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NEWSLETTER

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Dyscalculia, simply put, is difficulty with numbers, comprehending, learning, managing, manipulating and working with numbers, and also common arithmetic functions. There is also this huge gap where the ability to grasp concepts is not translated into practice.

Reading an analogue clock, following directions, recalling schedules and timetables, keeping track of time, distinguishing between right and left, working backwards in time, reading musical notations, choreography and dance steps, spatial awareness and judgement are all the classic challenges that point to Dyscalculia. Dyscalculia makes everyday functions that involve the sense of numbers like cooking, shopping and time management difficult. The challenge with numbers apart, Dyscalculia does affect a child's self-esteem and therefore their social skills. Negotiating space, reading maps, following directions are major stumbling blocks. So is money management.

Dyscalculia can be diagnosed with the standard tools of reference, and interventions through appropriate teaching practices do aid in remediation. One does not grow out of the condition but there are strategies that help children with Dyscalculia improve their maths skills and manage the challenges that numbers in any form pose.

Without agonising as to the why of it, which may be genetic as with many other conditions or it could be just the way the brain is wired, recognising the drawback for what it is and addressing it appropriately is the smart way to coping with the issue, to help the child deal with, live with and manage their circumstance.

It is imperative to know that it is never too late, nor is it impossible to overcome a learning difficulty. Right strategies, plentiful effort and consistent hard work can help the child with Dyscalculia work through their challenges and succeed in tackling numbers, in academics and more importantly in everyday life.

The Editors

#Dyslexic Advantage Makes Me

Paloumi Sheth
MA Broadcast Communication, MBA (One year Executive Course)

A Fitness Coach at F45

I did my 10th standard at Ananya and 12th from Sacred Heart, Church Park, B.Com Marketing Management, from MOP Vaishnav College and MA Broadcast communication. I also did a one-year executive MBA course at LIBA. And then decided to learn a little about Jainism. Fitness became my field of interest after being a member myself at F45. Right now, I'm a fitness coach at F 45 and am also involved in the family business, Health Care Company- Medical Distributors.

Process Associate in Investment Banking, Bank of New York Mellon (BNY Mellon)

Hinduja
B.Com Corporate Secretaryship

I did my 10th standard as a private candidate with the help of Ananya /MDA in 2015, 11th and 12th standard with Commerce, Economics, Accounts and English for Communication as major subjects at Good Shepherd Convent, Chennai (State Board). I completed my B.Com in Corporate Secretaryship an 3-year full-time undergraduate course at Anna Adarsh College for Women, Chennai. After which I joined the Bombay Stock Exchange for a 3-month course on Investment Banking in 2018. Now I am working with the Bank of New York Mellon (BNY Mellon) as Process Associate in Investment Banking and pursuing my MBA, dual specialization in HR & Marketing (Correspondence) course at IIBM Institute of Business Management, Delhi University.

Dyscalculia – An Insight

Revathi Sivasankar
Special Needs Educator for children with difficulty in mathematics

Dyscalculia (difficulty with calculation) is a Specific Learning Disorder (SLD) with impairment in Mathematics. It is associated with significant difficulty in understanding numbers and mathematical concepts. It is seldom identified at an early age. A person with dyscalculia may consequently become frustrated and develop a dislike for numbers.

Sample this work done by dyscalculics to get an idea of the difficulty they face in understanding numbers:
572 - 396 = 224 subtraction is done in both directions
647 + 285 = 81212 numbers are added without carry over

One has to clearly understand that Specific Learning Disorders (SLD) is not intellectual impairment. People with SLD have significant difficulty in one or more areas while coping well or even excelling in other areas of academics, sporting or artistic achievements.

Specific Learning Disorders occur arbitrarily and are not caused by the school the child attends or the instruction that is provided. Evidence suggests that there may be an associated genetic component.

Predictions of potential Mathematical difficulties:
The affected individual:

- Is unable to ascertain which 2- digit number is larger and is unable to grasp the concept of Place Value. (Number facts).
- Is not able to add simple single digit numbers mentally.
- There is limitations with working memory capacity. Hence the person is slower in completing math tasks.
- Lacks effective counting strategies and continues to use fingers and other manipulatives.
- It is interesting to note the variety of strategies the child comes up with:
- One of them found the fingers were not enough to count so stood up to use the toes to continue counting.
- Another child was continually tapping his pencil in the notebook. Turned out he was busy counting unaware of the noise he was making.
- Some place their hands under their desk so no one will notice they are using their fingers.

Advice for parents:

- Despite attending school regularly and getting adequate instructions some children are unable to reach the same level as their peers. Do not blame the child or the school.
- When the child begins to experience difficulty, identification and support is necessary.
- Targeted intervention involving remediation, accommodation, appropriate support and ongoing encouragement will help the child develop the skills to calculate effectively and efficiently.
- Get the child tested by the experts in the field. Sooner the testing, lesser will be the anxiety and stress for the child and the parents.

What are the tests and what is assessed?

Testing sheds light on issues with working memory. Specific tests assess:

Computation skills.

- Mathematical fluency.
- Mental computation.
- Quantitative reasoning.
- Once the test results are assessed appropriate remedial measures are recommended.

Remedial Measures

Remediation, appropriate support and encouragement help the child develop the skills necessary to cope with the curriculum. Since these children require extra time, schools help in giving extra time during the examinations.

Various boards also give concessions during the board examinations. Some concessions provided include:

- Extra time of one hour for a three-hour paper.
- Use of calculator.
- Using Clarke's table.
- Appointing an amanuensis or a scribe either to read the paper or to write the paper as per the need of the student.

Increasing awareness, help available through special educators and the concessions available in schools and the boards of education have had a positive impact. We hope the day is not far when no child will face ridicule and frustration and all children will enjoy working with numbers!
(For more information/clarification you can get in touch with me at revathi.siv@gmail.com or 09840696658.)

Dyscalculia — The Math Version of Dyslexia

Krishna Kumari
Special Educator, Project Associate TARA (Team for Accessibility and Reasonable Accomodation), Vidya Sagar

Yazhini, a ninth grader is a bright student, but her struggle with Math is often misunderstood by teachers and family members. Yazhini was diagnosed with Dyscalculia, the learning disorder specifically associated with difficulty in processing and grasping basic math concepts.

You've certainly heard of dyslexia, but have you heard of dyscalculia before? Perhaps not, given that children with dyscalculia – or mathematical learning difficulties – are less likely to be diagnosed. In addition, given the fact that dyslexia and dyscalculia are equally widespread, research indicates that children with dyslexia are more than a hundred times more likely to receive a diagnosis and educational support than children with dyscalculia.

Children with dyscalculia portray difficulty in memorising their multiplication tables, add up or subtract, and in fact numbers may make no sense to them at all. Passing math exams will always be difficult, and sometimes impossible. Not every student who has difficulty in learning mathematics has dyscalculia. There are, however, some basic areas of mathematical activity in everyday life that may indicate a dyscalculic tendency. This is when the mathematical tasks become persistently difficult and stressful. Such symptoms may manifest as: mathematics anxiety and dyscalculia.

Dyscalculia is listed as a learning disability in The World Health Organization and DSM-IV. Studies have shown that 4-7% of the world population

The common side-effects of dyscalculia are low self-esteem and low self-confidence, both directly proportionate to the exams and results. With the right support, students like Yazhini can get better at working with numbers at school and in their everyday life. Learners with Specific Learning Difficulties are often eligible for reasonable adjustments and/or accommodations during exams in line with their learning differences that affect their ability to perform optimally in their exams. And this support during tests and examinations is an essential necessity, because the accommodations are intended to limit the impact of the student's disability on their exam performance, to demonstrate their true ability in the examinations, while not giving the candidate any unfair advantage.

Current Provisions for Dyscalculia:

All boards of examinations have recognised Specific Learning Disability and have given some provisions during examinations to help these children work to their potential. Given below are a comprehensive list of the concessions provided by the different Boards and some of the procedures that need to be followed.

Tamil Nadu State Board – Samacheer:

- Extra time to answer examination paper
- Use of calculator
- Using Clarke's table
- Appointment of scribe to read the question paper or answer the paper.

CBSE:

- Twenty-five percent extra time for completion of the examination paper
- Facility of scribe or amanuensis when necessary
- Reader / adult prompter / Scribe and compensatory time
- Calculator

ICSE:

- Allowance of additional time.
- Use of an/a Amanuensis/Reader/Reader-cum-Write
- Casio fx-82 MS (Scientific Calculator) is to be used for Mathematical calculations only. Calculators of other makes with similar functions are also permitted.

Cambridge Board:

https://www.cambridgeinternational.org/exam-administration/cambridge-exams-officers-guide/

IB Board:

https://www.ibo.org/about-the-ib/the-ib-by-country/i/india/

Procedure for applications:

- A full psycho-educational assessment
- Medical report (if applicable)
- Both these reports need to clearly state how the child's barrier to learning or medical condition impacts their ability to perform to their full potential.
- Supporting historical evidence (occupational therapy, speech therapy or remedial therapy reports) – if any
- Teacher comments
- School report and school samples
- Cumulative report cards
- The final decision as to whether an accommodation will be granted lies with the Board and its accommodation panel not with the psychologist / Special educator who conducted the assessment or with the school.

Parents and schools need to understand that students with Specific Learning Difficulties who are not given the appropriate accommodations are going to be held back from achieving an accurate mark of their ability on their assessments and can therefore be at a disadvantage academically. Special arrangements were derived to give everyone a fair opportunity to access and engage in examinations. Many students with Specific Learning Disabilities have benefited hugely from these concessions to successfully complete their higher education.

Assessment Process:

Dyscalculia is a specific and persistent difficulty in understanding numbers that can lead to a wide range of mathematical difficulties. The assessment process must go beyond the mathematical components to include a thorough birth and developmental history, educational history and all skill-areas.

Given the fact that the behavioural properties of dyscalculia are defined and widely agreed upon, still there is a lack of identification and diagnosis of dyscalculia. There are a number of reasons why the diagnosis of dyscalculia is camouflaged, one of which is the co-occurrence of learning disorders. Hence, a complete comprehensive evaluation is essential to identify the exact areas where a child is struggling.

Assessment should use a range of measures, a test protocol, to identify which factors are creating problems for the learner. Assessors look at how well a child performs in a variety of Math skills areas as listed below;

- Basic numerical skills.
- Number Sense – It has three components that include counting, number knowledge and number operations.
- Math fluency - The child's ability to call up math facts, like 8 × 8 = 64, quickly and accurately is measured.
- Mental computation – It measures the child's ability to do math problems in their head, known as mental math.
- Math concept - The test is directed towards the mathematics program in the child's grade and to assess if the child has achieved the learning goals for his or her age.
- Quantitative reasoning - The child's ability to understand and solve math problem-solving skills are measured.
- Working memory.

Symptoms of Dyscalculia by Age:

Young Children

- Trouble organising things in a logical way, sorting by shape, size, colour, etc.
- Trouble comparing and contrasting: smaller/larger, taller/shorter
- Difficulty in learning to count and skips over numbers.
- There may be an impaired sense of number size, affecting the comparison of numbers, etc.
- Trouble recognising printed numbers, groups and patterns.
- May have trouble recognising number symbols (knowing that "5" means five).
- Difficulty with connecting the idea of a number with what it represents in the real world.
- Limited memory for numbers.

School age children

- Difficulty in understanding place value.
- Trouble in writing numerals clearly or putting them in the correct column.
- Difficulty in learning and recalling basic math facts, such as 2 + 4 = 6.
- May not notice visual patterns such as 10, 20, 30.
- Struggles to identify or confuses +, □ and other signs, and to use them correctly.
- May rely on tangible supports such as fingers, tally marks to count instead of using more advanced strategies, like mental math.
- Problem transferring information, e.g.: 4+3 = 7 therefore 3+4=7.
- Struggles to understand words related to math, such as greater than and less than.
- Trouble with visual-spatial representations of numbers, such as number lines.
- Difficulty keeping at grade-level in Math.
- Inability to grasp and remember mathematical concepts, rules, formulae, and sequences.

Limited long term memory for math functions.

- May not be familiar with math vocabulary.
- Difficulties in reading a clock.
- Slowness in given answers to math questions.
- Difficulty with fractions, measurements, estimation and approximation.
- Difficulty in recognising what arithmetical operation is required in a problem.
- Easily overwhelmed with pages/ worksheets full of figures.
- Avoiding games that require strategy.
- Struggles to keep score in sports games.

Teenagers

- Trouble with mental math.
- Difficulty in developing math problem solving skills.
- Difficulty in finding different approaches to the same Math problem.
- Visual-spatial difficulties hinder comprehension of written mathematics.
- Struggles to apply math concepts to money, including estimating the total cost, making the exact change and figuring out a tip.
- Problems with time perceptions, leads to problems with planning time required to complete a task.
- Difficulty in grasping information shown on graphs or charts.
- Difficulty in measuring things like ingredients in a simple recipe or liquids in a bottle.
- Trouble with visualising patterns, different parts of a math problem, or identifying critical information needed in problem solving.
- Difficulty in map reading.

Adults

- Difficulty in learning and remembering math concepts beyond basic math facts.
- Difficulty in performing calculations and has inconsistent results with mental arithmetic e.g. addition, subtraction, multiplication and division.
- Trouble in handling money or keeping track of finances.
- Difficulty in estimating costs (shopping, groceries).
- Trouble with concept of time, such as going by a schedule or approximating time.
- Difficulty in remembering a sequence of directions and acquiring spatial orientation.
- Finds it difficult to use Excel formulas.
- Keeping score in games is very difficult.
- High levels of mathematics anxiety.

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Meena Suresh

Independant Educational Consultant
Former Director, Ramanujan Museum and Math Education Centre
Her Motto - Every Child can Learn

Use of Manipulatives to teach Math

Math is an interesting subject in that it requires conceptual, logical and spatial reasoning – all these are usually easy for dyslexic children. Math also requires exactness and efficient computation skills – areas in which the dyslexic struggles.

Children with learning challenges are noticed quite early by their parent or by their teacher as soon as they begin schooling. In grade 1 and 2, students who have difficulty in information processing speed are not far behind their peers, but as they move up the grades, they are confronted with multi-step computation, their scores begin to tumble. By the time, the children are in grade 3, these students begin to fall behind. They seem to lack the basic intuition by which students comprehend number concept.

It is not that they have lost their acquired skills, but it is just that the problems they need to solve now, requires other skills like planning, sequencing, copying text, rote memorisation, handwriting etc. Given below are a few primary concepts which can be taught to the dyslexics by playing to their strengths.

1. Use of manipulatives provides spatial reasoning

A problem like 23 +44 is generally solved without understanding 'by routinely following the steps dictated by the teacher.

