

VIII. Math and Reading – Life Skills for Independence

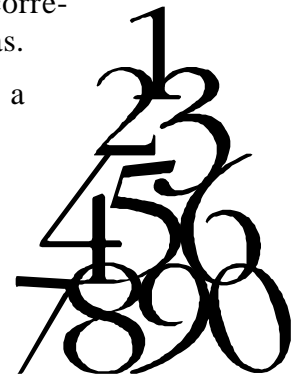
A. Meaningful Math

Students with Down syndrome need mathematical knowledge to master independent life skills such as getting on the right bus, realizing when they are late, following the rules of a card game and using the correct change to call home. Being able to count and collect, estimate and measure are the skills needed to function independently in daily routines and gain meaningful employment later in life.

While the majority of students will never have the abstract thought processes necessary to understand higher-level math concepts, they can still be expected to learn meaningful math skills. **Deficits in these skills more likely reflect a lack of teaching rather than a lack of ability.** Given the opportunity, students with Down syndrome can learn math!

Students learn best when math programs focus on basic number skills (e.g., number recognition, counting, adding, measuring and telling time) that apply to their own “real life” experiences. Rote learning has little or no application to daily activities. The following are examples of how to take students beyond rote learning and apply numbers meaningfully:

1. After learning to rote count aloud, a student must learn one-to-one correspondence and realize that the last number he counts is how many he has.
2. After learning to recognize numerals, a student must be able to match a numeral to the correct quantity of items.
3. After learning to memorize addition, a student must be able to demonstrate the concept of “more” and “less.”
4. After learning to use a calculator, a student must understand the meaning of the answer and how to apply it.



With curriculum adaptation, students will be better able to overcome some of the difficulties they face in learning math.

The Difficulties Students Face in Learning Math Concepts

Memory

Memorization of basic facts is the foundation skill needed to learn how to add, subtract, multiply and divide. A huge barrier to the acquisition of this skill is the short- and long-term memory deficits common in students with Down syndrome. They have trouble remembering the vocabulary of math, memorizing basic facts and sequencing the steps of problem solving. Memory deficits are evident by the behaviour that gets students into “hot water” in math class:

- They can count to ten one day, and not the next day.
- They add instead of subtract, subtract instead of add.
- They make random guesses on quizzes.
- They forget to check their work before handing it in.
- They tell you the correct answer, but write down the wrong number.

Information Processing

Students with Down syndrome also need more time to process and recall auditory and visual information. They struggle with the traditional measures of math testing such as timed drills because of the number of items and the time restraints. Assigning fewer items and allowing extra time alleviates the student's stress and promotes successful learning. Students with cognitive delays will assimilate information more readily when teachers:

- repeat group instructions to the student;
- outline the process step by step either on the board or on job cards;
- review the key vocabulary and each step of the process before starting to work;
- use colour coding as a visual reminder;
- remove time limits on math quizzes or tests; and
- give fewer test questions.

Motivation

Motivation declines when students rarely experience success or they perceive the task as being too difficult. Similarly, too much emphasis on correction creates a fear of failure. Since students with Down syndrome make many *unintentional mistakes* due to memory and processing difficulties, *errors must be permissible* if the student is to stay motivated. Students become confident risk takers when reassured that asking questions and making mistakes is the only way to learn.

One way the teaching team can guide and motivate a student is by focusing on the process rather than the score. For example, doing two out of ten problems meaningfully and accurately may be a significant accomplishment, but the wonder is lost when the student receives a failing mark of twenty per cent. Students need to feel good about getting the first two problems right so they'll remain motivated to keep on practicing the difficult task of getting the remaining eight problems right.

The speed of instruction and the pace of learning in a typical classroom can also discourage motivation. The student with Down syndrome may just be catching on to one task as the rest of the class is moving on to a new one. They become aware of their learning differences and feel disheartened to see others move on so quickly. While they may sit and listen or even guess at answers, without intervention they may plateau or regress in mathematical thinking.

Example:

Jayne could rote count and label and print all of her numbers from one to ten, so she joined her grade one classmates in working on single digit addition. But the novelty of the new activity quickly wore off and her education assistant was dismayed as inappropriate behaviours emerged. A review of Jayne's work revealed the unpredictability of the scores on the daily math minute, evidence that she was making random guesses. The conclusion was that she was missing prerequisite skills such as:

- recognizing number quantity (i.e., holding up one to five fingers, "How many do you see?");
- having no concept of place value; and
- understanding the meaning of the words "plus" or "add."

It was determined that Jayne lacked motivation because the new work was too hard. The solution was to use more manipulatives and set new, more meaningful goals.



Curriculum adaptation should provide motivating activities that ensures students stay at the appropriate developmental level until they are ready to move on. By analyzing *how* students answer questions, regardless of whether the answer is right or wrong, gives valuable insight into their current level of thinking. Furthermore, incorporating their feedback and ideas into goal setting reveals what they perceive to be their own strengths and weaknesses.

At times, progress will seem slow and tedious for both student and teacher, but imaginative teaching inspires motivation. Demonstrate applied mathematics by showing how one concept or skill relates to every subject area. Teach the same concept over and over using a variety of materials and adopt methods that are appropriate to the student's developmental age. Innovation that stimulates thinking and problem solving motivates students to learn math.

