LEARNING DIFFICULTIES IN MATHEMATICS (LDM) OF SECONDARY SCHOOL STUDENTS WITH RESPECT TO THEIR PERSONAL AND BACKGROUND VARIABLES

By

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ABSTRACT

The investigation was aimed to study the learning difficulties in mathematics among the secondary school students. The study proposed to measure the Learning Difficulties in Mathematics with respect to the students' personal and background variables such as sex, type of school, locality and medium of instruction; and also to explore the relationships of learning difficulties with students' scholastic achievement in mathematics and opinion on the different topics in mathematics. Survey method was adopted and developed three instruments for the study; they are Learning Difficulties in Mathematics (LDM), Mathematics Scholastic Achievement Test (MSAT) and Difficult Topics in Mathematics (DTM). A simple random sampling technique was employed in the selection of 480 students from government and private schools of Warangal district in Andhra Pradesh, India. The study revealed that boys had more Learning Difficulties in Mathematics than girls. It was also found that the students of Government schools, Urban and Telugu medium have more learning difficulties in mathematics than their counterparts of private, rural and English medium respectively. Further, it was found that the students who have less learning difficulties in mathematics scored better in mathematics scholastic achievement test and found that the students those who have opined that the topics are easy in mathematics secured highest marks than their counterparts those who have expressed the topics are average and difficult for them. Accordingly, the remedial measures and intervention programmes are suggested to enhance students' performance and to minimise their learning difficulties.

Keywords: Learning Difficulties in Mathematics, Mathematics Scholastic Achievement Test, Difficult Topics in Mathematics.

INTRODUCTION

Learning difficulties can be lifelong conditions that, in some cases, affect many parts of a person's life: school or work, daily routines, family life, and sometimes even friendships and play in some people, many overlapping learning difficulties may be apparent. Other people may have a single isolated learning problem that has little impact on other areas of their lives.

'Learning disabilities' is predominantly an American usage to include children who fail in academics despite having adequate sensory motor, intellectual and environmental factors. 'Learning difficulties' is a British usage. They use the term 'specific learning difficulties' to refer to children who have academic backwardness which is synonymous to the American terminology 'learning disabilities' (eg. Narayan,1997).

There is no clear and widely accepted definition of Learning Disabilities. Because of the multidisciplinary nature of the field, there is an ongoing debate on the issue of defining LD. Most professional utilize a "definition of exclusion" while defining an LD population. That is, the learning disabled child is one who is not functioning well in school setting (*Shankar, 2008, p27*).

Learning Disability (LD) is a disorder understanding or using language, spoken or written, manifested as imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations (*US Office of Education, 1977, p.65083*). A learning disability can be confined to

academic performance in subjects such as reading writing (or) arithmetic (or) pervade the child's performance in other area such as art, activities in the play ground, following instructions in class, and so on (*Nakra, 1996, p.11-12*). In fact, reading problems are the basis for referral twice as often as mathematics problems (*Kavale and Reese, 1992*).

Learning difficulties or disabilities noticed among children can be broadly classified into nine categories. They are:

- Oral Language Difficulties,
- Reading Difficulties,
- Writing Difficulties,
- Arithmetic Difficulties,
- Reasoning,
- Memory,
- Revisualization problem,
- Formulation & syntax disorder and
- Spelling problem.

Some studies have reported that the children lack social competence and have conduct disorder (Shankar, 2008).

Learning Difficulties - Characteristics

Wallance and Mc Loughlin (1979) believe that the term learning difficulties refers to a variety of specific difficulties, with no two individuals possessing the same patterns of skills and behaviours. Despite the diversity in this group of learners, many of these youngsters share some common characteristics and patterns of behaviour that have been noted by their teachers, peers, and parents. They are (a) Lack of motivation, (b) Attributions for success or failures and (c) Inattention, or attention deficits.

According to MacGregor etal, (1982) the common characteristics of children with Learning Disabilities (LD):

- Reading difficulties like omissions, additions, reversals, reading word, guessing words, ignoring punctuations, difficulties in phonetics, following line with finger while reading.
- Writing difficulties like overall poor handwriting, misplacing capitals for small letters, missing out letters, substituting letters, reversal of letters and numbers, adding a letter etc.
- Arithmetic difficulties like symbol confusion, difficulty in arithmetic, confusion between subtraction, division, addition and multiplication, can do maths mentally but cannot work it on paper.
- Other problems are misplacing books, not completing homework, difficulty in knowing days and seasons etc;

Kirk and Gallagher (1989) mentioned three criteria to classify a child as being learning disabled. They are:

(i) Discrepancy between child's potential and actual achievement

(ii) An exclusion criteria

(iii) The need for special education services

Learning Difficulties in Mathematics

National Curriculum Frame work (NCF-2000) has reiterated that the study of mathematics contributes in the development of precision, rational and analytical thinking, reasoning, a positive attitudes and aesthetic sense among students. A part from being a distinct area of learning, it helps enormously in the development of other disciplines which involve analysis, reasoning and quantification of ideas. A little reflection will show what a predominant role does mathematics play in our every day life and how it has become and indispensable factor for the progress of our present day world. It is the pilot of all civilization. It is a contributing factor in the property of human race.

