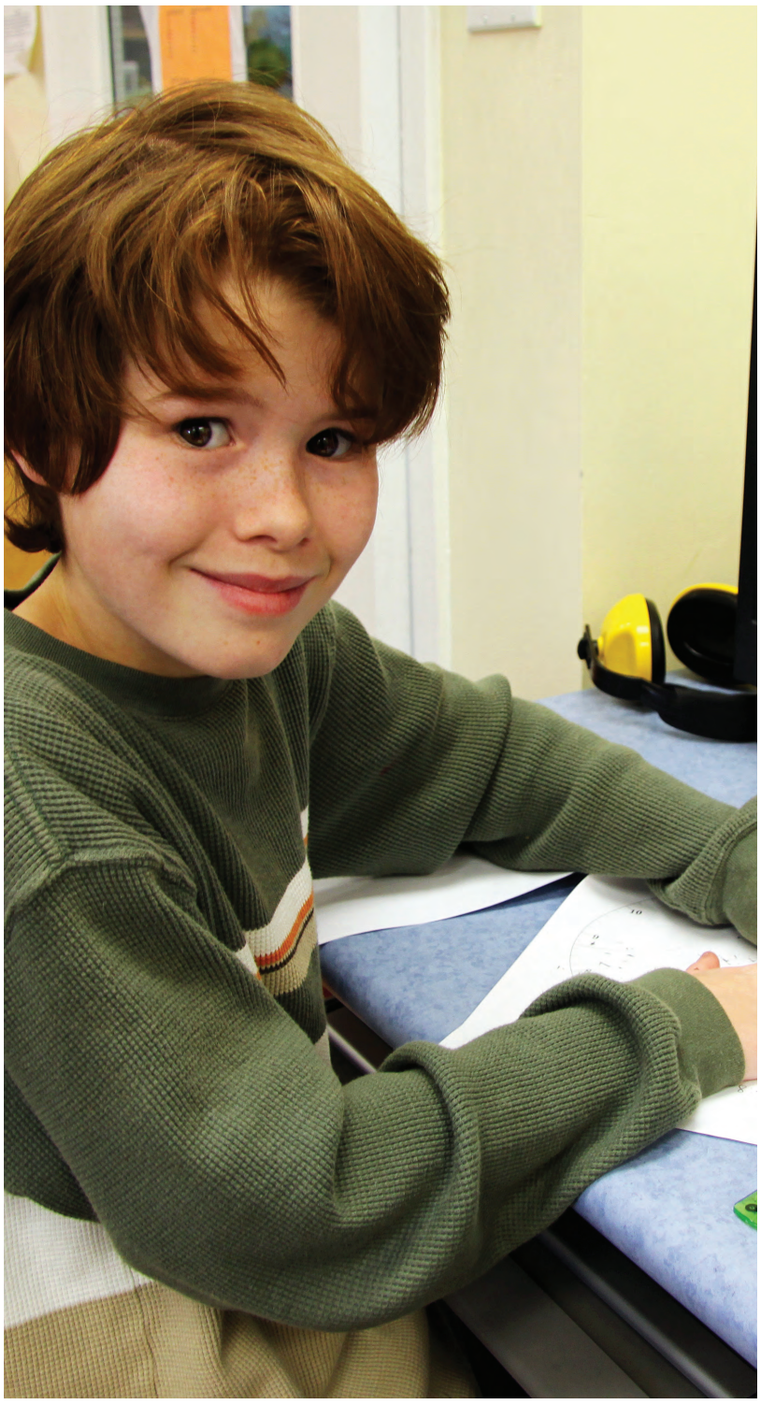
Arrowsmith PROGRAM

*Strengthening Learning Capacities®*

# Arrowsmith Program Implementation Brochure

www.arrowsmithschool.org



A cognitive program for students with **specific learning disabilities**

## A Message from the Director Barbara Arrowsmith Young of the Arrowsmith Program

The Arrowsmith Program is based on the application of neuroscience research and the premise that it is possible to address a range of learning disabilities, also know as specific learning difficulties, by identifying and strengthening cognitive capacities.

The Arrowsmith Program, through careful assessment, identifies areas of learning strength and weakness to create an individual learning profile for each student and then designs an individualized program designed to address their specific areas of weakness. The goal of the Arrowsmith Program is to strengthen learning capacities rather than teach ways to compensate for or work around specific learning difficulties. We have been helping children, youth, and adults with learning difficulties address their challenges and achieve academic and vocational success since 1978. Specially trained and dedicated Arrowsmith Program teachers have helped thousands of students through our individualized and specialized programs. The goal is to help students of all ages become effective, confident, and self-directed learners. Learning disabilities are estimated to afflict five to ten percent of the population; within this group there are thousands of students who could benefit from the Arrowsmith Program. Students without formal identification who are struggling in one or more subjects may benefit from this program.

The typical Arrowsmith Program student is of average to above average in intelligence and has a combination of the learning difficulties that are described in the *Description of Learning Functions* on the Arrowsmith Program website. To investigate if the Arrowsmith Program may be of benefit the *Arrowsmith Program Cognitive Profile Questionnaire* on our website can help determine if the learning difficulties experienced are typical of those addressed by the Arrowsmith Program.

The *Arrowsmith Program Chart of Learning Functions and Learning Outcomes*, on the website and in this document, provides a description of the relationship between the function of the cognitive areas for which the Arrowsmith Program has developed specific programs, the learning difficulties a student may have if there is a problem in this function, and the learning outcomes achieved related to the cognitive function upon completion of the Arrowsmith Program.

There have been a number of research studies on the Arrowsmith Program across different schools implementing the program that have demonstrated a range of improvements in academic performance and learning abilities. These studies have used different research designs and measures as well as educational and cognitive assessments. For updates on the research being conducted on the Arrowsmith Program, please visit the *Research* page on the website.

We recommend three books: *The Woman Who Changed Her Brain* by Barbara Arrowsmith-Young that chronicles the history of the Arrowsmith Program and illustrates through case studies what happens when specific cognitive functions are impaired and the transformation that occurs through the application of cognitive exercises to strengthen these weak learning capacities; *The Brain That Changes Itself* by Dr. Norman Doidge details the science of neuroplasticity, which is the foundation of the Arrowsmith Program and Chapter 2 describes the work of Arrowsmith School; and *Brain School* by Howard Eaton that describes the success of students from Eaton Arrowsmith School in Vancouver who improved cognitive functioning and demonstrated significant changes on academic and cognitive measures, and were able to participate more fully and effectively in the world.

We offer webinars and information session throughout the year for educators and others interested in learning more about our approach. Please visit our website for a list of dates or contact us to arrange a presentation at another date if you have a group interested in attending. We also invite visitors to attend our monthly evening parent open houses at Arrowsmith School Toronto, Canada.

The Arrowsmith Program is offered at educational organizations worldwide. A list of these organizations can be found on the *Participating Schools* page on the website. Our goal is to see the Arrowsmith Program more broadly available in both public and private school systems.