"Add 4 and 3 and write below and then add 2 and 4 and write below it".

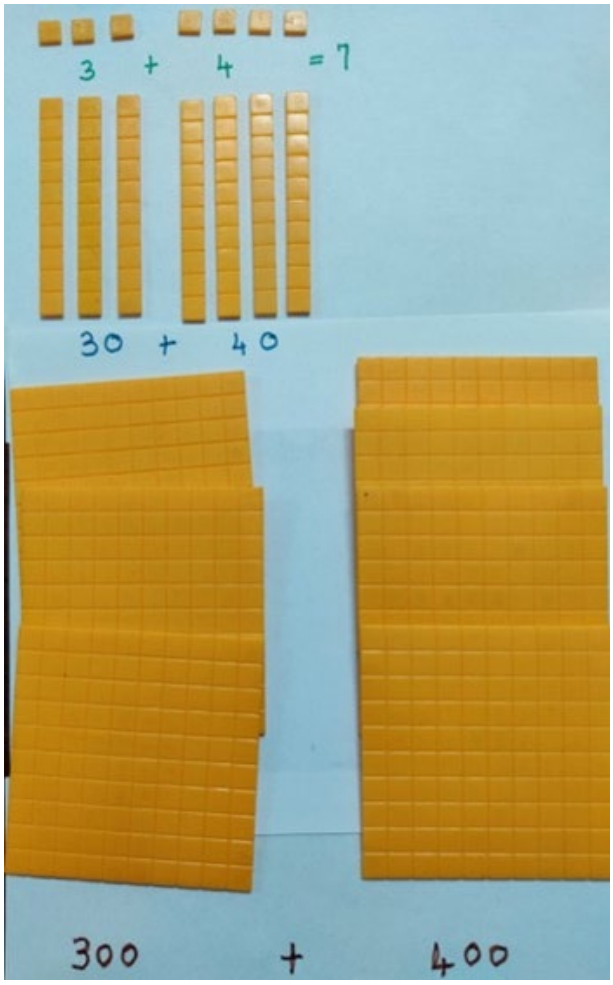
While most students get to do it without understanding the concept as the teacher dictates, which seems to be good enough to get good marks, but the concept enlightenment may dawn much later. The actual fact is that this problem cannot be solved by just the composing and decomposing skills acquired in the early grades. It requires understanding of our base ten system and place value. Use of base ten blocks provides the much-required visualization to add using place value.

The problem now looks logical for a dyslexic and hence solvable as well.

2. Manipulatives help in Patterning

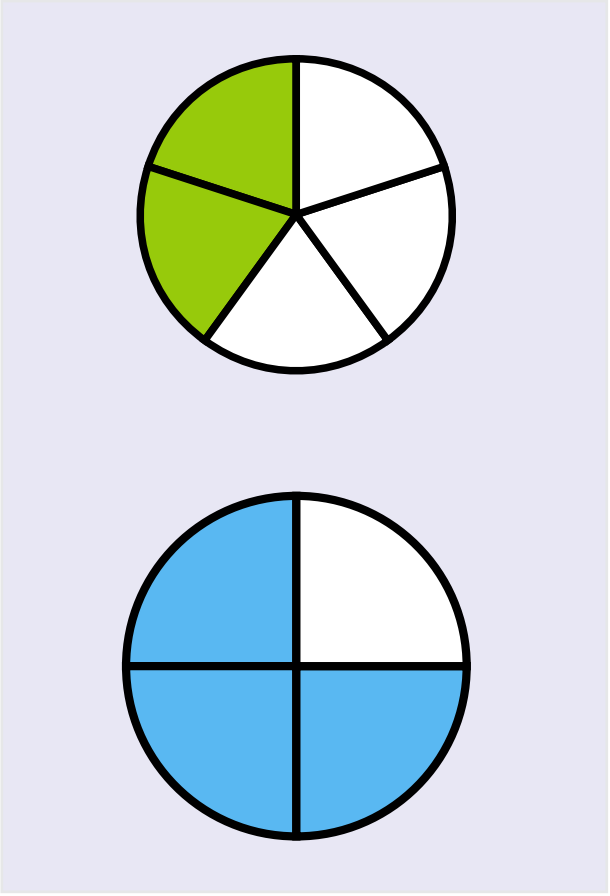
If 4+ 3 = 7; 30 + 40 = 70
What is 300 + 400 =?

Dyslexics are generally good in spatial reasoning, kinaesthetic learning. So, if the problem is presented using manipulatives, it will provide the much-required scaffolding to identify the underlying pattern. This will help in extrapolating the pattern to higher place values as well, thereby enhancing their speed as well.



3. Manipulatives help in visualization

Circle the greater fraction 2/5 and 3/4



If a teacher in grade 3 wants to introduce fractions, she needs to take care of the language, which is a challenge for dyslexics and hence understanding fraction is also difficult.

Fraction means that which is fractured. The denominator – denominals 'how many parts, the whole is broken into and the numerator nominates the number of parts in consideration. This needs to be explained not just orally but using hands-on materials like: 'Fraction Circles' which provides the visualization and hence better understanding of why the both denominator and numerator have to be considered in finding the bigger fraction and not just look at the denominator to decide. Use of manipulative in learning fraction helps in conceptual understanding, which is otherwise, taught procedurally.

4. Manipulatives help in sequencing and remembering

Find the LCM 3 and 4
This requires the student to use 'Tables" that they have memorised. But rote memorisation is not a strength of the dyslexic mind. So using tokens the concept of LCM can be understood through sequencing
LCM using tokens of two different colours.

The arrangement of tokens helps in sequencing the steps to find the LCM and not rely on their rote memorization of tables

Systematic teaching with focus on conceptual clarity aided by the use of manipulative and methodical practices works well. It is in providing conceptual clarity that manipulatives play a major role. Hands on learning help children understand the why behind math concepts.

How to Help Children Translate Math Concepts from Physical Tools to the Notebook

S. Sundaram

S Sundaram is an educator with more than three decades of experience in heading schools, across several boards, in several parts of India. He also trains primary school teachers in teaching math through visual, activity-based and experiential methods. He is the Math Advisor to Diksa (diksa learning centre, T Nagar, Chennai). He can be reached at sundaram021148@gmail.com

Anuraadha Jaishankar

Anuraadha Jaishankar is a Special Educator working with diksa learning centre for the last 12 years, teaching children with dyslexia. She specializes in teaching math to children with learning difficulties and life-skill math to young adults. She also heads dIksa's "Grow with Math" programme. She can be reached at vanujai@yahoo.co,in

How the brain understands "how many"?

Look at the two pictures below labelled A and B. Which picture do you think represents "more" as in "more vs less"?

Picture A	Picture B
	

Chances are that most will point to B. Children would almost definitely point to B.
The pictures illustrate the difference between judging "how many" and "how much". In terms of "how many", picture A is more and in terms of "how much", picture B is more.

Neuroscience research seems to indicate that the area of the brain widely thought to be involved in processing "magnitude", has two very separate, specific functions. One function is responsible for sensing "how many" and the other is responsible for estimating "how much".

Evolution seems to have trained our brains more for judging "how much". Our capability to "visually" judge "how many" is limited to smaller quantities, mostly less than ten.

Mathematicians call the "how many" ability as "number sense". As we encounter different kinds of numbers, number sense also has to be developed, to understand them, through focused instruction in the math class.

Criticality of Number Sense

In the last 6000 years, math as a discipline has progressed rapidly whereas our brains still have a natural capacity only to process small numerical magnitudes.

If a child starts out with a weak neural sense of "how many" they are unable to comprehend the math that is being taught. Very quickly they are out of depth with the subject. Matters come to a head in the middle school where the complexity of the math takes a quantum jump. Perhaps this is the basic reason why math is universally considered a difficult subject.
Most mathematicians, including Stanford mathematician Keith Devlin, agree that number sense is most critical skill for understanding abstract ideas in math.1

What is Dyscalculia?

Though the difficulty with numbers is a common problem, in a small percentage of people it is very acute and medically recognized as a condition called dyscalculia. One of the effects of dyscalculia is the extreme difficulty the child faces in the development of number sense.

Dyscalculic children usually have difficulty in the following areas:

1. Identifying small numbers visually as patterns of dots
2. Understanding the relation between a number, the related quantity and the numeral
3. Correctness of a sequence of numbers
4. Comparing numbers into smaller, larger and equal
5. Remembering sequential instructions
6. Comprehending time intervals and chronologically ordering past events

7. Reading a clock
8. Difficulties related to memory

Research is yet to confirm whether issues such as poor coordination or problems with visual-spatial processing are also symptoms of dyscalculia.

Dyscalculia, like dyslexia, is a life-long condition, which continues to affect people beyond their school years. Dyscalculia many times is also accompanied by other disabilities like dyslexia and ADHD. Unlike dyslexia, it seems to occur equally in males and females.
But dyscalculia is not a general intellectual disability. Dyscalculics can excel in many other skills and areas.

A common notion is that dyscalculia is the math equivalent of dyslexia which is a language related disability. This is not completely correct as the ways math and language are learnt are quite different. Research into dyslexia is much older and many diagnostic interventions have been worked out. In contrast, research into dyscalculia is less than two decades old.

Neuroscience Research of Dyscalculia

There are several reasons why the discovery of this condition and research into its causes is a very recent phenomenon.

1. Math has universally been considered a difficult subject and difficulties in learning math are considered normal. In fact, there are many adults who proudly claim that they were bad at math in school. Can you imagine them being proud of a language difficulty?
2. Math teaching is still a problematic issue all over the world. Hence, while studying the causes for lack of math achievement, it is very difficult to separate out the effects of "ineffective teaching" from those due to dyscalculia.
3. Because of the above, even identifying the right candidates for research studies have been difficult.

This situation has improved only after neurological studies of the brain with sophisticated scanning equipment were undertaken to understand dyscalculia. Research has also proved that elementary number sense emerges in children as young as six months.

Diagnosis and Remediation

Due to lack of research into the causes of dyscalculia, not many diagnostic and remedial procedures have emerged. Because of the hierarchical nature of math ideas, it is best if dyscalculia can be identified when children are in the early stages of learning. Otherwise, by the time dyscalculia is even suspected, the student is already in the higher classes where there is no time, either for the student or the teachers, to work on the fundamentals.

If the diagnosis identifies that the lack of math achievement is due to a neural condition, it also shifts the focus from the student to the remediation. It is no more about the student not trying hard enough. Hence the mental pressure on the student reduces, which itself could be a motivating factor for the student. They could also qualify for "accommodations" in assessments.

Accommodation for Students with Dyscalculia

Even the limited research undertaken has given a broad understanding of dyscalculia. Guidelines have also emerged for accommodating for the difficulties faced by such students. Some of them are given below.

1. Individualised assessments, taking into account the academic difficulties faced by the student
2. Flexibility on time constraints. The focus is on finding out what the student knows, rather than how fast they do the work
3. Combination of various assessment modes – oral, practical and written
4. Allowing the use of a calculator to help with numerical computations

Remediating Dyscalculia

The traditional way of teaching math in our schools, with emphasis on memorising computational procedures is not suitable for remediation of a student with dyscalculia. Math has to be taught in a more effective and child-friendly manner.

We provide, here, an effective mathematical framework for systematically developing and strengthening number sense in children with

dyscalculia. The framework is based on the work of late Shri PK Srinivasan. He was a pioneer in presenting math concepts in concrete ways visually, through play-like activities with daily-use materials and relating them to daily life events through role-plays.

Math Curriculum Framework

The framework starts from pre-number skills and number sense to understanding two-digit numbers (99). It has been developed in 16 stages, as described in Annexure 01.The stages are based on the critical stages in the development of number sense up to two-digit numbers.
The framework can also be used for diagnosing dyscalculia. Since these stages proceed incrementally through increasing complexity, we can use them to locate the stage at which a child's capabilities lie currently and the stage from which difficulties start emerging.

Once feedback from practitioners is available, these stages can be further fine-tuned. In future, the curriculum could even be extended to cover other areas of math.

Learning through Activities

Numbers and most of math are mostly abstract ideas. Children are not yet developmentally ready to understand abstract ideas. The concepts, skills and language have to be mirrored to learners indirectly through activities with daily use materials, role plays of daily transactions, interactions with peers and play.

Activities also provide opportunities for managed physical movement. Physical movement is one of the primary ways by which children explore the world and understand it.

Suggestions for Parents

Children with dyscalculia take longer durations to internalise concepts, skills and language associated with math. Hence, they require continuous engagement with these. Hence dyscalculia remediation requires a lot of active involvement by parents.

Parents can understand the various stages of the framework and keep track of the progress of their children. They can seek guidance from the teacher and help their child by regularly practise some basic concepts, procedures and language with them at home. This can be done by using everyday objects, such as beads or tokens, or playing simple number games. They can also play board games with dice – which can help to internalise basic number concepts.

References

[1]Number Sense: the most important mathematical concept in 21st Century K-12 education – Keith Devlin https://www.huffingtonpost.com/entry/number-sense-the-most-important-mathematical-concept_us_58695887e4b068764965c2e0

We will now give a brief description of the stages in the curricular framework. Annexure 01 gives the curricular framework that we will be using. The details of each stage are given in separate annexures, where necessary.

Annexures 9 and 10 have photographs of the various ways of representing numbers.

Stage 1 – Pre-Number Skills (Annexure 02)

Numbers are abstract mental objects. They do not exist in our world. The idea of numbers has to be constructed from seeing patterns in our world. Hence number is a difficult concept for students. Doing activities which are collectively called "pre-number" activities will help build the idea of number in their minds.

Stage 2 – Perceptual Numbers -1 (Annexure 03)

Numbers one to five are present in many ways in our body and the environment around us. So, children "see these numbers by sight" 24X7 and also hear them being referred to by their number names. Hence, they are called perceptual numbers.
They perceive these numbers in four different ways called "representations"

1. Sound representation – by hearing the number names being used by others. Each language has its own number names. Children would be more familiar with the names used in their homes.

2. Object representation – by instructions like "please bring two spoons". The child correlates the number sound "two" with sets of two objects
3. Finger representation – these numbers can also be represented by fingers on their palms. For this either or both the palms can be used.
4. Numeral representation – these numbers can then be associated with numerals (1, 2, 3, 4, 5). Here also each language has its own numeral shapes.

Children have to be trained through activities to match the representations with one another. A sample activity is described below.

Teacher calls out a number and the student has to pick up as many pencils as the number and show them to the teacher. This activity is for matching "Number Sounds" with "Objects".

Annexure 03 shows graphically the various ways in which the matching can be done. This would help teachers in designing activities for specific learning objectives.

Stage 3 – Perceptual Numbers -2 (Annexure 04)

In this stage, we add Zero to the numbers they have already learnt.

