have difficulty in:**

- Processing and storing information, especially when processing speech alone
- Phonological awareness: learning letters and letter sounds
- Differentiating speech from environmental sounds (auditory discrimination)
- Remembering things they hear (auditory memory)
- Learning new vocabulary
- Remembering unfamiliar or abstract vocabulary
- Remembering sequences or lists, unless rehearsed and used regularly
- Understanding information they hear (auditory perception)
- Following long verbal instructions
- Forming longer words and phrases
- Developing reading, comprehension and grammar

Short-term memory is particularly significant in making sense of language. It also supports thinking processes, problem solving, reasoning, any mental activity involving multiple or complex mental processes and the ability to learn routines and develop organising skills. Improvement will occur with maturity and can be supported by games and activities which practice processing and memory skills. Appendix 1 lists some games and activities to support enhancement of memory skills.

Difficulties with processing and memory mean that a student with Down syndrome may be confused by, and not see the relevance of, complex concepts or tasks. They may find it tricky to respond appropriately to ‘busy’ pictures or other visual stimuli or worksheets with lots of information. Tasks with a wide range of options or information to select from may also cause confusion – limit choices or selections to two or three options.

These difficulties impact on many fundamental academic activities such as:

**Reading comprehension**

Large extracts of text, both fiction and non-fiction, may not be grasped either in essence or detail. Teaching effective reading comprehension may require significant reduction in the amount and level of text to be processed in one go.

**Constructing written language**

All the different processes required for putting a sentence together mean that expressive written language may present difficulties for a student with Down syndrome. Classroom situations which require taking notes or dictation are likely to be problematic. Writing in all contexts may need scaffolding and structured support – for example, use of writing frames, sentence starters, a visual colour system to identify different grammatical, semantic or sentence elements (eg Alison Bryan’s *Colourful Semantics*).

**Mental maths**

Keeping track of numbers and sequences, whilst further processes are carried out, may be very difficult for a learner with Down syndrome.

## CLASSROOM STRATEGIES

Keep activities short and incorporate frequent breaks or changes in activity/pace.

Limit amount of new material introduced at any one time (use mind mapping or visual note-taking to assist retention).

Break tasks into small steps and provide scaffolding to encourage success.

Check understanding frequently – include non-verbal strategies which allow the student to demonstrate understanding.

Plan less material, slow down the pace, allow extra time for completion, and carry on practicing even after you think the student has understood.

Provide many opportunities for repetition and consolidation of new material.

Use short clear directions and instructions – be consistent in language and prompts, use simple language.

Simplify class worksheets, project briefs and homework sheets – reduce the information and simplify the language.

Use visual aids to support learning wherever possible.

Use association – contextualise and link new information to the familiar, using concepts already understood. Encourage categorisation and classification skills.

Utilise the student’s interests, learning strengths and motivations wherever possible.

Assign a quiet place for difficult work and an escape place or activity if students become overwhelmed.

Incorporate use of the computer and ICT into learning (see Appendix 2).



Wherever possible a strong visual component should be incorporated into all learning.

## USEFUL RESOURCES

*Black, Bob and Amanda Wood (2003) Utilising information communication technology to assist the education of individuals with Down syndrome Down syndrome issues and information series, Down Syndrome Education International*

*BoardMaker picture communication symbols (PCS) database [<http://mayer-johnson.com/>]*

*Bryan, Alison Colourful Semantics*

*Fitzgerald key*

*Hodgdon, Linda Visual strategies for improving communication. Practical supports for school and home <http://www.usevisualstrategies.com/index.html>*

*Inclusive Technology <http://www.inclusive.co.uk>*

*Topologika software <http://www.topologika.com>*

*Voss, Kimberly S (Woodbine, 2005) Teaching by design. Using your computer to create materials for students with learning difficulties.*

**CLASSROOM STRATEGIES**  
Keep key information on view as long as it is needed (use boards and displays). Provide daily class and individual schedules with graphics denoting school activities; use individual task boards to support the student to stay on task; use mind maps, word trees and other visual tools to help with organising work.

