Dyscalculia: A Little Known Learning Disability

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In recent years, Indian schools have become more sensitive to individual learning requirements, and teachers and psychologists have started to look more closely at individual learning trajectories. There have been attempts to explain differences in learning and response to teaching in spite of 'equal opportunities'. This explains why some schools have, on their panels, psychologists who can help plan instruction for individual needs. A lot has changed in recent years but much more needs to be done. This article dwells on a little known learning disability which affects around 5 percent of primary school children in India (see [5]), and 3% to 5% of the world school population according to an Australian study (see [8]). This means 1 to 2 children per class of 40 students.

For any child who is unable to do mathematics in spite of best instruction, a number of opportunities remain closed, but there are ways around the problem provided the child and her family have the awareness about the seriousness of the underlying condition. Literature in mathematics education has many terms that try to explain the 'learning difficulty in mathematics' and these range from 'learning disability in mathematics'

Keywords: *Mathematics difficulty, mathematics disability, Dyscalculia, Dysgraphia, Dyslexia*

to 'dyscalculia' to 'arithmetic disability' to 'maths disorder' to 'developmental dyscalculia', to 'acalculia' to 'anarithmetica', but there is no agreement on their use universally (see [7]), as we shall soon know why. Due to the different terminology used to describe difficulties in learning mathematics, there is also a lot of mismatch in the number of children reported in various studies having this condition in the normal classroom. Farham-Diggory (see [2]) in the US have reported that 80 percent of the children who are classified as 'learning disabled in mathematics' should not have been so classified in the first place (pp-56). I would like to make one important clarification though, that according to the available literature, 'learning difficulty' is a larger term and it includes students with learning disability in mathematics (Dyscalculia) and students whose low achievement may be a result of poor teaching methods. So, many students who are classified as 'learning disabled' could be having problems due to factors such as stressful environments or improper teaching and not due to a neurological condition.

Let us first try and understand how this learning disability – Dyscalculia – affects a child. I shall do so by drawing a summarised profile of a child coping with school at the expense of her carefree childhood. Ever since Solly started school, she had always had difficulty writing in straight lines. She would write at random places on a page and the teacher had to ask her where she had written what. After some time had passed, even Solly could not remember such details. She was slow to read in the primary grades and could not do addition and subtraction sums based on memory facts. For instance, most children by classes 2 and 3 can remember that 5+2 is 7, 3+4 is also 7, 5-2 is 3, and so on. Solly had to use her fingers over and over again and she would still make mistakes. She could not comprehend the passage of time in hours, minutes and seconds, that is, she also could not keep track of time. Sensing direction was also a problem; distinguishing left from right and east from west was difficult. These observations were recorded in Solly's portfolio maintained by her teachers over the years; thankfully, she had very observant teachers though they were not trained in identifying specific learning difficulties. Solly was referred to the school's child psychologist who put her through many standardised tests. The results showed that Solly had the IQ of a 'Slow learner', had mild dyslexia and that she needed help in mathematics. The school psychologist skipped a diagnosis on Dyscalculia. Had that condition been identified, Solly and her family would have been able to accept that her inability to do mathematics was due to a neurological condition, that is, a learning disability. As a result of this, Solly never improved much in mathematics but maths anxiety was added to her profile by the time she was in middle school. Clear indicators of her real problem were that though her IQ reached normal range, and she had no dyslexia three years later, numbers, operations, time and direction were very poorly comprehended by her.

Many individuals find it difficult to understand mathematics and it is so rampant and common that very often a learning difficulty is misread as learning disability in mathematics. According to Ginsburg (see [3]) there is a rampant misidentification of children with problems in mathematics due to two reasons. One, it is assumed that ordinary schools provide adequate learning opportunities to children (which may not be the case). Two, segregating children on the basis of IQ and achievement tests is overly broad because there are many reasons other than 'cognitive defects' that affect learning like motivation, self-concept, socio-cultural environment, etc. Shalev et al (see [6]) have reported that almost one half of the children who were identified with Dyscalculia in the fourth grade were still identified as having Dyscalculia 3 years later, clearly pointing to the tendency for misidentification or poor remediation.

A broad definition of Dyscalculia has been given by Chinn (see [1]): *Dyscalculia is a condition that impairs the ability to acquire mathematical skills. Dyscalculic learners can have difficulty in understanding number concepts, lack an intuitive grasp of numbers and have problems in remembering number facts and procedures.*

Each student has disabilities in mathematics which are unique, and they do not all exhibit the same traits. Some common characteristics listed by

many researchers and summarised by Lerner and Kline (see [4]) can be classified as:

1. **Information Processing difficulties**

a. Attention: Difficulty maintaining attention to do steps in algorithms or problem solving.

b. Visual-spatial processing: Losing place in a worksheet, difficulty in seeing the differences between numbers, coins or operation symbols, writing in a straight line, problems with direction (up-down, left-right), aligning numbers, difficulty using a number line.

c. Auditory processing: Problems in 'counting on' from within a sequence, problems in following oral instructions.

d. Memory and retrieval: Difficulty remembering number facts, forgetting steps while doing problems, difficulty telling and remembering time, forgetting multiple step problems, poor sense of direction.

e. Motor problems: Writes numbers illegibly, slowly and inaccurately, difficulty in writing numbers in small spaces.

