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Nicholas is an affable, bespectacled 10-year-old who attends Toronto's Arrowsmith School. He has a passion for dinosaurs and a gift for technical explanation, which is self-evident as he demonstrates the school's brain-based computer drills: "This is the symbol-recognition exercise," he states confidently. "It helps with visual memory and reading."

Nicholas was not always so composed in social situations.

His mother, Licia Manocchio, first realized that Nicholas had a problem when he was in junior kindergarten. "I was visiting his class one day and we were painting Easter eggs together," she recalls. "I noticed how withdrawn he was — very different from the way he acted at home. I was shocked when the teacher told me this was his usual school behaviour."

In Grades 1 and 2, despite supportive efforts from his teachers, Nicholas's social difficulties worsened. By Grade 3, the problems had escalated to the point where Nicholas spent most of the school day crouched underneath his desk. That was until two years ago, when Ms. Manocchio learned that Nicholas had a learning disability and enrolled her son in a unique educational program offered at Arrowsmith School.

The school is named after its founder and principal, Barbara Arrowsmith Young. It was established in 1980 in Toronto as a private school, offering a program of repetitive exercises designed to strengthen weak brain areas.

The program has been applied to the learning disabled, slow learners and individuals with traumatic brain injury. "Unlike conventional programs, which tend to teach compensatory strategies, this program works on directly strengthening the weak cognitive capacities underlying the learning dysfunctions," says Ms. Young, 48, who pioneered the program after searching for a solution to her own learning disability.

Diagnosed in Grade 1 with what is now called dyslexia, in which a person has difficulty reading and writing, Ms. Young eventually learned to read and write from left to right. However, learning difficulties plagued her until she reached graduate school and came across two lines of research that intrigued her.

The work of the late Russian neuropsychologist Alexander Luria was one of those research lines. In his work with brain-injury patients, Dr. Luria found that whenever we carry out any complex intellectual activity, such as reading or writing, several integrated but separate areas of the brain come together, each area contributing its own unique function to that activity.

Damage or weakness in one or more brain areas can interfere with the smooth execution of that particular task, according to Dr. Luria.

"The majority of students who walk through our door have five or more learning problems. Most of us have some learning challenges, but are able to compensate with our strengths. People with more than five problem areas have fewer compensations available, and that makes learning and performing complex tasks more difficult," Ms. Young says. That is, unless the weak areas are strengthened.



Barbara Arrowsmith Young, founder and principal of Arrowsmith School, looks on as pupil Nicholas Manocchio, 10, studies symbols as part of a computer drill to help improve his memory and reading.

TIBOR KOLLEY/The Globe and Mail

Learning how to learn

Not everyone is a born thinker. The Arrowsmith School has a unique program to help make weak brains stronger

Here is where the second line of research comes in: Mark Rosenzweig, a psychologist at the University of California at Berkeley, found that the brain, originally believed to be a rigid and fixed organ, is actually pliable and elastic, a concept known as neuroplasticity.

It is this neuroplasticity that allows the brain to change in response to specific stimulation. Dr. Rosenzweig observed that when laboratory rats were placed in an interactive, stimulating environment with plenty of toys, tunnels and running wheels, they developed improved problem-solving abilities, grew a heavier cerebral cortex and produced new branches, called dendrites, on their neurons.

By contrast, rats raised in stark laboratory cages, with no interactive stimuli, exhibited lower mental capacities.

The brain needs to be exercised to perform optimally. If the brain is weakened through trauma or certain life experiences, brain exercises, like physiotherapy, can strengthen it, according to Dr. Rosenzweig. While the window of neuroplasticity is greatest in children under age 10, the brain can respond to stimulation at later ages as well.

When Dr. Rosenzweig placed

middle-aged rats in a more stimulating environment, they also demonstrated improved mental abilities.

Arrowsmith integrates the research of Dr. Luria and Dr. Rosenzweig into its testing and treatment programs. All new students are evaluated over a period of three to four days to determine the precise areas of learning disability.

A specially tailored brain-exercise program is then created and

languages, including Mandarin, Urdu and Korean."

Exercises are simple at first, with students starting at a level slightly above their degree of learning disability to challenge the weak areas. "If the exercises are too advanced, the student will get frustrated and give up. If they are too easy, no strengthening of the problem area can occur," Ms. Young explains.

Students must successfully complete each level of exercise before

'The greatest thing I can say about the program is that it enabled me to realize my dreams.'

the student is expected to follow it for three to four years.

The exercises are repetitive and focused to intensely stimulate the areas of the brain that require attention. "For example, a student with an inability to distinguish between similar sounds such as 'hear' and 'fear' will practise hearing speech sounds from other languages until he or she can accurately hear and reproduce the sounds," explains Ms. Young. "For students who cannot remember visual symbol patterns, there is a computerized exercise consisting of symbol patterns from 27 different

proceeding to the next, and each area under treatment requires four hours of exercises a week to cause positive change. Currently, the Arrowsmith program can accommodate up to 19 specific learning dysfunctions, including difficulty with writing, performing mental arithmetic, problem solving, social judgment and abstract reasoning.

To measure progress, students are retested every five months and the school tracks its students over the long term as well. "Our follow-up research of over 200 students shows that 80 per cent went on to reach their academic goals and career goals," Ms. Young adds.

vate school with campuses in both Bolton and Vineland, Ont., and two publicly funded Toronto schools, St. Patrick's Secondary School and St. Theresa Shrine Elementary School.

Lynda Widnhofer was the first teacher in the publicly funded school system to work with the Arrowsmith model and was instrumental in bringing it into both St. Patrick's and St. Theresa's schools in 1997, the year before her retirement.

Working with a group of 17 Grade 9 students who tested as learning disabled at St. Patrick's, Ms. Widnhofer witnessed profound improvements in the students' academic performance within a few months. "By the time we did the retesting the following May, the results were remarkable. Of the 15 students that completed the program that year, 11 chose to take summer-school courses on their own, without my suggesting it, and seven of them applied for advanced credits and got them."

Many of the parents of students who have followed the Arrowsmith program, both in the private and public systems, are advocating increased government funding and support. With the current annual tuition fees of \$14,000 for the private school, the program can be cost-prohibitive for many families.

Ms. Manocchio, mother of Nicholas, says: "Keeping my son in the publicly funded system was not an option for us. They kept encouraging us to 'celebrate his differences' but wouldn't give him an assessment, despite my requesting it."

"Finally, they told us there would be a two-year waiting list for the assessment, followed by another two years of evaluation and then finally a treatment program, a total of four years. I had to export him out of the system at my expense to get him the appropriate help, and Arrowsmith has been the only program that has significantly helped him."

Despite individual success stories, the Arrowsmith program has been slow to catch on with North American educators.

However, among the researchers and academics who have studied it, or done research along similar lines, many hold the brain-exercise model in high regard.

One of those scholars is Marcel Danesi, professor of semiotics and communication theory at the University of Toronto. "The brain-based model is recognized as the only way to treat learning disabilities in Italy, where it has received concrete support and is part of the educational system," said Dr. Danesi, who is also cross-appointed to the Ontario Institute for Studies in Education.

Dr. Danesi has applied the model in his research on second-language learning and believes "it's just a matter of time before... it's studied in clinical trials and published in education journals."

Nicholas and his parents are glad he didn't wait. While Nicholas has a way to go, his progress over the past two years has been steady, and he is enthusiastic about his future. He wants to become a paleontologist some day and find a way to resurrect dinosaurs from extinction. It's a lofty ambition perhaps, but whatever he decides to do, his mother says there's now less chance that his learning disability will deter him.

On the Web: www.arrowsmithschool.org