When explaining a task, model what the student needs to do.

Use pictures and written words (eg a structured checklist of the component parts of the activity) to focus attention and support understanding the task.

Create a visual handbook of important information to teach and remind the student about school routines or behaviour guidelines – include digital photos of the student doing the right thing; provide visual supports for more complex processes which may be routinely memorised by other students (eg school locker combination system); mark visual boundaries (such as red tape) across no-go areas.

Modify class activities to incorporate use of pictures and written text and provide, or assist the student to compose, a visual record of the main points of the lesson.

Use underlining and highlighting to draw attention to key information.

Where possible, choose text books with a high proportion of pictures and diagrams.

Use concrete materials, real-world aids and visual cues extensively to support learning. For example, to support language learning use colour codes to classify word groups, parts of speech etc and use the coding consistently in word banks, sentence construction and other language activities.

Incorporating ICT into learning is particularly useful for visual learners (see Appendix 2)

### **Reading ability**

Reading activities play an important part in developing speech and language competence and working memory capacity. Reading is also essential both for the development of wider learning skills and for day to day functioning and independent living.

There is significant variation in the reading levels attained by learners with Down syndrome, just as is the case in the general population. While some students with Down syndrome will become competent and enthusiastic readers others may struggle with basic literacy skills. Functional reading should be a priority goal for all students with Down syndrome. Different approaches may be needed for different learners. However, comparatively strong visual memory skills mean that, in many cases, children with Down syndrome can learn to sight read words before they can say them. Hence, children with Down syndrome often benefit from learning to read initially through a 'whole-word' learning approach. Using a whole-word approach, children can start learning key words as soon as they are able to play matching picture games. A methodology for teaching reading in this way is described and illustrated comprehensively in *Teaching Reading to Children with Down Syndrome* by Patricia Oelwein (the strategies described have also been shown to assist learners who do not have Down syndrome but are experiencing

delay in learning to read). Key words which are meaningful to the child are taught first, and then used to build simple sentences and personalised reading books. Alphabet and letter sounds and word group phonics are commenced once the child is already reading some simple texts – it is important that phonics and spelling are taught in conjunction with reading since some children with Down syndrome may otherwise come to rely on visual memory and sight vocabulary for spelling. However, a note of caution with the whole-word approach: the tendency in some children to focus on a part (a single letter) rather than the whole (word) has reportedly sometimes lead to confusion and detracts from reading progress.

Learners with Down syndrome frequently experience difficulty with reading comprehension, and may accurately decode a text without grasping the meaning. Difficulties with short-term memory contribute to this. Be careful to select reading materials at the student's comprehension level, even though the student may be able to decode higher levels of text. Comprehension skills can be developed using specific structured materials to assist students to record what they have read or to write about what they have read (eg visual prompts, story boards, cloze activities). Note that a student's expressive language skills may hamper their ability to demonstrate comprehension verbally – include non-verbal means to demonstrate comprehension.

### **USEFUL RESOURCES**

- Bird, Gillian, Jane Beadman and Sue Buckley (2001) Reading and writing for children with Down syndrome (5-11 years) Down syndrome issues and information series, Down Syndrome Education International*
- Bird, Gillian and Sue Buckley (2002) Reading and writing for teenagers with Down syndrome (11-16 years) Down syndrome issues and information series, Down Syndrome Education International*
- Down Syndrome Association of Queensland 'Reading' in Where do we go from here? Information and ideas for regular primary schools about including a child with Down syndrome pp97-101 and section 5.8: 'Modified worksheets'*
- Down Syndrome Association of Queensland 'Reading and understanding text' in Where else but here? Including students with Down syndrome in Secondary schools pp82-85, 100-105*
- Down Syndrome Scotland Language development. A booklet about language in secondary school <http://www.dsscotland.org.uk/publications/professionals-students/language-development.pdf>*
- Oelwein, Patricia L (2000, Woodbine) Teaching reading to children with Down syndrome. A guide for parents and teachers*



