Learning Community: 7(3): 217-229, December, 2016

DOI: 10.5958/2231-458X.2016.00022.1

Dyscalculia: Its Types, Symptoms, Causal Factors, and Remedial Programmes

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The term dyscalculia comes from Greek and Latin which means "*Counting badly*". The prefix "dys" comes from Greek means "*badly*" "*calculia*" comes from the Latin "*calculare*", which means "*to count*" the word "*calculare* " comes from "*calculus*" (the diminutive of "*calx*", which means stone), Which means "*pebbles*" or one of the Counters on an abacus.

Dyscalculia is a learning disorder that involved math. Those who are diagnosed with the disorder can either have problems of understanding the meaning of numbers, their qualities difficulty using mathematical symbols and concepts, and inability to apply mathematical principles to solve problems. People with developmental dyscalculia show signs of the disability from a young age a condition that causes the same symptoms later in life.

Although math learning difficult occur in children with low IQ. Dyscalculia occurs in people across the whole IQ range. Dyscalculia is possibly caused by a miscommunication in brain involving the language and visual processing centers. Some believe that Dyscalculia is inherited while other think environmental toxins like lead paint can cause the learning disorders. Those who suffer from dyscalculia cannot understand the meaning of numbers and their quantities. Simple mathematical skills like knowing how to add, subject, multiply, or divide are difficult.

Those who suffer from these learning disorders are usually skilled in reading and writing. They excel in the creative arts; they are unable to grasp the simplest of mathematical concepts. Usually dyscalculia is diagnosed when the sufferer is school age.

If the child does have dyscalculia, they may be placed in special education and teacher might develop a remedial programme for them. The focus is to help the child to learn math vocabulary and understanding of mathematical principles and concepts involved in calculations.

Keywords: Dyscalculia, Mathematical disorders, Nagaland

Definitions of Dyscalculia

Kosc (1974) defined developmental dyscalculia as 'a structural disorder of mathematical abilities which has its origin in genetic or congenital disorder in those parts of the brain that are the anatomical – physiological subtract of the maturation of the mathematical abilities adequate to age ,without a simultaneous disorder of general mental function.

Sharma (1997) defines dyscalculia as "an inability to conceptualize numbers, number relationships (arithmetical facts) and the outcome of numerical operations estimating the answer to numerical problems before actually calculating."

The DSM-IV (2000) Document used by educational psychologists, defines "mathematics disorder in term of the scores and as measured by a standard test that is given individually, the person's mathematical ability is substantially less than would be expected from the person's age, intelligence and education. This deficiency materially impedes academic achievement living."

Butter Worth (2001) Says, "most dyscalculia learners will have cognitive and language abilities in the normal range, and may excel in non-mathematical subjects".

The National Numeracy Strategy DFES (2001) offers the following definition "Dyscalculia is a condition that affects the ability to acquire arithmetical skills. Dyscalculia learners may have difficulty understanding simple number concepts, lack an intuitive grasp of numbers, and have problems in learning of number facts and procedures. Even if they produce a correct answer or use correct method, they may do so mechanically and without confidence."

Types of Dyscalculia

There are two subtypes of mathematical disorders:

1. Mathematical computation disorder
2. *Mathematical reasoning disorder*

1. Mathematical computation disorder affects an individual to solve math calculations. A person with dyscalculia may have difficulty in solving simple addition, subtraction, multiplication and division problems. Math problems usually begin in elementary school and continue through secondary school and into adulthood.

Signs that may be indicative of mathematics disorders include:

- Writing or printing numbers.
- Counting
- Adding and subtracting.
- Working with mathematical signs.

- Learning names that include disorder affects an individual's ability to utilize mathematical reasoning to solve problems.

2. Mathematical reasoning disorders affect an individual's ability to utilize mathematical reasoning to solve problems. People with dyscalculia have difficulty with abstract concepts of time and direction. Those who suffer from mathematics disorder usually suffer from other learning disorder as well, math of visual processing difficulty associated with it. An individual suffer from a visual processing difficulty is unable to see the difference between two similar letters, shapes or objects. A person with dyscalculia may need special education services to treat this neurological disorder.

