

TECHNOLOGY FOR DYSCALCULIC CHILDREN

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Abstract: The first few years of child's life play an important role in overall development of a child personality. No one can ignore the importance of this golden period. During this period, child physical, social and intellectual need to be discovered, nurtured and developed so as to enable him to lead a successful and productive life. In this process, education plays a significant role. Education is the most strong and convincing instrument in the progress of a man or say in the progress of nation. Mathematics is a branch of science, which deals with numbers and operations. It involves numeration, computation, measurement and solving of problems etc. Mathematics is also called the key and gateway of all sciences. From earliest to today time mathematics has an important place in our life. Dyscalculia is a mathematics disability. So in this paper we will discuss dyscalculia, symptoms and how can the technology help to resolve this problem.

Keywords: Dyscalculia, Technology.

INTRODUCTION

Dyscalculia refers to a range of mathematics learning disabilities. Students with dyscalculia have difficulties in understanding numbers concept, remembering math facts and formulas, steps to complete math problems or may have difficulty with visual-spatial concepts used in making patterns or in geometry. Dyscalculia is related to mathematics language processing disorders which result in difficulties learning math vocabulary needed to understand math concepts and to solve more complex problems. Someone living with Dyscalculia will have difficulty in the areas of math like numeration, reasoning, computation (addition, subtraction, multiplication and division), math memory, math writing, sequencing and math speaking, as well as visual-spatial orientation. A Dyscalculia will be challenged by both retrieval and memory difficulties, in addition to processing errors and will need to employ coping strategies his entire life. Those who facing this disability have been known to saying that Dyscalculia causes numbers to "slip their minds," that looking at large and trying to read a new language or even that it is "memory banks" continually get erased after a unit. Learning disabilities children are vulnerable to take multiple risks, including persistence of the learning handicap, school dropout and emotional instability children with dyscalculia mainly felled similar problems. Therefore, treatment for dyscalculic children should address the multiple facets of the disorder while focusing on educational interventions to improve study skills in general and strengthening number perception and arithmetic concepts in particular area. Research in this domain indicates that students with disabilities like dyscalculia can improve their overall study skills and benefit from specific techniques and assistive technology for their individual problem.

SYMPTOMS OF DYSCALCULIA:

- Difficulty in working with numbers
- Confused by math symbols
- Difficulty with basic facts like adding, subtracting, multiplying and dividing
- Difficulties in reverse or transpose numbers (83: 38)
- Difficulty with mental mathematics
- Difficulty in telling time
- Difficulty with directions concept (as for playing a game)
- Difficulty grasping and remembering math concepts and formulas
- Poor memory for sequencing of things (for example, numbers on a clock)
- Lacking of using planning skills like used in chess ect.
- Difficulties in tangible supports such as fingers, tally marks
- Laziness in given answers to math questions
- Difficulties with estimation and approximation
- Difficulty in finding different approaches of one problem
- Trouble with spatial patterns, different parts of a math problem, or identifying critical thinking needed in problem solving
- A child with dyscalculia will have average or above average I.Q. but cannot achieve up to their potential in the area of mathematics.

TYPES OF DYSCALCULIA:

Verbal Dyscalculia: Difficulty in understanding mathematics when mathematical problems are presented orally or under condition when a verbal response is required.

Practognostic Dyscalculia: Impaired ability to manipulate real or pictured items for mathematical purpose.

Graphical Dyscalculia: Difficulty in writing math symbols and digits or copying them.

Lexical Dyscalculia: Practical difficulty with, or inability to read numbers, digit and symbols.

Ideognostic Dyscalculia: Disabilities in understanding mathematical ideas, relation and in doing math calculations.

Operational Dyscalculia: Inability to learn and apply the rules for fundamental math operation like addition, subtraction, multiplication and division.

Sequential dyscalculia: Disability in counting sequences, operational sequences, math facts, time and directions.