For further information about the Arrowsmith Program and the learning difficulties it addresses or its implementation please contact us by email at: info@arrowsmithprogram.ca or visit our website at: www.arrowsmithschool.org

Barbara Arrowsmith Young
Director, Arrowsmith Program

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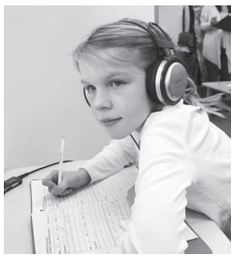

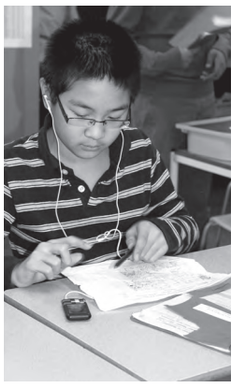



A cognitive program for students with **specific learning disabilities** including:

**READING**

**WRITING**

**MATHEMATICS**

**COMPREHENSION**

**LOGICAL REASONING**

**EXECUTIVE FUNCTION**

**VISUAL MEMORY**

**AUDITORY MEMORY**

**DYSLEXIA**

**NON-VERBAL LEARNING**

**AUDITORY PROCESSING**

**WORKING MEMORY**

**ATTENTION**

# Neuroplasticity and the Arrowsmith Program

"Every man can, if he so desires, become the sculptor of his own brain"
*Neuroscientist and Nobel Laureate Santiago Ramon y Cajal (1852-1934)*

In the late 1970s, before neuroplasticity gained widespread attention, students were using the first of the cognitive exercises that today comprise the suite of exercises of the Arrowsmith Program at a small tutoring service in Toronto operated by Barbara Arrowsmith Young. By 1980, Arrowsmith School had been established, and it has been in continuous operation since that time, offering the program to students as well as providing the environment within which the entire suite of cognitive programs have been developed and refined.

At the core of the Arrowsmith Program is the principle of neuroplasticity. This is the capacity of the brain to change both structurally and functionally in response to training and experience over a person's lifetime.

Research has demonstrated that the brain has the ability to change as a result of specific stimulation and this positively impacts learning: "Now a spate of studies show that mental exercise can have profound effects on mental capacity" (The Society for Neuroscience, Brain Briefings, December 1997).

The Arrowsmith Program integrates two lines of neuroscience research - that of Russian neuropsychologist, A. R. Luria and the American psychologist, Mark Rosenzweig - into a new methodology with practical applications for addressing specific learning difficulties.

Neuroscientists have been identifying different areas of the brain that contribute to cognitive and perceptual activities since the 19th century. A.R. Luria established that different areas of the brain work together in functional systems to accomplish complex mental activities, such as reading or writing or numeracy, and that each brain area has a very specific and critical role to play in the learning process. A weakness in one area can affect a number of different learning processes.

Dr. Rosenzweig was one of the early scientists who discovered that the brain can physically change in response to stimulation, developing new neuronal and synaptic connections believed to be the physical substrate that underlies learning.

Luria's work led to the identification and understanding of the function of specific cognitive areas critical to the learning process which became the basis of the Arrowsmith Program's cognitive exercises. Rosenzweig's contribution was that specific targeted stimulation could stimulate and improve the functioning of specific areas of the brain.

A premise of the Arrowsmith Program, based on these lines of research, is that underperforming or weak cognitive functions can contribute to specific learning difficulties. The specific nature of the learning difficulty will depend on the nature of the underlying cognitive function impacted. For example, a problem in the area involved in motor planning in learning symbol sequences will affect learning motor plans in writing, reading, speaking and spelling.

The Arrowsmith Program has postulated, since it began providing the cognitive exercises, that the functioning of the cognitive areas that contribute to a range of specific learning difficulties can be improved through targeted cognitive exercises and this leads to improved learning abilities.

The philosophy that the learner is not fixed, but can be modified through the application of the principles of neuroplasticity, sets the Arrowsmith Program apart from the majority of other programs for students with learning difficulties. The Arrowsmith Program is capacity based, in that the goal is to change the student's capacity to learn, rather than compensatory which tries to work around the problem. Strengthening these weaker capacities, it is hypothesized, increases the overall functioning of these specific cognitive areas, allowing them to be used more effectively for learning.

The Arrowsmith Program is tailored to the unique requirements of each individual student. Upon completion, and with the attendant improved cognitive capacities, the majority of students are able to participate in a full academic curriculum at their appropriate grade level without the need for resource support or curriculum modification.

Upon completion of the program some students may require one to two years to gain experience using their newly strengthened cognitive capacities and some students may need tutoring initially to bring academic skills to grade level given their gaps in academic learning.

The goal of the Arrowsmith Program is for students to capitalize on their strengthened cognitive capacities to become effective, confident, and self-directed learners for life and to enable them to achieve their goals of academic and career success.

## From a review of "The Brain That Changes Itself"

*Scientific American Mind, April/May, 2007*

**"… in the past couple of decades, scientists have compiled formidable evidence of the persistence throughout adulthood of neuroplasticity, the brain's capacity for structural and functional change. Sophisticated scanning technologies reveal brains to be more flexible and dynamic than traditionally thought. Moreover, new therapies and exercises draw on neuroplasticity to counter conditions ranging from strokes and balance disorders to learning disabilities and age-related cognitive decline….**

**… neuroplasticity pioneers discussed include …educator Barbara Arrowsmith Young, who developed mental exercises, such as reading cards with complex clock faces, to overcome her own early difficulties with abstract thought."**

# The Heart of Learning Disabilities

It's been thought deficits in the brain cannot be reduced, only compensated for. But a Toronto educator aims to prove that's not the case. *(Part one of a two-part series)*

*Dr. Norman Doidge* 

A new system of understanding and treating learning disorders, pioneered by Barbara Arrowsmith Young, a Toronto educator, is showing remarkable results.

The system is of particular interest to doctors because it is based on strengthening weak brain areas, and derives from familiar territory: studies of patients with strokes and brain lesions. It provides hope for significant improvement for those with learning disabilities who have problems with reading, memory, putting thoughts into words, comprehension, logic, mathematics, learning languages, organizational difficulties, clumsiness, impulsivity, attention, speaking smoothly, trouble writing neatly or reading emotions in others.

Learning disorders are one of the most underestimated causes of failure in both school and life. A person can be intelligent but still have a focal learning problem that has a major impact on their life. Many depressed adolescents have undetected learning disorders. Many of us chose a career not because we wanted it, but because we had limited options owing to an area of cognitive difficulty, which was undetected. Some who are stuck in psychotherapy actually have undetected learning disorders.

For those with several areas of dysfunction (which is quite common), life options dwindle rapidly, starting in elementary school. Those whose difficulties are mild may get through elementary and high school, but in university, when the load is increased, suddenly begin to bomb out for reasons they can't explain. "My mind is like a sieve, when it comes to (fill in the blanks)." This new system helps explain these difficulties with great economy.

Young, who founded and directs the Arrowsmith School in Toronto, developed the treatment by putting two lines of research together.

The first is the discovery of neuroplasticity. Even up through the 1980s, medical schools taught that the brain cannot recover from deficits or regenerate itself.

But in a study published in American Psychologist in 1966, Prof. Mark Rosenzweig of the University of California at Berkeley, described an experiment in which he placed rats in both stimulating and cognitively impoverished environments. He found those who had been in the stimulating environments had heavier brains, with better blood supply and greater quantities of neurotransmitters. It was one of the first substantiations of the idea the brain could change its structure with stimulation.

This year's Nobel Prize for Medicine went to Dr. Eric Kandel (PhD), who showed that as snails learned, the branches between their neurons were physically altered and enhanced.

Evidence for neuroplasticity has been coming fast and furious lately. Dr. Fred Gage of the Salk Institute discovered the brain has stem cells deep within it which seem related to the capacity for regeneration.

Neuroscientists have also shown that after amputation the area of the brain that mapped or represented the lost limb gets taken over to be used to map adjacent areas of the body. Thus the brain can reorganize itself structurally. All these findings show the brain has more capacity to recover from deficits than once thought.

The second line of research was the work of Russian physician and neuropsychologist Dr. Alexander Luria who, analysing Russian soldiers wounded in the Second World War, mapped the brain in the 1940s without the benefit of brain scans by precisely correlating location of wound with loss of function. He was also able to analyse complex activities such as reading, or the use of logic, grammar and writing, into their constituent parts.