   According to some Researchers, dyscalculia can be of many types. They are:

   i **Sequential:** The disorder makes it difficult for the disabled to count numbers in a sequence. Besides, he or she may have a problem with time calculation, schedule check, direction tracking and measurement taking.

   ii. **Developmental:** Children facing this find it difficult to count and recognize mathematical signs.

   iii. **Operational:** This problem is associated with remembering or memorizing mathematics rules.

   iv. **Verbal:** This disorder makes it difficult for the child to carry out normal mathematical signs and symbols.

   v. Acalculia: This stage usually occurs during the later stages of life. This type of dyscalculia is generally acquired through a brain injury or stroke. The disorders make it difficult for sufferers to carry out simple mathematic function like addition, subtraction, multiplication and division.

   Dr. Ladislav Kosc 1974, the researcher who identified six types of dyscalculia within the general area of mathematical disability. These types of dyscalculia may occur individually or together.

3. Lexical Dyscalculia : A person with lexical dyscalculia can understand mathematical concepts when talking about them, but has difficulty reading symbols such as numerical, and cannot understand them when they occur in number sentences or equations. People suffering from lexical dyscalculia may be able to read individual digits, but unable to recall their places in a larger number.

4. Graphical Dyscalculia: Graphical dyscalculia causes difficulties' with writing mathematical symbols, including but not limited to numbers. A person with this disability can understand mathematical ideas when talking about them, and can read mathematical information, but has trouble writing or using math symbols to convey this understanding.

5. ***Verbal Dyscalculia:*** Verbal dyscalculia involves a difficulty with talking about mathematical concepts or relationship. For instance, a person with verbal dyscalculia may be able to read and write numbers, but unable to talk about them, remember their names, or recognize them when they are spoken by others.
6. ***Ideognostic Dyscalculia:*** A person with ideognostic dyscalculia has trouble with tasks that require an understanding of mathematical ideas and relationships, such as identifying which sequence of numbers is larger or smaller. This type of dyscalculia is not limited to oral or written understanding; it is a generalized difficulty with understanding math and numbers as a whole. It can also describe a difficulty in recalling mathematical ideas after learning them.
7. Practognostic dyscalculia: People with practognostic dyscalculia have difficulty translating their abstract mathematical knowledge into real-world actions or procedures. They have difficulty working with actual quantities, volumes equations in a practical way.

Operational Dyscalculia: Operational dyscalculia is a difficulty with performing, mathematical operations or calculations. A person with operational dyscalculia can understand numbers and their relationship to one another, but finds it hard to do any kind of calculation that requires manipulating numbers and mathematical symbols.

I had conducted a research work on "A study of learning disabilities of primary school tribal children in Nagaland" under Nagaland University in North East India. I picked up a sample of 24 schools covering two government schools and one private school in each district of Nagaland which were drawn through stratified random sampling technique. 564 tribal Naga children studying in grade 1V level were taken from each district as a sample of the study. The research tools used for data collection were: Group test of intelligence (GTI) by Pramila Ahuja, Diagnostic reading and spelling test (DRST), Hand writing test (HT), Diagnostic Arithmetic test (DAT), Interview schedule for learning disabled pupils, Questionnaire for teachers, Interview schedule for parents developed by me (investigator).

Through the research work, I found that out of 564, there were 373 children with learning disability in one area or another, which make 66.13% children suffering from learning disability at grade 1V level. If the findings of the study is generalised in Nagaland then it may be concluded that at primary school level around 60% children might have suffered from learning disability, which might be one of the causes of their low achievement, dropouts and stagnation etc. at the primary level itself and the next higher level as well. It has got support from the pass percentage of high school leaving certificate (HSLC) examination in Nagaland which is generally around 40% over the past many years. It clearly indicates that children with learning disability could have been failing in their examination.