## CLASSROOM STRATEGIES

*Use concrete materials (including commercial materials such as Cuisenaire™ and Numicon™) and hands-on activities.*

*Maximise use of visuals and support learning with visual materials, cues and supports wherever possible.*

*Break tasks down into small component steps with lots of practice and reinforcement.*

*Find extra activities to practice and consolidate skills in a range of contexts.*

*Relate mathematics to real life and daily living skills wherever possible, as seeing the purpose will support motivation.*

*Use simple language – explicitly teach the language of mathematics alongside the concepts.*

*Use ICT for skills practice – it increases motivation and allows intensive repetition of skills.*

### **Mathematics and number**

Learners with Down syndrome may develop mathematical ability at a significantly slower rate than other learners. Whilst this tends to be a difficult area for learners with Down syndrome, there is a wide range of achievement. Part of the difficulty relates to the nature of mathematics – it relies on understanding abstract concepts which are difficult for people with an intellectual disability. Skills development in mathematics is also hampered by difficulties with short term memory, language processing, language delay (and confusion relating to the precise meaning of words in a mathematical context), delayed fine motor skills and difficulty with sequencing – and not least, by motivation and confidence.

Whilst learners with Down syndrome are likely to need a significantly modified maths program from that of their age peers, providing a modified program within the regular class is likely to be more beneficial than extended periods of withdrawal. Taking a student away from the regular class tends to decrease the student's motivation and enthusiasm for the subject, diminish belief in their mathematical abilities and undermine self esteem.

When planning a mathematics program for a learner with Down syndrome, focus on the skills that will support independent functioning and be useful in real life. The program should incorporate concepts and skills related to money, time and measurement and a basic understanding of number including the basic counting

principles. Use of a calculator – as a tool, not a support – will also be important. Each new skill will require lots of practice and reinforcement, using varied tasks to facilitate generalisation of the concepts. Because maths is sequential – new skills build on those already learned – the program needs to be carefully structured and graded. New concepts should be broken into small component parts and tasks into small steps to foster success which, in turn, will support the learner's confidence in their mathematical abilities. Previously learned skills will need to be revisited and consolidated before introducing other new material which builds on them. Wherever appropriate, introduce new concepts in real contexts as this helps the learner to see the purpose.

Very little research has been conducted in the area of Down syndrome and mathematical ability. It is therefore likely that significant improvement may be demonstrated by future learners who will have benefited from inclusion in mainstream maths instruction, increased expectations and as teaching modifications which support the learning strengths commonly associated with Down syndrome are introduced.

### **USEFUL RESOURCES**

- Bird, Gillian and Sue Buckley (2001) Number skills development for children with Down syndrome (5-11 years) Down syndrome issues and information series, Down Syndrome Education International*
- Bird, Gillian and Sue Buckley (2002) Number skills development for children with Down syndrome (11-16 years) Down syndrome issues and information series, Down Syndrome Education International*
- Down Syndrome Association of Queensland 'Mathematics' in Where else but here? Including students with Down syndrome in Secondary schools pp 115-126*
- Down's Syndrome Scotland Developing mathematics skills. A booklet about teaching mathematics in the secondary school available to download at: <http://www.dsscotland.org.uk/publications/professionals-students/developing-maths-skills.pdf>*
- Horstmeier, DeAnna (2004) Teaching math to people with Down syndrome and other hands-on learners: Basic survival skills (Book 1)*
- Horstmeier, DeAnna (2008) Teaching math to people with Down syndrome and other hands-on learners: Advanced survival skills (Book 2)*
- Horstmeier, DeAnna Teaching maths activities and games CD-ROM (accompanying material for books 1&2)*
- Munro, John (2000) Practical teaching strategies in numeracy for children with learning difficulties: Book 1-5: (1) Prenumber, (2) Numbers to five, (3) Numbers to ten, (4) Numbers to twenty, (5) Numbers to one hundred*
- Nye, Joanna (2008) Teaching number skills to children with Down syndrome using the Numicon Foundation Kit*  
Numicon <http://www.numicon.com>
- More information about the use of Numicon to support learners with Down syndrome is available from Down Syndrome Education International at <http://www.downsed.org/activities/numicon/>*
- TouchMath <http://www.touchmath.com/index.cfm>*

Select paper size (and line size and square/graph size) appropriate to the child's fine motor abilities.