A small percentage of students with learning difficulties have problems only in mathematics; however, most of them find all areas of academics challenging. In the past, students with specific academic difficulties were grouped together. For example, those with severe reading problems were called dyslexic. Students with writing difficulties were said to have *disgraphia*, and those unable to learn mathematics readily had *discalculia*. These terms imply that the individual has experienced brain injury that resulted in the difficulty. Given that very few students with learning difficulties have documented brain damage, such terms should be applied cautiously.

Mathematical Disabilities (or) Dyscalculia

Research in the analysis and remediation of problems related to mathematics has been rather neglected. Large number of school children continues to experience failure in this subject. Koppitz (1971) reported that 88% of the children referred to the learning disabled programme in her study, were one to three years below the expected grade level in arithmetic computation. Perhaps some of this neglect is due to the feeling among many parents and teachers, that arithmetic is not as vital to academic success as other subjects. The focus is largely on reading and writing, and less attention is given to the quantitative aspects of thinking. Although the traditional term of arithmetic is now replaced by the all-inclusive "mathematics" under the influence of modern maths programmes, the nature of the difficulties remain the same. Children with arithmetic disabilities can be found at all age levels, and early identification is very important.

Further research in these areas was conducted by Hacaen (1967) and Kosc (1974, p. 47) introduced the term *developmental dyscalculia* which he defined as "a *structural disorder of mathematics which has its origins as a genetic or constitutional disorder ... without simultaneous disorder of general mental functions".* An individual could be low functioning in mathematics and yet have above average intelligence. According to Kosc, true dyscalculia can be measured by using the formula:

$$\text{Math Q (Quotient)} = \frac{\text{Mathematical age}}{\text{Chronological age}} \text{ X } 100$$

Different Types of Mathematical Learning Problems

- Mastering Basic number facts.
- Interactive and Intensive practice with motivational materials such as same attentioners during practice is as crucial as time spent.
- Distributed practice, meaning much practice small doses.
- Small number of facts per group to be mastered at one time and then frequent practice with mixed groups.
- Arithmetic weaknesses / maths talent.
- The written symbol system and concrete materials.
- The Language of Mathematics.
- Visual Spatial Aspects of Maths.

Operational definition of Learning Difficulties

In this study the researchers preferred the term 'Learning Difficulties (LD)' to refer to children who are below average in their academic performance consistently in one or more of the subjects as revealed by the school progress reports and their assessment in mathematics by the investigators.

Review of related studies

A limited amount of empirically available research evidences on the performance of secondary school students in mathematics learning difficulties and opinion on difficult topics in mathematics have been presented.

Roopalatha (2003) investigated that the private school children are better than government school children with respect to their abilities of representation and interpretation of geometrical concepts and there is an impact of social background on students' abilities in graphical representation and interpretation of statistical concepts.

Ngailiankim (1991) found that

1. There was a significant association between

(a) attitude towards mathematics,

(b) educational aspiration,

(c) numerical ability,

(d) abstract reasoning,

(e) personality factor A, and

(f) personality factor G and achievement in mathematics.

2. None of the other variables studied showed association with achievement in mathematics.

Jayaraman (1989) found that

1. There was an association between attitude towards mathematics and achievement in mathematics.
2. There was a negative association between hindrances for students' learning mathematics and their attitude towards mathematics.

3. There was a negative association between hindrances for students' learning mathematics and Their achievement in mathematics.

Rosaly's (1992) studied that

1. The attitude of high school students towards learning mathematics and their achievement in mathematics were related.
2. Urban girls had a more positive attitude towards mathematics than rural girls.
3. Similarly, urban boys had a more positive attitude towards mathematics than rural boys.
4. Girls were higher than boys in their achievement in mathematics.
5. Urban girls were higher than rural girls in mathematics.

Desai (1985) investigated that:

1. The most potent cause of learning disability was poverty.
2. The second cause of the malady was the apathy of teachers to their duties in school.
3. The third cause of learning disability was the abolition of examinations from standards I and II in the schools of Gujarat.

(4) Low intelligence was also one cause of the malady.