One of the major reasons behind the poor pass percentage could be the poor learning ability or learning disability among students on the other hand there has been a serious problem of drop-outs and wastage and stagnation at school level, and for that also learning disability could be one of the major factors. Therefore, there is an urgent need to undertake research work, to investigate into the type and nature of learning disability prevailing among the tribal school children in Nagaland and to bring out appropriate

remedial programme for school children to improve their performance since beginning which may reduce number of drop-outs and may enhance the pass percentage of HSLC results, resulting into quality students for next higher stage of education and ultimately self-independents, and constructive citizens of the society. Keeping this in view the present study was undertaken.

Objectives of the study

(i) To study different types of learning disabilities among grade IV children in Nagaland.

(ii) To diagnose different types of learning disorders.

(iii) To investigate the probable causes of learning disabilities.

(iv) To devise and try out remedial programme correcting those learning disabilities.

Research areas of the study

This study was confined to the primary schools grade IV tribal Naga children who had poor learning ability or suffered from learning disability.

Methodology

Sample

The sample comprises of 564 students which were drawn through random sampling technique from 24 schools covering 2 Govt. schools and one private school in each district of Nagaland.

Table 1: Showing district wise name of the schools and the number of students drawn

Sl no	Districts	Name of the schools	No. of Students
1	Kohima	Govt. 1. PWD Govt. Primary School	25
		2. New Market Govt. Primary School	20
		Private 1. Fernwood School	57
2	Dimapur	Govt. 1. Govt. Primary School, Nagarjan	28
		2. PWD Govt. Primary School, Veterinary	33
		Private 1. Pine Mount School	48
3	Phek	Govt. 1. PWD Govt. Primary School, Phek Town	22
		2. Govt. Middle School, Phek	36
		Private 1. Baptist School	26
4	Wokha	Govt. 1. Govt. Primary School PWD	11
		2. Govt. Middle School, Wokha Town	10
		Private 1. CME School	27
5	Zunheboto	Govt. 1. Govt. Primary School, Zunheboto Town	6
		2. Govt. Middle School	9
		Private 1. Christian English School	25

6	Mokokchung	Govt. 1. Govt. Primary School, Salengtem	11
		2. Govt. Middle School	13
		Private 1. Douglas School	41
7	Tuensang	Govt. 1. Govt. Primary School Sector-I	22
		2. Govt. Primary School Sector-II	20
		Private: 1. Baptist Thangyen School	45
8	Mon	Govt. 1. Govt. Middle School, Mon Town	5
		2. Govt. Primary School, Mon Town	9
		Private 1. Christian English School	15
Total	8	24	564

Tools: The following tools used for data collection were: group test of intelligence by Dr. Mrs. Pramila Ahuja, Diagnostic reading and spelling test (DRST), Handwriting test, Diagnostic Arithmetic test (DAT) developed

by investigator. Interview schedule for learning disabled pupils, Questionnaire for Teachers. Interview schedule for parents prepared by investigator.

Data Analysis: - The data collected through standardized test was analysed by following the instructions, norms and techniques suggested by intelligence test used. Data collected through non-formal tests were analysed by calculating the responses and converting them into percentages.