Fine Motor Skills

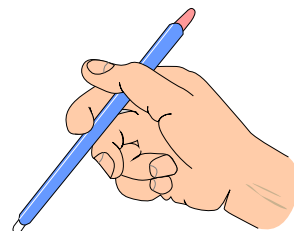
Significant hypotonia or moderate to severe motor-planning difficulties impairs the ability of a student with Down syndrome to print numerals and can make math class frustrating and fatiguing. Instead of staying focused on the math, the lesson inadvertently becomes a printing lesson. The student “turns off” even if he has the competence to understand and process math facts. The goal is to ensure that math concepts can be worked on in math class.

Students unable to print can respond to questions by pointing to or circling their answer, holding up a number card or tile or using a specially built rubber stamp. Dictating answers to a scribe during a test reduces stress and fatigue and compensates for illegible printing. For printers, decrease the number of items on tests and assignments, allot additional time for completion and make computer time available.*

Abstract Thinking

Students with Down syndrome tend to stay at a cognitive stage typified by concrete learning. When math moves into concepts that require abstract-thinking skills (e.g., subtraction, multi-digit calculations or written problems), they lack the perceptual capacity to master the concepts. Their perceptual errors are due to sequencing and problem solving difficulties, and being unable to distinguish differences in size, shape and quantity.

For example, ECS and grade one students succeed at counting from one to ten when they use their fingers. Take away the fingers – a visual cue – and the students can't respond accurately because they have not yet internalized the meaning of the numbers, which entails “seeing” and “feeling” rather than memorizing. Likewise, students often struggle with recognizing quantity and meaningful counting (e.g., “How many fingers am I holding up?” and “Give me seven pencils.”). Careful material preparation and adapted, purposeful activities will advance the student beyond imitating what they see and just copying the numbers to actually understanding what numbers represent.



*Refer to Chapter 9 for tips on printing success.

Curriculum Adaptation in Math

Considering the limitations students with Down syndrome have in learning math skills, it's evident that curriculum adaptation is not an option but a necessity. In the elementary grades, math centres that use hands-on materials, such as manipulatives, make it easier for students with special needs to stay in the classroom for instruction by encouraging peer teaching and collaborative learning.

However, in junior and senior high, the use of a lecture format denies education assistants or other classmates from providing instructional help to the student. Other hindrances include the competing noise factor and the considerably wider gap in skills.

It's important that teachers pursue hands-on learning and visual-teaching methods in the higher grades until the student demonstrates understanding. In these ways, they can tap the student's potential for grasping abstract math concepts. For example, as the student constructs equivalent sets with objects, he is learning higher-level math concepts such as one-to-one correspondence and quantification.

Students with Down syndrome also need practice and more practice at the same level over a longer time. However, in assigning practicing problems, less is more; never assign more than five problems of the same type. Avoid boredom by showing them how to practice the same skills in different ways and with different materials. By facilitating the generalization of skills, the students learn to demonstrate their competence in a number of different learning situations. They also discover there is more than one right way to practice a concept when taught to solve several problems using one strategy or to solve one problem using several strategies.

Making Math Meaningful to Students

Math becomes specialized at the junior and senior high level and, for students with Down syndrome, it's unreasonable to expect learning of pure math concepts. It becomes necessary to balance the need for a student to stay in the classroom with the need to learn meaningful math. At this age, the student's educational plan should include "math for life"; real world, independent living skills such as:

- knowing his age and date of birth;
- memorizing important telephone numbers;
- keying in a banking machine code;
- getting on the right bus;
- counting money/receiving the correct change;
- remembering locker combinations;
- preparing a budget;
- shopping, cooking, baking;
- writing a cheque and knowing how much money remains in the account; and
- telling time.



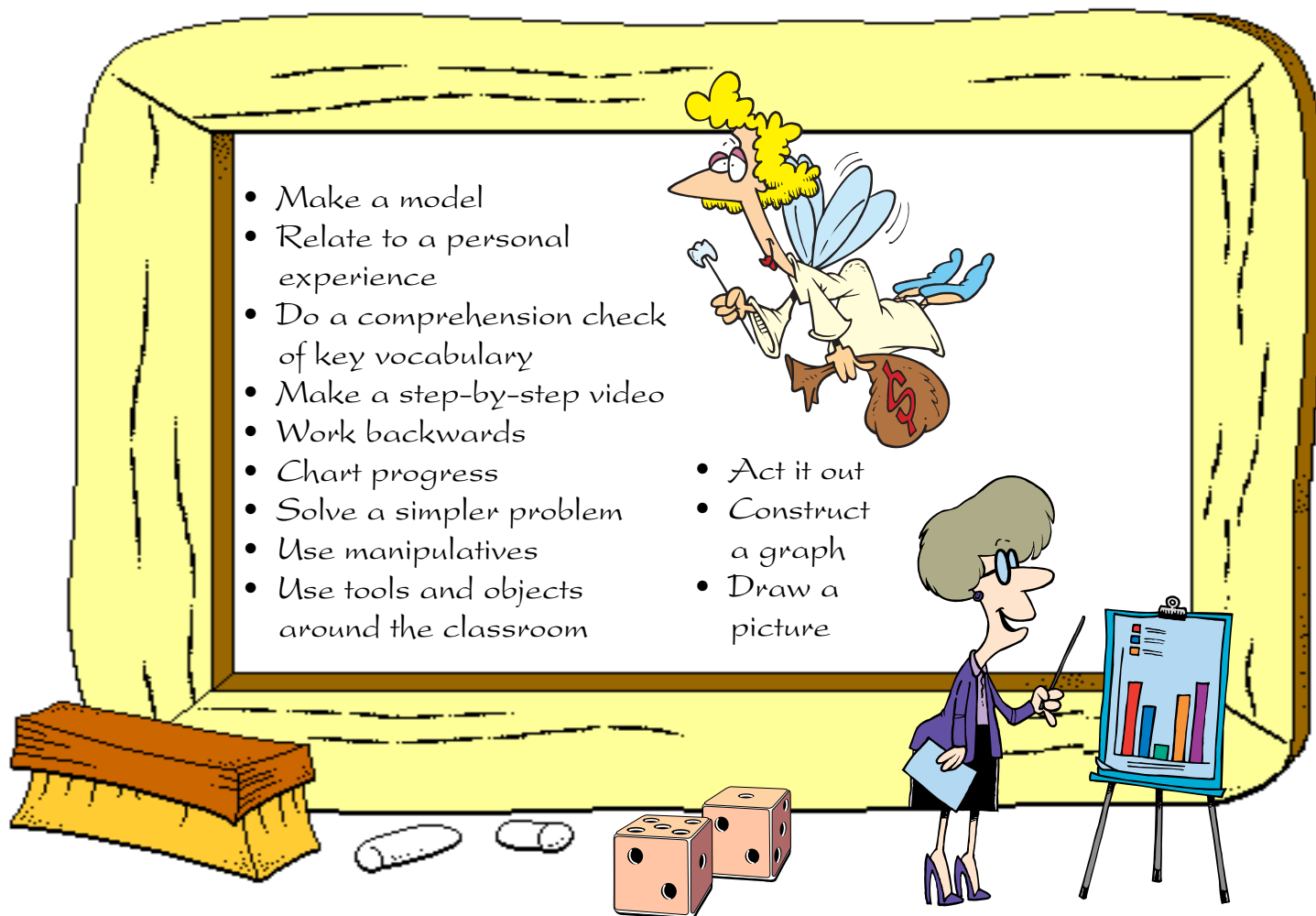
Math is about number relationships and cannot be learned by copying numbers from the board. Since math also leads the list of "top ten" unpopular subjects, it helps to focus on an area of skill development that the student shows an interest in. The gift of a watch, the desire to be "unaided" in home economics, extra time in the computer lab or selling tickets for the school dance are activities that provide extra motivation and exciting opportunities to learn math.