IMPORTANCE OF ASSISTIVE TECHNOLOGY FOR DYSCALCULICS:

Children with learning disabilities experience unique learning challenges in classroom environment; they often differ from their peers. It is important when using technology in a classroom that all students will benefit from it and learning outcomes should be significantly effective. Assistive technology can be used to help students with dyscalculia present in the classroom. It enables students with learning disabilities to learn independently. Assistive technology can also provide remedial and compensatory support to the learning disabled students. Categories of dyscalculia learning disabilities that affect mathematics learning include verbal language, written language, arithmetic ability and reasoning. There is a variety of assistive technology that can help students with different types of dyscalculia to overcome their difficulties. Some important are given below:

1) MULTIMEDIA AS A HELPER FOR DYSCALCULIA:

Children with dyscalculia have a "less number sense"---they have problems relating number symbols to real-world objects and situation. Software such as "**Mighty Math**", which is available for classroom and home learning. Interactive videos, stories, music and visual clues can help students to relate mathematics with everyday life.

1.1 Electronic math worksheets

These worksheets are delivered to a child's computer. These worksheets take the place of traditional paper worksheets. According to student suitability which facing visual difficulties, the font size and style can be adjusted. These sheets provide feedback also to the students.

1.2 Number Race- A Mathematics Software

Children with Dyscalculia may have difficulties to make visual-spatial connections with numbers. By using 3D technology and software package like "The Number Race" is a multidimensional computer algorithm which allow students to see connection between symbol and space. This math software is available for all age's students.

1.3 Books reading

Most people which are facing learning disabilities are known to be strong reader. So it should not a surprise that books are as tools are available for these children.

1.4 Babakus

The Babakus is a calculator that combines the best qualities of the western slide ruler with those of the eastern Abacus. It's part of math for dyscalculic children to work easily with addition, subtraction, multiplication and division. Although the focus of this calculator lay down to solve difficulties related with numbers and figures. The Babakus is an excellent training tool for those who are adapt at counting very well. The method is highly suitable to fit each student's level of skill and understanding.

1.5 Computer Assisted Instruction (CAI)

CAI is especially effective for ·

- To Motivating students
- To provide individual instruction
- Provide precise monitoring for teachers.
- Drill and practice type activities in Mathematics

1.6 I-Pad

Applications or say apps are run on the I-pads' operating system called iOS which allows the user to control the I-pad by a multi-touch feature. Math Board is an example of a popular app which teaches children addition, subtraction, multiplication, division, squares, cubes and square root problems. The Long Division app can be used to teach the long division method on iPod. This app allows the user to solve a long division problem step by step. In the steps the user can divide, multiply or subtract their given number. The correct answer will fly to the 5 right places. If the user presses the wrong button the answer will appear above the keyboard but it will not move.

1.7 Quicklink Pen Elite & Super Pen Professional

- It is used to scan a word or line of text and hear it.
- To see the definition of the word.
- To transfer text and images to PC ,,

1.8 Digital Pen

- IO Pen saves an image of pages written in a special notebook to a PC.
- can use handwriting recognition but problems with spelling error and terminology and equation,,

1.9 Graphics Tablet

A graphics tablet can be used to enter diagrams or equations graphically on a PC. But requires good co-ordination skills and it still slower than writing by hand

1.10 Talking calculators

Talking calculators are used as a voice synthesizer to tell the students which keys are being pressed. If students reverse a number like 13 with 31, the calculator's assistance will help the students to identify the correct number. Additionally, the calculator will speak the answers loud so that the student does not have to read the screen. This eliminates the risk of reversing numbers where transferring them from the screen onto paper. ,,

- Read & Write Gold and ClaroRead provide speech-enabled software-based calculators ,,
- Handheld talking calculators are available but these are expensive ,,
- Designed for visually impaired children.

1.11 Speech Engine

- It will pronounce terminology of math using phonetic rules
- It cannot read-back equations represented as images or as PDF files

1.12 Virtual Classrooms

Virtual environments are computer generated, 3D environments, which respond in real time to the activities of their users. They are 3D virtual worlds depicted on a screen where the user can navigate their way around the graphical environment using input devices, such as mice, keyboards and joysticks. This is a particularly positive aspect for users who are facing severe learning difficulties for whom certain skills and particular training can be difficult to learn. In virtual worlds users are unable to practice skills repetitively until they cannot command themselves to move on comfortably with new exercises.

1.12 Microsoft PowerPoint 2010

PowerPoint 2010 is a presentation type of software which is used in classroom technology, which is usable for both teachers and students. Microsoft developed PowerPoint 2010 which allows presentations to be displayed live on a computer screen or navigated through at the command of the presenter.