Table 2: Combined table showing learning disability among the class –iv students

Districts	Schools	Percentage of learning disability	Aphasia	Dyslexia	Dysgraphia	Dyscalculia
Kohima	Govt.	66.66%	37.78%	44.44%	33.33%	53.33%
	Private	35.08%	24.56%	22.81%	15.78%	28.07%
Dimapur	Govt.	80.33%	40.98%	77.04%	42.64%	77.04%
	Private	64.58%	31.25%	54.16%	31.25%	64.58%
Zunheboto	Govt.	93.33%	53.33%	86.67%	66.67%	86.67%
	Private	80%	32%	72%	32%	68%
Mokokchung	Govt.	79.17%	75%	75%	70.83%	79.16%
	Private	53.65%	31.71%	41.46%	17.07%	46.34%
Mon	Govt.	92.86%	42.86%	85.71%	71.43%	85.71%
	Private	73.33%	26.67%	40%	26.67%	46.67%
Wokha	Govt.	85.71%	57.14%	76.19%	57.14%	76.19%
	Private	67.24%	33.33%	66.67%	37.04%	44.44%
Phek	Govt.	67.24%	51.72%	67.24%	43.10%	51.72%
	Private	65.38%	30.77%	65.38%	23.08%	50%
Tuensang	Govt.	71.43%	38.10%	64.29%	33.33%	69.05 %
	Private	48.89%	8.89%	46.67%	15.56%	40%

Govt. Schools two in number and private one in each district had been included
Aphasia – Language disorders
Dyslexia – Reading disorders

Dysgraphia – Handwriting disorders
Dyscalculia – Arithmetic disorders

The following findings were:

Symptoms of Dyscalculia

A. The study revealed some of the common symptoms of dyscalculia. They are mentioned below:
B. Difficulties in understanding arithmetic sign, ÷, +, x,< and >, often confusing their operation need.
C. Difficulty with time tables.
D. Difficulty in learning and understanding the basic knowledge of arithmetic like multiplication, subtraction, addition and division may find it difficult to understand the words "plus" "add together".
E. Problems with counting.
F. Problems with insight mental arithmetic.
G. Dislike for arithmetic and estimations.
H. Confusion with digits hundred and thousand, fractions and decimals.
I. May reverse or transpose number for e.g., 12 for 21, 9 for 6, 465 for 645 etc.
J. A very poor sense of mathematical concepts, rules, formulas and sequences.
K. May also have trouble grasping the mechanics of a calculator.
L. A common noted symptoms is that people with dyscalculia do fairly well in science and geometry, especially where no formula or calculation are involved.
M. Difficulty keeping score during games.
N. Confusion with concepts of money, distance, area, weight, days, of the week, year etc.
O. Errors become more common and simple arithmetic learnt may be easily forgotten.

Causal factors responsible for dyscalculia

The following common factors were found to be responsible for dyscalculia (disorders of arithmetic):

1. Improper basic knowledge about mathematical vocabulary, concept, principles.
2. Due to confusion of number formation, visual perceptual disturbances, poor visual memory resulted reversals of number example, 12 for 21, 9 for6, etc.
3. Confusion with mathematical signs example,(+,x,>,<,).

4. Due to parents who have had difficulty in mathematics may convey these insecurities to their child.
5. Poor basic knowledge of multiplication table results difficulty of solving problems.
6. Confusion with sequence of steps for calculation and mathematical symbols and formulas as one of the factors responsible for dyscalculia.
7. Lack of drilling and practice.
8. Due to linguistic difficulties in understanding instructions and lack of communication skills.
9. Pre-thought that arithmetic is hard.
10. Poor study habit.
11. Hesitate to clarify doubts.
12. Lack of motivation results unfavorable attitudes towards mathematics.
13. Lack of studious friends and neighbors.
14. Unfavorable attitude towards mathematics.
15. Poor power of Reasoning.
16. Lack of special attention from teacher due to overcrowded classroom.
17. Transfer of teachers.
18. Lack of guidance and help from parents.
19. Lack of trained and concerned specialist.
20. Lack of study facilities at home.
21. Discipline based on fear.
22. Poor teaching or inappropriate teaching techniques.
23. Problems of teacher's pronunciation and reflections of dialectical speech pattern made the pupil's unable to understand the instruction.
24. Absence of teacher-parents association.
25. Attitude of teachers towards students.
26. Poor administration.
27. Fear and anxiety on the part of the students.
28. Due to disturbances of quantitative thinking.
29. Irregular attendance of students.
30. Misuse of entertainment media.

The study revealed that most of the learning disabled children were identified from very poor economic statuses which made them deprived of educational facilities at home as well as in schools. Parents neither pay due attention nor have the time to help and support their children studies. They were also not aware about their children's problems.