Math takes place all day long ... not just in math class. Students may be more motivated when they don't perceive themselves as working on "math." Use a favourite subject to introduce math concepts in different and surprising ways. For example, the number of different math skills used to bake a cake in home economics would surprise many students.

Students with Down syndrome need to review their basic skills regularly. This may entail having them work on a different aspect of math than their classmates. For instance, a student in elementary school may not completely grasp the concept of telling time. Yet, it's a very relevant skill to include on his IPP in junior high because he must be able to follow a timetable. The teaching team, including the parents, can determine when, where and how to provide this instruction. Depending on the size of the class and the activity level, consider the following strategies:

- The student receives one-to-one instruction at a back table so the class isn't distracted.
- The student works independently at a back table on a special project or with activities from a workbasket.
- The student leaves the classroom for a short time of instruction, then returns for the balance of the period to work independently on a worksheet.
- The student goes to the resource room for instruction during math periods.
- The student goes to another appropriate grade level class for math instruction.

When You Are Stuck Teaching a Math Concept: Tips to Try



Tools for Math Instruction

Math Manipulatives

Manipulatives are objects and materials that students can use to visualize and construct mathematical concepts. The introduction and resultant popularity of math manipulatives have changed classes into busy, interactive environments. Students work collaboratively or individually on the floor or at tables on interesting and motivational math tasks.

Math manipulatives can include a range of household items and are not limited to “counters” such as bears and other small plastic objects. Included in the math-enriched classroom are:

- games that use dice or a spinner (e.g., Snakes and Ladders);
- flannel boards and cutouts;
- teacher-made books;
- play money;
- graphs; and
- a vast array of sorting containers (e.g., ice cube trays, cardboard boxes of all sizes, plastic jars).



The goal is to have a variety of sets of moveable objects for comparison and contrast purposes. It may be necessary for assistants to make materials – with few yet obvious distinguishing features – that are appealing and easy to manipulate. Students will require manipulatives even in the higher grades.

At all grade levels students need to see the “big picture” before they start to work. Demonstrate each step of the activity and show them what a completed project (e.g., graph, chart or sorting tray) looks like.

When teachers model “thinking aloud” – otherwise known as metacognitive thinking – students are encouraged to verbalize each step aloud as they work with manipulatives. Metacognitive thinking is an excellent strategy to help students learn new math vocabulary and sequencing skills. Repeat the process several times and always follow the *same* steps in the *same* order using the *same* words.

Whenever it’s appropriate, teachers should deliberately make mistakes so as to model problem solving strategies. Students will then become comfortable with the trial and error process that makes math more meaningful!

Number Lines

Number lines are a permanent visual reference on the student’s desk to assist with self checking work. For example, a red arrow on the top of the number line indicates that the numbers are getting larger. There are many commercial number lines readily available for purchase, but it’s often more motivating to personalize one for the student. Number lines with removable numbers assists students to sequence numbers and to acquire the concept of “before” and “after.”

The Calculator

Calculator skills are useful to students with Down syndrome in daily-living activities because, in the “real world,” they don’t have unlimited time to complete math problems. For instance, they can use a calculator at the store to add up the cost of items, determine how much change they should get back and figure out how much money they have left over.

While the old school of thought was to avoid calculators so that the student would learn basic arithmetic, the new school of thought has the student using a calculator when new learning doesn't entail basic operations. The calculator allows the student to focus on learning new concepts rather than struggling to do the computations by hand. It's a tool that compensates for weak memory skills and relieves the stress of poor printing skills. Students will work faster and more efficiently.