Arrowsmith Young took Dr. Luria's work and applied it to learning disorders. She realized many patients with learning disorders had deficits in the same areas Dr. Luria's patients did.

Treatment for learning disorders before the discovery of neuroplasticity was generally based on the premise deficits cannot be strengthened, only worked around or compensated for. Those with trouble listening and taking notes were encouraged to tape lectures or hire "note-takers." Those with trouble learning foreign languages were encouraged to drop them.

Arrowsmith Young developed exercises for the 19 areas that lead to the most common learning difficulties. These exercises are the opposite of compensations; they tax the weakened area. Recently, American groups have begun using similar techniques. Thus the Fast ForWord program taxes two areas, probably those related to-to use Arrowsmith Young's way of understanding things-deficits in Broca's area and Wernicke's area of the brain.

What follows are clinical descriptions of learning dysfunctions that underly learning disabilities.

- **Problems in motor symbol sequencing:** Those with messy handwriting, or who have to print when they write, or who read slowly or with difficulty, or who have laboured speech and trouble getting to the point, or who omit important information, often have a problem here. The deficits stem from an area of the pre-frontal cortex that normally converts sequential symbolic processes into sequential motor actions.

  Such people can do simple movements, but when longer, sequential motor activity is called for, they get overloaded. Thus, they can often type or print neatly enough, because each letter is produced by a few movements at a time. Since each printed or typed letter is made in the same way (except for capitals) long sequences are not required. But cursive writing connects all the letters in a slightly different way, and requires a complex sequence of movements, overloading the memory capacity of the prefrontal cortex. Hence, writing is jerky.

  Reading is slowed because it also involves integrating symbolic sequences with motor movements of the eyes. The reader's eyes must track across the page at the right speed and take in precisely the right-size visual gulps of words. People with weak motor symbol sequencing often misread words because their eyes skip in a jerky way.

  Finally, speech involves converting symbolic sequences into motor sequences. These people sometimes find their thoughts come faster than they can convert them into speech. Often they can't find the right word, so they ramble and talk around the point. Frequently they leave out important information they thought but couldn't put quickly enough into words. Treatment involves sophisticated, high-speed tracing techniques, which isolate the left hemisphere motor region area that controls eye movements.

- **Auditory memory for instructions:** We once imagined the brain had completely separate areas for perception, memory and reasoning, but that doesn't appear to be the case. Some people have excellent visual memories and can scan a printed list of words and remember them well, but have awful auditory memories. The memory systems for these perceptual systems are different.

  In young children, the auditory memory problem manifests itself as forgetting instructions to do things, especially things not related by meaning, such as things they might need to do to help their parents, or what the teacher said their homework is.

Parents and teachers have to repeat instructions over and over, and think the child isn't listening, or has ADHD, but the problem is more focal. Parents often think their child is stubborn, irresponsible or lazy. If the child is told to do something and then gets distracted, the instruction will be totally forgotten.

If the average person can remember seven unrelated things they hear (as in a typical phone number), such people might be able to remember only two or three. They often feel embarrassed about asking others to repeat things over and over, and develop strategies to deal with it in later life (such as compulsive note-taking, Post-its, writing on the hand). In severe cases, they can't follow the story in a song lyric. With effort, they can keep up with others for a while, but then get exhausted. They tune out easily in lectures or classes. While something like methyl-phenidate hydrochloride will improve their performance, it is not getting at the root cause: a focal difficulty of a particular kind of memory.

Using various memory exercises, these children can improve, and some who came to the school on drugs for ADHD can go off them, as the underlying learning disorder is treated.

A follow up study at the Arrowsmith School showed 80% of students achieved their educational goals. Though some entered the school as many as seven grade levels behind in reading, math and other activities, they caught up to peers.

*Norman Doidge is a Toronto research psychiatrist and psychoanalyst. He is on faculty at Columbia University, Centre for Psychoanalytic Training and Research, and head of long-term psychotherapy in the Department of Psychiatry at the University of Toronto.*

# Identifying Brain Deficits

Toronto's Arrowsmith School treats a wide range of the learning dysfunctions that affect our children *(Part two of a two-part series)*

*Dr. Norman Doidge* 

Last week's article described a new technique developed by Barbara Arrowsmith Young, director of Arrowsmith School in Toronto, for assessing and treating learning disorders. Using the work of Dr. Alexander Luria, a Russian physician and neuropsychologist, Arrowsmith Young found that many people with learning disorders actually have deficits that are like milder forms of certain known brain lesions. Thus, to take a simple example, physicians are familiar with lesions in the left frontal area leading to Broca's speech deficit in stroke patients. Arrowsmith Young postulated - and recent brain scan studies have shown - that people who have milder difficulties pronouncing words have weakened Broca's area. But she also found numerous other interesting deficits, and has developed treatments for them.

What follows are some common clinical presentations of learning dysfunctions. Arrowsmith Young distinguishes between learning dysfunctions, which are problems stemming from deficits in particular areas of the brain, and learning disorders. A learning disorder might be "reading difficulty." But several different kinds of dysfunctions might contribute to it (such as motor symbol sequencing, problems with auditory speech discrimination or troubles with comprehension).

- **Symbol relations:**
  Arrowsmith Young has pioneered the treatment of difficulties in this area. Dr. Luria discovered that there is a part of the brain where the parietal, occipital and temporal lobes meet that is responsible for allowing us to understand the relations between symbols, hence Arrowsmith Young called this function "symbol relations." People with problems in this area present with a funny conglomeration of difficulties, which seem unconnected but are not. They often have trouble learning how to read an analog clock because they can't understand the relationships between the hands. They have trouble with grammar. Prepositions, which are about relationships (in, out, with, without) are difficult to understand. Logic, which is also about relationships (if A, then B) is compromised. So is mathematics, which is often about symbolic relationships (such as fractions, correlations or percentages). While other parts of their reasoning might be quite effective, when people who have problems in this area must think about relationships, particularly a lot of relationships, they are easily overloaded. This can lead to difficulty learning to read as well. The angular gyrus in the left hemisphere has been implicated in this, and the Arrowsmith School developed a specific exercise to strengthen this area to above the normal range. Children who complete the exercise find they can much more easily begin to understand math and grammar.

- **Artifactual thinking problems:**
  This describes difficulties in reading non-verbal emotional cues, which are crucial for understanding how people behave. It is hard to "read people" if this area is compromised. Not picking up on cues, people with artifactual thinking problems may speak on and on about a subject, when others would know to stop. Environmental deprivation or defences are not the sole cause of lack of empathy. The right frontal cortex, devoted to processing non-verbal cues such as facial expressions and body language, makes an important contribution to empathy. In testing, these people often fail to consistently observe visual details. They often stop looking before taking in the overall picture, and come to the wrong conclusion about the situation. A deficit here also leads to limitations in the co-ordination, modulation and interpretation of one's own emotions. Consequently, emotions are less refined, differentiated or modulated. Unmodulated emotions can easily overwhelm one, and these people are prone to impulsive reactions. Being "out of it" they are prone to misunderstand, anger or acting in odd or frustrated ways.

- **Symbol recognition difficulties:**
  This capacity, dependent on the left occipital area, allows people to recognize and remember a word or symbol visually that they have seen before. People with a deficit in this area have to study a word many more times than average before they can visually memorize it. In severe cases they might not recognize a simple word such as "house" even though this is a word they have seen many times before. Reading is slowed, and people with difficulty in this area may fall back on

trying to sound out the words, if the part of the brain that processes the sound of words is working well. Needless to say, learning foreign alphabets is especially hard. The capacity to recognize symbols is different from the capacity to recognize "real" things such as landmarks or real objects - a right occipital function. (People with those deficits have object recognition difficulties, involving a right occipital deficit.)