Moreover, the rural children mostly engaged in household works, field and also looking after their siblings which made them away from their studies and cause lack of concentration in their studies, in turn resulting in learning disabilities and low achievement.

According to Coln (1971) Dyscalculia may have disturbances in visual-motor integration, either for writing or for non-verbal motor skills. Kosc (1974) identified specific disturbances that may be indicative of dyscalculia. These may occur in clusters or individually and include verbal disturbances in which students cannot designate numerals or mathematical terms by name, disturbances of visual-spatial organizations in which students are unable to manipulate objects abstractly to determine relative sizes, shapes, and amounts, disturbances related to reading and writing numerals and operational symbols, disturbances of concept formation in which students are unable to understand mathematical concepts and relationship among numbers, and operational disturbances in students are unable to compute. Bryan (1977) found in his studies that dyscalculics are poor in social perception and in making judgements, they may be unable to pick up or give non-verbal cues, often apart of social communication. Rourke and Finlayson (1978), Rourke and Strang (1978) children who performed poorly in most measures of verbal and auditory perceptual abilities made arithmetical errors involving memory for number facts, sequencing steps necessary to do complex written computation, and word problems. Their deficient language skills were reflected in these errors. Conversely those children who performed poorly on visual-perceptual, complex psychomotor and bilateral tactile-perceptual tasks showed an impoverished understanding of mathematical concepts, difficulty with column alignments, number formation and directionality and general visual-spatial disorganization. Chel, M.M. (1990) has examined the problem of under achievement in compulsory mathematics in the Madhyamic examination of W. Bengal. He found the following causes for underachievement: Gaps in knowledge of concepts, difficulties in understanding of mathematical language, lack of openness and flexibility in teaching, difficulty in mathematisation of verbal problems and interpretation of mathematical results, the abstract nature of mathematic,fear and anxiety on the part of the students. Sinha(1973) reported that children from economically inferior homes went significantly inferior to schools which admitted children from well to do and upper middle class families. Bhattacharya (1982) conducted study on diagnosis and prevention of the learning disabilities of primary school children in arithmetic, and found that experimental group taught by the audio-visual materials and techniques would achieve significantly and showed prolonged memory more than the controlled group taught by conventional method. Desai (1985) studied learning disabled children and found the most potent cause of learning disability was poverty, apathy of teachers to their duties, low intelligence.

Remediation of Arithmetic Disorders (dyscalculia)

The following remedial programmes for correcting arithmetical disorders (dyscalculia) are:

1. Encourage dyscalculics to have clear conception about basic knowledge of mathematical principles, concepts vocabulary, symbols and formulas sequence of steps for calculation etc. at the lower stage.

2. There should be separate paper for multiplication table and make them to memorize with clear concepts at the lower stage.
3. There should be an intimate relationship between teacher and pupils. The teacher as a motivator should pay special attention to each and every student and create classroom activities in such a way that it enables pupils to share their personal experiences which cause learning difficulties and clarify their doubts freely. Encourage and approach them to feel that they have enough capabilities to solve arithmetical problems.
4. Through manipulation of the locally available low cost, no cost materials, the children should discover the formulas, or the generalization. For example, use of pebbles for addition and use of sticks for subtraction etc.
5. Self-Study: children with dyscalculia can be improved through individual's own independent study. Self-study can be maintained by giving homework or assignment. The teacher should encourage them to be self-confident in studies and also make them to cultivate the habit of coaching and guiding themselves and solve every problem without any outside help.
6. Supervised Study: It is one of the most effective techniques for dyscalculic children as it may enable them to get direct supervision of the teachers. It may be conducted in regular periods or after school where a teacher may be put on duty to watch and guide them. Through supervised study, mistakes, learning difficulties can be removed on the spot.
7. Drilling and Practice: It is one of the most effective techniques, widely used devices and practices in the teaching learning situations of mathematics. It enables even the learning disabled children to learn effectively and resulted self-improvement, adequate speed and accuracy in solving arithmetic problems. The principles, basic facts, formula of mathematics have to be memorized through sufficient drill and practice, but there should be no mechanical and cramming. Drill should be done with proper understanding and clear ideas of the aims and objectives of materials.
8. Home-work: As the school timing is in sufficient to provide every aspects of curriculum of mathematics. Home work has to be given regularly for practice and to supplement classroom teaching. It may be established the habit of working hard regularly and provide opportunity of independent work among the learning disabled pupils. Home work should be duly and regularly checked and corrected by the concern teacher to prevent the worst habit of evading and copying it.
9. Assignment: Special emphasis should be given on the assignment. It can be effectively used for teaching mathematics as it is a sort of self-study which supplements classroom learning; cultivating study habit and concentration etc. it may be done at home or at school. Assignment should be checked, corrected and evaluated at the end.