Large-size crayons, pencil grips and modified grip scissors may be useful.

For children handling science and technology equipment, it may be useful to divide groups into 'observers' and 'doers' and include the student with Down syndrome as an observer initially, until (s)he is familiar with the equipment. Simple visual charts exemplifying safe handling of equipment will also be useful.

Children with Down syndrome may become competent keyboard and mouse users while the precise motor skills for handwriting are still being developed. The computer can therefore be useful to support learning activities which require writing and drawing.

## CLASSROOM STRATEGIES

### **Physical and motor skills**

Delayed motor skills mean that children with Down syndrome may not be as physically adept as their peers, and may experience difficulty with both gross and fine motor skills.

Delay in areas of gross motor skills may influence climbing, running, jumping, skipping etc and impact on physical education, sports activities and playground games. Most children with Down syndrome have hypotonia at birth, which means that muscles are less well developed than usual. Whilst this improves with age and physical development, it may still be impacting on the child's physical abilities in school. It is important for children with Down syndrome to engage in – and experience success in – physical and sporting activities, both for general health and wellbeing and to support motor skills development. Regular support from a physiotherapist may be advisable.

Delay in fine motor skills will impact on:

- classroom activities, eg drawing and colouring, using scissors, handwriting development, use of keyboard and mouse, any activities using small items or parts, handling equipment
- self-help skills, eg managing buttons, zips and shoe laces, and locker padlocks; dealing with lunchbox, drink bottles and food wrappers and containers – and eating and drinking

Development of handwriting skills may be assisted by a program of targeted fine motor exercises, which can be practiced both at home and in school. An occupational therapist will be able to offer advice and support in this and all motor skills areas.

Enlist the support of the student's parents to ensure that clothing and shoes worn to school can be managed independently, or are selected deliberately to assist the learning of specific self-help skills.

A student with Down syndrome may be shorter and physically smaller than their age peers, and it may also be advisable to make adaptations to the physical environment of the classroom. For example, in early primary a smaller chair may be needed in order for the student to reach the ground, and a stool may be needed to assist the student to reach benches, pegs and toilets. In secondary school, consider allocating the student a lower-level locker.



## USEFUL RESOURCES

*Bruni, Maryanne (2006 Woodbine) Fine Motor Skills in Children with Down Syndrome. A Guide for Parents and Professionals 'Topics in Down Syndrome' series (second edition)*

*Down Syndrome Association of Queensland 'Health and physical education' in Where do we go from here? Information and ideas for regular primary schools about including a child with Down syndrome pp115-117*

*Down Syndrome Association of Queensland 'Health and physical education' in Where else but here? Including students with Down syndrome in secondary schools pp127-128*

*Winders, Patricia C (1997 Woodbine) Gross Motor Skills in Children with Down Syndrome. A Guide for Parents and Professionals 'Topics in Down Syndrome' series*

# Some important issues to consider

## **Social development and behaviour**

Young people with Down syndrome will develop appropriate social behaviour if expected and encouraged to do so. It is important that they are expected to do so, because their social abilities will be crucial in ensuring meaningful inclusion in the community. Learning appropriate social behaviour is facilitated enormously in mainstream settings in which the student's peers provide role models, although social and relationship skills that other young people would simply 'pick up' informally (such as sharing, developing friendships, differentiating between different types of relationship) may require explicit teaching and extended repetition and reinforcement.

Most children with Down syndrome are able to infer the emotions of others from non-verbal cues (facial expression, voice tone, body language), which also means that they may easily pick up on negative emotions (such as anger, dislike, disapproval, rejection, anxiety). Because of limited verbal ability, some students may respond to such negative emotional cues with distress expressed through behaviours.