Dutta (1986) studied learning disabilities in the reasoning power of the students in geometry-diagnosis and prevention. The major findings were: (1) thirty-three major patterns of disabilities were identified. (2) The experimental groups taught by audio-visual materials and techniques achieved significantly more than the controlled groups taught by conventional methods.

Vasanthi's (1991) study explores the incidence and content of certain mathematical learning disabilities as well as the influence of select psychological, social and educational factors on these. The learning disabilities chosen for investigation are: acalculia, agnosia, asymbolia, perceptual problems, forward-backward confusion, mixed laterality, reversal of numbers, strephosymbolia, time and distance confusion, and up-and-down confusion. Major Findings: (1) Mathematical learning disabilities had a significant negative relation to intelligence and socio-economic status, and a positive relationship to behaviour problems. (2) The incidence of mathematical disabilities was the greatest among pupils in government schools affiliated to the State Board, less among pupils in matriculation schools, and the least among pupils in schools affiliated to the Central Board of Secondary Education. These differences among the three types of schools were statistically significant.

Lynn and Douglas (2002) studied mathematical problem solving profiles of students with mathematics disabilities with and without comorbid reading disabilities (RD) of fourth grade students were verified through testing. Then a hierarchy of mathematics problem solving tasks was administered. The results demonstrated large deficits for both groups. However, the difference between students with mathematical disabilities and those with both mathematical disabilities and reading disabilities are mediated by the level of problem solving (arithmetic story problems vs complex story problems vs real world problem solving) and by performance dimension (operations vs problem solving). On arithmetic story problems- the differences between the disability subtypes were similar for operations and problem solving. By contrast, on complex story problems are real world problem solving, the differences between the subtypes were larger for problem solving than for operations.

Krishna Kumar (2003) studied on learning disabilities in mathematics at secondary school level and found the following disabilities of the students.

- Inability to solve problems differently
- Ignores relevant data of the problem
- Lacks speeding solving problems
- Commits mistakes in decimal division
- Applies meaningless formulae to a given problem
- Lacks precision in using geometrical instruments
- A+B is assumed-as a + b
- Selecting convenient class interval in statistics is difficult
- Confusion in selecting the type of graph for a given data

Need for the Present Study

Mathematics has its own language, which includes various symbols and signs, like other languages, it has its own grammar. But this language is far more abstract than other languages. We speak and use other languages in our communication. But the language of mathematics is used only in mathematical situations. Although the nature of mathematics is so deep and complex, our curriculum is not teaching highlights of its nature. We never talk about abstractness of mathematical concepts. We never discuss the beauty of this discipline. We never talk about origin and applicability of mathematical concepts. We rather make mathematics very mechanical, limiting to solve problems. Whenever we have to solve a problem we need to focus on three issues: (1) What is the problem all about?; (2) How to comprehend it?; and (3) How to transfer it into the desired form?

We need to teach mathematics not to get scores of marks and degrees but to develop an intellectual personality with sharp observation, deep concentration, and precise decision-making and scientific approach. We need to cultivate aptitudes such as power of abstractness, precisions in the use of words, logical thinking and skills in calculation.

Some students have an excellent grasp of mathematical concept, but are inconsistent in calculating. They are reliable at paying attention to the operational sign, at borrowing or carrying appropriately, and at sequencing the steps in complex operations. Some students are particularly hampered by the language aspects of mathematics resulting in confusion about terminology, difficulty following verbal explanation and weak verbal skills for monitoring the steps of complex calculations.

A small number of students have disturbances in visual spatial moral organization which may result in weak (or) lacking understanding of concepts, very poor "number sense", specific difficulty with pictorial representations and poor controlled handwriting and confused arrangements of number and signs on the page. Students with profoundly impaired conceptual understanding often to have substantial pictorial motor deficits and are presumed to have right hemisphere dysfunction (Strong and Rourke, 1985). In fact this subgroup is specifically in need of remediation in the area of picture interpretation, diagram and graph reading, and non-verbal social cusses (Johnson, 1987).

It is observed from the SSC results for many years that most of the failures are in mathematics subject. There are innumerable reasons for this among them learning difficulties occupies a very important share. Learning difficulties faced by SSC students in Mathematics are such as faculty erring practices, applying meaningless formulae to given problem, improper substitution of variables, aversion towards mathematics etc.

The researchers' personal experience in teaching mathematics at high school level also helped to identify the problems such as the students trying to avoid some particular problems which were drawn from plain geometry, linear programming, how to chat from computing etc; in their SSC exams as they have an ample choice in it.

