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Mathematics Disability – Unperceptive Truth

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Abstract

In the technology world, importance of mathematics cannot be ignored. In India, if a student shows low achievement in mathematics it is not taken as serious problems by Parents and teachers. There was less awareness on mathematics disability and research done in this area is very less when compared to dyslexia. The purpose of this paper is to identify the mathematics disabled students, highlight the symptoms of mathematics disability, to find the factors contribute to math disability, the need to adopt different teaching strategies for children with mathematical disability, and ways to overcome the mathematics disability by understanding the problem and the overwhelming strategies to remove the impediment which cause math disability.

Key Words: *Mathematics Disability, Working Memory, Cognitive Factors.*

Introduction: Mathematics and Science are useful in the real world. “Mathematics and Science create the basis of our modern world and as long as our present generation continues to focus on Mathematics and Science, we can benefit the world and stresses need to disseminate globally the ancient Indian theories containing scientific and mathematical knowledge”- Abdul Kalam (2007), 11th president of India a renowned Scientist and Engineer. Mathematics and Science are mandatory subjects in school syllabus. ‘Without the knowledge of science and mathematics, the doors of almost every form of useful occupation are closed for a student. Mathematics teaches ways of thinking that are essential to work and civic life’- Harpal Kaur (2012).

In India 10 - 20% million school children, have some specific learning disability. In that disability 60% have some difficulty with school mathematics and also studies reveals that about 4% to 8% of the school-age population suffers from mathematical disability (Fuchs & Compton, etc., Diane Pedrotty Bryant, 2005; Geary, 2004). Though the definition of specific learning disability includes mathematical disability (Federal Register, Department of Education part II 34 CFR-3007, USA, August 23, 1977), due to unidentified/untouched/ unanswered research gaps, there is no universally accepted definition of mathematics disability. Mathematics disability subtypes will not share a unifying core deficit because several different domains of function have been linked to poor math achievement, primarily reading-related, memory, visuo-spatial skills, and/or executive skills. In the field of mathematics disability, work toward establishing a consensus definition is in its early stages. (Michele, Mazzocco and Gwen F. Myers, 2003). There are many factors responsible for cause mathematics disability. No core deficit has been identified for mathematics disability, so not many children are referred for evaluation specifically because of deficits in mathematics problem solving. Research in mathematics disability is not well developed and documented compared to other disabilities.

In the technological world, importance of mathematics cannot be ignored. But in India, if a student shows low achievement in mathematics it is not taken as serious problems by their parents and teachers. They consciously ignoring and preparing students to get pass marks or blaming mathematics as a dry subject and not ready to understand their children’s mathematics competencies and deficiencies or not well informed or aware about their children’s problem. These children’s are inclusive in education process, but they are not identified and taken care as students of special education needs. There is less awareness on mathematics disability and research done in this area is very less when compared to dyslexia.

The purpose of this paper is to identify the mathematics disabled students, highlight the symptoms of mathematics disability, to find the factors contribute to math disability, the need to adopt different teaching strategies for children with mathematical disability, and ways to overcome the mathematics disability by understanding the problem and the overwhelming strategies to remove the impediment which cause math disability.

Mathematics Disability: Dyscalculia is a term that has been used for many years when talking about a math disability. Dyscalculia means "a severe or complete inability to calculate"(Diane Pedrotty Bryant, 2008). In other words, Dyscalculia means "the child has difficulties as learning math concepts like quantity, place value, and time; difficulty memorizing math facts, and difficulty organizing numbers."-(Amiteswar Ratra,2008). Mathematics disability is characterized by an unexpected learning problem after a classroom teacher or other trained professional has provided a child with appropriate learning experiences over a period of time. The child with a math disability has difficulty making sufficient school progress in mathematics similar to that of her peer group despite the implementation of effective teaching practices over time. It affects the ability to acquire arithmetical skills comprehension or computation. Some people use the term dyscalculia to describe a child who has problems in learning mathematics skills and concepts. However, the terms learning disabilities in mathematics and math disability are used more widely today (Diane Pedrotty Bryant, 2008).

Factors Contribute to Math Disability – Research Evidences: Studies had identified factors like lack of attention, memory, motivation or interest, cognitive growth, and visual-spatial ability, low self efficacy, high anxiety, inappropriate earlier teaching or poor school attendance, generalized poor learning capacity, immature general ability, severe language disorders or sensory processing are responsible for mathematics disability & attention deficiency(Garnett, & Fleischner, 1983; Geary, 2004, Montani & Smith, 2005)Children might have memory problems that interfere with their ability to retrieve (remember) basic arithmetic facts quickly. According to Gersten et al., Students delayed cognitive development hinders learning and processing information with also leads math disability. Jordan et al., found visual spatial problems trouble interpreting maps and understanding geometry. Attention increases ones efficiency and it is important for acquisition of skills. It is an important aid to remembering and recall which is very basic to learn mathematics skill. Attention deficiency one or other way causes math disability. Studies have shown that some students with math disability also have a reading disability or Attention-Deficit/Hyperactivity Disorder (AD/HD). A study by Mayes & Calhoun, (2006) found that 26% of children with ADHD have a specific math disability. Gross-Tsur, Manor& Shalev, suggested that attention deficits may be strongly associated with math disability than reading ability. Bynner & Parsons(1997) in their studies revealed that poor mathematical skills are more of a handicap in the workplace than poor literacy skills. So math skills should be improved to give confident among the learners. There are many evidences supports my work very few have been presented. These studies suggests that a deeper understanding of the relationship between attention deficiencies, working memory, visual spatial performance and math disabilities.