There are no behaviours specific to children with Down syndrome and the child with Down syndrome should be expected to adhere to the same behavioural norms as apply to his or her peers, although explicit teaching, visual reinforcement and support and frequent repetition are likely to be needed in the initial stages.

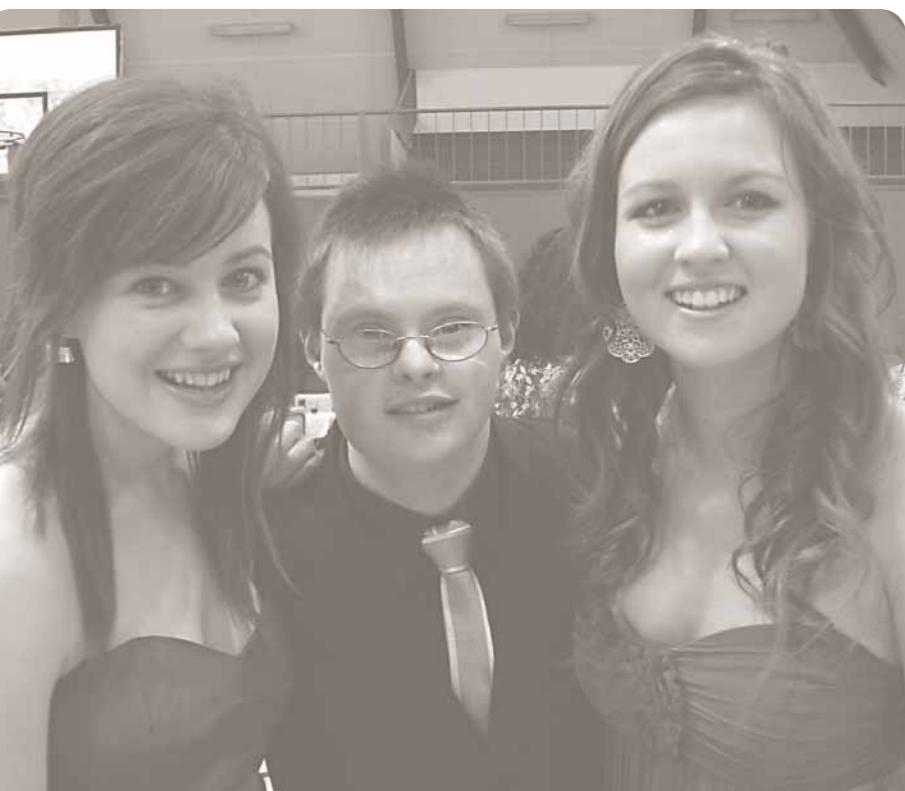
Inappropriate behaviour may have a number of root causes:

- It may be an expression of social and emotional immaturity – the behaviour might be tolerated or expected in younger children, but is inappropriate in this age group.
- Limited expressive language ability may lead to frustration which in turn can manifest itself in sometimes undesirable behaviour. Verbal communication difficulties may mean a child with Down syndrome uses behaviour as a way to react to situations rather than verbally express a reaction. It is often necessary to look beyond the behaviour itself and to the real message the child is trying to convey, to understand and deal with the behaviour.
- Undiagnosed health or medical issues or medication issues may also be an underlying cause. These should be ruled out or investigated as the first step in a behaviour modification plan.

Inappropriate or challenging behaviour is usually a manifestation of an unmet need. An essential step in dealing with it is to understand what is causing the behaviour – determining the root cause is likely to provide the key to modifying the behaviour into a more appropriate one. This may entail careful observation of the student and the collection of data and information relating to the behaviour over a period of time. Hence, behaviour modification is rarely a speedy process and improvement usually occurs in gradual stages rather than one instant reformative step.

Students with Down syndrome are commonly labelled as being stubborn, without due attention being given to possible underlying causes of this apparent unwillingness to cooperate.

Social stories can assist children with Down syndrome in modifying their behaviour – use simple story books using photographs of the child which demonstrate the right thing to do.