Today's teachers work by the performance of the children. The children themselves are also worried about their performance. Generally children who perform better will face less learning difficulties, whereas those who don't perform better will encounter more learning difficulties. Learning difficulties and performance are reciprocal to each other. In addition to the parental and peer pressure, even from societal point of view, learning has become a major issue and high achievement a status symbol. The problem today is the alarming performance of the children in academics. Children's performance in a class varies. Those who score creel and those do not score so well are converging evidence. Kosc (1974) reveals that 6 to 7% of the school age population suffers from Mathematical difficulties.

Many pupils perform poorly in Mathematics and find the subject very difficult and uninteresting. The probable reasons may be some socio-economic factors that have a bearing on the performance of such pupils and existing school conditions etc.

Many changes are being made in the Mathematics

curriculum. There may be certain new topics, which have been included in the present curriculum, with which the teachers are not familiar. Even in other topics, there could be some points about which the teachers have some doubts.

Some secondary school students lack even the knowledge of four fundamental operations as the teachers are not given good orientation in primary Mathematics.

As mentioned in need and importance of the study, identifying learning difficulty in mathematics is a crying need into contemporary research in education. Students, teachers, parents and curriculum designers including policy makers need to get a clear picture about student learning difficulties. They can modify or exchange their practices accordingly.

The present study may provide deep insight to understand the problems that are being faced by secondary school students in mathematics. The further investigations throw light on content area, objectives and mathematical ability components that are to be developed.

Objectives of the Present Study

It is considered worthwhile to study the learning difficulties of secondary school students in mathematics, their mathematics achievement and opinion on the topics at secondary level with respect to the selected variables such as sex, type of school, locality and medium of instructions. The study was undertaken with the following major objectives:

- To investigate the differences in Learning Difficulties in Mathematics (LDM) in relation to sex, type of school, locality and medium of instruction at secondary school level.
- To find out the relationship between Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT).
- To find out the relationship between students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT).

Null Hypotheses

Hypothesis 1

There is no significant difference between boys and girls in Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 2

There is no influence of type of school on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 3

There is no influence of locality on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 4

There is no influence of medium of instruction on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 5

There is no significant relationship between Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

Hypothesis 6

There is no significant relationship between students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT).

Hypothesis 7

Topics are Easy (TE), Topics are Average (TA) and Topics are Difficult (TD) groups do not significantly differ with respect to their Mathematics Scholastic Achievement Test (MSAT).

Research Method Used in the Study

In view of the nature and purpose of the present study the investigators have selected a suitable research method called "Normative Survey Method", which is a concern itself with the present phenomena in terms of conditions, practice, beliefs, processes, relationships (or) trends. It brings into focus the attention towards existing educational problems and also suggests ways of meeting them; worthwhile survey studies collect three types of information such as: 1. Of what exits, 2. Of what we want and 3. Of how to achieve goals.

Tools Used in the Study

For the purpose of data collection, four instruments 1. Bio-data sheet and 2. Learning Difficulties in Mathematics scale (LDM), 3. Mathematics Scholastic Achievement Test (MSAT) and 4. Difficult Topics in Mathematics (DTM) for Secondary school students have been constructed by the investigators for the study.

Development of Learning Difficulties in Mathematics (LDM) Tool

The LDM scale was constructed after having discussions with staff of the Department of Education and psychology, mathematics subject teachers of schools, experts in the field and resource persons. All the precautions were taken to minimize the common errors that normally occur in a test. While preparing the tools, the investigators have referred to the test items on Learning Difficulties from different sources such as Adjustment Inventory for School Students (AISS) inventory developed by Dr. A.K.Sinha and Dr. R.P.Singh (1984) and other related psychological tools and books.

A scale was prepared for Learning Difficulties in Mathematics (LDM) in keeping view of the psychological aspects. The investigators constructed a Learning Difficulties Scale in Mathematics tool consisting of 3 Parts i.e. Part-A, Part-B and Part-C. Part-A was named as 'Emotional Disorders in Learning Mathematics'; Part-B was named as 'Social and Environmental problems in Learning Mathematics' and Part-C was named as 'Educational and Subject Related Problems in Learning Mathematics'. Part wise descriptions were given in detail.

Part A: Emotional Disorders in Learning Mathematics

Emotional Disorder items are included from the areas such as Mathematical Anxiety, Difficulties in Comprehending Mathematical ideas and making mental Calculations, Inability to make comparisons of objects that vary on some dimension for example size, taking decisions and gaining control over their immediate environment, beginning to think about the strategies they use and explaining them to others questions, develop a powerful set of thinking tools.

Part B: Social and Environmental Problems in Learning Mathematics

The social and environmental problems in learning mathematics are included from the areas that build on their awareness of events and actions to recognize changes in pattern, quantity and space in their immediate environment, using their developing awareness to anticipate and predict changes, school environment and classroom atmosphere.