Introducing Zero - Zero is a difficult concept which has to be demonstrated separately. It cannot be easily perceived like numbers 1 to 5. We can start with a child having four pencils in a cup. Then the child has to give the pencils one by one to the teacher. At each stage, she has to see how many pencils are left in the cup. Starting from four, the pencils in the cup will reduce to three, two and one. At the next step the cup will be empty. The teacher should explain at this point that we can say "the cup has no pencils" or "the cup has zero pencils". This activity should be repeated many times with different kinds of materials until the student understands the meaning "I have zero pencils."

Then the same activities as in Stage 2 should be practiced with numbers zero to five. The only difference would be that the objects should be kept in a cup so that zero would be an empty cup.

Annexure 04 shows the matching possibilities graphically.

Finger Representation – Zero can be represented with a closed fist.
Numeral – 0 can be added to 1, 2, 3, 4 and 5.

Understanding the number sequence 0 – 5

Now that children know these numbers, the sequence of these numbers have to be shown with "one more" and "one less" concept.
Starting with 5 pencils in a cup and taking out one by one, they should see numbers 4, 3, 2, 1 and 0. Similarly starting with an empty cup and adding pencils one by one they should see the numbers 0, 1, 2, 3, 4 and 5.

Practicing the sequence 0 to 5 and 5 to 0

Children should practise reciting this sequence both in the increasing and decreasing order. Along with this recitation the student should simultaneously either display the numeral shape or touch a cup with that number of pencils.

Stage 4 – Single Digit Numbers – 1 (Annexure 05)

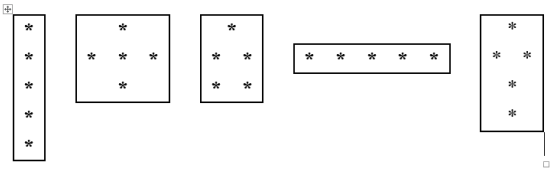
Introducing numbers up to 9

Now, the numbers 6, 7, 8 and 9 have to be introduced using the same "one more" and "one less" concept as described in Stage 3.

Then the same activities as in Stage 2 should be practiced with numbers zero to nine. The only difference would be that the objects should be kept in a cup so that zero would be an empty cup.

The sequence 0 to 9 and 9 to 0 has to be practiced as in stage 3.

Object representations – Numbers 1 to 9 can be represented with tokens (like, used bottle tops) in as many designs as possible. For example:



The patterns will help in associating numbers with these patterns and in recognizing these numbers. Later they will also help in decomposing numbers into smaller numbers.

Stage 5 – Single Digit Numbers – 2 (Annexure 06)

At this stage, we introduce another representation called "icon" representation. Icons are tally marks like +, X, * etc. For example, five would be represented by *****.
For matching activities, cards with number representations using different icons should be prepared.

Then the same activities as indicated in the annexure should be practiced with numbers zero to nine. The only difference would be that the objects should be kept in a cup so that zero would be an empty cup.

Stage 6 – Understanding Ten (Annexure 07)

Ten is an important stage in the number sequence. It is the first number which uses two numerals and that too with a totally different meaning. For example, the relation between ten (10) and the numbers 1 and 0 is not easy to understand.

At this stage, ten is represented only through its number-sound and with fingers or objects. It is not yet represented in numerals as students have not yet been introduced to 2-digit numbers or place value. But they need an understanding of ten as a quantity before understanding place value representation through bundles and sticks.
Then the same activities as indicated in the annexure should be practised with numbers zero to ten.

Representing ten with sticks – Children should count out ten sticks and then make them into a bundle using a rubber band. With time, they should associate ten with a bundle held together with a rubber band!

Stage 7 – Counting – 1

Once a child is able to understand and represent numbers from zero to ten, counting can be introduced. Introduction of counting can be done in these steps:

1. Match different number names (in any random order) with collections of objects. Using cups for holding objects would be convenient.
2. Arrange the object collection in increasing order of quantities. Initially this may have to be done with a smaller set of collections.
3. The collections can be increased up to ten, as student gains confidence and understanding.
4. With the collections arranged in increasing order from 0 to ten, match them with
   a. Number names (orally)
   b. Icon representation (with cards already marked with various icons)
   c. Representation with ice cream sticks– ten would be a bundle
   d. Numerals (with cards written with various numerals)
5. Practise this activity several times until students gain fluency and confidence
6. Practise reciting number names from zero to ten and ten to zero
7. Practise reciting starting with any number and ending with a higher number (say four onwards) and similarly in decreasing order

Stage 8 – Writing Numerals

Writing should be the last stage after plenty of listening, speaking and reading. Reading includes both identification of numerals and object sets.

1. Listening
   a. Student is able to listen to a number name and pick out any required representation of it – object, icon and numeral
2. Speaking
   a. Student is shown any representation at random – object, icon or numeral and they are able to tell the number name correctly
3. Reading or Identifying
   a. Identifying – They are able to observe a collection of objects or an icon representation and tell the number correctly
   b. Reading – They are able to see a numeral and tell the number correctly
   After many repetitions of these activities, the student possibly has internalised the shapes of the numerals as visual images in the brain. Then they are ready for writing.

4. Handwriting Numerals
    a. Start with tracing of the numeral shapes (big sizes) on sand
    b. Trace the numeral shapes on sandpaper cut outs
    c. Trace the numeral shapes with pencils
    d. Write the numerals in big size
    e. Write the numerals in normal size

Stage 9 – Understanding 2-digit numbers - 1– (0-19) (Annexure 08)

Nineteen is another major step in the number sequence basically because the number names are not logical and children have difficulty in relating the number to its name.

1. Start with ten (1 bundle)
2. Ask student to keep one more next to it (it would become a bundle and one stick)
3. Ask student to keep one more than previous, next to it (it would be a bundle and two sticks)
4. Ask student to repeat the process till nineteen (one bundle and nine sticks)
5. Make sure student understands the logic of this arrangement (one more)
6. Introduce number names orally – eleven, twelve, thirteen etc., till nineteen
7. Introduce the logic of these number names – thirteen is actually three teen (ten is pronounced as teen), four teen, five teen, six teen, seven teen, eight teen, nine teen
8. If a student has difficulty, eleven and twelve can be introduced as one teen and two teen. These can be corrected later once student remembers the number names.
9. Representing with Numeral Cards
    a. Ask student to represent the bundles and sticks with numeral cards.
    b. 1 bundle and 5 sticks – with card written with 1 and 5 -> 15
    c. Tell them the importance of the position. The bundle (number) is on the left (written first) and the sticks (number) is on the right (written next)
10. Repeat the number matching activities from zero to Nineteen with number names, bundles and sticks and numerals (cards printed with numbers 0 to 19)

Stage 10 – Writing Two Digit numbers (0 to 19)

1. Nineteen is a bundle and nine sticks. This is written as 19. The 9 represents the nine sticks. The 1 represents one bundle.
2. Point out that “writing” the number” follows the reverse order of “telling” the number
3. Thirteen -> Three Teen -> Three and Ten written as 13
4. Practice a lot of dictation – listening to number names and writing the number

Stage 11 – Counting in Bundles (Tens)

1. Ask students to make many bundles with ten sticks
2. Start with one bundle – ask the number name (ten)
3. Ask them to add one more bundle – how many bundles are there now? – Tell them this is called “twenty”
4. Similarly adding one bundle at a time, introduce the number names twenty, thirty, forty, fifty, sixty, seventy, eighty and ninety
5. Point out the logic of the names – twenty is two tens (bundles), thirty is three tens (bundles), forty is four tens (bundles), fifty is five tens (bundles), sixty is six tens (bundles), seventy is seven tens (bundles), eighty is eight tens (bundles), ninety is nine tens (bundles)
6. Repeat number matching activities for ten to ninety using number names, bundles

Stage 12 – Counting in Bundles and Sticks (21 to 99)

1. Start with two bundles – what is the number? - Twenty
2. Add one stick – how many bundles and how many sticks – two bundles and one stick – this number is called twenty-one
3. Introduce numbers from twenty-one to twenty-nine
4. Similarly introduce numbers from thirty to thirty-nine, forty to forty-nine etc.,

5. Remember the counting sequence
    a. If there are three bundles and four sticks then the counting sequence would be
    b. Ten -> Twenty -> Thirty (counting the bundles first)
    c. Then Thirty-one -> thirty-two -> thirty-three -> thirty-four
    d. The number is thirty-four (number name)
    e. Match with the number card (showing 34)

Stage 13 – Understanding 2-digit numbers - 2– (0-99) (Annexure 08)

1. Repeat the number matching activities as in Stage 09.
2. From zero to Ninety-Nine with number names, bundles and sticks and numerals (cards printed with numbers 0 to 99)

Stage 14 – Writing Two-digit numbers (0- 99)

1. Repeat activities as in Stage 10
2. Practice a lot of dictation – listening to number names and writing the number
3. Writing multiples of ten
    a. Twenty -> 2 bundles and no sticks -> 2 bundles and 0 sticks -> written as 20
    b. Thirty -> 3 bundles and no sticks -> 3 bundles and 0 sticks -> written as 30
    c. Similarly, up to Ninety -> 90

Stage 15 – Comparing Numbers (bundles and sticks)

1. Listen to two number names (initially start with smaller numbers)
    a. Represent both of them with bundles and sticks
    b. Visually identify which has more sticks? Or which is the bigger number?
2. Listen to two number names (initially start with smaller numbers)
    a. Represent the numbers with number cards –
    b. Keep the bigger number above the smaller number
3. Gradually increase the magnitude of the numbers
4. Gradually decrease the difference between the compared numbers
5. Repeat activity till the logic of comparison is internalised and student can compare numbers in numeral representation
6. Introduce the “<” and “>” symbols.
    a. Repeat the activities and ask students to use these symbols with numbers

Stage 16 – Comparing Numbers (Numeral Form)

1. Select two number cards at random
2. Compare the numbers by using “<” and “>” symbols: 35 < 43 and 43 > 35
3. Express in language – Thirty-five is smaller than forty-three and forty-three is bigger than thirty-five.

Annexures

Dyscalculia **Curricular Framework** **Annexure 01**

Stage	Title	Numbers	Description
	Curricular Framework		Summary of all the stages
1	Pre-Number Skills	None	Numbers of abstract concepts. Pre-number skills prepare the ground for understanding numbers as representing quantities Annexure 02
2	Perceptual Numbers 1	1-5	One to Five are called perceptual numbers – numbers that can be "seen" without counting Matching sound, finger, object and numeral representations Annexure 03
3	Perceptual Numbers 2	0-5	Zero is not Nothing. Understanding zero as the absence of anything to count. Zero as a number. Matching sound, finger, object and numeral representations Annexure 04
4	Single Digit Numbers 1	0-9	Matching sound, finger, object and numeral representations Annexure 05
5	Single Digit Numbers 2	0-9	Adding icon representation (markings on paper) to sound, finger, object and numeral representations Icons can be drawn in different shapes and formations Annexure 06
6	Representing Ten	'0 - ten	Ten is the first number to use two numerals Ten is one more than 9 Representing with sound, fingers, objects (bundles and sticks), icons and numerals (up to 9) Annexure 07
7	Counting	'0 - ten	Counting is NOT just reciting numbers in a sequence Understand sequence of numbers with the principle of "one more" Practice reciting number names
8	Handwriting Numerals	0-9	Practice writing numerals, after sufficient practice of listening, speaking, reading, observing numbers as numerals
9	Two Digit Numbers -1	0-19	Understand the code underlying the place value concept Proceed from ten to nineteen continuing the "one more" idea Match sound, "bundles and sticks" and numeral representations (with printed numeral cards) If necessary, convert eleven and twelve into "oneteen and twoteen" Annexure 08
10	Writing two digit Numbers-1	0-19	Understand the "reverse" relation between numbers names and numeral representations. Five Teen (fifteen) is written as 15
11	Counting in bundles	Ten - ninety	Arrange sets of bundles with the principle "one more" Learn the number names – ten, twenty, thirty...till ninety Write numeral representations

12	Counting in bundles and sticks	0 to 99	If there are 3 bundles and 4 sticks the counting goes like this Ten -> twenty -> thirty -> thirty one -> thirty two -> thirty three -> thirty four
13	Two Digit Numbers-2	0 - 99	Match sound, “bundles and sticks” and numeral representations (with printed numeral cards) Annexure 08
14	Writing two digit Numbers-2	0 to 99	Write numeral representation of any given collection of bundles and sticks Forty is 4 bundles and No sticks, which is 4 bundles and 0 sticks Hence written as 40. Similarly, for all multiples of ten
15	Comparing Numbers-1	‘0-99	Listening to number names and comparing by a. using the bundles and sticks representation AND b. using numeral representation – 37 < 45 Introduce < and > symbols
16	Comparing Numbers-2	‘0-99	Comparing numbers written on number cards using < and > symbols