2. **Language and Reading difficulties:** Math word problems are difficult for students with reading disabilities because the child may not understand the underlying language structure.

3. **Math Anxiety:** Many children report that anxiety is their constant companion.

Dyscalculia is not a uniform phenomenon. By 'not uniform' we mean that the problem may be experienced differently by different individuals because of coexistence with other conditions like Dyslexia, ADHD and Autism. Also, since mathematics presents many facets like arithmetic, topology, probability, and so on, mathematical thinking is not unitary. It is thus necessary for us to look at the individual's problems in various domains and plan measures accordingly. Like other learning disabilities, Dyscalculia cannot be treated, but its effects can be mitigated so that a child can understand the basic ideas of mathematics even if she cannot perform mathematical tasks independently or express herself in the precise language of the subject. Some measures can be listed as follows.

First, it is important to consider the child's informal knowledge about mathematical concepts, because knowledge is an outcome of one's experiences with the real world; for instance, notions like bringing together, taking away, sequencing, equivalence, and so on. We should try to root all discussions in the child's external and internal world, especially problem solving, precisely because we all have an intuitive grasp of our personal problems and this helps in planning better solutions. It would also help to encourage variability in expressing a problem, such as drawing figures, animations, drama, songs and poems, etc. We should therefore accept solutions from children in varied modes as well. This way, the focus is on thinking rather than on the language or syntax of expression. This flexibility needs to be extended to the assessment of learning. Teachers can reduce abstraction of ideas by using manipulatives and multiple modes for introducing concepts to children and reduce their use gradually, based on individual needs. For instance, manipulatives like counters (beads, pebbles and marbles) can be used for counting and number operations. Involving whole body movements such as climbing stairs can be used to introduce integers. Many physical games can also be planned around mathematics concepts. Cues, primers and 'prosthetic aids' can be given to children for assistance. For instance, number charts and calculators for performing basic number operations, computer spreadsheets and word processors can help in writing. Reading software can help those with coexisting conditions because Dyslexia, Dysgraphia and Dyscalculia can exist together. Such a situation affects a student with Dyscalculia even more. Mnemonics can be devised to help remember steps in problem solving and markers can be developed for sensing time and direction. The individual students may benefit from one-to-one sessions so that they can cope with the whole class discussions. For older children, it is helpful to provide them with a checklist of possible strategies. This provides them with a structure. Most importantly, math anxiety should be minimised at all costs by encouraging students to develop alternate interests and hobbies for emotional growth and professional

development. By developing other interests, students understand that Dyscalculia does not define them as a person. This helps in limiting a problem to a small part of one's persona rather than casting a shadow on one's existence.

Dyscalculia is not recognised by CBSE as a learning disability and that is why the relaxation given to children with Dyslexia is not extended to children with Dyscalculia. This must change because children with Dyscalculia need assistance in terms of extra time and writing support (option to use a scribe), just like children with Dyslexia.

Moreover, an option to leave mathematics after primary school also must be offered in special cases of Dyscalculia so that time and resources can be utilised more constructively. General awareness about Dyslexia is greater when compared with Dyscalculia but that does not make Dyscalculia any less important, because every individual has the right to special instruction in order to realise her potential. Given the 'halo' around mathematics in modern times, it is time we address the problem of mathematics disability for the sake of every individual.

Resources

1. www. orkidsped. com (Consultancy centres in India)
2. www. dyscalculia. org
3. Chinn, S. (2015) (Ed.) *The Routledge International Handbook of Dyscalculia and Mathematical Learning Difficulties.* New York: Routledge.
4. Chinn, S. (2004). *The Trouble with Maths.* London: Routledge Falmer.

References

1. Chinn, S. (2004). *The Trouble with Maths.* London: Routledge Falmer.
2. Farham-Diggory, S. (1992). *The Learning Disabled Child*. Cambridge, MA: Harvard University Press.
3. Ginsburg, H. P. (1997). Mathematics Learning Disabilities: A view from Developmental Psychology. *Journal of Learning Disabilities*, 30, 20-33.
4. Lerner, J. & Kline, F. (2006). *Learning Disabilities and Related Disorders.* Boston: Houghton Miffin Company, 475-515.
5. Ramma, S. &Gowramma, I. (2002). A systematic procedure for identifying and classifying children with Dyscalculia among primary school children in India. *Dyslexia*. 8(2), 76-85.
6. Shalev, R. S. , Manor, O. , Kerem, B. , Ayali, M. , Badihi, N. , Friedlander, Y. , Gross-Tsur, V. (2001). Familial-genetic facets of Developmental Dyscalculia. *Journal of Learning Disabilities*. 34, 59-65.
7. Sharma, M. C. (1986). Dyscalculia and other learning problems in arithmetic: A Historical perspective. *Focus on learning problems in Mathematics*. 8, 3, 4, pg. 7-45. In Chinn, S. (2004). *The Trouble with Maths*. London: Routledge Falmer.
8. Van Kraanyenoord, C. , Elkins, J. , Palmer, C. , & Rickards, F. (2000). *Students with disabilities*. Canberra: Australian Government Printing Services. In Evans, D. , (2007). Developing Mathematical Proficiency in the Australian context: Implications for students with Learning Difficulties. *Journal of Learning Disabilities*, 40, 420-426.

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