## **USEFUL RESOURCES**

Beach Centre on Disability Handling behaviour [http://www.beachcenter.org/pbs/pbs\\_at\\_home/handling\\_behavior.aspx](http://www.beachcenter.org/pbs/pbs_at_home/handling_behavior.aspx)

Wood, Mandy and Gillian Bird (2004) Magic and sparkles: a creative approach to modifying children's behaviour  
*Down Syndrome News and Update* 3 (4) 128-131 <http://www.down-syndrome.org/news-update/3/4>

Johnson, Carol (originally publ 1998 Newsletter of Canadian Down Syndrome Society) Stubborn is... as stubborn does <http://www.ndcenter.org/resources/documents/stubborn.php>

Lorenz, Stephanie Behaviour – Information sheet UK Down's Syndrome Association <http://www.downs-syndrome.org.uk/pdfs/Behaviour.pdf>

### **Errorless learning**

Children with Down syndrome learn best through success. Not only may they not learn from their mistakes, but instead, once a mistake has been made there may be a maddening tendency to repeat it. As far as possible, learning should be structured in small achievable steps and in such a way as to ensure that the student gets it right from the outset. Break tasks and learning down into simple chunks or steps, and provide appropriate scaffolding, so that the student can work independently and experience success in their learning.



### **Sensitivity to failure and disempowerment**

Studies suggest that children with Down syndrome often regress from being initially keen and active learners into progressively more reluctant learners, to the point of adopting a range of avoidance strategies. Low expectations by parents, teachers and peers, perceiving themselves as ‘different’ to others in the class or ‘not belonging’, constant assistance from others and feelings of powerlessness in their learning may all contribute to this.

Many children with Down syndrome demonstrate sensitivity to failure. It is therefore critical to set the student tasks at which they can succeed – and to offer specific ‘labelled’ praise whenever appropriate. Continual experiences of failure may lead to the student taking steps to avoid tasks in which they have not experienced success or situations they find difficult. For example, this might mean that a student routinely plays up (eg disappears under a table, or to the toilet) in order to avoid a lesson they find tricky; or that a student seeks the company of teachers or other adults during recess breaks because this feels safer and more successful than interaction with their peers.

Feelings of disempowerment can lead to the student attempting to assert themselves in inappropriate ways, such as deliberately ignoring instructions, procedures and rules. An important way to empower students is by offering choices wherever possible.

### **Learned helplessness**

It cannot be over-emphasised how important it is to maintain high expectations for the student and aim for the greatest possible level of independence in learning. If the student is always told what to do, or assisted in everything, they may come to rely on this. It then becomes difficult to get them to initiate learning or take responsibility for their learning. Unless directly told what to do, they do nothing; or they do not attempt tasks, knowing that someone else will do it for them. This ‘learned helplessness’ is often seen in people with Down syndrome (of all ages) who have been over-assisted, and provides a real barrier to ongoing learning both in school and in later life.

### **A note on medical issues and dual disability diagnoses**

If a student has an underlying medical condition or physical ailment it will have an impact on their learning. Children with Down syndrome are more prone than the general population to a number of specific medical conditions (eg thyroid conditions, heart conditions, sleep apnoea, coeliac disease) and some children are particularly prone to infections. In addition there is a greater incidence of hearing and vision issues in children with Down syndrome than in the general population. In a small number of children with Down syndrome, compounding conditions such as severe hearing loss or autism add complexity to the learning difficulties the student may experience. Consult the family and obtain a clear understanding of any medical or health issue or compounding disability which may impact on the child’s learning.

# Successful inclusion rests on positive attitude

*In the past people with Down syndrome had limited opportunities to demonstrate their abilities. Low expectations meant that some people with Down syndrome never reached their full potential. As a result, we are still learning about the potential and full range of abilities of people with Down syndrome.*

A significant body of research now demonstrates that the most important factor in successful inclusive education for children with disabilities is the attitude of the teachers and school.