Dyscalculia **(Activities for Learning) Pre-Number Skills** **Annexure 02**

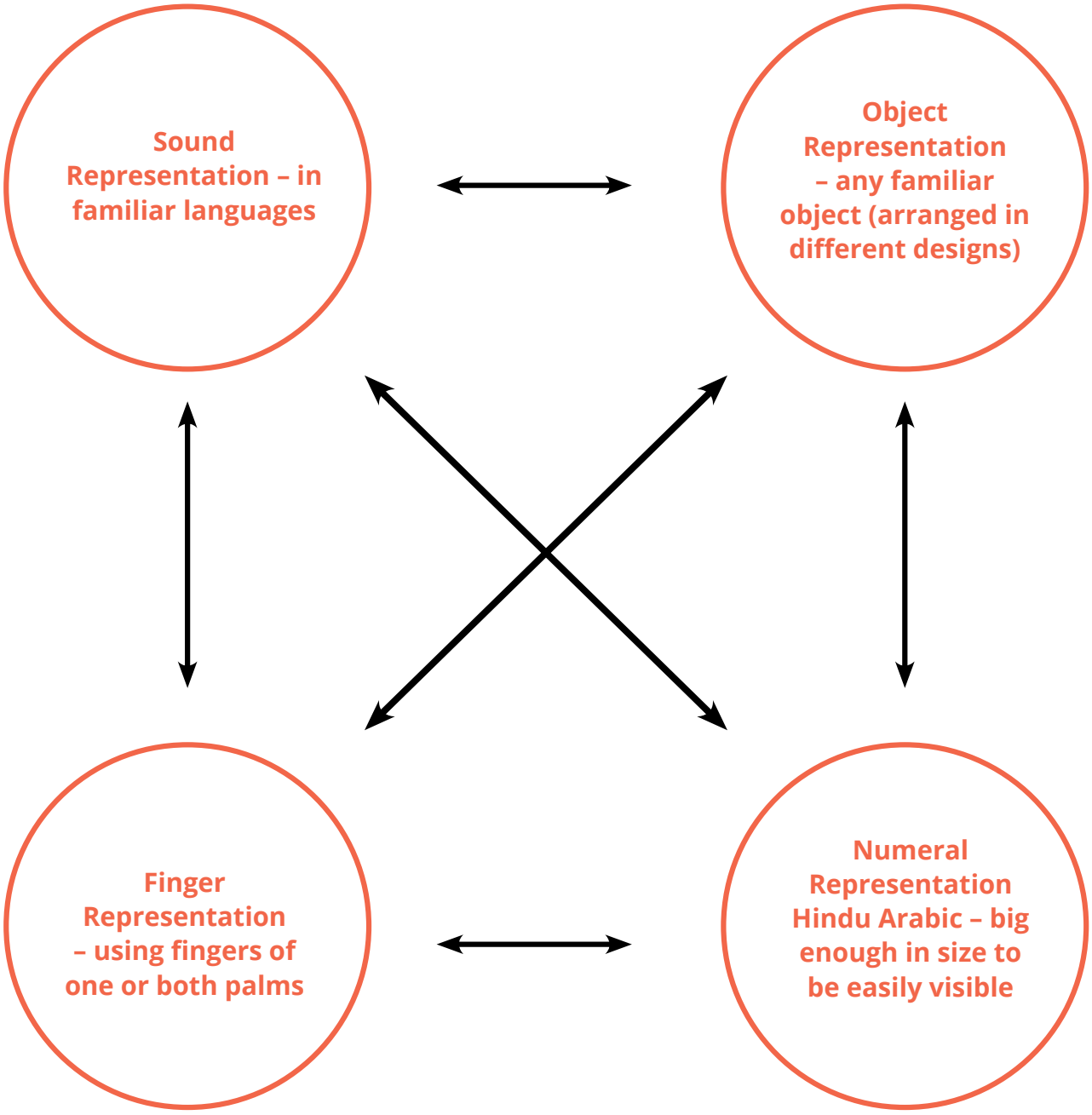
No	Brief Description of the Skill	Explanation/Comment	Sample Activity
Notes These activities are for introducing the idea of numbers one to five as quantities These activities are for understanding the concepts and also learn the related vocabulary They are just indicative. Teachers can vary them keeping the objective of the activity in focus These activities may need many repetitions for the student to grasp the ideas			
1	Belongs/Does not Belong	Given an object and a set of things, decide whether it belongs to the set or not	Given a basket of fruits, decide whether a ball belongs to that basket or not
2	Pair two things taken from 2 different collections	Is there any logic by which 2 things can be paired	Shoe from one collection can be paired with socks from the other collection
3	Sorting	Sorting a collection of things by various criteria	Sort a collection of circles, squares and triangles of different colours, by colour
4	Contrast	Choosing any two objects which can illustrate the idea of contrast	Choosing 2 pencils to illustrate the idea of long and short

5	Arrange objects in serial order	Arrange in order as per a criterion	Given a set of pencils of different lengths, arrange them in order of increasing length
6	Few and Many - 1	Identify two sets (with a large difference) as few and many	Identify 2 cups with varying number of tokens in them to illustrate the idea
7	One and Many	Identify two sets as one and many	Identify 2 cups with varying number of tokens in them to illustrate the idea
8	Give/Take/Bring one	From a cup with a few tokens carry out these instructions	Give one token from the cup you have Take one token from the cup in front of you Bring one token from the cup on a table
9	Give one each	Share tokens one at a time	From a cup of tokens, give/put one token in each cup
10	Give one more to each	Share one more token	In continuation with the above activity, give/put one more token
11	Pair 2 sets by one-to-one correspondence	Comparing sets without counting	Given a set of cups and spoons, place a spoon in each cup. Announce which is left over
12	One-to-one correspondence with fingers and separation - 1	Touch tokens on the table with fingers of one hand and separate the tokens	Spread tokens on the table. With fingers of one hand, touch as many tokens with the fingers and slide them out
13	One-to-one correspondence with fingers and separation - 2	Separate 1, 2, 3, 4 and 5(one number at a time) tokens with fingers	Keep 3 tokens. Ask student to move all of them with their fingers
14	One-to-one correspondence with fingers and separation - 3	Numbers with fingers (do numbers up to 5)	Touch the given number of tokens with fingers and hold up the fingers
15	Few and Many - 2	Identify two sets (with a smaller difference) as few and many (slowly reduce the difference)	Identify 2 cups with varying number of tokens in them to illustrate the idea
16	More/Less/Same As or Bigger/Smaller/Same As	Comparison idea and language (use quantities up to 5)	Given 2 cups with tokens in it, label it as in the 1st column
17	Arrange sets in serial order	Arrange sets of objects (up to 5) in order	Given cups with 1, 2 and 3 tokens arrange the cups in increasing order Start with 3 cups then increase to 4 and 5 cups Always keep the quantities increasing continuously

18	Finger and object representations starting with 1	Ask for showing “one” using finger and tokens	Learning the idea of one in sound (one), fingers and objects
19	Continue above activity with one more - 1	Ask for showing one more finger, keep one more token	Tell that this is “two”
20	Continue above activity with one more – 2	Ask for showing one more finger, keep one more token	Tell that this is “three”
21	Continue above activity with one more – 3	Ask for showing one more finger, keep one more token	Tell that this is “four”
22	Continue above activity with one more - 4	Ask for showing one more finger, keep one more token	Tell that this is “five”
23	Listen and show (numbers 1 to 5 called out at random)	Listen to a number and show it with fingers and tokens	Ask for the number to be shown with fingers and tokens
24	Repeat the activity with “one less” principle	Know the sequence in reverse	Listen to a number. Show it with fingers and tokens Remove 1 – tell the number name, show with fingers and tokens Continue until 1 is reached

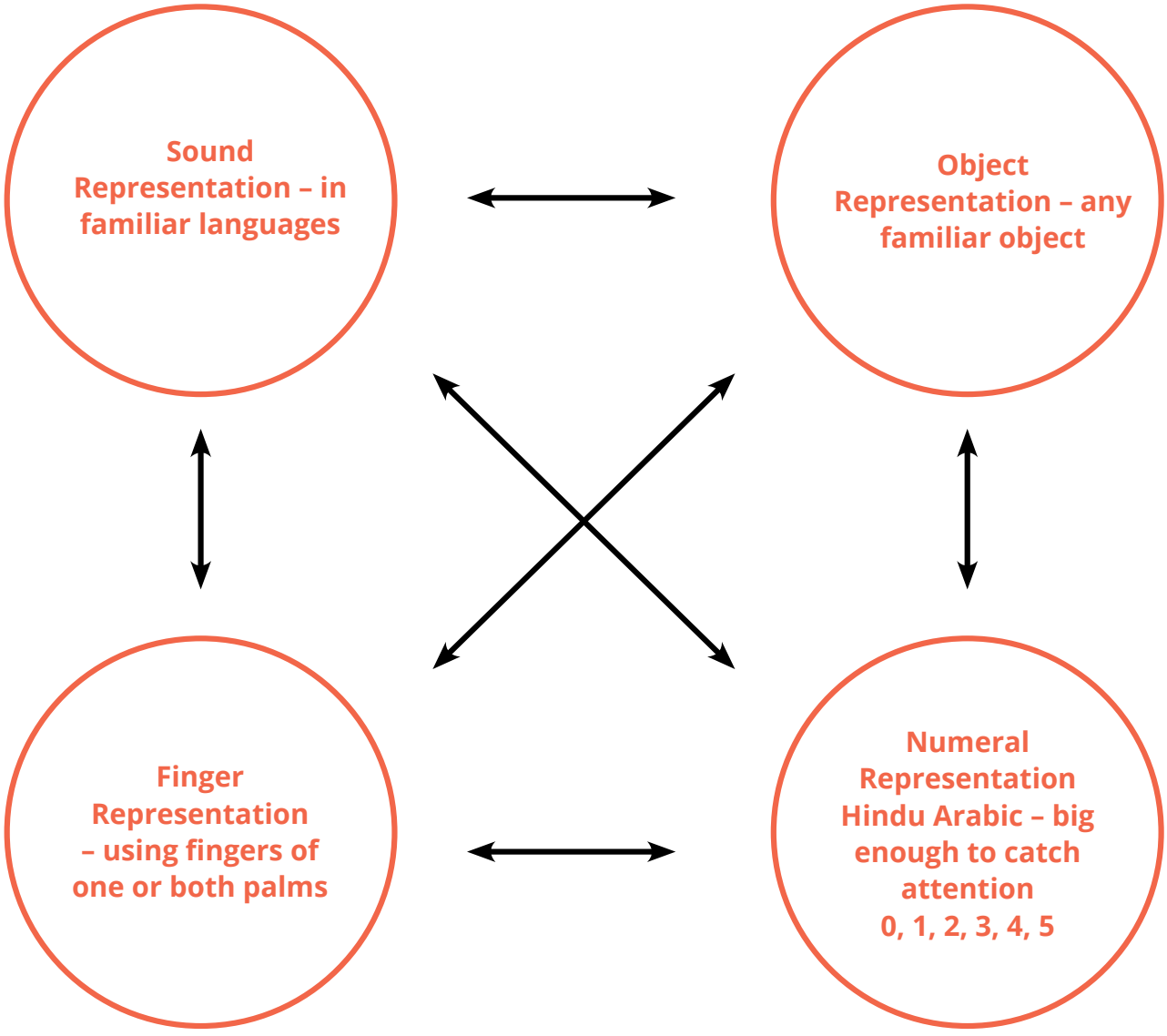
Dyscalculia **Perceptual Numbers - 1** **Annexure 03**

Matching different representations of numbers **ONE TO FIVE** with one another



Dyscalculia **Perceptual Numbers - 2** **Annexure 04**

Matching different representations of numbers **ZERO to FIVE** with one another. We add representations of zero.

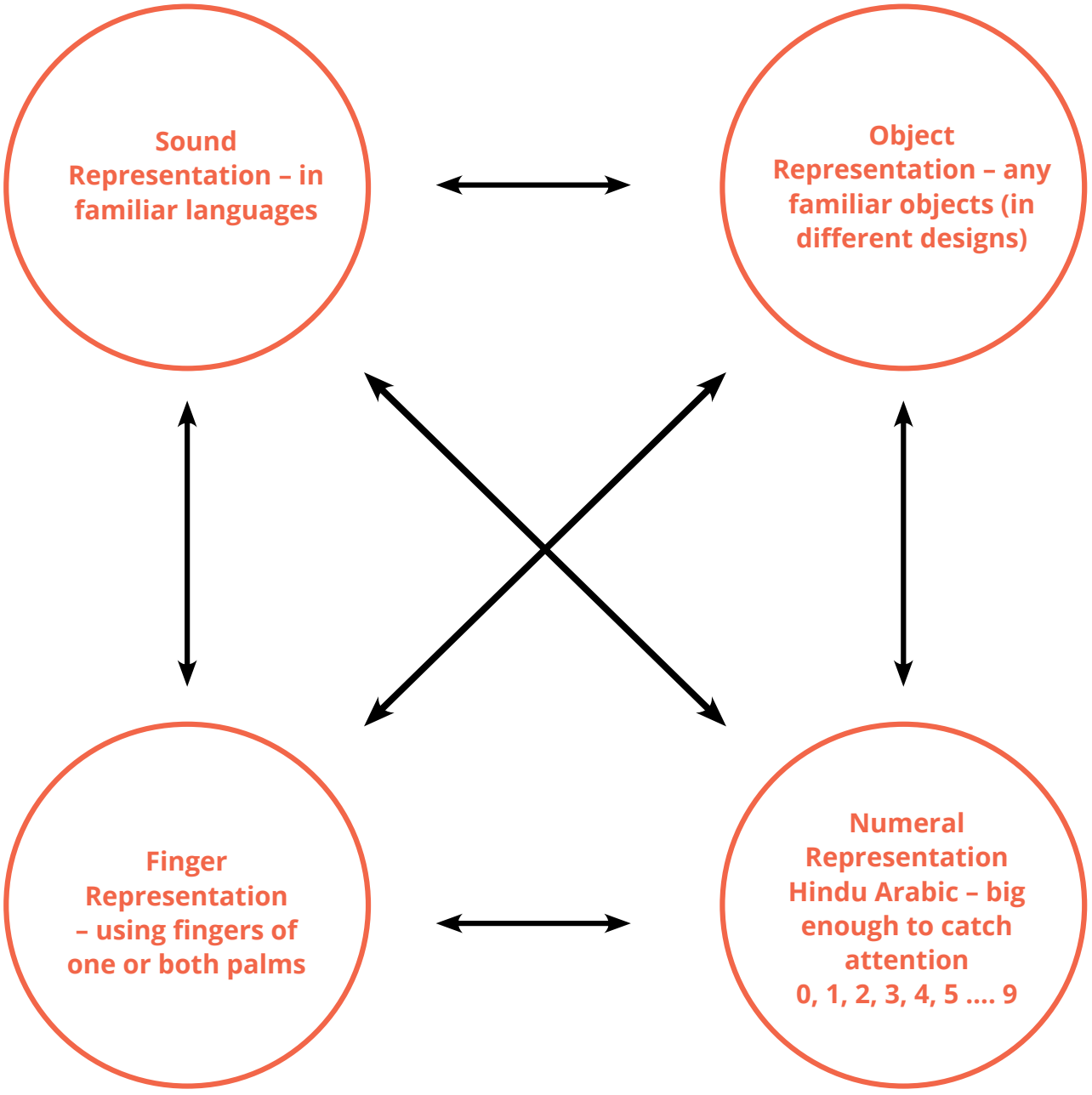


Representing zero

1. Object representation – keep tokens representing various numbers in cups. Zero is represented by an empty cup
2. Finger representation – zero is represented by a closed fist meaning no fingers are extended