MULTISENSORY HELP FOR DYSCALCULIA:

Children with dyscalculia have problems in abstract number symbols, physical quantities and amounts using the senses to establish a physical connection to the symbol is helpful. Programs such as "**Touch Math**" encourage children to establish a tactile connection to number symbols by tracing, touching or outlining them, creating a physical understanding of quantity and size relationship.

2) MULTISENSORY RESOURCES FOR MATHS

2.1 Numicon

The Numicon shapes make real image of number for children because they can see them and touch them. The shapes make odd and even numbers very apparent and they help children to understand addition, subtraction, multiplication and division. There are kits available for 7 groups of children and 'One to One' kits that are ideal for tutors and parents. Included in the kits are guide books with structured teaching ideas.

2.2 Cuisenaire Rods

The Rods are of 10 different colors and lengths representing different numbers. Young children feel suitability to the colour system and older students find Cuisenaire Rods acceptable to work with too. They can be used to illustrate things like number bonds, area, perimeter, factors, multiples, double numbers, near doubles, fractions, ratios. Cuisenaire rods can be used in combining with the number tracks from Numicon.

2.3 Nuggets

Glass nuggets are very easy to tackle, so good for any counting exercise.

2.4 Plastic Peg Board & Peg Set.

Peg Boards with 100 holes are good for illustrating percentages and fractions.

2.5 Base Ten or Dienes Blocks

The blocks are good for explaining the number system and place value. They can be used for adding and subtracting numbers and concepts such as 'carrying' and 'borrowing'.

2.6 Stile System

This is a self checking system. The tiles are placed in a special tray and if all the answers are right, a given pattern, which matches with the exercise from the book, will be showed when the tray is turned over. There are three packs like 'Numbers and the Number System' (which is especially helpful for children with dyscalculia), 'Calculations' and 'Shape and Measure' that is suitable for children in kindergarten stage and older children who need reinforcement at that level. The packs offer a systematic approach.

2.7 Numbershark

Numbershark is a motivating computer programme that uses 45 games to teach and reinforce numeracy and improve understanding and the use of numbers. The wide variety of carefully designed games provides many ways in which to practice at a chosen level and then to build 8 skills in very gradual steps. The games focus on the number system and sequencing like addition, subtraction, multiplication, division, fractions, decimals and percentages.

2.8 Stern's Structural Arithmetic

Stern's multi-sensory mathematics system that was designed to develop a child's emergent number sense ability by building-up number knowledge and number facts in a logical and structured manner thus enabling children to think logically and reason mathematically. Stern facilitates the understanding and application of the four number operations. Since the system is based on two numbers representation of blocks and patterns promote a clear image of number in the concrete enabling pupils to discover for themselves all of the attributes on a present level. When numbers are introduced they symbolized to the blocks and patterns by embodying the intrinsic qualities and values of those numbers.

2.9 Concrete models

Using concrete models is the first step to understand meaning behind mathematical concepts. These models include a variety of mathematics manipulative function, measuring tools, building blocks, fractional boards, peg boards, chips, marbles, 2D and 3D charts and shapes, dice, straws and strips that students can handle during class instruction. Studies based on Research show that the effectiveness to use concrete materials develop more precise and more comprehensive mental representations, often show more motivation and on-task behavior, understand mathematical ideas and better apply these ideas to life situations.

DISADVANTAGE IN THE AREA OF TECHNOLOGY IN INDIAN CONTEXT

- Lack of knowledge among researcher in assistive technology among teachers and Indian educational institutions especially government sector.
- Needs more time, labour and huge money for preparation or buying the aids for teaching of dyscalculia..
- Lack of awareness in screening, identifying, assessing dyscalculic children and providing individual remedial measures for them.
- Inadequate number of special educator to teach dyscalculics children both in special and inclusive schools.

CONCLUSION:

This paper focused on symptoms of dyscalculia, different types dyscalculia prevailing among children and the importance of technology in the lives of dyscalculic children both at home and in classrooms. It widely discussed about the various assistive technology multisensory and multimedia. It also looked at the disadvantage that surrounds the area of technology in Indian context for the children with dyscalculia.

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