Part C: Educational and Subject Related Problems in Learning Mathematics

The educational and subject related problems identified specifically related to mathematics subject are: Identifying the meaning of signs. (e.g. $+$, , $\times$, $<$, $=$, $>$), Remembering answers to basic arithmetic combinations, Using Effective counting strategies to calculate answers to arithmetic problems, reading problems, lack of mathematical readiness, arithmetic weaknesses, the language of mathematics problems, dyslexia and dyscalculia problem, difficulty in reading digits, symbol (or) multi digit numbers, difficulty in completing basic operation of addition, subtraction etc., and remembering answers to basic arithmetic combinations.

Scoring Procedure for Learning Difficulties in Mathematics (LDM)

The constructed scale Learning Difficulties in Mathematics (LDM) consists of 3 Parts. They are Part-A, Part-B and Part-C. These parts are combined in the scale given for the students which consist of 70 items. Part-A consists of 24 items, Part-B consists of 23 items and Part-C consists of 23 items. Each item is anchored by the option of Yes (or) No. Each item carries one mark. The scoring key is provided in the Appendix-A4. Maximum score is 70 and minimum score is 0.

- High score in LDM scale indicates more learning difficulties in mathematics.
- Low score in LDM scale indicates less learning difficulties in mathematics.

Pilot Study

A pilot study was undertaken to verify the applicability of the items. The preliminary draft of LDM was administered

to 100 pupils (both boys and girls) of standard X. The time allotted for the administration of the test was determined on the basis of observation of pre-pilot study. The investigators observed every time the number of answer sheets returned. Then the average time was taken, which was fixed for preliminary. The timing fixed for LDM was 1 hour 10 minutes.

Item Analysis of Learning Difficulties in Mathematics (LDM)

In order to the discriminative power and usefulness of statements chosen for the scale the χ^2 (Chi-Square) value for each of the statements was calculated. The items those χ^2 (Chi-Square) values were less than 3.84 (df=1, p<0.05) were discarded. On the basis of this process out of 70 items, 10 items were discarded and 60 items retained in the final form. After deleting the items which had shown poor discriminative responses calculated with χ^2 (Chi-Square) formula out of 70 items, sixty (60) items were retained in LDM for final study. The items were arranged in the same order. The time limit was fixed for 1 hour. The final drafts of LDM English and Telugu media papers were used in the final study.

Sample for the Final Study

The sample for the final study was selected in two stages. In the first stage, the selection of schools was made. In stage two, students were chosen from the selected schools. Twelve (12) schools were eventually chosen, of which 4 schools belonged to Government and 8 schools belonged to Private managements of Warangal district in the state of Andhra Pradesh (India). A total of 480 students belonging to tenth standard were selected from Private (N=363) and Government (N=117) high schools by using a Simple Random Sampling technique. The students' personal and background variables such as sex, locality, medium of instruction and type of school were collected for analysis purpose.

Variables Included in the Study

The review of Literature in the field of Learning Difficulties has been influenced by a number of psychological and sociological variables collectively. Hence the following variables are included in the present study.

Dependent Variables

Learning Difficulties in Mathematics (LDM): As measured by Learning Difficulties Test (LDM) for school students as constructed by the researchers.

Independent Variables

1. Sex, 2. Type of School, 3. Locality, and 4. Medium of instruction.

Data Collection Procedure

The researchers visited the schools for collection of data with prior permission of the Head of the institution. The purpose of conducting the study and special instructions were given orally to the group before starting the tests/ scales. The researchers emphasized the personal value of the tests / scales for each student, so that the pupils will not only accept them but also put forth their best efforts. All the candidates were given booklets of Bio-data, LDM, MSAT and DTM along with separate answer sheets. The students were asked to read the instructions given in the booklet and the researchers clarified doubts of the students during the sessions. The students were assured that the responses will not be disclosed to any one.

Reliability and Validity of the LDM

The Learning Difficulties in Mathematics (LDM) was given to senior experts in the field of Psychology, lecturers and senior mathematics school teachers to give their judgment about each item in the tool and its validity. They made some suggestions and it was carried out. Hence it can be considered that the tool has validity. The intrinsic validity of the test is $\sqrt{0.88} = 0.94$. For the item validity of the LDM scale the Chi-Square test (X^2) values for the whole sample (N=480) were calculated. All the items are highly or moderately significant at 0.01 level which indicates that the item responses are widely distributed.

For the LDM only the test-retest method of reliability was adopted to establish the reliability of the test because the data is in discrete data in the form of frequencies. The two set of total scores in each time (test and retest) are correlated to find the reliability and corrected with Spearman-Brown Prophecy Formula for estimating reliability from two comparable halves of a test. The coefficient of correlation was found to be 0.88, which is

highly significant at 0.01 level. Hence, the reliability of the tool has been established.