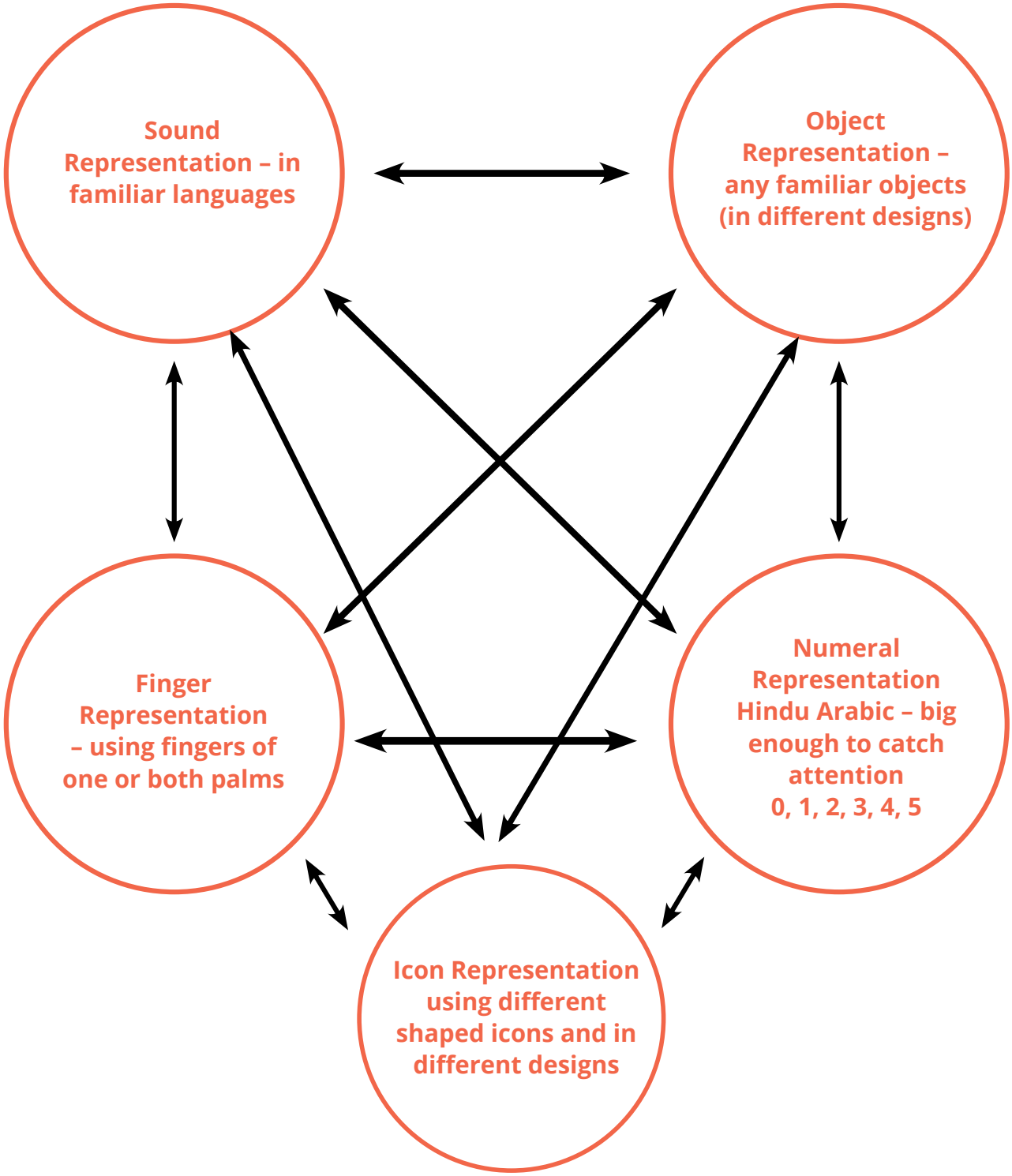
Dyscalculia **Single Digit Numbers - 1** **Annexure 05**

Matching different representations of numbers **ZERO to NINE** with one another. We add representations of zero.



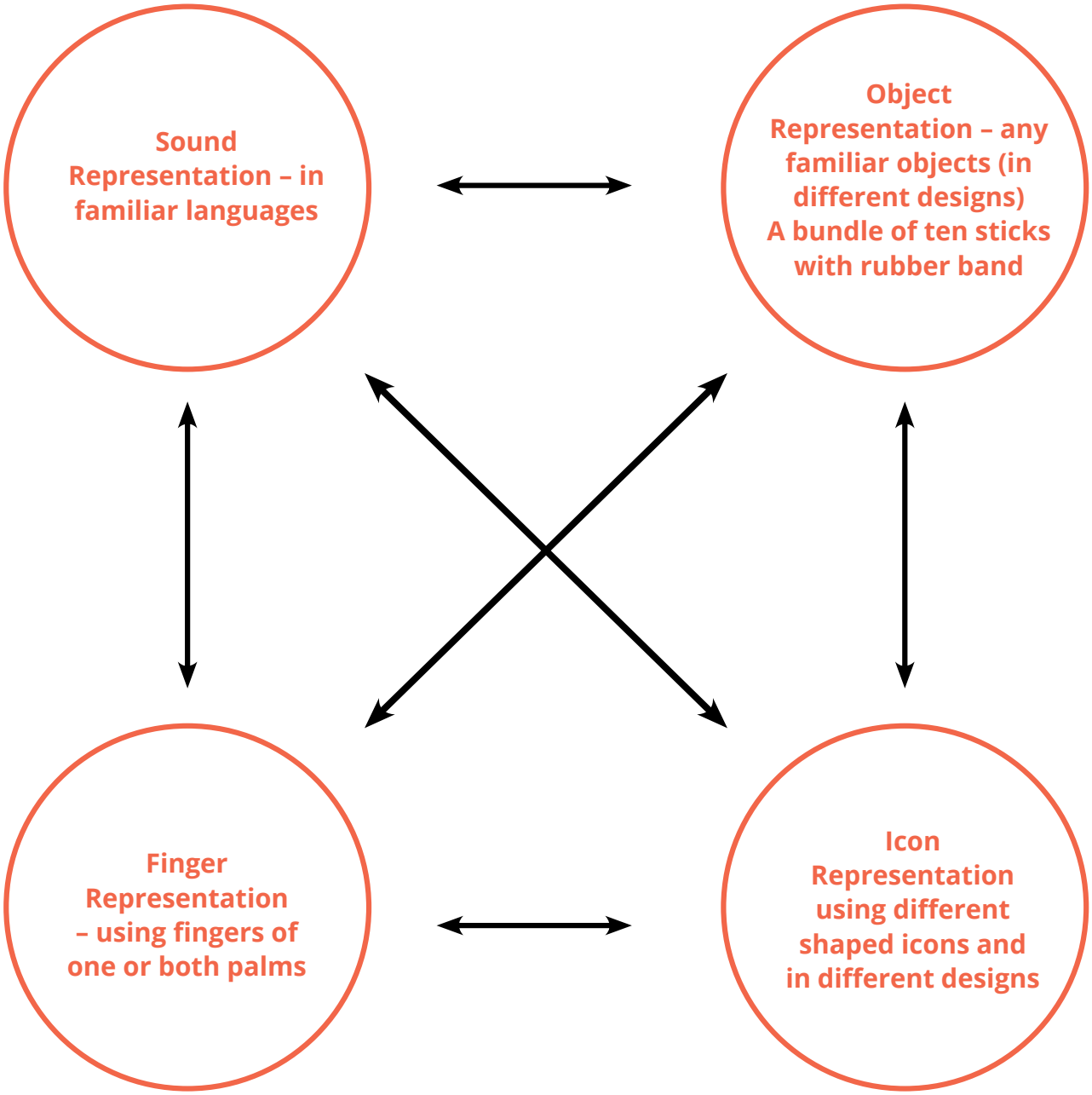
Dyscalculia **Single Digit Numbers - 2** **Annexure 06**

Matching different representations of numbers **ZERO to NINE** with one another.
We add icon representations.



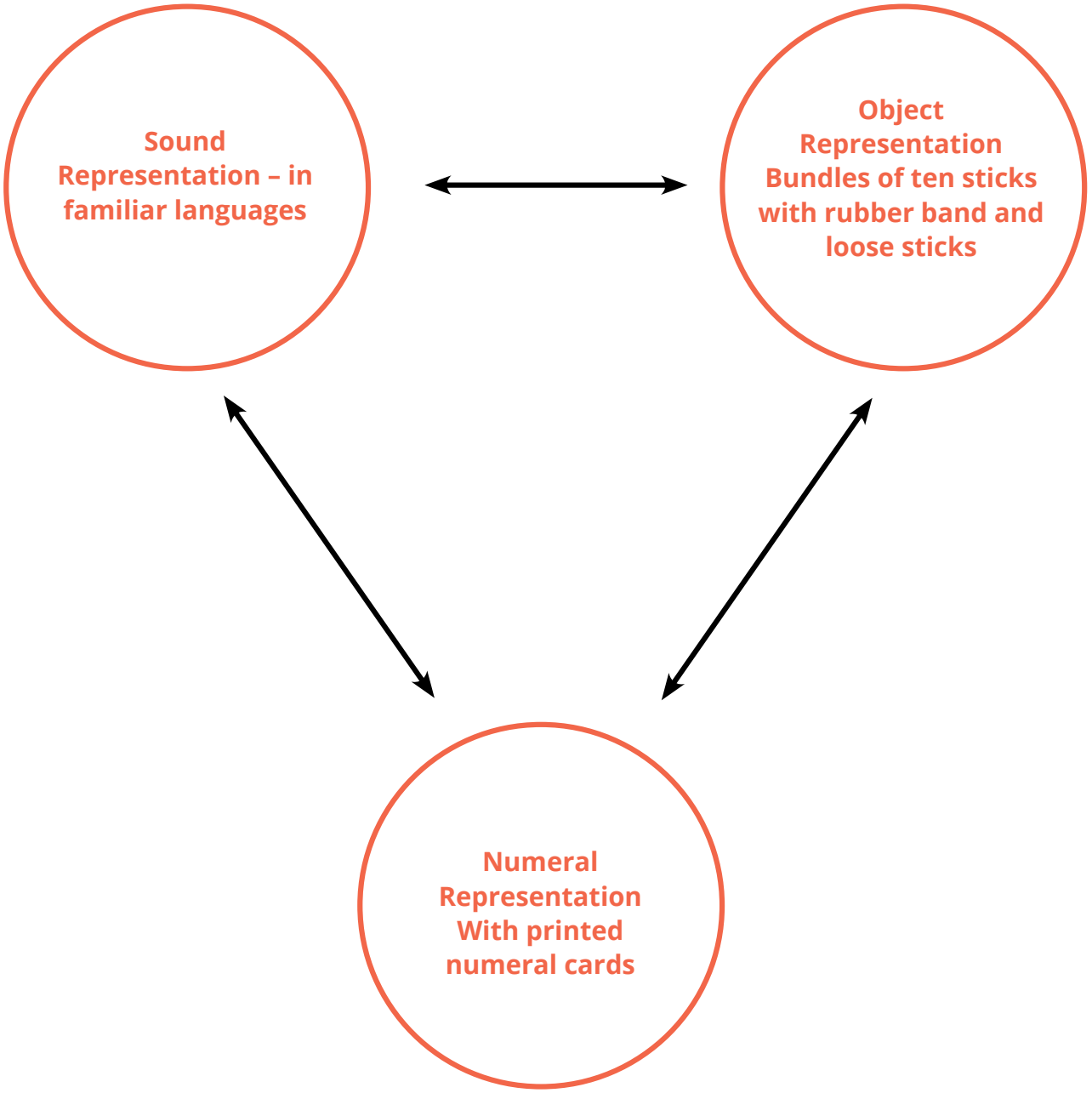
Dyscalculia **Understanding Ten** **Annexure 07**

Matching different representations of numbers **ZERO to TEN** with one another.



Dyscalculia **Understanding Two-Digit Numbers** **Annexure 08**

Matching "bundles and sticks" and numeral different representations of numbers
ZERO to NINETEEN with one another.



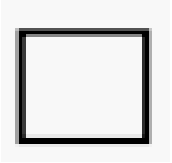
Dyscalculia **Number Representation** **Annexure 9**

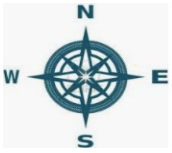
Pre-Number Skills – Pairing

Pairing of like things

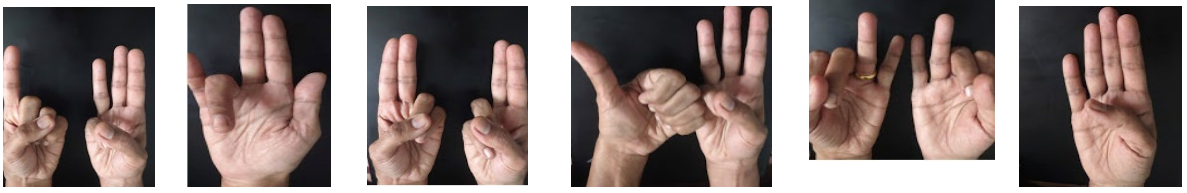
Pairing of unlike things

Perceptual Numbers: "Four" around us

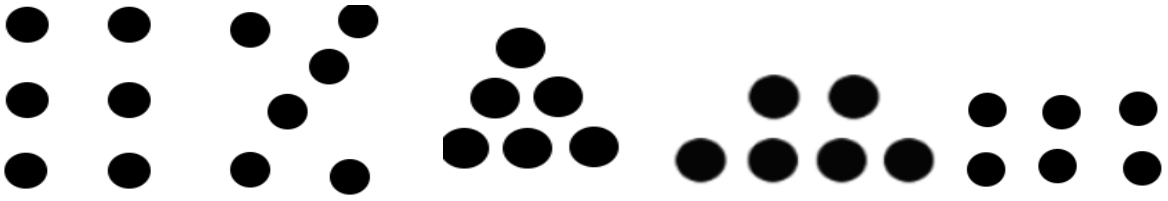




Finger representation of number "four"

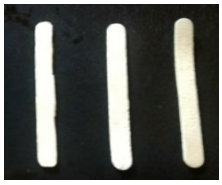
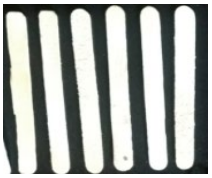


Icon representation of number "Six"

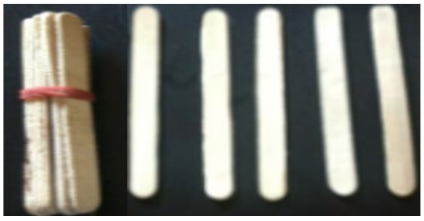
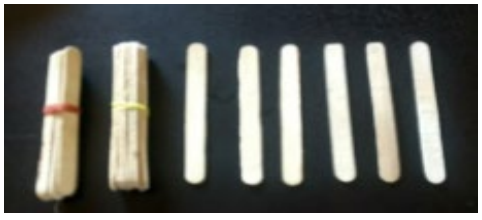


Ordering of numbers using object representation

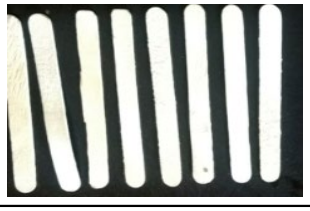
Dyscalculia **Bundles and Sticks Representation** **Annexure 10**

Representation of single-digit number using sticks	
	
3	6

Representation of 10 using bundles	Counting in bundles (10s)
	
10	40

Representaion of two-digit numbers	
	
15	26

Comparing Numbers – Which is greater?	
	