Your attitude is VERY important, both for the self esteem and confidence of the student with Down syndrome, and as a model for class peers and their interaction with the student. Expect and encourage success – it may come in smaller steps than for other students but this does not matter. Ensure that the student with Down syndrome is encouraged to participate in all aspects of class life along with their peers and that everyone understands that this child is a full member of the class, just like everyone else. Inclusion includes aspects such as classroom practices and responsibilities and homework expectations. Allocate classroom responsibilities to the student with Down syndrome which are commensurate with their abilities. Support and encourage independence, and avoid constant one-on-one attention, which hampers independence, effectively isolates the student from his or her peers and can send a message to everyone that the student is not a full participating member of the class.

Model respect and tolerance and appreciate the range of differences among all students in the class. Remind everyone of what they have in common and ways in which they are different – and that everyone is better at some things and not so good at others. Be careful with the way you refer to disability. *Please try to always put the person before the disability:* a child with Down syndrome, a student who has Down syndrome (not IS Down syndrome). Avoid reference to generalisations and misleading stereotypes.

In the face of lack of previous experience with Down syndrome and the modifications that may be needed to any teaching program, many teachers understandably feel apprehensive or overwhelmed when faced with the prospect of including a child with Down syndrome in their classroom. However, in most cases, teachers later report that addressing the learning needs of the student with Down syndrome proved to be significantly less daunting than they had expected, and that a range of other children in the class benefited from the strategies that were implemented to meet the needs of the child with Down syndrome.



Overall, teachers and schools that have embraced the challenge of meeting the educational needs of a child with Down syndrome, report that the inclusion of the student proved to be a positive and rewarding experience for all.

**The key to making a success of this is the way you approach it.**

**Please, above all:**

- think ‘child’ not ‘Down syndrome’; and
- think ‘difference’ not ‘disability’.

*Please do not hesitate to contact the Education Consultant and other staff at Down Syndrome Victoria if you need more detailed information about Down syndrome or further support in relation to any of the areas covered in this material.*

Model respect and tolerance and appreciate the range of differences among all students in the class.

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## APPENDIX 1

### STRATEGIES AND GAMES TO SUPPORT DEVELOPMENT OF MEMORY SKILLS

Listening games (eg Twenty Questions, Simon Says – with two or three instructions at a time)

Listing games: 'I went shopping and bought...' or 'I went to the moon and took...'

Category games: choose a topic (eg animals, things to eat) and develop an alphabetic listing (first person says one beginning with 'a', next person adds one beginning with 'b'... each time listing from the beginning)

Memory games: Picture pairs card games, Kim's Game (remembering items on a tray having memorised them for one minute)

Barrier games (carrying out simple verbal instructions such as arranging or building, given from behind a screen or barrier – start with simple instructions 'put the pen on the block' and gradually increase complexity)

Read part of a story then ask simple comprehension questions or use visual prompts to allow the student to demonstrate memory and understanding

Ask the student to make up a simple story and then ask questions to recall details from it

Retelling stories from books, TV shows or films

Ask student to recall a personality or actor they saw on television the night before. Ask for detail about what they were doing, how they were feeling, what they were wearing etc

Silly stories: tell the student something silly then ask them to tell you why it's silly

Practice recalling meaningful number sequences (eg phone numbers, addresses)

Learn songs and rhymes

Remembering picture sequences – show the student a series of pictures or flashcards for 10 seconds then ask them to place them in the same sequence (for greater difficulty, ask them to name the pictures in order)

Targeted activities and responsibilities, eg delivering simple messages, collecting several objects from around the classroom, gradual increase in the complexity of verbal instructions in class

Teach sequencing skills in a variety of contexts

## APPENDIX 2

### BENEFITS OF COMPUTER-ASSISTED LEARNING FOR PEOPLE WITH DOWN SYNDROME

Bob Black and Amanda Wood (2003) *Utilising information communication technology to assist the education of individuals with Down syndrome* Down Syndrome Issues and Information series

**Improving motivation:** the learning experience is enhanced with pictures, sounds and animation which may increase a child's interest and attention.

**Multi-sensory experience:** computers provide both visual and auditory input. Children with Down syndrome are 'visual learners' who learn best when information is presented visually and find learning from listening more difficult. ICT is particularly well suited to this learning style.