Results of the study

The results related to Learning Difficulties in Mathematics (LDM) in relation to the variables selected for the study such as sex, locality, medium of instruction and types of school are presented. The data is systematically classified and tabulated according to the formulated hypotheses.

Frequency Distribution of Learning Difficulties in Mathematics (LDM)

The frequency distribution of learning difficulties test scores and descriptive statistics is given in Table 1. The mean, medium, and mode of the scores were found to be 19.6, 19.6 and 19.3 respectively. The Standard Deviation (SD) of LDM is 9.6. The maximum score obtained by the sample in this test was 39, while the minimum score obtained was 4, giving a range of 35. The coefficient of Skewness is 0.070, which indicates that the distribution is slightly skewed positively. In this distribution Kurtosis is 0.292, which is greater than 0.263 denotes that the sample distribution is "platykurtic". The frequency polygon curve on the basis of data given in Table 1is drawn (Figure 1).

Influence of Sex on Learning Difficulties in Mathematics

S.No	Scores	F	Cum f	Smoothed frequency	Descriptive Statistics	
1.	0 – 8	67	67	69	Mean	= 19.6
2.	9 – 17	140	207	116	Median	= 19.6
3.	18 – 26	141	348	133	Mode	= 19.3
4.	27 – 35	118	446	91	S.D	= 9.6
5.	36 – 44	14	480	44	Minimum	= 4
					Maximum	= 39
					Range	= 35
					Skewness	= 0.070
					Kurtosis	= 0.292

Table 1. The frequency distribution of Learning Difficulties in Mathematics (LDM)

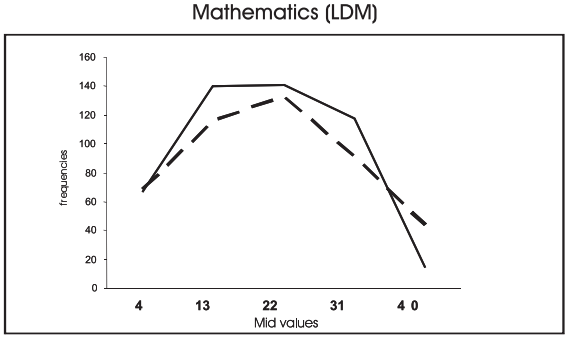

Figure1. Original and Smoothed frequency polygon for the data given in Table 1_____ Original -------- Smoothed

at Secondary School level

The influence of Sex of the students on Learning Difficulties in mathematics subject is investigated. The students are divided into gender wise viz., (1) boys and (2) girls. The results pertaining to the Hypothesis 1 are presented in Table 2.

The Table 2 reveals that the boys mean score (M=20.15) is higher than girls mean scores (M=18.20) in Learning Difficulties in Mathematics (LDM). The 't' value 2.26 indicates that the difference is statistically significant at 0.05 level. Hence, the formulated Hypothesis 1 is rejected and concluded that there is a significant difference between boys and girls in Learning Difficulties in Mathematics (LDM) at secondary school level. It can be interpreted that boys have more learning difficulties in mathematics than girls.

Influence of type of school on Learning Difficulties in Mathematics (LDM)

The influence of type of the school on learning difficulties in mathematics is investigated. The schools are categorized on the basis of management into two types viz. (1) Government Schools (GS) & (2) Private Schools (PS). The results pertaining to the hypothesis-2 are presented in Table-3.

The Table 3 shows that Learning Difficulties in Mathematics (LDM) scale results reveals that Government Schools (GS) and Private Schools (PS) mean score are 21.58 and 14.57 respectively. There seems to be differences in the mean scores among groups. The 't' value is 8.37, which is highly significant at 0.001 level. Hence, the Hypothesis 2 is

S.No	Sex	Sample (N)	Mean	S.D	't'-value
1.	Boys	186	20.15	9.28	2.26*
2.	Girls	294	18.20	9.10	

Note: High mean score indicate more learning difficulties in Mathematics
* Significant at 0.05 Level

Table 2. Influence of sex on Learning Difficulties in Mathematics (LDM)

S.No	Type of School	Sample (N)	Mean	S.D	t-value
1.	Govt Schools (GS)	117	21.58	9.20	8.37**
2.	Private Schools (PS)	363	14.57	7.40	

Note: High mean score indicate more learning difficulties in Mathematics
** Significant at 0.01 Level.

Table 3. Influence of Type of School on Learning Difficulties in Mathematics (LDM)

rejected. Therefore, there exists a significant difference between the Government Schools (GS) and Private Schools (PS). It can be concluded that Private School students have less Learning Difficulties in Mathematics (LDM) than Government school students.