The Computer

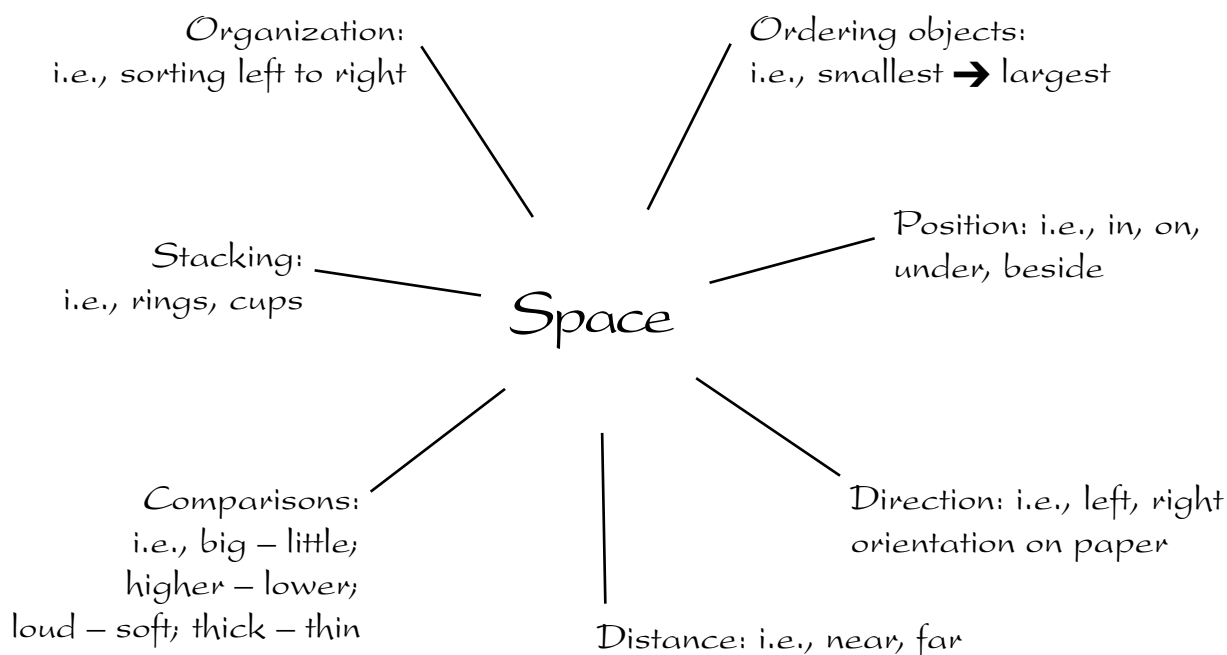
A computer centre is a valuable addition to the math classroom. Not only does the computer provide visual, motivating feedback, but it gives the student opportunities to work independently. Like the calculator, the computer can also help the student compensate for limited printing skills.

Computer time can be used as practice time for basic facts or as a reward for learning a new concept. As well as having a built-in calculator function, many excellent programs apply math to life-like situations.

Readiness Skills – Always Part of the IPP

The basic skills that provide the groundwork for math success need to be reviewed on a regular basis. Identifying missing skills may provide the reason for a plateau in learning or regression in skills. *The age of the student is not relevant.* If there are gaps in his learning, it's important to revisit the readiness skills. Remember that it's not necessary to teach all skills to mastery for the student to make meaningful progress. At all levels, re-test the student at regular intervals to ensure that he is working on meaningful goals with attainable objectives.

Readiness skills for two or more digit calculations include the ability to memorize basic math facts. Even memorizing numbers plus zero, or numbers plus one, allows students to be more efficient in calculating simple problems. If retention and recall of basic facts remains inconsistent, the student will need more time and visual manipulatives to assist in calculations.



Basic concepts that lay the foundation for numerical skills are knowledge of space, sorting and shape. These concepts should always be a part of the math program for students with cognitive delays. Teach the fundamental skills of “match, select, then name” whenever introducing any new math vocabulary or concept. Teaching the following skills with visual manipulatives will capture the student’s interest and allow for meaningful progress.

Sorting, Classification and Sequencing Readiness Skills

- Completes single insert puzzles independently
- Matches objects
- Matches pictures (i.e., LOTTO)
- Selects objects that are the same
- Completes interlocking puzzles (5 - 10 pieces)
- Sequences graduated materials (i.e., stacking cups)
- Constructs a bead or block pattern of two colours
- Sorts objects by attribute (i.e., colour, size, shape)
- Sorts objects or pictures into categories (i.e., clothes, animals, function)
- Understands and labels opposites
- Understands exclusionary statements (i.e., “Which is not _____?”)
- With visual clues, lines up objects or pictures left to right (i.e., small to big)
- With sequence cards, identifies first, next, last
- Describes past events
- Tells a sequential story to a listener

Number Concept Readiness Skills

- Rote counts
- Recognizes numbers 1 - 10 and labels
- Understands “give me one,” “some,” “all”
- Organizes material to count accurately
- Counts left to right, using 1 - 1 correspondence
- Sequences numbers in correct order (1 - 10)
- Knows what number comes next, before, after
- Demonstrates understanding of more
- Uses math manipulatives for one digit addition
- Counts to 20 or more accurately
- Demonstrates understanding of less
- Subtracts one digit numbers

Alternative Approaches to Traditional Math

As math activities move into higher number quantities, estimations and groupings for multiplication and division, the barriers to success become more difficult for the student with Down syndrome to overcome. Traditional methods of math instruction don't teach these concepts visually and the expectation is for students to rely on skills that they don't have, such as memory and abstract thinking, to solve problems. The key is to use the student's strengths through the visual channel to teach to the student's weaknesses in the auditory channel.