Comparing Numbers – Which is lesser?	
	

Dyscalculia **Math Ideas Independent of Numeracy** **Annexure 11**

1. Comparison of magnitudes

a. Length - short/long, tall/ short
b. Distance - far/near, far away/close by, farther/ nearer
c. Width - wide/narrow, thick/thin
d. Weight - heavy/light
e. Volume - big/small, large/ small
f. Area – large/small
g. Speed – fast/slow
h. Temperature – hot/cold, warm/cool
i. Countable – many/few, more/less, plenty/less
j. Age – young/old
k. Time – more/less, old/recent, long/short
l. Money – plenty/less, expensive/cheap

2. Number Representations

a. Fingers

3. Naming a collection of tokens through activities (number properties)

a. No emphasis on the "number" involved
b. If a collection can be arranged in pairs then it is even. If it cannot be then it is odd
c. If a collection can be shared equally between two persons, then it is even. If not it is odd
d. If a collection can be arranged as a rectangle then it is composite
e. If a collection can be arranged as a square then it is square
f. If it can be arranged only in a line then it is prime

4. Operation metaphors

a. Addition – Put together, More than
b. Subtraction – Take away, Separate, Give, Less than
c. Multiplication – Same amount repeated many times, scaling (a picture)
d. Division – Equal sharing

5. Money

a. Simple conversion problems with rupee notes and coins
b. Simple problems which they may encounter while shopping

6. Time

a. Measurement of time – from a second to a year
b. Reading the clock

7. Word problems to test the above concepts

a. Ram has some pencils. His father gives him some pencils. Will Ram have less or more pencils now?
b. Amar and Akbar have a running race from the classroom to the school gate. Akbar reaches the gate first. Who ran faster?
c. A shopkeeper is measuring a bag of rice with a weighing balance. The bag is on the right pan and some weights are on the left pan. If the left pan is lower, what should the shopkeeper do?

8. Measuring instruments

a. Length – ruler, tape
b. Volume – measuring jars, teaspoon, tablespoon, ladle
c. Weight – weighing machine, weighing balance, standard weights
d. Temperature – thermometer
e. Practical daily measures

9. Fractions

a. Half, quarter, three quarter, whole (full)
b. Half + Half =?
c. Quarter + Quarter =?
d. Some friends go to a pizza parlour and order a pizza. When the pizza comes to the table, some more friends join them. Will each of them get more or less of pizza?

10. Ratio

a. Ram daily has a glass of milk and one spoon of sugar. His elder brother Lakshman has a larger glass of milk with one spoon of sugar. Who drinks sweeter milk?
b. Identify similar triangles by sight

11. Geometry

a. Constructions with a rules and a compass
i. Straight line
ii. Draw a line parallel to it
iii. Draw a line at an angle to it

iv. Bisect the straight line
v. Draw a line perpendicular to it
vi. Draw a circle
vii. Draw an ellipse

b. Point and Line

i. Point, Line – straight line, curved line, zig zag line
ii. Perimeter

c. Angle

i. Comparing angles in the set squares
ii. Adding angles with set squares
iii. Add 2 given angles
iv. Demonstrate angles using dance postures and moves
v. Fold a paper into a right angle
vi. Form a right angle with a string and a stone
vii. Folding angles with paper – less than a right angle, more than a right angle
viii. Understand a straight angle and a complete angle
ix. Understand an acute angle, obtuse angle, reflex angle
x. Identify angles in a clock

d. Triangles

i. Forming different triangles using sticks
ii. Folding a triangle into a rectangle
iii. Understanding congruent triangles
iv. Understanding similar triangles
v. Find if 2 triangles are congruent
vi. Find if 2 triangles are similar
vii. Understand Pythagoras theorem by activity with paper

e. Quadrilaterals

i. Identify familiar types of quadrilaterals – trapezium, parallelogram, rectangle, square, rhombus, kite
ii. Which of the shapes can be cut into two congruent triangles?
iii. Identify – pentagons and hexagons
iv. How to cut pentagons and hexagons into triangles

f. Rectangle

i. Can always be cut into two triangles. Are they congruent?
ii. Making a BIG hole in a SMALL piece of paper
iii. Cut a rectangle along the diagonal into 2 right triangles. Try to join them in as many ways to produce other shapes.
iv. Identify similar rectangles
v. How many ways to divide a rectangle into 2 congruent shapes?

g. Circle

i. Converting a circle into a rectangle
ii. Drawing a hexagon in a circle

h. Perimeter and Area

i. Activities to understand the difference - like building a fence and laying a lawn
ii. People sitting around a table and keeping dishes on the table

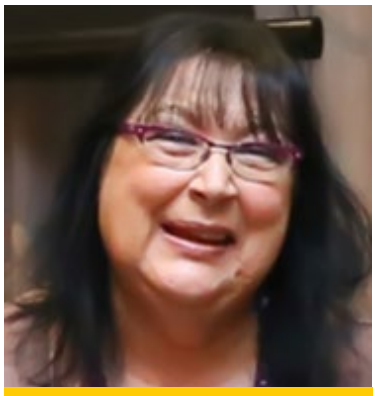
12. Games

a. Chess
b. Checkers
c. Pallanguzhi
d. Carrom
e. Nim

13. Puzzles

a. Sudoku
b. Loop the Loop
c. Figures with match sticks
d. The chessboard and rice problem
e. Chess
f. Bridges of Konigsberg
g. Tangram shapes

Using Technology to Teach Mathematics to Children with Dyscalculia



Angela Fawcett
Vice President, British Dyslexia Association

Dyscalculia is an interesting developmental disability that seems to affect around 3 to 6 per cent of children and adults but despite this prevalence it has not been researched as intensively as dyslexia. DSM-5, the fifth edition update to the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (APA, 2013) defines Dyscalculia as follows: Dyscalculia is a specific learning disorder, an impediment in mathematics, with evidence of problems in

- Number sense
- Memorisation of arithmetic facts
- Accurate and fluent calculation
- Accurate math reasoning.

Although there are elements in common between the two conditions a study in 2004 by Landerl, Bevan and Butterworth established clear differences between 8 to 9-year-old children with dyslexia and dyscalculia with the children who are dyscalculia impaired in all of the tasks they were asked to undertake, whereas the dyslexic children showed a mild problem linked to language and articulation problems, as well.

However, one of the key problems in dyslexia and also in dyscalculia is the difficulty that children experience in automatising skills. Unfortunately, maths is one of the key tasks in which you need to automatise a number of facts in order to process fluently. Add to this the difficulty that many children experience with maths anxiety, which means that even the suggestion of undertaking a maths test lowers performance and you have a very real problem that demands an intensive response.

Those readers interested in understanding how to best help their children with dyscalculia would do well to seek out a series of books from Dr Steve Chinn, who emphasises the need to help and support children with dyscalculia to ensure that they are able to understand mathematical concepts, allowing for their memory issues. He also emphasises the importance of never shouting at the children, and the need for incessant practice with feedback to ensure performance improves. A key here can be the use of digital resources, and those can that be used in both school and home which are likely to prove a considerable asset to teachers and parents. This is particularly important during this period of time, when it is likely that the Covid pandemic could shut down schools once again, or the need for social distancing lead to a combination of online and home schooling. It is also important to remember that dyscalculia can affect adults throughout their lives, impacting on many everyday activities and causing ongoing problems for those affected with this problem. It is therefore particularly important that schools and parents attempt to address these issues.

Firstly, a range of very simple and concrete assistive technology can be effective and necessary for children with dyscalculia. These might include manipulatives, such as blocks which can be built and sorted by colour or shape. A major problem can be simply the alignment of sums, and graphing paper can be useful here. Simple maths facts cards such as table squares mean that a dyscalculic child is not forced to rely on their weak memory skills. Text to speech and speech to text facilities can be used to provide the sequence in working through sums, always a problem for a dyscalculic child. Finally, calculators, and especially talking calculators can be used to ensure that children are reading numbers correctly. Even the more traditional abacus can be effective.

In recommending a range of computer games to support dyscalculia, it is important to differentiate between free games, those designed to provide some practice in memory, and the type of program that requires institutional or parental subscription to access a broad range of activities. In reporting on the free games available, Numberdyslexia.com recommends a number of games to help children with difficulties in using a number line. Pearl Diver from the Apple App store, or Lobster Diver is intended for Grades 3 to 8, and has been recommended by Special needs teachers to play on the iPad, although the element of time urgency can be stressful for some children. Number Line by Clarity allows the child to see a very concrete demonstration of the number line, which is less game like but again recommended by teachers. One app which can originally be downloaded free, and which allows a 40-minute dyscalculia assessment to be completed at home, is Meister Cody Talasia. This seems to be highly praised by parents, with claims that it is scientifically based, and although designed for 6-12 year olds, also seems to appeal to adolescents, who provide some very satisfactory reviews. One key aspect seems to the fantasy scenario within which the app is based, with a magician Master Cody who travels through the land of Talesia, trying to save the country from the dragon Sordan. Once downloaded, users are entitled to 5 lessons or 5 days of free intervention, before a subscription of 19.99 a month is required to proceed, which will be extracted from your bank account until you actively cancel. Teachers recommend using the program for at least 30 minutes a day, 5 days a week for at least 6 weeks. The format of the game does seem to be one that children would enjoy which would motivate them to continue.

Figure 1. Simple block matching from Meister Cody Talesio

A child with dyscalculia is likely to need a much more comprehensive approach to support than can possibly be provided by free apps used at home, no matter how colourful and user friendly. One of the most highly recommended digital approaches for dyscalculia is DynamoMaths, which is a subscription-based service which allows data to be shared between school and home, with a parental subscription available for at £30 for the initial assessment, and £120 annually for the intervention. As with all the best computer programs of this type, success is built on 3 levels, assessment, planning and intervention for ages 6-11.

Figure 2. An overview of Dynamo

Over 240 modules are available in this program, which allows plenty of practice to ensure that children begin to acquire the skills that they struggle with. Above all, the program is set up to indicate when an error has been made and provide feedback to ensure better understanding as the child progresses. One of the key advantages of working through a program of this type is that unlike the best intentioned or parent, a computer program never loses patience, and never accuses the child of not concentrating, or trying their best.

Figure 3. Some of the modules available in Dynamo Maths 1 for primary school year 1.

Figure 4. Online activities designed to build mastery on DynamoMaths.

The program includes over 600 lesson plans, 600 workbooks, and 600 worksheets moving in small steps through Number sense towards Number proficiency. The website suggests that "The activities encourage the pupils into a cycle of success, learning, understanding, regulating and reflecting on their responses whilst boosting their confidence". Motivation is built in to their programs, recognising that this is a key to success for any child with developmental differences.

Important aspects for parents to remember are: that each child is an individual and has their own characteristic learning pattern. It is crucial that computer programs can be adapted to suit your child's individual needs, and no matter how widely praised a computer program has been by others, if it does not suit your child and provide them ongoing motivation to try to succeed, then it will fail. It is important at this stage not to persist, because there is a strong component of anxiety in maths failure and dyscalculia, and this could do more harm than good. The key aspect to achieve success is that your child understands what they are trying to do, and so some of the simpler programs such as Numericon from Oxford Owl have been found to be extremely effective in building maths vocabulary, understanding of concepts, and thinking and reasoning

Finally, on a cautionary note: Not all of the computer programs mentioned here may be available in India. There is certainly evidence that IXL Maths can be obtained here, with versions for home and school priced reasonably for home at 9.99 monthly, but this seems to be set up more for standard learners, although the publishers claim that it is well targeted at dyscalculia. However, a foundation with the strength and reach of the Madras Dyslexia Association should be able to encourage publishers to increase the availability of their programs, where there seems to be considerable interest in moving them forward into a vibrant new market such as India.

How Montessori Method Helps Students with Dyscalculia

Team from Vruksha Montessori School, Chennai

The human child is a fascinating creation. From the time it is a zygote in the womb, the mother nourishes the child to develop it to its full potential. It is amazing how all the organs in the baby are developed to face the world as soon as it is born, except the brain. As the child performs different actions, he himself helps his brain build and refine connections between neurons, growing his brain until it is almost 80% of its full adult size by the age of 3.

This amazing organ gives us the capacity to learn at the astonishing pace that we do. Sometimes, there are difficulties, like dyscalculia, that cannot be explained. Dyscalculia is a difficulty in understanding numbers. Young children might find it difficult to remember the symbols for the numbers or the quantities associated with that number. They might have trouble understanding the place value of a given quantity and comprehending the four basic mathematical operations of addition, subtraction, multiplication and division. They might also find it hard to recognise patterns, size differences (big and small, tall and short) etc.

There is no medication to treat Dyscalculia but the Montessori Method of learning can help dyscalculics build the skills of learning and thus cope with Dyscalculia. Introducing activities from Sensorial and Exercises of Practical Life (EPLs) helps the children use their visual and tactile senses to identify objects which are 'big or small', 'long or short' and so on. While doing the EPLs pounding activity, for example, they figure out if the grain is coarse or fine and proceed accordingly. They understand how to sequence the steps of the various activities from start to finish.

When numbers are introduced, they trace the numbers, which helps them connect the symbols to their names. When the basic mathematical functions are introduced, there are many different materials to work with. One can help the child by allowing him to work with the concept he is comfortable with. Since Montessori learning is a fun way of learning, the child does not mind repeating the activity often which is done until he internalises the concept. Children with Dyscalculia need a little more attention, a quiet place to work and more time to overcome the difficulty and lead a normal life.

The way a new born baby's tactile sense creates connections between neurons and helps his brain develop, the Montessori way of learning will also help him use the tactile sense to understand mathematical concepts.

Harini Mohan
Special Educator, Madras Dyslexia Association

Dyscalculia - Significance of Language in Math

In a broad sense, Dyscalculia is about difficulty in learning Math. To understand this better, one would need to split Math learning itself into 3 parts

- Language assimilation
- Concept application
- Familiarity with the calculation methodology

In the overall approach to Math in schools, more importance is given to the concept and calculation with little or no attention to the language in the problems being solved.

The language aspect in Math is as important as the others since it involves interpretation of words and symbols. Unfortunately, this is taken as implied and a given. Math tends to be taught with an underlying premise that the concerned child understands the words used and internalises the same.

It is generally believed that children with dyscalculia have difficulties in the concepts and calculations alone and issues are rarely if, at all, traced back to gaps in their assimilation of the language used. Such children could have difficulties with words that we do not use in everyday life. Consequently, a lot of innovative methods are being used to make children internalise concepts and calculation alone, ignoring the hurdle language poses. There tends to be inadequate focus on the language used in the problems and for the ways for the child to get around them. It is important for this to be addressed as meanings of some of the words used in the problems may differ according to the context in which they have been used.