Ashlock (1972) made certain remedial instruction step for moving arithmetic errors of learning disabled children. Some of the steps are as follows:

10. Use manipulative such as buttons and chips to teach number. Use visual material and give reinforcement. Use graph paper for alignment difficulties. Time line, colored, chalks and markings are helping for attention to cues. A sample problem can be given for each assignment. The size of numbers can vary to indicate more or less. Reduce distractions as far as possible. Reduce number of examples in the assignment and eliminate copying. Use of display charts, abacus, playing cards, calculator, and language master are quite useful.

Curricular concerns

Learning disabled children read in the class as other children. Hence, certain extra care would benefit these pupils. These concerns may relate to four areas, such as:

Auditory perception

1. Identify classmates from voice when one is blind.
2. Produce a speech sound and ask if they listen.
3. Ask whether pairs of words are same or different.
4. Start naming objects that starts with a particular sound.
5. Practice rhymes.
6. Ask them to repeat oral directions.
7. Tell a sequence of information to improve auditory memory.

Visual Perception

1. Match a geometric design.
2. Ask them to replicate a pattern.
3. Ask them to classify objects.
4. Match, sort and group word cards.
5. Start copying with pictures. Then scramble the pictures ask pupils to tell the story.
6. Recall letters speedily and find a series of letters in words.

Sensory Motor Development

1. Manipulation of object according to directions that is, in front of, in the middle etc.
2. Use puzzles.
3. Reproduce block designs.

4. Pour water in different container.
5. Design games.
6. Use tracing, lacing and cutting activities and visual tracking activities.

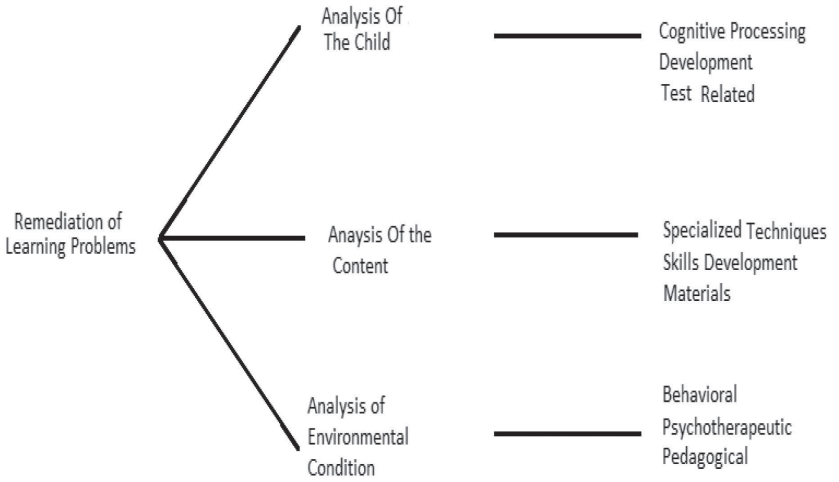
Social Skills

1. Discuss different emotions through pictures.
2. Explain body language and symbols.
3. Use T.V for explaining social encounters and social interactions.
4. Identify topics for discussion with pairs and neighbors.
5. Remember key point's conversations.
6. Discuss personal experiences that have caused social difficulties.