- **Broca's area:**
  As stated, people with weakness in this area frequently mispronounce words. Interestingly, people with a mild weakness in this area can pronounce words, but require mental effort to do so, making it hard for them to talk and think at the same time.

- **Auditory speech discrimination:**
  Broca's area is an expressive area; this area is a receptive one, and people with difficulty here have trouble distinguishing similar sounding words, like "hear" and "fear" for instance.

- **Lexical memory difficulties:**
  Though once it was imagined that the mind had separate areas for reasoning, perception, emotion and memory, Arrowsmith Young has found that many important cognitive brain areas have their own memory systems. There is a separate area, behind Wernicke's area (described in the first article in this series), devoted to remembering the sound of words, and people with problems here have difficulty expanding their vocabularies.

- **Spatial reasoning:**
  Spatial reasoning depends on right premotor areas. It is the capacity to imagine a series of moves through space inside one's head, before executing them. If weak, the person not only gets lost easily, but can't work out a map inside his or her head before doing things such as going places or moving about in sports. A dentist planning how to drill a tooth, a surgeon planning an operation, or even a driver changing lanes requires skill in this area. Some people with this deficit find they forget where they have left objects, have trouble organizing their workspace, and interestingly, find, if they put something away in a filing cabinet, they have trouble imagining where it is.

- **Kinesthetic perception:**
  This is the capacity for perceiving where both sides of the body are in space. Those with this problem are clumsy, often cut themselves and can have trouble writing if the problem is on the affected side. At times this problem can affect speech articulation as well.

Arrowsmith Young has sorted out other areas, including helping children with narrow visual span, or trouble with math facts or mechanical reasoning, and even poor muscle tone.

A follow-up study at Arrowsmith School involving interviews with parents, students and teachers, and assessment of student records showed that 80% achieved their educational goals. Though some entered Arrowsmith School as many as seven grade levels behind in reading, math and other activities, they caught up to their peers. Arrowsmith School tests for 19 learning dysfunctions. More information, and individual's cases and their progress are available on the web site: www.arrowsmithschool.org.

## Straining weak areas

So just what kind of exercises does the Arrowsmith School use to improve children's capacity in an area where they have a learning disorder?

Brain exercises for a weakened function require finding a way to isolate that function, then exercising it until it is strained, over a significant period, so that the child achieves perfection at that level. Tests determine the child's level of competence. The level is gradually increased.

Thus, children with trouble visually recognizing symbols (which can slow learning to read by making it hard to decode letters) are flashed all sorts of symbols on a computer screen which they must learn to recognize. English words are not used because then the children might be able to remember the words by meaning or might remember them by their sound. Rather, Persian, Chinese, Hebrew, Urdu, Sinhalese, Burmese, Armenian, Mongol and other characters that the child is unfamiliar with are used.

*Norman Doidge is a Toronto research psychiatrist and psychoanalyst. He was a Columbia National Institute of Mental Health Research Fellow, and has presented his research at the White House.*

# Chart of Learning Functions and Learning Outcomes

| Cognitive Function | Description of Cognitive Function | Common Features if there is a Problem | Learning Outcomes |
|---|---|---|---|
| Motor Symbol Sequencing | Ability to learn and produce a written sequence of symbols | Messy handwriting, miscopying, irregular spelling, speech rambling, careless written errors in mathematics, poor written performance | Improve handwriting; reduce careless errors in written work; develop fine motor skills, sequential motor memory and motor planning in writing, capacity for hand-eye coordination |
| Symbol Relations | Ability to understand the relationships among two or more ideas or concepts | Difficulty with reading comprehension, trouble with mathematical reasoning, trouble with logical reasoning, difficulty reading an analog clock, problem understanding cause and effect, reversals of 'b'-'d'; 'p'-'q'(younger students and in more severe cases) | Develop ability to read a clock; improve capacity necessary for understanding relationships between concepts necessary for logical and mathematical reasoning and reading comprehension that affect all aspects of curriculum and life |
| Memory for Information/ Instructions | Ability to remember chunks of auditory information | Trouble remembering oral instructions, difficulty following lectures or extended conversations, problem acquiring information through listening | Develop auditory memory and the capacity to remember and follow oral instructions and retain information for learning; improve the capacity to remember chunks of information |
| Predicative Speech | Ability to see how words and numbers interconnect sequentially into fluent sentences and procedures | Problem putting information into one's own words, speaking in incomplete sentences, difficulty using internal speech to work out consequences, trouble following long sentences, breakdown of steps in mathematical procedures | Improve the capacity to understand a sentence of increasing difficulty and length; improve the ability to put information into own words; develop the capacity for the sense of how symbols (words and numbers) interconnect sequentially; improve the ability to follow procedures in mathematics; develop the ability to write and speak in complete sentences |
| Broca's Speech Pronunciation | Ability to learn to pronounce syllables and then integrate them into the stable and consistent pronunciation of a word | Mispronouncing words, avoiding using words because of uncertainty of pronunciation, limited ability to learn and use phonics, difficulty learning foreign languages, difficulty thinking and talking at the same time, flat and monotone speech with lack of rhythm and intonation | Develop/improve the capacity for sound-symbol correspondence; develop the phonemic memory necessary for the phonetic aspect of reading; develop the ability to pronounce multisyllabic words correctly; develop the ability to read with greater oral expression |

| Cognitive Function | Description of Cognitive Function | Common Features if there is a Problem | Learning Outcomes |
|---|---|---|---|
| Symbolic Thinking | Ability to develop and maintain plans and strategies through the use of language | Problem being self-directed and self-organized in learning, limited mental initiative, difficulty keeping attention relevantly oriented to the demands of a task necessary for completion, difficulty thinking, planning, problem solving, trouble seeing the main point | Develop/improve the ability to grasp the main point of written or orally presented material; develop the ability to state the main idea of a selection using one's own words; develop the ability to maintain plans and strategies for problem solving; develop the capacity to express ideas more clearly in writing; develop the capacity to self-direct, to develop initiative and to remain focused on tasks to completion |
| Symbol Recognition | Ability to visually recognize and remember a word or symbol | Poor word recognition, slow reading, difficulty with spelling, trouble remembering symbol patterns such as mathematical or chemical equations | Develop/improve the capacity to visually recognize and remember words or symbols necessary for reading, spelling and mathematics |
| Lexical Memory | Ability to remember several unrelated words | Problems with associative memory, trouble following auditory information, trouble learning names of things such as animals, places, people, colors, days of the week | Improve vocabulary development and auditory memory for words |
| Artifactual Thinking | Ability to register and interpret non-verbal information and plan and problem solve non-verbally | Problems interpreting non-verbal information such as body language, facial expression and voice tone, weak social skills, difficulty perceiving and interpreting one's own emotions, difficulty thinking, planning, problem solving non-verbally | Develop the capacity for non-verbal thinking and problem-solving; develop the ability to interpret body language, facial expression and voice tone and to respond appropriately in interpersonal interactions; develop ability to interpret and modulate his/her own emotions |
| Quantification Sense | Ability to carry out internal sequential mental operations, such as mental mathematics | Finger counting, trouble retaining numbers in one's head, difficulty making change, problem learning math facts, poor sense of time management, difficulty with time signature in music | Develop the capacity for number sense; develop the capacity for carrying out internal sequential, mental computation of addition and subtraction; develop the ability to use time wisely through scheduling and organization; develop an understanding of quantification related to money, time, space |

# Quick Facts

## What the Arrowsmith Program provides in a Full and Part Time Program

- the Arrowsmith Program suite of cognitive programs comprising over 12,000 discrete levels of computerized, auditory and pencil and paper exercises that are refined and updated annually
- the Arrowsmith Program Assessment that identifies cognitive strengths and weaknesses
- an Initial Learning Profile for each student
- an individualized program of cognitive exercises for each student
- the web-based Arrowsmith Program Cognitive Tracking System which allows teachers to enter quantitative and qualitative data for each student's program to track progress and engagement
- training in the evaluation of student progress data
- a year end assessment that measures student progress in each of the cognitive areas addressed
- a year end Learning Profile based on improvements in the specific cognitive areas being addressed for each student
- a revised program of cognitive exercises for each year a student is enrolled
- a Program Coordinator assigned to each site who offers training, support and professional development about the Arrowsmith Program methods and communications
- a three-week teacher training course including a comprehensive Reference Manual and ongoing web-based professional development seminars throughout the year

# Implementation and Administration of the Arrowsmith Program

## The Arrowsmith Program and Outcomes

The Arrowsmith Program is based on the application of neuroscience research and the premise that it is possible to address a range of specific learning difficulties by identifying and strengthening cognitive capacities.