An effective strategy is to investigate other related fields of study to discover teaching approaches and techniques that could provide students with a visual approach to higher math. A prime example is the development of excellent math programs in the field of learning disabilities studies. Their methods make math more concrete and thus more meaningful to the student. However, they are not yet being well utilized for *all* students with intellectual challenges.

One example of such an approach is **Chisanbop Math**. Translated from Korean, Chisanbop means "finger calculation method" and is a precise, accurate method of calculating using fingers. Based on the abacus, it can be as accurate and as fast as a calculator can. Addition, subtraction, multiplication and division are all made meaningful using this approach.



B. Teaching Reading to Students with Down Syndrome

The Gift of Literacy

One of the most valued skills that an individual can possess is the ability to read. Readiness skills for reading are dependent on many factors, the most important being **opportunity**. Years ago it was erroneously assumed that people with Down syndrome *could not* learn to read. Therefore, being denied the opportunity, they *did not* learn to read. It took parents and educators with a special interest and passion to ignore the label and teach the child. Their pioneering work led to the realization and belief that children with special needs deserve this opportunity.

While opportunity is essential, it's still only the first step. For students with Down syndrome to acquire literacy skills, continued tutoring from childhood to adulthood is necessary. Since they lack the retention and generalization skills essential to incidental learning, what they learn must be taught directly. *Plateaus in reading ability need not be an indicator of limited potential, but a reminder that further teaching is required.*

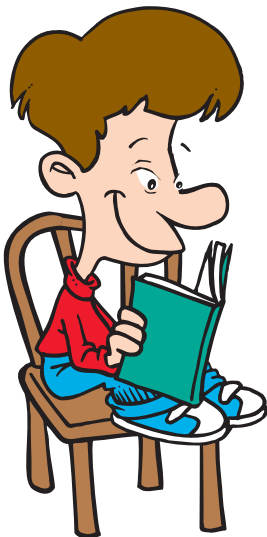
Reading is a life skill that is essential for independent living and assists individuals to:

- **enhance knowledge acquisition** by expanding vocabulary and learning new concepts in all subject areas;
- **gain information** for following directions, shopping, finding an appropriate job and being informed about the world; and
- **find pleasure and entertainment** through both fiction and non-fiction literature.

The Literacy Journey

Reading is more than decoding print on a page. A comprehensive reading program entails:

- enabling the student to make sound/symbol associations – which is called **phonics**;
- helping him develop a **sight word** bank;
- teaching him how to **print** letters on a page to **spell** words; and
- assisting him to enhance his **comprehension skills** at every step.

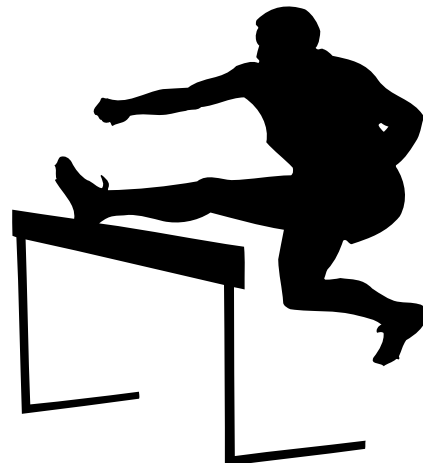


Every student can be expected to learn to read. However, not every student will achieve literacy, which is a grade five or six reading level. Progress will depend on the method of teaching, the student's learning potential *and* the support he's given at home. Learning potential is most affected by cognitive capabilities such as auditory and visual memory skills. For students with Down syndrome, reading ability may range from having only a small sight word bank to reading fluently and phonetically with comprehension.

For children of all abilities, reading brings meaning and independence to their lives. For some, the reading process will be difficult, but overcoming the hurdles will ultimately be rewarding for both student and teacher.

Hurdles to Overcome

Aside from individual differences in potential, the key factor in determining achievement level is choosing the appropriate teaching method. Students with Down syndrome benefit when the teaching method utilizes both the *visual* and *tactile* learning channels to maximum effect. The following hurdles to the acquisition of reading skills are not insurmountable. By making adaptations to compensate for the cognitive and physical deficits common to Down syndrome, students will succeed in the reading process.



Deficit	Implication	Adaptation
<i>Short Term Memory</i>	<ul style="list-style-type: none"> – Rate of learning is slower – Comprehension skills are weak 	<ul style="list-style-type: none"> – Repetition of instructions by teacher <i>and</i> student – Visual and tactile cues
<i>Long Term Memory</i>	<ul style="list-style-type: none"> – “Forget” rate is higher – Retention of new skills is unpredictable 	<ul style="list-style-type: none"> – Repetition/rehearsal – Visual and tactile cues
<i>Sequencing Skills</i>	<ul style="list-style-type: none"> – Prediction skills are weak – Unable to connect the parts to the whole 	<ul style="list-style-type: none"> – Visual and tactile cues – Breakdown tasks into small steps
<i>Problem Solving</i>	<ul style="list-style-type: none"> – Guessing/giving up – Unable to see the whole picture – Unable to understand abstract language 	<ul style="list-style-type: none"> – Visual and tactile cues – Vocabulary building – Rehearsal/repetition
<i>Articulation</i>	<ul style="list-style-type: none"> – Unable to make some sounds 	<ul style="list-style-type: none"> – Speech-language therapy
<i>Auditory Discrimination</i>	<ul style="list-style-type: none"> – Unable to discriminate between sounds – Unable to rhyme words – Unaware of word families 	<ul style="list-style-type: none"> – Auditory training/phonics repetition – Visual and tactile cues
<i>Generalization</i>	<ul style="list-style-type: none"> – Unable to generalize concepts to new activities or situations 	<ul style="list-style-type: none"> – Repetition/rehearsal in each new area – Visual and tactile cues
<i>Vision</i>	<ul style="list-style-type: none"> – Unable to discriminate words on a page 	<ul style="list-style-type: none"> – Vision check/glasses