Mildly and moderately learning disabled pupils can function satisfactorily in the regular classroom with these adjustments. The regular curriculum may require little modification. These are some of the techniques of remediation but a specific theoretical model should guide the practitioner.

The cognitive processing approach provides a way of thinking about how a child learns and offers a framework for teaching. The development approach emphasizes sequential approach for remediation. Test related approach identifies specific area of deficiency which can be taught.

The specialized techniques approach indicates that the teacher will follow the prescribed order and fashion for the specified period of time. Hierarchies of skills are to be developed in the skill developmental approach using criterion referenced teaching. Published materials can be used for remediation of learning disability.



The model of the remediation of learning problems. (Ashlock1972).

Behavioral approach refers to behavior modification approach for manipulations of environmental conditions of learning. Apply reinforcement and change behavior. Psychotherapeutic approach should build feeling of success and establish a healthy psycho-dynamic relationship between teacher and student. The major cause of reading failure dyspedagogia i.e., lack of good teaching. Inadequacy in the child's teacher and the teaching environment are the answer to remediation.

References

Ashlock 1972. Education for exceptional children 1997 by K.C. panda, vikas publishing House, New Delhi, pp.19, chapter 8

Bryan (1977) encyclopedia of special education, second edition, Vol.A.A.A.S to D.M.D by Cecil. R. Reynolds E.F jansen 2000, published by John Wiley and sons, Canada.

Bhattacharya, 1982. Fourth survey of research in education, M.B. Buch, Vol. 11, SCERT. New Delhi, 1991,pp. 1322.

Coln (1971) Encyclopedia of special education, Second Edition, Vol. I A.A.A.S. to D.M.D. by Cecil R. Reynolds 2000. Published by John Wiley and Sons, Canada.

Chel M. M (1990) Fifth survey of Educational Research 1988-92 Vol. I, 1997 by A.K. Sharma. Published Secretary NCERT, New-Delhi.

Desai, 1985. Fourth survey of research in education M.B.Buch, vol. 11, NCERT., New Delhi 1997, pp. 1322.

Kosc (1974) Encyclopedia of special education, second edition Vol. I AAAS to D.M.D. C.R. Reynolds EF. Jansen 2000, published by John Wiley and Sons, Canada.

Kosc L. (1974) Development of dyscalculia, Journal of learning disabilities, 7 (3), 164-177.

Ladislav Kosc (1974) six types of dyscalculia, Learning Disabilities, identification, remedies & teaching strategies. Bweyhunle Khing First edition june 2014, Gwanyu publishers, city printing press, Kohima, Nagaland, Chapter 7 pp. 149-150

Rourke and Finlayson 1978, Rourke and Strang (1978) Encyclopedia of special education, second edition, Vol. I by CR. Reynolds 2000 by John Wiley and Sons, Canada.

Root meaning and types of Dyscalculia: Learning Disabilities, identification, remedies & teaching strategies. Bweyhunle Khing First edition june 2014, Gwanyu publishers, city printing press, Kohima, Nagaland, Chapter 7 pp. 146-148

Sinha, 1973. Education for exceptional children 1997, K.C.Panda, Vikas publishinf house New Delhi, pp. 266.

The National Numeracy Strategy DFES 2001: Learning Disabilities, identification, remedies & teaching strategies. Bweyhunle Khing First edition june 2014, Gwanyu publishers, city printing press, Kohima, Nagaland, Chapter7 pp. 147

Websites and Online sources

Butter worth: htt: //www.mathematical brain.com/inT06.html

DSM- 1V, 2000, 315.1) htt: //www.mathematical brain.com/inT06.html

Sharma 1997 htt : //www.dyscalculia.org/expert/Sharma-ctlm