Influence of locality on students' Learning Difficulties in Mathematics (LDM)

The influence of locality on the students' Learning Difficulties in Mathematics (LDM) at secondary level is investigated. The students are divided into two categories viz., (1) Urban Students and (2) Rural Students. The results pertaining to the hypothesis-3 are presented in Table 4.

The Table 4 shows that the mean score of urban students (21.45) is higher than the rural mean score of rural students (16.82). The 't'-value 5.32 indicates a statistically significant difference in their Learning Difficulties in Mathematics (LDM) at 0.01 level. Hence, the Hypothesis 3 is rejected and concluded that there is a mean difference between urban and rural students in Learning Difficulties in Mathematics (LDM) at secondary level. It can be interpreted that rural students have less Learning Difficulties in Mathematics (LDM) than urban students.

Influence of medium of instruction on students' Learning Difficulties in Mathematics (LDM)

The influence of medium of the students on Learning Difficulties Mathematics Subject is investigated. The Students are divided into 2 groups viz., (1) Telugu Medium Students (2) English Medium Students. The results pertaining to the Hypothesis 4 are presented in Table 5.

The Table 5 reveals that the Telugu medium students' mean score (24.27) is higher than English medium students mean score (15.32). The 't'-value 12.02 indicates the difference between Telugu and English medium students is highly significant in their Learning Difficulties in Mathematics (LDM) at 0.001 level. Hence, the formulated Hypothesis 4 is rejected and concluded that Telugu medium students are having more Learning Difficulties in Mathematics (LDM) than English medium students at secondary level.

S.No	Locality	Sample (N)	Mean	S.D	t-value
1.	Urban students	316	21.45	9.45	5.32**
2.	Rural students	164	16.82	8.16	

Note: High mean score indicate more learning difficulties in Mathematics
** Significant at 0.01 Level.

Table 4. Influence of locality on Learning Difficulties in Mathematics (LDM)

S.No	Medium	Sample (N)	Mean	S.D	t-value
1.	*Telugu**	236	24.27	8.25	12.02**
2.	English	244	15.32	8.03	

Note: High mean score indicate more learning difficulties in Mathematics
* Telugu is a regional language / mother tongue for majority of the studentsin the state of Andhra Pradesh, India.
** Significant at 0.01 Level.

Table 5. Influence of Medium of Instruction on Learning Difficulties in Mathematics (LDM)

Relationship between students' Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

The results pertaining to the hypothesis-5 are tested by employing Pearson product moment coefficient of co-relation (r) which is computed and results are presented in Table 6.

Table values of r (df = 478) is 0.098 at 0.05 level and 0.128 at 0.01 level. The Table 6 shows that co-efficient of correlation was found to be negatively correlated (r = -0.248), which is highly significant at 0.01 level. The negative correlation indicates that low scores in Learning Difficulties in Mathematics (LDM) tend to accompany with high scores in Mathematics Scholastic Achievement Test (MSAT).

It can be interpreted that the students' who have less Learning Difficulties in Mathematics would show better performance in Mathematics Scholastic Achievement Test (MSAT). It can be interpreted that children who perform better will face less learning difficulties, whereas those who don't perform better will encounter more learning difficulties. Learning difficulties and performance are reciprocal to each other.

Relationship between students' opinion on Difficult

No	Factors	N	Df	R
1.	Mathematics Learning Difficulties (X)	480	478	-0.248***
2.	Mathematics Scholastic Achievement (Y)	480		

*** Significant at 0.01 Level.

Table 6. Relationship between the Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT)

The results pertaining to the Hypothesis 6 coefficient of co-relation (r) method and results are presented in the Table 7.

The Table values of r (df=478) is 0.098 at 0.05 level and 0.128 at 0.01 level. The Table7 shows that co-efficient of correlation was found to be positively correlated (r=0.289), which is highly significant at 0.01 level. The positive correlation indicates that high scores in opinion of Difficult Topics in Mathematics (DTM) tend to accompany with high scores in Mathematics Scholastic Achievement Test (MSAT).

Hence the null Hypothesis 6 is rejected. It can be interpreted that the students' whose opinion on Difficult Topics in Mathematics (DTM) is good, tend to high score in Mathematics Scholastic Achievement Test (MSAT).