The Arrowsmith Program is a suite of cognitive programs comprised of intensive and graduated cognitive exercises that are designed to strengthen a series of underlying weak cognitive capacities that are hypothesized to underlie a range of specific learning difficulties.

The Arrowsmith Program, through careful assessment, identifies areas of learning strength and weakness to create an individual learning profile for each student and then designs an individualized program of exercises to target the areas of weakness.

Each student enrolled in the Arrowsmith Program is assessed at the end of each year to evaluate progress and revise the student's program as needed for the subsequent year.

The *Arrowsmith Program Chart of Learning Functions and Learning Outcomes*, on the website and in this document, provides a description of the cognitive functions for which the Arrowsmith Program has developed specific targeted programs, the learning difficulties a student may have if there is a problem in this function, and the learning outcomes achieved related to the cognitive function upon completion of the Arrowsmith Program.

Upon completion of the program, the majority of students are able to capitalize on their increased learning capacities, and after a three to four year program they are reintegrated into a full academic curriculum without further special education assistance or program modifications.

## Arrowsmith Program Delivery

The Arrowsmith Program is available in educational organizations and facilitated by trained Arrowsmith Program teachers.

The cognitive programs are delivered in three formats:

- **Computer exercises** to strengthen the ability to reason, use logic, and comprehend, as well as exercises for strengthening numeracy skills, reading, and visual memory for symbol patterns and face and landmark recognition
- **Auditory exercises** to improve short and long term auditory memory, phonemic memory, oral and written output and vocabulary development and to increase the ability to hold and process information (working memory)
- **Pen and paper exercises** to improve the cognitive capacities related to the mechanical aspect of writing, for written communication, for organization and planning, executive function, and for non-verbal communication.

Performance criteria are built into each of the cognitive programs based on accuracy, consistency and automaticity of performance. A student needs to meet these criteria to master each level before advancing to a more difficult level. The Arrowsmith Program is modified throughout the year based on the student's progress.

## Students Who Benefit from the Arrowsmith Program

The Arrowsmith Program is designed for students who are of average or above average intelligence and who have one or more of the learning difficulties that are described in the *Chart of Learning Functions and Learning Outcomes* in this brochure and on our website.

Students with severe intellectual, emotional or behavioural disorders, severe brain injury or autism spectrum disorder will not benefit from the program as the program is designed to address specific learning disabilities. These conditions prevent students from engaging in the cognitive programs.

The program is appropriate for students who have learning difficulties ranging from mild to severe, including those who are experiencing difficulty with just one or with several subject areas and those who have been identified with a learning disability as well as those who have not been formally identified.

# Implementation and Administration of the Full Time Arrowsmith Program

Students six years old and up have shown benefit. While most students are of elementary or secondary school age, the program is also available to adults worldwide.

We have post-secondary young adult programs and have worked with students who are mature adults. Students in the young adult programs have frequently completed their formal education and enrol in this program when they discover that they lack the cognitive abilities to function effectively in the workplace or in college or university.

Educational organizations that offer the Arrowsmith Program decide on the appropriateness of each student. This decision is based on discussions with parents and teachers or in the case of older students, with the students themselves. The Arrowsmith Program Coordinator is available for consultation with the Arrowsmith Program teacher or administrator on the appropriateness of the Arrowsmith Program for any particular student.

## Enrolment and Web Assessment

Once a decision has been made to enrol a student in the Arrowsmith Program, the organization completes the Arrowsmith Program enrolment process and Arrowsmith Program assigns a student number and provides a link to the Arrowsmith Program Web Assessment, which allows the Arrowsmith Program teacher at the school to complete the assessment.

The Web Assessment is conducted at the school by the Arrowsmith Program teacher and identifies the student's cognitive strengths and weaknesses. An initial assessment is conducted when the student first enrols, and there is a further assessment at the end of each school year.

The Web Assessment guides the Arrowsmith Program teacher, who has been trained in this program during the teacher training course, to enter the student's responses using tests developed by the Arrowsmith Program and also includes a rating scale containing questions that can be completed by a parent, a teacher or the student.

The Web Assessment takes approximately one day to complete for each student. The Arrowsmith Program assessment needs to be administered in a quiet room. In the first year that an educational organization offers the Arrowsmith Program, a teacher will require approximately two weeks to complete the Web Assessment for ten students.

The Arrowsmith Program teacher has completed the teacher training course, the Arrowsmith Program students remain in their academic classrooms during this time.

The results of the Web Assessment are used to produce an Individual Learning Profile describing the student's cognitive strengths and weaknesses. Arrowsmith Program uses this Learning Profile to create an individualized program of cognitive exercises to meet the learning needs of each student.

The initial Individual Learning Profile also establishes the approximate number of years that the student will require in the Arrowsmith Program, with most students requiring three to four years in the program.

The year-end assessment enables the Arrowsmith Program to create an updated Learning Profile based on improvements in the specific cognitive areas being addressed and to revise the student's program of cognitive exercises for the following year.

## The Arrowsmith Program Classroom

An Arrowsmith Program classroom is similar to any other classroom. The age range is wider and the cognitive programs look different from the standard academic curriculum, but the students have the same needs and interests and require the same dedicated and trained teachers as every other student.

All grade levels are accommodated in the Arrowsmith Program classroom with students rotating in and out to age-appropriate academic classes. The Arrowsmith Program periods are not necessarily consecutive. Students will usually spend four, forty minute periods per day, five days a week, for three to four years on cognitive programs designed specifically for their areas of learning difficulty.

Students may spend as many as eight periods per day or as few as one or two periods when they are nearing completion of the program.

The number of periods will depend on the individual student's need and school regulations. Arrowsmith Program requires an initial commitment of four periods per day, five days per week for each student.

Our experience has shown that this amount of time is required to produce the cognitive change that enables students, who previously experienced significant struggles, to successfully return to a full academic curriculum.

An Arrowsmith Program classroom is a joyful and rewarding place. Students who have experienced failure or who have significantly struggled to achieve success enjoy a newfound sense of accomplishment working with their peers as they move through the levels of their program. The students are now able to effectively and proficiently manage academic curriculum that was previously difficult for them.

## Web-Based Record of Program

The quantity and quality of each student's work on each exercise is entered into the web-based Arrowsmith Program Cognitive Tracking System (ACTS) by the Arrowsmith program teacher and measured against Arrowsmith Program benchmark goals for each exercise.

## Program Coordinator

Arrowsmith Program assigns a Program Coordinator to each site to act as the liaison between Arrowsmith Program and the site Arrowsmith Program Team.

The Arrowsmith Program Coordinator offers methodology support, expertise about the Arrowsmith Program methods and communications, and provides ongoing education and professional development in the delivery of the Arrowsmith Program.