#### Non-verbal mode of response

Children are able to give non-verbal responses, enabling them to demonstrate their understanding without having to produce a spoken response, which may be particularly difficult for them due to troubles with articulation, word finding and intelligibility.

#### Being in control

Children begin to understand that they can have an effect on their surroundings through 'cause and effect' software; this sense of being in control develops further as children start to use familiar programs unassisted; self esteem develops as they become more independent in their learning and presentation improves.

#### Immediate feedback

Children are rewarded for their success immediately, eg with pictures, sound effects or music, or prompted if they need to try again. The computer never gets impatient or frustrated by repeated errors, feedback is non-threatening and non-judgemental.

#### Errorless learning

Software can be designed in such a way that the child is supported in order to achieve repeated success. The child is supported at each step as necessary, before they make a mistake. This allows the child to learn a sequence of steps to achieve success every time.

#### Opportunities for practice

Children with Down syndrome need much more practice to acquire new skills and ICT can provide as many opportunities as necessary to repeat the same objective in exactly the same way.

#### Self-paced learning

The child is able to proceed as fast or as slow as he or she wishes; the computer will 'wait' for the child to respond without prompting them before they have had time to fully process the information and construct their response.

#### Clutter free working environment

Computer programs can provide a highly organised and predictable working environment which focuses the child on specific targets.

#### Assistive technology

Both hardware and software can be modified and customised to meet the requirements of children with individual needs.

#### Differentiation

A vast range of software can be purchased or downloaded from the Internet in order to produce differentiated activities to meet individual requirements.

**APPENDIX 3****FURTHER RESOURCES FOR TEACHERS**

Bird, Gillian, Sandy Alton and Cecile Mackinnon (2000) *Accessing the curriculum – strategies for differentiation for pupils with Down syndrome* Down syndrome issues and information series, Down Syndrome Education International

Down Syndrome Education International *Inclusion in practice – Educating children with Down syndrome at primary school* (DVD)

Down Syndrome Scotland *Making it work. Supporting inclusion in secondary school* <http://www.dsscotland.org.uk/publications/professionals-students/making-it-work.pdf>

Hammeken, Peggy A (2008) *The Paraprofessionals essential guide to inclusive education* (3rd ed)

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Tien, Barbara (1999) *Effective Teaching Strategies for Successful Inclusion – A Focus on Down Syndrome: a Resource Guide for Educators and Parents*

British Columbia Ministry of Education *Students with Intellectual Disabilities. A Resource Guide for Teachers* <http://www.bced.gov.bc.ca/specialed/sid/>  
Excellent site with lots of advice, strategies and further resources in all areas of the curriculum.

Precision Academics <http://www.precisionacademics.com.au/>  
Commercial site with adapted educational resources.

SEN Teacher <http://www.senteacher.org/>  
SEN Teacher provides cost-free teaching & learning resources for students with special needs and learning disabilities (UK base)

Teachers helping teachers <http://www.pacificnet.net/~mandel/Teaching>  
ideas from around the world contributed by teachers.

Unicom Education <http://www.unicomeducation.com.au/>  
Publishers and distributors of a wide range of special needs resources.



## About Down Syndrome Victoria

*Down Syndrome Victoria is the state-wide peak membership organisation representing people with Down syndrome and their families. It is a not-for-profit organisation established in 1978 to provide support, encouragement, information and resources to people with Down syndrome, their families and the broader community.*

### We are a whole of life service offering

- Personal support and information to families
- Advocacy, information, support, mentoring and training for adults with Down syndrome
- An education support service to assist students with Down syndrome and their teachers in mainstream schools
- Peer support groups around the state
- An annual Family Fun Day and other events
- Annual conference and education/information sessions
- A quarterly journal
- Information and professional development for health and education professionals
- A library of Down syndrome specific resources.

Down Syndrome Victoria is an active member of the Down Syndrome Australia network of state associations. Down Syndrome Victoria relies on public and private sector support to fulfil its mission of empowering individuals to achieve a lifetime of meaningful inclusion in the community.





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