Language is the key to understand the right concepts to be applied and the calculation methodologies to be followed. The words used indicate what needs to be done with a given set of numbers in any problem. As an illustration, a child in Class 2, when working out a problem on ascending and descending numbers should be made to internalise the meaning of these words without the knowledge of which, the child may not be able to work out the sum.

Another instance is when most often while teaching prime numbers it is said that prime numbers are numbers that have 1 and the same number as its factors. But a child with dyscalculia may not know the meaning of the word Factors. Factors as word is used different contexts in various subjects. In Geography, the word Factors relates to factors affecting climate and internalises the word as meaning issues or reasons. The child could struggle with the same word when used in a Math class in a totally different context.

Similarly, the word successor: History could well be visualising this word with the kings that the child might have studied in History classes.

If these are difficult, geometrical terms are scary. What can the child make of words like circumference, perimeter and transversal? In Algebra most of them may find it difficult to understand variable and coefficient when efforts are not taken to make them understand and internalise. We run into terminology and concepts like elevation and depression in Trigonometry. The child could associate these words with extreme feelings of happiness and sadness based on what has been taught in the context of other subjects.

This list is endless.

The language part of math therefore is of extreme importance and needs to be addressed first before proceeding to concepts and calculations. Missing this key step can have serious gaps in understanding by children with dyscalculia and generate extreme fear for Math. This has to be done not by merely putting the words on a chart but by means of activities that could make it interesting and easy for them to internalise.

It is important that there be focus on the Math language before getting into concepts, formulae and calculations.

Dr Swati Sircar
Professor of Mathematics, Azim Premji University

Why and How to Overcome Difficulties in Math

It is how maths is taught in most schools that makes the subject difficult for most children. The standard practice focuses on a ritualistic algorithmic formula driven teaching with lots of practice. This gives the impression that math is all about rules with no explanation. Calvin articulates that brilliantly in a cartoon (see reference).

What happens in the name of math in the classrooms is exactly the opposite of what math is. So, children don't get the real taste of math. NCERT textbooks have a done a remarkable job in bridging this gap. Many states, like Sikkim, whose efforts in following and building on these textbooks have also been garnering praise by the MHRD (see reference). The essence of math is in meaning making. By its very axiomatic nature, this can be discovered on one's own once one knows the basics. The award-winning short film 2 + 2 = 5 showcases an example of how deep this meaning making can be.

Life skills change across time, with advances in technology. Mental maths and calculators is an example. At the same time, understanding the place value of numbers, the meaning and application of the four operations remains extremely crucial (see reference).

Most children start having difficulty with math when it stops making sense to them and their questions seeking clarity is either inadequately answered or is discouraged. This is deeply disappointing since everything in school math, barring conventions and definitions can be questioned and reasoned out at a level that children understand. The only exception to this is the fact that pi (π) is irrational, the explanation of which requires calculus and can be taken as a given.

The other aspect is, 'why should we learn this'. Not many teachers connect the dots from aims of education to the content they are teaching. Is the goal to learn theorems? Or is it to learn thinking logically? Or is it to successfully clear the board exams? There needs to be more resources for (i) linking math to the skills and knowledge needed in professions and (ii) answering why a topic is included in the textbook. What is the root cause of the difficulty that children are facing? Is it their lack of conceptual clarity? Is it careless mistakes causing wrong answers? Often lack of conceptual clarity leads to following rules without understanding the why behind them. This can work as a band-aid solution and the gap in the understanding can catch up sooner or later (see reference).

The vicious spiral of (i) lack of meaning making i.e. lack of understanding → (ii) losing interest → (iii) spending less time with math → (iv) poor performance → (v) loss of confidence → (vi) giving up on learning math can also be broken – the earlier, the better.

The starting point in all this has to be meaning making. Having someone whom the child can turn to with all the doubts and questions takes care of much of the problems. Let the child ask all the doubts/ questions. This can be very powerful in rebuilding the lost confidence. An able teacher can facilitate learning by asking questions. Often, after all this, children start liking the subject to the point of being confused why they hated it earlier! So, there is hope!

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A Parent's Perspective on Dyscalculia

Mrudula Govindaraju

When you Google "dyscalculia", this is one of the definitions you will read: "The innate ability to estimate quantities is impaired in children who have a math learning disability...People with math learning disability, also known as dyscalculia, have difficulty understanding math concepts and solving even simple math problems despite adequate education. About 10% of school-age children have persistent and significant difficulties with math, while many more fail to reach basic levels of mathematics achievement. The causes of dyscalculia, however, remain poorly understood."

(Source: https://www.nih.gov/news-events/nih-research-matters/insights-into-math-learning-difficulties)

I now know and understand what dyscalculia is. When I turn back the clock to 13-years-ago, when my daughter was five-years-old, it was a different story.

My daughter, when she was five-years-old, was diagnosed with dyslexia and "difficulty with maths" as dyscalculia was then described. It wasn't until she was 12-years-old that she was assessed again and was found to have dyscalculia along with dyslexia. There is more widespread awareness about dyslexia now than what was known thirteen-years-ago but many parents don't know much about dyscalculia. Therefore, what I share is my experience in understanding and helping my daughter cope with dyscalculia. Perhaps you will find some aspects resonating with your journey too!

These are the areas in which my daughter had problems:

1. Grasping the meaning of quantities or concepts like biggest vs. smallest
- At 4-years she could not identify if 2 potatoes were more or "looked" less than 4 potatoes. She could not identify which was the biggest or the smallest among those potatoes.
2. Understanding that the numeral 6 is the same as the word six, and that these both mean six items.
- Inability to understand and identify that 6 chocolates in her hand means the same in quantity when you write "six" chocolates on paper.
3. Remembering math facts in school
- Difficulty in remembering the multiplication tables, understanding mathematical operations and their symbols (+, -, x,÷). Word problems were a nightmare.
4. Counting money or making change
5. Estimating time
6. Judging speed or distance
7. Understanding the logic behind math
8. Holding numbers in her head while solving problems

What can we do to help?

The first step is to have empathy for our child. We must understand the child is genuinely struggling to understand and grasp mathematical concepts because there is a problem with processing numbers. It is neither laziness nor indifference. Therefore, we must make maths as real-life and practical as possible.

This is what I did:

- I used different kinds of vessels in the kitchen to show what is big and what is small first.
- Once she got that concept I moved on to different varies of dals to understand quantities.
- I took her to buy groceries and vegetables. She understood quantities, weight – estimating and actual weight when she looks at the bill.
- I saw that my daughter loves to cook and bake. I taught her maths concepts through cutting vegetables, baking and cooking.
- My daughter learnt to workout sums using the calculator.

- Handling money and keeping an account of what is spent.

All this I taught her in addition to the special education classes she was getting. She still has a lot to learn. I am confident she will learn those essential life-skills like banking and money transactions too, given the training she's getting in learning life-skills maths from her teacher.

Have faith in the abilities of your children and be patient. They will learn maths just like they will learn other strategies to manage various situations in their lives.

Akshay

Why I studied Math at the Higher Level – A Student's Perspective

Maths as a subject has always puzzled and fascinated me, not because I liked the subject but because I didn't understand why I couldn't understand the concepts even when taught by the best of teachers.

All the areas of math, arithmetic, algebra, geometry, trigonometry....name it, it was a challenge.

My teachers used to give up on me but I didn't give up on the subject or on myself.

With remedial help from math teachers at MDA I was able to comprehend the concepts though it was still a challenge to score. That is when I decided to practice on the concepts for at least two hours a day with my math teacher, after school hours. I devised my own ways of understanding the working of theorems which was unique to me and may not work for all.

When told I will not be able to do math after the 10th, I was offended as I still liked the subject despite all the difficulty.

So, I challenged myself, took up math in 12th, struggled a lot but did not give up. My belief in sincere practice paid off this time too. Math, in the engineering course seemed impossible to crack, giving me sleepless nights but with determination after couple of attempts I passed in the subject in 6 semesters each time with decent grades.
My only advice to all with challenges in math is: Find your own ways to understand, practice each and every day, find a pattern in the theorems.

Nothing is impossible is my motto.

சிறப்பு தமிழ் பதிப்பு

Sasikala Raman
Special Educator

கணிதமும், கற்றலில் குறைபாடும்

கல்வி பயிலும் மாணவர்களிடையே மொழியைப் பயன்படுத்துவதில் ஏற்படும் சிரமங்களை கற்றலில் குறைபாடு என்று கூறுகிறோம். இக்குறைபாடுள்ள குழந்தைகளுக்கு கணிதப் பாடங்களை கற்றுக்கொள்வதிலும் குறைகள் காணப்படலாம். இதனை ஆங்கிலத்தில் "டிஸ்கால்குலியா" Dyscalculia என்று கூறுவர். இதனால் அவர்களுடைய கல்வியின் செயல்திறன் பாதிக்கப்படுகிறது. அதன் விளைவாக குறைந்த சுயமரியாதை காணப்படுகிறது.

இவர்களுக்கு எண்கள் தொடர்பான செய்திகளை உள்வாங்கிக் கொள்வதில் மூளைச் செயல்பாடு குறைவாக இருக்கும். கணிதக் கருத்துக்களை புரிந்துக் கொள்வதிலும், பெருக்கல் வாய்ப்பாடுகளைப் புரிந்துக் கொள்வதிலும் சிரமங்கள் காணப்படும்.

இக்குறைபாடுள்ள மாணவர்களை எப்படிக் கண்டறிவது?

- எண்களை பின்னோக்கி எண்ணுவதில் சிரமம்.
- மனக்கணக்குகளைப் புரிந்து கொள்வதில் இயலாமை
- இடமதிப்பீடு பற்றிச் சரியாகப் புரிந்துக்கொள்வதில் இடர்பாடு
- கூட்டல், கழித்தல், பெருக்கல் மற்றும் வகுத்தல் ஆகிய கணிதச் செயல்பாடுகளில் அடிக்கடி ஏற்படும் தவறுகள்.

கணிதப்பாடம் என்றாலே ஒருவித பயம் ஏற்படுதல்.

மேல் வகுப்புகளில் கற்றுக்கொள்ளும் வடிவவியல், ஆகியவற்றிலும் சிரமங்கள் காணப்படலாம். மொழியைக் கற்றுக் கொடுக்கும் போது மாற்று போதனைகளைப் பயன்படுத்துவது போல் கணிதத்தில் ஏற்படுகின்ற குறைபாடுகளையும் வேறு வேறு முறைகளில் கற்றுத்தர முடியும். இதற்கான சில வழிமுறைகளைப் பார்க்கலாம்.

கணிதக் கருத்துக்களைக் கற்றுக் கொடுக்கும் போது பொருட்களை உபயோகித்தல், சுற்றுப்புறங்களில் காணப்படும் பொருட்களை உதாரணமாகக் காட்டி பெரியது, சிறியது, உயரம், குட்டை, அதிகம், குறைவு போன்ற கணிதக் கருத்துக்களைக் கற்றுக் கொடுக்கலாம். அவர்கள் பார்த்துத் தெரிந்துக் கொண்ட பொருட்களை படமாக வரைந்து காட்டச் சொல்லலாம். விதைகள், குச்சிகள், இலைகள் போன்ற பொருட்களை பயன்படுத்தலாம். இதன்மூலம், மாணவர்கள் கணிதக் கருத்துக்களை உள்வாங்கிக் கொண்ட பின் அவற்றை எண்களோடு தொடர்புபடுத்திக் கற்றுத் தரலாம்.

காட்சி, கேட்டல், தொடுஉணர்ச்சி போன்ற ஒன்றுக்கு மேற்பட்ட புலன்களைப் பயன்படுத்துதல் சிறந்த வழிமுறையாகும். கூட்டல், கழித்தல், பெருக்கல் மற்றும் வகுத்தல் கணக்குகளில் கணித வாக்கியத்தில் கருத்தை மொழி வாக்கியமாக எழுதச் செய்தல்.
ஒரு கணித வினாவுக்கு விடைகாண பல வழிகள் உள்ளன என்பதை மாணவர்கள் அறிந்து கொள்ளுதல் முக்கியமான திறனாகும். ஆசிரியர்கள், மாணவர்களுக்கு அதற்கான வாய்ப்புகள் ஏற்படுத்திக் கொடுக்கும் போது கணிதப் பாடத்தில் விருப்பம் அதிகமாகும்.

அடுத்ததாக, வகைக் கணக்குகளில் கணித மொழியைப் புரிந்து கொள்ள முடியவில்லை என்றால் அவர்களுக்கு விடை காண்பதில் கடினம் ஏற்படுகிறது. இதைக் கற்றுக்கொடுக்கும் போது அதை அவர்கள் மனக்கண் முன் காட்சிப்படுத்தி விளக்கம் கொடுக்கலாம்.
அந்தக் கணிதத்தை வரைபடமாக வரையச் செய்து கற்றுக் கொடுக்கும்போது காட்சி மூலம் கற்றுக் கொள்ளும் திறன் பெற்ற மாணவர்கள் எளிதில் புரிந்து கொள்வார்கள். கணக்குகளை பகுதிகளாகப் பிரித்துக் கற்றுக் கொடுத்தல். இதன்மூலம் அந்த நேரத்தில் அவர்கள் அதில் கவனம் செலுத்தி கணிதத்தில் வரும் தொடர்புகளைக் புரிந்துக் கொள்ள முடியும்.

பாடங்களைத் திருப்புதல்:

மாணவர்கள் முன்பு கற்றுக்கொண்டகணிதக் கருத்துக்களை, தினசரி வகுப்புகளில், வெவ்வேறு முறைகளில் செய்யச் சொல்வது மிகவும் அவசியம். அதனால் அந்தப் பாடங்கள் பற்றிய செய்திகள் அவர்களது நீண்ட கால நினைவாற்றலில் பதிந்து கொள்ள ஏதுவாகும். சிறிய கையேடுகளில் கணித வாய்ப்பாடுகளை எழுதி வைத்துக் கொண்டு அடிக்கடி அதை படித்துத் தெரிந்துக் கொள்ளலாம். பன்முகத்திறன்களைப் பயன்படுத்தி கற்றுக் கொடுப்பது சிறப்பான வழிமுறையாகும். ஒரு கருத்து பல சூழலில் கற்பிக்கப்பட வேண்டும். குழந்தையிடம் எந்த அறிவுத்திறன் மேலோங்கி இருக்கிறது என்பதை அறிந்து கொண்டு அதற்குத் தக்கவாறு பயிற்சிகள் கொடுக்கலாம். ஒரு கருத்தை அறிமுகம் செய்யும் போது எட்டு விதமான அறிவுத்திறத்திற்கு பொருத்தமான பல செயல்பாகுகள் மூலம் அறிமுகப் படுத்த வேண்டும். மாணவர்களிடம் உள்ள திறமைகளைப் புரிந்துக் கொண்டு அவர்களுடைய தேவைகளை அணுகுதல் சிறப்புப் பயிற்சியாளரின் கடமையாகும்.