## Teacher Training Course and Ongoing Professional Development

The Arrowsmith Program teacher training course is an intensive three-week course that provides participants with a solid grounding in the theory and methodology of the Arrowsmith Program.

The course includes lectures, video demonstrations and small group hands-on practice. There is substantial homework requirements and a summative evaluation. Each trainee completes pre-course readings.

The participants in the course are employed by the educational organizations that offer the Arrowsmith Program and upon successful completion of the teacher training course, are certified as an Arrowsmith Program teacher to implement the program.

The Arrowsmith Program teachers should have multi-tasking, organizational, analytical and problem-solving skills. They should have a good memory for detail, the ability to motivate and facilitate student learning and be comfortable working with computers.

All Arrowsmith Program teachers are required to participate in online professional development seminars throughout the year as part of ongoing training and to maintain their certification.

# Implementation and Administration of the Full Time Arrowsmith Program

## Site Arrowsmith Program Team

The site Arrowsmith Program Team is a key body within the educational organization and plays a critical role in the implementation of the Arrowsmith Program. It is strongly suggested that either the Principal or administrator or a key executive team member is included in the site's Arrowsmith Program team along with the Arrowsmith Program teacher(s) and other relevant personnel. From the intake and enrolment process, communication with the board, staff, parents, and key stakeholders, the educational organization's Arrowsmith Program team is crucial to the progress of the students in the program.

## Arrowsmith Program Teacher

Each Arrowsmith Program teacher must successfully complete the training course and is responsible for:

- implementing the program in accordance with the procedures established by Arrowsmith Program in the training course and Reference Manual
- conducting the Web Assessment for each student including initial and year-end assessments
- tracking and entering student progress in the web-based ACTS
- participating in ongoing professional development provided by Arrowsmith Program
- participating in the selection of appropriate students in accordance with the policies of their school and in consultation as necessary with the Program Coordinator
- ensuring that all materials that the students require are prepared, organized and maintained in accordance with Arrowsmith Program procedures
- reporting to parents in accordance with the policies of their school and Arrowsmith Program procedures in consultation, as required, with the Program Coordinator
- keeping parents informed and aware of their child's progress, homework responsibilities and goals

## Classroom Set-Up, Supplies and Equipment

Educational organizations offering the Arrowsmith Program provide a self-contained classroom for the exclusive use of the Arrowsmith Program students. The teacher to student ratio is one Arrowsmith Program teacher for each group of approximately 10 full time students.

Overall class size is not limited to 10 students and larger groups may be accommodated in the same classroom provided the same teacher-to-student ratio is maintained.

**Each school provides the following:**

- two computers for every three students equipped with the Windows 7 or later operating system with internet access
- one computer equipped with the Windows 7 or later operating system with Internet access for the Web Assessment and Record of Program including printer and USB port for the Arrowsmith Program teacher
- a unique school email address for communicating with Arrowsmith Program
- one MP3 player for every two students and a set of headphones for each student on an auditory program
- exercise materials printed from Arrowsmith masters that cost approximately $300 to $400 per student annually
- miscellaneous supplies (such as timers, red pens, eye patches) that cost approximately $100 per student annually

**From January 2018:**

- one andriod tablet (specifications will be provided) for each Arrowsmith Program teacher
- wireless internet access in the Arrowsmith Program classroom

## Agreement with Arrowsmith Program

Each educational organization enters into an agreement with Arrowsmith Program for a one year term that renews automatically but may be cancelled by the organization at the end of any year of the agreement without penalty.

The Arrowsmith Program fee is charged on a per student basis payable in two installments during the school year (with a deposit prior to the start of the school year in the first year only). The fee per student covers everything that is described in the Quick Facts section of this document under "*What the Arrowsmith Program Provides in a Full and Part Time Program,"* other than the fee for the teacher training course.

## Planning to Offer the Arrowsmith Program

The decision to offer the Arrowsmith Program should be made as early in the academic year as possible to allow time to plan and prepare for the start of the program in the next academic year including:

- **Students** - identifying and enrolling a minimum of 10 full time students who are appropriate for the Arrowsmith Program
- **Teachers** - recruiting a teacher with the skills to manage a class of students with specific learning difficulties and who will be available to participate in the three-week teacher training course
- **Classroom set-up, supplies and equipment** - providing a classroom for the sole use of the Arrowsmith Program with the necessary supplies and equipment
- **Initial Assessment** - in the first year that a school offers the Arrowsmith Program, one teacher will require two weeks to assess a group of 10 students individually

We will be pleased to list prospective schools on our website and to assist them in their planning.

# Other Arrowsmith Program Implementation Models

## Part Time Programs

There are two types of part time programs:

### On-Site Program:

The On-Site Program can address up to three cognitive functions per year. Based on the student's learning profile determined by the assessment, an individualized program will be designed to address the cognitive areas requiring work. Each cognitive program has been designed to target a specific area of learning difficulty and each student's program is tailored for that student's particular needs. The student will engage in each cognitive program for four hours per week.

### Motor Symbol Sequencing Program (MSS Program):

This program only addresses the Motor Symbol Sequencing cognitive function which is responsible for the motor planning necessary for efficient and automatic writing. This is an at-home program with the student engaging in six hours of the MSS Program per week at home and returning to the site for a check-in session twice per month. At the check-in session, the Arrowsmith Program teacher will monitor the progress of the student and will make modifications to the student program where necessary.

## Assessment Models

The Arrowsmith Program assessment provides insight and awareness into the learning profile of an individual by identifying the strengths and weaknesses in specific cognitive functions that impact a broad range of learning. The assessment takes approximately one day to administer. Once completed the Arrowsmith Program provides the individual's learning profile to the assessor who then provides this report and an interpretation of the profile during an Assessment Briefing.

## Cognitive Enhancement Models

The general population can benefit from improving fundamental cognitive functioning and the Arrowsmith Program offers opportunities to participate through its Cognitive Enhancement models. There are two ways an organization can implement such a model. An assessment is not required for the Cognitive Enhancement models.

### Whole Cohort Program:

In a Whole Cohort Program, students in a mainstream academic class will participate in one 40-minute cognitive period each day. In this cognitive period, all students will engage in one cognitive exercise that works to strengthen a particular cognitive function that would most benefit that age-group.

### Cognitive Enhancement Program:

This model will provide cognitive enhancement to participants in the cognitive function of Symbol Relations. This cognitive function is involved in processing concepts across all academic disciplines, understanding and quickly grasping what is read and heard, gaining insight, logical reasoning, seeing connections between ideas, cause and effect processing, and mathematical reasoning. Students in this model would complete a minimum of four hours per week on this cognitive exercise across a ten month period.

# Report on the Effectiveness of the Arrowsmith Program in the Toronto Catholic District School Board

*(January, 2007)*

The Arrowsmith Program was introduced in the Toronto Catholic District School Board (TCDSB) in 1997 for students identified as Learning Disabled.

In 2007, a review of the effectiveness of the Arrowsmith Program in the TCDSB was undertaken. There had been 235 students enrolled in the Arrowsmith Program in the TCDSB since September 1997 up to the date of this Report.

This Report tracked the progress of these students on standardized achievement measures. It also compared the amount of resource support prior to the student enrolling in the Arrowsmith Program and after leaving.

In addition, the Report contains observations made by parents, teachers and students, on cognitive and academic gains made by students and tracks their success in high school and post-secondary programs.