Milestones on the Literacy Journey

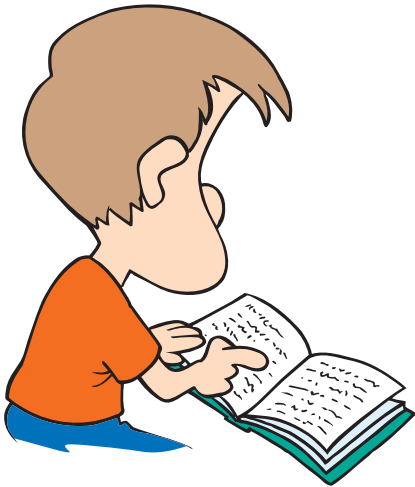
A student’s journey on the road to literacy begins with language. Typically, students with Down syndrome are delayed in their acquisition of receptive and expressive language skills. Yet, despite this delay, the *frequency, repetition* and *rhythm* of words in every day situations can awaken an interest in the relationship between the spoken and printed word. The first step to reinforcing this interest is opportunity. Early intervention – exposing children to books and word games at a young age – will develop the interest in pictures and words that starts the literacy journey.

“A child’s task early in life is to learn language;
later, the child’s task is to use language to learn.” (Masland and Masland, 1988)

Interest in Books

A child's initial interest in reading is born when he is read to regularly. "Read early and read often" is the soundest advice a parent can receive. When parents model that reading is an integral part of the daily routine for everybody in the family, children soon learn to appreciate books.

Daily quiet reading times develop important pre-requisite listening and attending skills so children are able to:



- sit quietly and listen as books are being read;
- point to pictures on request;
- pick a book and sit quietly and turn the pages independently;
- rehearse the left to right, top to bottom progression;
- finger track, touching each word with the index finger;
- participate verbally when expected to join in;
- begin to predict what will happen next in the story;
- tell others in his own words what happened in a story; and
- request a favourite book.

Interest in Words

Printed words are all around us as we travel through the day. These words start to take on meaning when students begin to recognize the names of favourite destinations or familiar street signs (e.g., McDonalds, Stop). A student's first sight words will most likely include meaningful vocabulary such as the names of family members and best liked friends, fast food restaurants, ice cream flavours or toys. Spontaneous recognition of these words is often an early sign that the student is capable and ready to take the next step in learning to read.

Singing songs and rhyming words are important word play activities that increases the student's awareness of the connections between sounds and letters. Singing helps him attend to words and intrigues him to sing along to the beat. Rhyming helps him develop phonological awareness that assists him to categorize and generalize words.

A lack of interest in words may be a sign that the student cannot hear or see properly. Students with Down syndrome are at high risk for hearing deficits. Early detection and ongoing monitoring ensures that they have the hearing acuity needed to listen and attend to auditory stimuli. Due to weaknesses in the eye muscles, most students also experience vision problems before age six. Corrective surgery or glasses generally enable them to focus on the printed word.

Reading Readiness Skills

At every age, it's important to stimulate the development of auditory and visual memory skills that help the student "get ready to read." One standard predictor of readiness is the ability to match objects and pictures. However, many other precursor skills need to be taught before words are introduced.

Often, with older students in particular, educators are loath to “go back to the beginning” and start afresh. Nonetheless, the time and energy invested in reviewing basic matching and sorting skills will awaken the student’s interest in words. While it’s possible to learn to read without *all* of the following readiness skills, if these foundation skills are weak or missing, there is a greater likelihood that the student will plateau at a later date.

1. **Attending Skills.** The ability to “*look, listen and learn*” is established when students are expected to behave appropriately in teaching situations. One example of a basic attending skill is to initiate and maintain eye contact with others. Students need more practice and a greater number of visual cues in regular teaching sessions to make eye contact with the teacher, learn to sit at a desk, cope with visual and auditory distractions and comply to simple instructions.
2. **Visual Discrimination.** The ability to *match* and *sort* objects and then pictures indicates that a student is able to discriminate between the similarities and differences in colour, shape and/or size. The next step is to introduce the concept of *same* and *different*. Students benefit when the task is simplified by providing fewer choices and using photos or real objects. As the student demonstrates understanding, make the differences progressively more subtle to challenge him to identify distinctive features. Eventually, he can apply this skill to differentiating between similar looking letters and words.
3. **Auditory Memory.** The ability to *recall sounds and words* and imitate them spontaneously or on request is dependent on a student’s short-term auditory memory. Development of this critical readiness skill requires exposure to music and beat from an early age and encouragement to sing, move and clap to the rhythm. Pairing actions with words provides a visual and sensory cue that assists in remembering auditory information. Phonological awareness, which is hearing the differences and similarities in spoken words, requires daily practice in recalling and reproducing sounds and words on request.

Memorizing finger plays, nursery rhymes and songs facilitates the development of long-term memory skills that assists in vocabulary retention and recollection. Including auditory memory activities at all ages and levels of development exposes students to sound/symbol associations needed for reading and spelling new words.