செய்தித் துளிகள்

ஆசிரியர் தின விழா

மஹாலிங்கபுரத்தில் உள்ள பள்ளிக்குப் பிறகான தீர்வு மையத்தில் ஆசிரியர் தின கொண்டாட்டங்கள் ஒரு "மெய்நிகர்" (virtual) விருந்தாக அனைவருக்கும் அமைந்தது. ஆசிரியர்கள் கலை- கைவினை, கையெழுத்து, பேச்சு, கதை கூறுதல் மற்றும் மாறுவேடப் போட்டி என பல போட்டிகளை ஏற்பாடு செய்திருந்தார்கள். அதில் குழந்தைகள் அனைவரும் மிகுந்த ஆர்வத்துடன் கலந்துக் கொண்டார்கள். இது அவர்களின் ஆற்றல்களை ஊக்குவித்தது. இது அனைவருக்கும் ஒரு வரவேற்பு மிக்க மாற்றமாகவும் இருந்தது. இது மாணவர்களின் திறமைகளை வெளிப்படுத்த ஒரு தளமாக மட்டுமல்லாமல், பழைய மாணவர்கள் புதிய மாணவர்களை சந்திப்பதற்கு வாய்ப்பாக அமைந்தது.
குழந்தைகள் வீட்டில் கிடைத்த பொருட்களிலிருந்து அற்புதமான பல பொருட்களை உருவாக்கி இருந்தார்கள். அவர்கள் அழகான ஓவியங்களை வரைந்திருந்தார்கள். குழந்தைகளின் பேச்சு அவர்கள் நம்பிக்கையுடன் இருப்பதை வெளிப்படுத்தியது. அவர்களில் சிலர் தாங்கள் உருவாக்கிய கைவினைப் பொருட்களைப் பற்றியும், அதை அவர்கள் எவ்வாறு உருவாக்கினார்கள் என்பது பற்றியும் பேசினார்கள்.

நீதிபதிகளின் பணி தான் இதில் மிகவும் கடினமாக இருந்தது. அனைத்து நுழைவும் (entry) தகுதி வாய்ந்ததாகவும், பாராட்டப்பட வேண்டியதாகவும் அமைந்திருந்தது. தீர்வு மையத்தின் ஆசிரியர்கள் இது போன்ற இன்னும் பல நிகழ்ச்சிகளை ஏற்பாடு செய்ய எதிர்பார்த்துக் காத்துக் கொண்டிருக்கிறார்கள்.

பயிற்சி திட்டங்கள்

தொடர்ச்சியாக 3 வது ஆண்டாக, எம்.டி.ஏ, குறிப்பிட்ட கற்றல் குறைபாடு மற்றும் அதனுடன் தொடர்புடைய தீர்வு குறித்த அமர்வுகளை டி.ஏ.வி குருசிக்ஷாணத்தில் நடத்தியது.
OMEIAT க்காக குறிப்பிட்ட கற்றல் குறைபாடுகள் மற்றும் அதனுடன் தொடர்புடைய தீர்வுகளின் அடிப்படைகளை உள்ளடக்கிய ஒரு நிகழ்நிலை (online) பயிற்சி திட்டங்கள் நடைபெற்றது.
நடுநிலைப் பள்ளி ஆசிரியர்களுக்கான பயனுள்ள கற்றல் திட்டம் பி.எஸ்.சீனியர் பள்ளி, ஸ்ரீ சங்கரா வித்யா கேந்திரா, திருவற்றியூர் மற்றும் ஸ்ரீ நடேசன் பள்ளி ஆகிய பள்ளிகளில் நடத்தப்பட்டது

உலக டிஸ்லெக்ஸியா தினம் மற்றும் செய்திமடல்

அனன்யாவில் நடந்த உலக டிஸ்லெக்ஸியா தின கொண்டாட்டம் கண்களுக்கு விருந்தாக இருந்தது. குழந்தைகள் நமது சுற்றுச்சூழலை பேணி பாதுகாப்பதின் அவசியத்தை விளக்கினர். யசோதரா நாராயணனுடன் அனன்யா ஆசிரியர்களும் பாதுகாப்பின் பல்வேறு அம்சங்களை எடுத்துரைக்கும் திட்டங்களை சிந்திக்க, திட்டமிட, செயல்படுத்த மற்றும் காட்சிப்படுத்த மாணவர்களுக்கு வழிகாட்டினார்கள். இந்த ஆன்லைன் நிகழ்ச்சியை எம்.டி.ஏ ஊழியர்கள் மட்டுமல்லாமல் பெற்றோர் மற்றும் எம்.டி.ஏவின் நலவிரும்பிகளும் பாராட்டினார்கள்.

மராத்தான் படித்தல்

தீர்வு மையத்தின் குழந்தைகளில் படிக்கும் பழக்கத்தை வளர்ப்பதற்காக, ''படித்தல் மராத்தான்'' ஏற்பாடு செய்யப்பட்டது. இது 26 நாட்கள் தொடர்ந்தது. குழந்தைகள் ஒரு செய்தித்தாளில் கதைகள் அல்லது கட்டுரைகள் அல்லது அவர்கள் விரும்பும் எந்தவொரு செய்தியையும் ஒரு நாளைக்கு குறைந்தபட்சம் 26 நிமிடங்கள் படித்தல் அவசியம். அதைத் தொடர்ந்து தினமும் படிப்பதைப் பற்றிய அறிக்கைகளை சமர்பித்தல் வேண்டும். அனைத்து குழந்தைகளும் பங்கு கொண்டார்கள். சிலர் முதல் நாள் முதல் மிகவும் உற்சாகமாக இருந்தனர். சிலருக்கு தொடங்குவதற்கு ஊக்கமளிக்க வேண்டியிருந்தது. ஆனால் மராத்தான் முடிவில், எல்லா குழந்தைகளும் தினமும் படித்து மகிழ்ந்தனர்.

இறுதி நாளில், குழந்தைகள் அவர்கள் விரும்பிய புத்தகத்தை பற்றியும் அவர்களின் அனுபவம் பற்றியும் மராத்தானினால் அவர்கள் எவ்வாறு பயனடைந்தார்கள் என்பதைப் பற்றியும் பேசினார்கள்.

அனைத்து குழந்தைகளுக்கும் பங்கேற்பு சான்றிதழ்கள் வழங்கப்பட்டன. அனைத்து 26 நாட்களையும் பூர்த்தி செய்து 26 அறிக்கைகளை சமர்ப்பித்த நான்கு வெற்றியாளர்களுக்கு அமேசான் பரிசு வவுச்சர்களுடன் ஒரு சான்றிதழும் வழங்கப்பட்டது.

இந்த படித்தல் மராத்தான் வெற்றியாக அமைந்தது. சிலர் புதிய சொற்களைக் கற்றுக் கொண்டார்கள். வேறு சந்தர்ப்பத்தில் அந்த வார்த்தையை படிக்கும் போது அதன் பொருளை அவர்களால் புரிந்து கொள்ள முடிந்தது. இன்னும் சிலர் தாங்கள் படித்த தலைப்பைப் பற்றிய கூடுதல் தகவலுக்காக வலையில் உலாவத் தொடங்கினார்கள். சிலர் செய்தித்தாளைப் படிக்கும் பழக்கத்தை தொடங்கினார்கள். மற்றும் சிலர் சொந்தமாக ஒரு சொல்லகராதி புத்தகத்தை உருவாக்கினார்கள். சிலர் அறிக்கைகளை எழுதி விளக்கக்காட்சியை உருவாக்கி மகிழ்ந்தார்கள். கதைகளின் வரும் கதாபாத்திரங்களிடமிருந்து கதைகில் சொல்லப்பட்டிருக்கும் கருத்தை உணர்ந்தார்கள். ஒரு சிறிய ஆனால் குறிப்பிடத்தக்க படி கல்.

இணையவழி கருத்தரங்கு

'ஒரு தொற்று நோய் மத்தியில் கற்றல்' என்ற ஒரு சர்வதேச ஆன்லைன் கருத்துக்களத்தை சிங்கப்பூர் டிஸ்லெக்ஸியா சங்கம் நடத்தியது. அதில் எம் டி ஏவின் தலைமை அதிகாரி திரு.டி சந்திரசேகர் கலந்துக் கொண்டார்.

இணையவழி கருத்தரங்கு/வெப்பினார் (Webinar)

டி.சந்திரசேகர் சர்வதேச டிஸ்லெக்ஸியா அசோசியேஷன் நடத்திய கேள்வி பதில் அமர்வில் நிபுணர் குழு உறுப்பினராக /பேனலிஸ்டாக *(panellist)* அமர்ந்தார்.

ஸ்வேதா கிருஷ்ணா மற்றும் சந்ஸ்கிருத்தி ஷா ஆகியோர் மெட்ராஸ் மிட் டவுன் லேடீஸ் வட்டம் 7 வழங்கும் பாரம்பரிய விளையாட்டுகளில் ஒரு இணையவழி கருத்தரங்கு/ வெபினாரை *(webinar)* வழங்கினார்கள்.

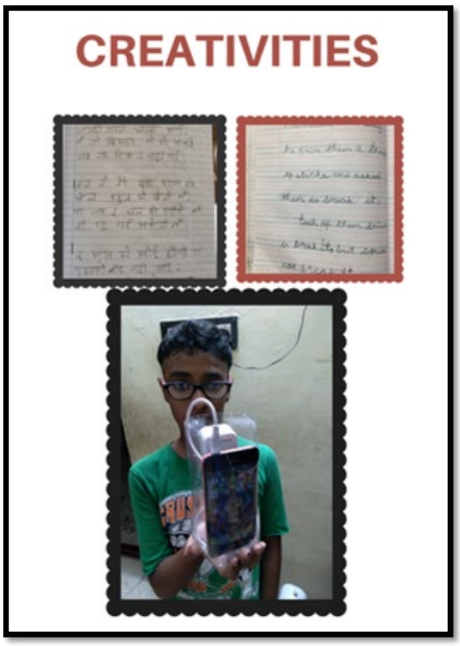
Happenings in MDA

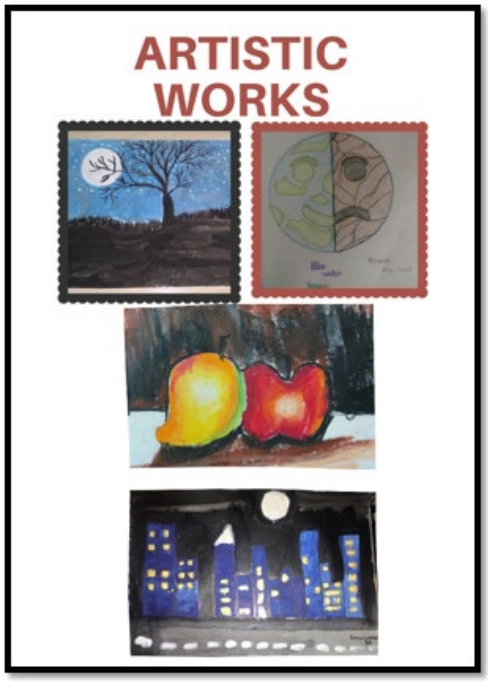
After-school Teachers' Day

Teacher's Day Celebrations at the Remedial Centre, Mahalingapuram was a "Virtual" treat for all. The teachers organised art/craft, handwriting, speech /storytelling and fancy dress competitions. The children participated with great enthusiasm. It worked as an energy booster and a welcome change for all. It was not only a platform to showcase talent but also a platform where old students could meet new students.

Children made wonderful things out of materials they found at home. They created beautiful paintings. Children spoke very confidently. Some of them even spoke about their craft work and how they had made it.

It was a very difficult task for the judges, as all entries deserved merit and appreciation. Teachers of the Remedial Centre are looking forward to organising many more events like this.





After-school Teachers' Day

For the 3rd consecutive year, MDA conducted sessions on Specific Learning Disability and associated remediation at DAV Guru Shikshanam.

An online programme covering the basics of Specific Learning Disabilities and associated remediation was held for OMEIAT.

Effective Learning Programme is being conducted for middle school teachers of P.S. Senior School, Sri Sankara Vidya Kendra, Tiruvottiyur and Sri Natesan School

children had to read stories or articles in a newspaper or any material of their choice for a minimum of 26 minutes a day. They had to follow it up with a report of what they read daily.

All children participated. Some were very enthusiastic from Day One. Some had to be motivated to begin. But by the end of the Marathon, all the children enjoyed reading every day.

On the day of the Grand Finale, the children spoke about the book or topic they liked, their experience and how they benefited from the Marathon.

World Dyslexia Day and Newsletter

World Dyslexia Day celebration at Ananya was a treat for the eyes. Teachers of Ananya and Yashodhara Narayanan guided the children to ideate, plan, execute and showcase projects highlighting different aspects of conservation and preservation of our ecosystem. This online talent show was appreciated by not just the staff of MDA, but by parents and well-wishers too.

Reading Marathon

To inculcate the habit of reading in children of the Remedial Centre, "Reading Marathon" was organized. It was a 26-days Marathon and

All the children were awarded with participation certificates. Four winners who completed all the 26 days and submitted 26 reports were given Amazon gift vouchers along with a certificate.

The Reading Marathon proved to be a great success – some learnt new words and were able to understand the word when used in another instance, some others started surfing the net for more information about the topic they had read, some started reading the newspaper while some made a vocabulary book of their own. They enjoyed writing the reports and creating the presentation. They learnt from the characters and morals of the stories. A small but significant step!

Webinar

D Chandrasekhar participated in an International Online Forum - "Learning Amidst a Pandemic" - conducted by Dyslexia Association of Singapore.

D Chandrasekhar was a panellist in the Q & A session hosted by International Dyslexia Association. Swetha Krishna and Sanskriti Shah presented a webinar on Traditional Games, hosted by Madras Midtown Ladies Circle 7.

Our Donors

My wife and I were looking to help a good cause, in memory of our fathers. There are plenty of worthwhile causes, but our concern was to make sure that the funds would be utilized properly. We knew about the work my IIT classmate, D Chandrasekhar, was doing to help youngsters with Dyslexia. Having known DC for over 50 years, I was aware of his dedication and systematic approach to any problem. We could not think of a better person to put our money to proper use, and we were right.

Vuyyur Ramesh and Raji

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