The Report contains the following findings that, combined with previous research, strongly support the effectiveness of the Arrowsmith Program for a wide range of learning disabilities:

- an increase in the rate of acquisition of specific academic skills (Word Recognition, Arithmetic, Reading Comprehension, Reading Speed) of between 1.5 to 3 times, indicating that students who were acquiring these academic skills at the rate of ½ of a year per year prior to Arrowsmith began to learn at the rate of 1 to 2 years per year after Arrowsmith
- parents, students and teachers observed and rated noticeable changes in cognitive abilities necessary for learning such as the ability to focus, understanding instructions, listening skills, organizational skills, remembering factual information, understanding ideas, and in skill acquisition such as reading comprehension, legibility of written work, telling time and in areas of confidence, self-esteem and frustration level
- students observed and noted specific changes in auditory memory, visual memory, comprehension, reading, spelling, mathematics, mental math, reasoning, writing, grammar, understanding concepts, improved grades in academic classes, doing work independently, homework completion, and self-organization
- teachers observed and noted specific changes in reading, writing, logical reasoning, understanding concepts, concentration and focus, visual memory, non-verbal problem solving, mental arithmetic, number sense, thinking and problem solving
- a reduction in the amount of resource support required while the student was in the Arrowsmith Program
- a reduction in the amount of resource support required after the student left the Arrowsmith Program
- success in high school and post secondary programs with no or minimal resource support

The full report can be read on the website under *List of Research Studies and Reports.* Along with the statistical analysis this link contains many reports of observable changes from students, parents and teachers.

### Research Studies and Reports

All of the studies and full research reports conducted on the Arrowsmith Program can be found on the website under the Research tab.

# Excerpts from an Outcome Study of the Arrowsmith Program

*(November, 2005)*

In 2001, the Donner Canadian Foundation funded a three year study that was designed to follow a sample of 79 learning disabled students attending Arrowsmith School in Toronto. The study was prepared by Dr. W.J. Lancee, Head of Research in the Department of Psychiatry at Mount Sinai Hospital and Associate Professor, Department of Psychiatry, University of Toronto. The study was completed in 2005 and the complete text is available on the Research page of the website.

## From the Introduction

Learning Disabilities (LD) seriously affect academic and emotional development and are unlikely to remit without specialized intervention. Students with learning disabilities tend to fall farther and farther behind their peers in academic performance and subsequently tend to have a low sense of self-worth...

Various special education programs have been developed to address learning disabilities. The approach of the Arrowsmith Program is first to distinguish finely between elemental cognitive impairments and then to implement an individualized task-oriented program that challenges the identified deficit. It is thought that these highly targeted cognitive exercises create ways for the brain to provide the necessary functionality for encoding and decoding spoken and written discourse, and for storing, organizing, processing, and integrating knowledge.

## From the Executive Summary

The results were informative and encouraging. The amount of improvement was slightly dependent on intake severity level (the number of performance problem areas on intake). The rate of improvement varied from one year to three years, and was dependent on initial severity. The amount and rate of improvement were not dependent on other baseline characteristics such as age, gender or IQ. Furthermore, the rate of improvement was not dependent on the type of impairment at intake. All deficit areas identified by the Arrowsmith Program improved as a result of the application of Arrowsmith Program cognitive exercises. A specificity of effect was found suggesting that the cognitive exercises could be directly linked to performance improvement. Moreover, students who through specific cognitive exercises improved with respect to Arrowsmith Program cognitive functions also improved on related achievement tests.

In the study sample, the cognitive decifits tended to be multi-dimensional, and there was no clear pattern of combinations of deficits. In other words, a given Arrowsmith Program student was likely to have more than one deficit and his or her combination tended to be specific to the student.

This study, combined with previous research of the program, strongly supports the effectiveness of the Arrowsmith Program for a wide spectrum of learning problems. These results provide hope for parents and teachers, and open up opportunities for children struggling with learning difficulties.

## Summary and Conclusion

Previous research on the Arrowsmith Program has supported its effectiveness in broad terms. The present study funded by the Donner Canadian Foundation provides specific answers to important questions about why and how the Arrowsmith Program cognitive exercises are effective.

# From a Study of the Arrowsmith Program in the Toronto Catholic District School Board

*(January, 2003)*
*Prepared by Dr. W.J. Lancee*

## From the Conclusion of the Study

Despite some study design limitations and small sample size, the study results strongly support the Arrowsmith Program as instrumental in changing the developmental course of the majority of children with LD in this sample. In only 12 months, almost one third of the Arrowsmith Program students were on a course that brought them closer to their peers. Another 27% improved their performance at the same rate as expected from their non-LD peers, that is, they stayed at the same distance but did not fall further behind. All other Arrowsmith Program students (43%) improved at least somewhat on the various achievement tests. None of the 10 students in the comparison group progressed substantially beyond their entry status.

## Relationship between Improvements and Satisfaction

The 30 Arrowsmith Program students, their parents and teachers completed a 24 item satisfaction questionnaire. Improvements were seen by at least 2 raters (teacher and student; student and parent; or teacher and parent) in more than 80% of students in the following areas: reading comprehension; ability to focus on task; understanding ideas; legibility of written work; confidence; self-esteem; and ability to self-advocate. Between 70% and 80% of students were seen as having improved in: telling time; remembering factual information; listening skills; organizational skills; and understanding and following instructions.
The correlation between improved comprehension as seen by teachers correlated highly with the Relative Progress GE scores (Pearson $r = 0.49$; $p<0.01$).

## Selected Comments from Parents

"We can't believe the change in our son. He has become confident in the way he walks in a room. His head is held high and no longer hangs low. This is an amazing program. His report card are all As and Bs and his teacher writes that he is a pleasure to teach and is a hard worker, that is a first. We are so proud of him."

"When my son was put into Arrowsmith he could not read, write and do basic things without being upset, because it was just too difficult. But with the Arrowsmith Program his confidence has increased dramatically and he is now pretty close to being at his grade level. I am so grateful for the program and because of it my son has a real good chance at a good future. This program is so important. Without it many children would suffer."

"Excellent program, should be available to more children. Our child would not be at the academic and social level our child is at without having been in Arrowsmith."

"Our child has made a great improvement this year. He is excited about learning and tells me everyday what he has accomplished. I didn't understand this program at first, but now I see our child wanting to read and excited to learn. I am pleased with the results."

"The biggest area of improvement for our child is thought to print. Our child always had great ideas but could not write them. Now our child can write beautifully thanks to the Arrowsmith Program."

# Summary of Additional Research on the Arrowsmith Program

### Eaton Case Studies (2004)

Howard Eaton has a B.A. in Psychology from the University of British Columbia and a Masters in Education from Boston University specializing in Special Education and Assessment. For 13 years he was involved in conducting psycho-educational assessments as well as teaching at the University of British Columbia as a Sessional Instructor for the Faculty of Educational Psychology and Special Education.

In 2004 three Arrowsmith students were post-tested independently by Howard Eaton after one, two and three years in the Arrowsmith Program.

The following improvements were observed:

- faster cognitive effi ciency
- improved working memory
- improved visual-motor integration
- improved visual-perceptual functioning
- improved semantic knowledge
- improved auditory processing for speech sounds and discourse
- improved achievement skills

The significance of these findings led Howard Eaton to establish Eaton Arrowsmith School in Vancouver in 2005, modeled after Arrowsmith School in Toronto. These results have since been replicated with more than twenty students at Eaton Arrowsmith School.

### A Brain-Based Intervention Program That Changes Cognition: Implications for Academic Achievement (2014)

A study presented at a poster session at the American Psychological Convention, Washington, D.C. August 2014 by Dr. James Hale, Dr. Fitzer, Dr. Kubas, Dr. Carmichael, Dr. Eaton and a research team at the Brain Gain Lab at the University of Calgary.
Findings: following Arrowsmith Program intervention improvements were found on the following cognitive domains: Auditory Processing; Fluid Reasoning; Processing Speed; Short-Term Memory; Phonemic Awareness; and Working Memory.