Key Components of a Comprehensive Reading Program

A teacher’s experience and training will dictate which of the many reading programs on the market she is comfortable using. The best ones are those that can be individualized to meet the learning needs of a particular student. Look for reading programs that capture the student’s imagination and interest. A lack of flexibility and understanding of individual needs is the biggest obstacle to achieving success. Demonstrate flexibility by:

- following the student’s lead;
- using developmentally age appropriate materials;
- incorporating visual and tactile cues at every level;
- being willing to go *back* and review the basics when needed;
- giving the student more time and more practice at each step;
- reviewing past lessons regularly to check on the student’s retention of knowledge;
- recognizing that plateaus are an opportunity to strengthen and practice skills previously learned; and
- experimenting with different teaching methods or materials.

Sight Words

A sight word reading program will be successful if the student has the ability to first match, select then name *pictures*. Taking this skill to the next step of matching *words* will establish a beginning sight word bank. This is a significant milestone in learning and, for students with Down syndrome, proof that “I can read.”

Using words that are meaningful to the student is essential when starting a reading program. Create small, personalized picture books comprised of photographs and names of people and places that are important in his life. Familiar, repetitive sentence patterns, such as “I like ...” and “I see ...”, help him to match words to pictures and to sequence, predict and expand his sight word bank.

Students with Down syndrome *can* learn to sight read before becoming competent verbal communicators. Those with limited verbal ability are able to expand both their receptive and expressive language skills by learning to read. (Sue Buckley, 1996, 1997) As their sight word bank continues to grow, it’s imperative to implement and evaluate comprehension strategies to reinforce learning and ensure that the student is, in fact, *reading with meaning*.

Comprehension

At every step in the reading process, comprehension is essential if the student is to generalize what he has read to his world. When he recognizes the meaning of a written word, he is more likely to recall the words and recognize them in his reading. This ensures that he is reading with meaning and not relying on rote memory. Establish a routine of stopping to ask questions throughout any reading exercise and check for comprehension at every level of reading by:

- **clarifying** any words or sentences;
- asking the **5W questions**;
- taking turns **predicting**; and
- asking students to **summarize** what was just read in their own words.

**WHO? WHAT? WHERE?
WHY? WHEN?**

To promote independence in older students, print out these points on cue cards so they can self-check comprehension when reading alone. Then reinforce self-help skills by encouraging students to be open with questions and concerns and teaching them the vocabulary to ask for help, for clarification or to say, “I don’t understand.”

Phonics

Knowledge of the alphabet – the names of the letters, their sounds and the sequence – provides a student with many valuable tools for learning to read and write. Students lacking alphabet awareness can develop a sight word bank, but will inevitably plateau in their reading ability.

For students with Down syndrome, auditory memory deficits interfere with learning both the names of the letters and the associated sounds. Repeated practice with *visual* and *tactile* cues is needed to recognize, produce and remember letters and sounds. For example, an alphabet line is a *visual* cue that allows the student to self-check his work and recall vocabulary. An effective *tactile* cue is to “feel” how sounds are made (e.g., blowing, popping lips). Students who watch themselves in the mirror receive auditory and visual feedback that assists them in learning new letters and the associated sounds.

Teaching sight words and phonics concurrently provides students with the *word attack skills* necessary for decoding the printed word. By using sound/symbol associations, they learn to discriminate and articulate each sound or syllable in a word. This focus on sound production improves their oral reading and spelling and increases intelligibility of speech.

Recent advances in teaching students with Down syndrome to read have been made possible by collaboration with colleagues in the field of learning disabilities. The alternative teaching methods and programs they have developed for those with learning disabilities can be adapted to have direct application to students with diverse special needs such as Down syndrome.

One such method is **Auditory Discrimination in Depth (ADD)**, a multisensory preparatory program developed by Charles and Patricia Lindamood that develops the auditory/perceptual skills basic to reading, spelling and speech. The major premise of this program is that the auditory elements of speech sounds should not be separated from the more basic oral-motor activity that produces them. Developing the student's ability to monitor sensory cues from the eye, ear and mouth (e.g., "What shape do you see your mouth making?" "What sound do you hear?" "What do you feel your lips doing?") helps him to self-correct while reading and spelling. With some modifications to individualize the program and make it more visual, this approach can be used successfully with students with Down syndrome. Again, the importance of *daily* practice with sound/symbol association cannot be over emphasized.

Spelling

Students with Down syndrome benefit when a combined approach to reading and spelling is used. Those who also have hearing impairments (e.g., fluctuating hearing loss due to chronic ear infections) are especially helped when sight words, phonics, comprehension *and* spelling skills are worked on with a multisensory approach. This tactic provides increased memory recall because information can be stored in more than one place in the brain. The resulting increase in the use of visual and tactile learning channels can help compensate for any decline in hearing acuity.

Knowledge of the Alphabet

When introducing letters and words:



By incorporating a variety of tactile and visual experiences in each of the above steps, the student receives the sensory integration and repeated practice needed to learn his ABC's.