Objectives of the study:

1. To identify the mathematics disability students from IX standard students by developing and administering a diagnostic cum achievement test in mathematics.
- 2.To find influence of each of the following cognitive factors on the extent the mathematics disability (i) Working Memory (ii) Logic - Mathematical Intelligence, (iii) Verbal - Linguistic Intelligence, (iv) Bodily-Kinesthetic Intelligence (v) Spatial/Visual Intelligence, (vi) Numerical Ability, (vii) Verbal Reasoning, (viii) Abstract Reasoning, (ix) Space Relations.

Methodology of the Study: In the present study descriptive survey research method was mainly adopted by the researcher. The present study is explorative and normative in nature. The aim of the study is to identify the math disabled IX standard students belonging different backgrounds. The data collected for the study are both nominal and scaled data. Both descriptive and inferential statistics are employed to analyse the data. The study employed inferential analysis to explore the various types of cognitive variables that could influence the occurrence of in mathematics disabled.

Samples Selected for the Study: A total sample of 900 students was selected for the final study included 439 boys and 461 girls from eighteen selected schools of IX standard were included for the final study. The selected sections were of students with mixed ability.

Research Instruments Used For the Study:

- Mathematics Diagnostic cum Achievement Test (MDAT) constructed by Investigator
- Digit Span Backward tests of the Wechsler Intelligence Scale for Children-Third Ed. (1992)
- Differential Ability Test subtests by Bennett et al., (1962)

Statistical Techniques and Findings of the Study: The Mathematics Diagnostic cum Achievement Test (MDAT) constructed by investigator was used to identify the mathematics disabled students. The responses of each student were analysed to determine how many times each of the different types of errors are committed. The students who did not do any error in any one particular type he/she was identified as 'Non Error Doers' in that error type. Based on the frequencies of errors committed by students error doers in each type separate frequency distribution were made for all the 900 students taken together. All the remaining students in any particular error category who have committed different types of errors at least once in the provided chances were grouped as 'error doers'. A total of 22 students were identified as mathematically disabled students and their background, cognitive factors were analysed. The mean scores in cognitive factors of the students belonging to error groups in each type of error were compared using one way analysis of variance (ANOVA). From all the selected cognitive factors namely working memory, logic-mathematical Spatial Visual intelligence, numerical ability and space relations had significant influence on mathematics disability. At the same time general verbal-linguistic intelligence, bodily-kinesthetic intelligence, verbal reasoning, abstract reasoning, had no influence on it.

List of Symptoms:

1. Poor math memory, mental math ability and inconsistent computation results in addition, subtraction, multiplication and division. Almost always unaware of these mistakes: (number additions, substitutions, transpositions, omissions, reversals)
2. Poor with money and credit. Short term, not long term, financial thinking.
3. Poor memory for the "layout" of things, long-term memory (retention & retrieval) of math concept mastery. They have Normal or accelerated language acquisition
4. May be unable to comprehend or "picture" mechanical processes.
5. Mistaken recollection of names. (Newman, 1985).
6. Experiences directional confusion & has difficulty in remembering the rules for playing order, how to keep score in games and time management.
7. Tendency to personalize statistics, odds and probabilities due to a lack of appreciation or true understanding of common large numbers relative to a situation
8. Tendency to drastically underestimate the frequency of coincidences. Tendency to attribute "Great significance to correspondences of all sorts, while attributing too little significance to quite conclusive but less flashy statistical evidence (Paulo's, 1988)

Different Strategies for Teaching Math Disability Students: Every child is unique so identifying and understanding the individual differences, needs, strength and weakness of students in mathematics and also other areas teachers should adopt the following strategies while teaching a student with mathematics disabilities. Before taking class introduce needed materials and additional resources related to the content and make ready by summarizing what is going to be done in the classroom that day. If it is already taught continuations then remind children that yesterday's lesson focused on learning how to regroup in subtraction. Based on that select the teaching strategies that creates and provides active participation of learners. Use audiovisual materials, assistive technology, Software and cooperative learning strategies and visual monitoring. Introduce new skills beginning with concrete examples and later moving to more abstract applications. Use graph paper for students who have difficulty organizing ideas on paper. Work on finding different ways to approach math facts instead of memorizing. Practice estimating as a way to begin solving math problems. For language difficulties, explain ideas and problems clearly and encourage students to ask questions as they work. Provide a place to work with few distractions and have pencils, erasers and other tools on hand as needed. (National Center for Learning Disabilities-NCLD,2006).To enhance the attention memory

strategy like mnemonics, Mercer & Miller's FAST DRAW and SLAM strategy, Owen's TINS Strategy should be practiced. Teachers must try to capture the attention of students by motivating objective factors and subjective factors. (David Mitchell, 2008). To improve attention of students, active participation activities should be encouraged. Avoid memory overload. Assign manageable amounts of work as skills are learned. Build retention by providing review within a day or two of the initial learning of difficult skills. Provide supervised practice to prevent students from practicing misconceptions and "misrules." Make new learning meaningful by relating practice of sub skills to the performance of the whole task. Reduce processing demands by pre-teaching component skills of algorithms and strategies. Help students to visualize math problems by drawing. Use real-life situations that make problems functional and applicable to everyday life. Do math problems on graph paper to keep the numbers in line. Use uncluttered worksheets to avoid too much visual information. Practice with age-appropriate games as motivational materials. Have students track their progress. Challenge critical thinking about real problems with problem solving. Use manipulative and technology such as tape recorders or calculators (Rochelle Kenyon)

Conclusion: According to SSA in Indian education system largest number of school aged children (around) 2.2 percent in the 6-14 aged has special needs. Awareness should be created to the parents and teachers about math disability. Different strategies should be introduced and adopted by the teachers in the classroom who are next to god to save the mathematics disabled children's. More research must be done to identify to find the exact causes for math disability in the classroom and provision should be made to remove the hindrance which blocks the path of mathematics disabled children's.

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