### Effects of the Arrowsmith Program on Academic Performance: A Pilot Study (2014)

A study presented at a poster session at the CanadianPsychological Convention, Vancouver June 2014 by a research team at the Brain Gain Lab at the University of Calgary.
Findings: following Arrowsmith Program intervention all academic scores improved and were in the average range except math fluency. Strengthening cognitive neuropsychological functions presumed to underlie academic achievement deficits improves reading, mathematics, and writing by targeting the cause (i.e., cognitive deficit) rather than the symptoms (i.e., achievement deficits).

**Correlates of a Test of Motor Symbol Sequencing Performance (105th APA Annual Conference at Chicago on August 15, 1997)**

*by Barbara Young, M.A. and Donald F. Burrill, PhD*

This study investigated the relationship between a test developed to measure the rate of learning a repeated sequence of symbols as an automatic motor pattern and standardized tests of writing and copying. Performance on the motor symbol sequencing test, for a group of 12 learning disabled individuals and a control group of 35 adults, correlated significantly with standardized tests of copying and handwriting. Performance on the test significantly discriminated between the two groups.

**Treatment Outcome for a Motor Symbol Sequencing Dysfunction (108th APA Annual Conference at Washington, D.C. on August 7, 2000)**

This study investigated the relationship between a treatment program designed to train automatic written motor symbol sequences for a group of 12 learning disabled individuals having difficulty with the writing process and outcome measures on a test developed to measure the rate of learning a repeated sequence of symbols as an automatic motor pattern and standardized tests of writing and copying. Significant positive changes were found from pre- to post-treatment testing on all measures.

# Comments from Educators at Schools that offer the Arrowsmith Program

In following the students who left Holy Spirit for High School, the parents of all but one reported that their sons and daughters managed to pass the EQAO Math and Literacy tests [Province of Ontario standardized testing for all students in publicly funded schools] on their first attempt. This would have been unthinkable without the contribution of the program, as most of these students were exempted at the Grade 3 level EQAO due to their learning disabilities.

This program is a major asset to Holy Spirit, and an important tool in assisting students with learning disabilities to discover their potential and become self-assured life long learners.

***H. Toni Mayer, Principal***
***Holy Spirit Catholic School***
***Toronto Catholic District School Board, Toronto, Ontario***
***(The Toronto Catholic District School Board is a publicly funded school board that serves 93,000 students)***

I have been involved in the fields of Learning Disabilities and Attention Disorders for the past 20 years as a teacher, educational assessor, principal, consultant, university instructor and author.

In 2004 I completed three updated psycho-educational assessments of students who attended Arrowsmith School in Toronto. The results of these updated assessments astounded me. I had, for the first time in my years of assessment, observed significant intellectual and cognitive improvements in my clients with learning disabilities.

I had previously seen improvements in academic achievement, but never such improvements in intelligence and cognition. I realized that these changes in cognitive ability were likely to have the greatest impact on students' future success, even more so than the academic changes. It was then that I decided to bring the Arrowsmith Program to Vancouver.

The Arrowsmith Program brings forward to the field of Learning Disabilities a renewed sense of possibilities. The reports from our graduates who have returned back to the public and private school systems continue to show very positive results.

The Arrowsmith Program identifies the neurological weaknesses resulting in the learning disability and then designs a brain remediation program that improves cognitive functioning. It is by far the most comprehensive neurological improvement program for children with learning and attention disorders in the world.

***Howard Eaton, Director***
***Eaton Arrowsmith School***
***Vancouver and Victoria, British Columbia***

Arrowsmith has proven to be a vital and integral program at our school. One of our core values is that every student matters and having the Arrowsmith Program available is one way of fulfilling that core value.

Confidence levels were the first indicator that the Arrowsmith Program was having an impact. Students who previously seemed shy or unengaged, were now making eye contact, voicing opinions, and speaking up.

Reading scores for these students have increased, with some students making a gain of a year or more in four months. Other students have seen improvements in math, in writing, and penmanship. We are proud of our students and love celebrating their successes.

***Marianne Vangoor, Principal***
***Halton Hills Christian School***
***Georgetown, Ontario***

For many years the Learning Disabilities Association (LDAS) of Saskatchewan has been advocating for people with learning disabilities and has been providing programming to help students compensate for their disabilities. The LDAS learned about the success of Arrowsmith through families who were forced to leave the province in order to access a program that corrects the learning disability as opposed to teaching compensation strategies.

The LDAS has been delivering the Arrowsmith Program since September of 2008. Within a few months of starting the program we began to observe positive changes in the students' ability to focus on their work. In addition, they showed more interest in reading and started to have an easier time comprehending social situations.

Testing has already shown that, even without direct instruction, Arrowsmith students' reading and math levels have increased. Students are happier and more emotionally healthy as they now realize many more things are possible for them in the future.

***Dale Rempel, Executive Director***
***Learning Disabilities Association of Saskatchewan***
***Saskatoon, Saskatchewan***

The Arrowsmith Program has filled a void in our educational program by reaching out, giving students hope, and providing an opportunity to taste success. Patty was a senior in high school. She had difficulties remembering and when she did, she was unable to sequence the information correctly.

After a few months in the Arrowsmith Program she stunned her parents by relating the events of an episode of "I Love Lucy" she had viewed the previous evening in perfect order. As she continued to make progress a family member who had not seen her in months didn't believe she was the same person.

The changes I have witnessed in ability and personality in our Arrowsmith students in the 3 years that we have offered the program is miraculous. It offers hope and a chance to succeed to the overwhelmed and overwrought.

***Dr. Carol Midkiff, Principal***
***American Christian School***
***Succasunna, New Jersey***

Camperdown Academy, an elementary school for bright children with language based learning disabilities, or dyslexia, has been offering the Arrowsmith Program to our students since the fall of 2010. The multisensory, structured, sequential teaching provided in the academic classroom, combined with the Arrowsmith Program's intensive and graduated cognitive exercises has been a dream combination. We have seen our students excel in the classroom as a result of strengthened cognitive capacities. Children who participate in the Arrowsmith Program are better able to maintain attention and retain information. Their handwriting has improved, as well as their ability to write fluently. Gains are also evident in reading decoding, fluency, and comprehension.

As a reading specialist and special education teacher for 25 years, I have always felt there has been a gap between what academic remediation can offer a learning disabled child and true success in the traditional classroom. Accommodations have been the norm. The Arrowsmith Program is closing this gap for students. We are seeing students leave Camperdown and go on to excel in the traditional classroom with little or no accommodations. In addition, our students are more confident in their own abilities, eager to learn and face new challenges, and are well prepared for High School and beyond.

***Mandy Blanch, M.S.Ed., Cognitive Teacher,***
***Arrowsmith Program Site Administrator***
***Camperdown Academy***
***Greenville, South Carolina***

A cognitive program for students with **specific learning disabilities**

## Comment from an educator

As an educator of 22 years, I have had the opportunity to teach in Canada and the United States. In my everyday educational practice, I see students struggling and abandoning hope because most programs are similar and none focus on building the brain.

I implemented the Arrowsmith Program because it does not draw on compensatory methods or the repackaging of curriculum. This program imparts a method of remediating learning issues instead of creating accommodations.

With this program, I now see daily the vibrant growth in every student. Every child is capable of handling curriculum as long as the brain is given the correct retraining to allow meaning, ideas and concepts to break in.

The Arrowsmith Program permits the individual to gain ground and thrive and later reunites academic programming and educators together to take their rightful place, with the prospect of teaching with purpose.

***Claude LeFrancois, Principal, Access School***
***Davie, Florida***

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Arrowsmith PROGRAM®

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