Auditory Discrimination

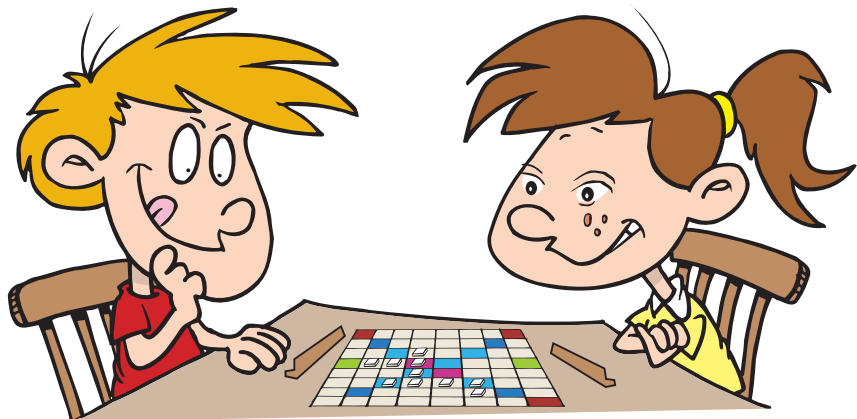
Good listening skills are a pre-requisite for auditory discrimination activities. Students must listen closely and carefully to notice the similarities and differences in sound production. For students with Down syndrome, these subtle differences may only be recognized when paired with tactile and visual cues. Then, with concerted effort and persistence, they can learn sound/symbol associations. For spelling, introduce sounds in different positions of words in the following progression:

1. **Initial position.** Start with easy to distinguish and regularly occurring consonants ... b, m, f, s, t. For example:
 - a. What do the words ball, bat and boat begin with?
Think of three more words that start with b.
 - b. Circle every word that starts with b.
 - c. Fill in the missing letter at the beginning of each of these words; __all, __at, __oat.
 - d. Tell me, then print the first sound/letter in the following words: toast, bag, mom, sun.
2. **Final Position.** Start with the same few consonants used with the initial position.
 - a. What do the words beet, bat and boat end with?
 - b. Circle every word that ends with t.
 - c. Fill in the missing letter at the end of each of these words; bee__, ba__, boa__.
 - d. Tell me, then print the last sound/letter in the following words: toast, bus, mom, bob.
3. **Both Initial and Final Position.** Using one blank for each of the first and last letters of a word gives the student a visual cue of what he's expected to print. "Can you print the initial and final sounds you hear in the word bat?"

b	t
—	—
4. **Medial Position.** Sounds in the medial position are tougher to discriminate and need more time and repetition to master. The use of visual (e.g., pictures of mouths that are smiling, open and round) and tactile cues (e.g., "Feel your lips; are they round when you make the /oo/ sound?") helps the student see and hear these sounds.

Games

- Bingo – with pictures or words; "Find a picture that starts with the sound /m/";
- Flash cards – for matching and memory;
- Fill-in-the-blank sentences
– for a comprehension activity, use "silly" words and talk about why they do or don't make sense;
- Boggle®;
- Go Fish®;
- Scrabble®.



Spelling Tests and Spelling Lists

Any student on a spelling program needs to be tested weekly to gauge proficiency and vocabulary growth. Regular tests also provide a chance to observe whether the student is using phonetic strategies. His ability to sound out the word and make an “educated guess” is a mark of success.

Spelling lists are a visual reminder for students to cue in on new vocabulary and theme words. The list contains words they will subsequently recognize in textbooks, incorporate in their journal, add to their personal dictionaries and practice for spelling and vocabulary tests.

Spelling tests and lists are helpful records to include in a portfolio assessment to grade and record progress.

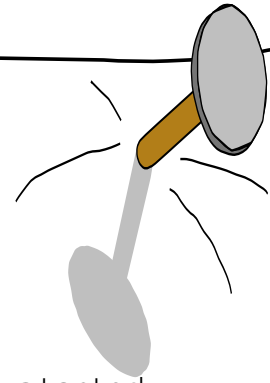
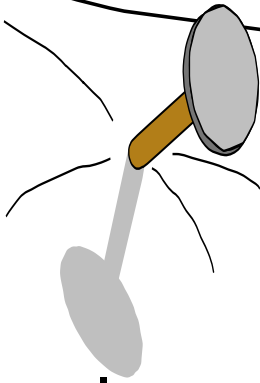


The Journey Continues ...

The literacy journey is perpetual, without a final destination. It is a continuing quest to enhance knowledge, gain information and find pleasure in reading. For students with Down syndrome, this journey depends on the opportunities and support provided by families and educators.

Wherever the student is on the continuum, there is always room and hope for improvement. Daily reading practice is essential for students to continue to progress in small steps. Success is illustrated when they are motivated to read independently, whether picking up a favourite book or following a recipe for the first time.

Remember, if reading is an important part of the family’s daily life, it will become a part of the individual’s life. Whether the student with Down syndrome learns to read functionally or advances to reading for pleasure, each milestone reached is important and should be celebrated as another step on the journey.



Inclusion for our daughter has worked very well. She started early intervention at six weeks old and PREP at eighteen months. We tried all the intervention we could to prepare her for her years ahead.

At four years old she was integrated into a preschool. At five years old she attended kindergarten and had a very successful year, partly due to her exceptional teacher and help from a full time assistant. This first year at school (kindergarten) gave our daughter the successful start she needed for her future school experiences. The teacher worked very hard at adapting things so she could follow along with the class and feel like a contributor.

Her years at PREP attending Fun with Moms and the preschool program set the first stepping stones to enable her to move so easily into school. Without these early years of valuable hours at PREP, integration would probably not have been so easy as she would not have been as prepared. PREP's speech therapists and teachers prepared her by improving her speech language skills, introducing her to her first reading experiences, teaching her appropriate behaviours while in a classroom setting and how to interact with peers and teachers.

Our daughter has had a very positive experience with integration in the school system and in out-of-school activities. It is so important for her and her family for her to have the same privileges as everyone else.