Influence of Different Levels of Students' Opinion on Difficult Topics in Mathematics (DTM) groups on Mathematics Scholastic Achievement Test (MSAT)

To test the influences of different levels of opinion on Difficult Topics in Mathematics (DTM) on Mathematics Scholastic Achievement Test (MSAT), they were calculated and presented in the Table 8. The students are divided into 3 groups on the basis of students' opinion on Difficult Topics in Mathematics (DTM). The Mean and SDs of the DTM are 43.4 and 5.9 respectively. The Topics are Easy (TE) for group (N=72) scored those marks above 49.3 (Mean +1 SD); the Topics are Difficult (TD) for group (N=67) those scored below 37.5 (Mean-1 SD); and the Topics are Average (TA) for group (N=341) those scored between 37.5 and 49.3 (Mean ±1 SD).

S. No	Factors	N	df	r
1.	Students Opinion on Difficult Topic in Mathematics (DTM)	480	478	*0.289***
2.	Mathematics Scholastic Achievement Test (MSAT)	480		

** Significant at 0.01 Level

Table 7. Relationship between the students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT)

Opinion on Difficult Topics in Mathematics (DTM)		Mathematics Scholastic Achievement Test					
No	Level of Opinion on Difficult Topics in Mathematics (DTM)	N	Mean	SD	F-ratio	Mean difference (T-values)	
1.	Topics are Easy (TE)	72	46.92	12.1		TA	TE
2.	Topics are Average (TA)	341	40.10	12.4	17.82***	TD 5.41**	12.23**
3.	Topics are Difficult (TD)	67	34.69	10.8		TA -6.82**	

Note: High mean score indicate more learning difficulties in Mathematics
* Significant at 0.05 ** Significant at 0.01*** Significant at 0.001.

Table 8. Mean Scores, SDs and F-ratio of students' level of opinion on Difficult Topics in Mathematics (DTM) in relation to their MSAT

The results pertaining to the Hypothesis 8 are tested by employing One-way Analysis of Variance (ANOVA) technique and results are presented in Table 8.

The Table-8 shows that the students' opinion mean scores of different groups on Difficult Topics in Mathematics such as Topics are Easy (TE), Topics are Average (TA) and Topics are Difficult (TD) groups were 46.92, 40.10 and 34.69 respectively. There seems to be differences in the mean scores among the groups. The analysis of variance (ANOVA) reveals that the F-ratio for these three groups is 17.82 ($p < 0.001$) which is highly significant. Hence the formulated Hypothesis 7 is rejected. Therefore, it is concluded that the students' opinion on Difficult Topics in Mathematics (DTM) groups are differing significantly in their mean scores with respect to their MSAT. The mean differences with Turkey's HSD test results are presented in the last column with 't' values and an asterisk marks (* or **) used for different levels of significance such as 0.05 level (or) 0.01 level.

It can be concluded that the students who expressed that the 'Topics are Easy (TE)' in Mathematics performed better in Mathematics Scholastic Achievement Test (MSAT) than their counter parts, who have expressed that the 'Topic are Average (TA) and 'Topics are Difficult (TD)'. The critical analysis from the Table-8 shows that the Easy, Average and Difficult group students mean scores are relatively decreasing in their Mathematics Scholastic Achievement Test (MSAT).

Discussion

Students who expect academic failure tend to be passive. This trait is seen in many students with learning difficulties, who are said to be inactive learners. They do not approach the learning task purposefully and are not actively involved in their learning. They do not ask questions seek help, or read other related material to learn

more. They often attribute their success to luck rather than to their abilities or effort, and 70 percent attribute poor performance to lack of ability (Kavale and Forness, I996). Research findings show that many students with learning difficulties, probably because of their excessive number of failure experiences, have a greater incidence of overall negative attitudes (Yasutake and Bryan, 1995). However, when those attitudes are turned around, learning and performance improve. Rosaly (1992) studied that the attitude of high school students towards learning mathematics and their achievement in mathematics were related.

In the present study boys, urban students and Government school students have more learning difficulties in mathematics than their counterparts. Therefore, boys, urban and government school students those who have specific learning difficulties in mathematics must be provided special programmes. The schools should allocate suitable special education programmes like Integrated Education / Inclusive Education either in a regular classroom or special education in a separate classroom for several hours in a week. When regular classroom instruction fails, individualized skills-based approaches must be used.

It is found in the present study that the Telugu medium students had more Learning Difficulties in Mathematics (LDM) than English medium school students. While teaching mathematics for Telugu medium students, reference books should be used in addition to the text books to get clarity about the concepts. Appropriate intervention programmes should be provided to enhance students' performance and also minimize their difficulties in learning.

The study reveals that level of difficulty in mathematics related with the students' mathematics performance. Teachers should allow the students for clarification in their doubts in the mathematics subject and can discuss the difficult topics in the syllabus. Teachers need to pay attention in developing positive attitude towards mathematics and create interest in learning mathematics by adopting innovative teaching methods.

It is strongly recommended that every secondary school should have guidance and counselling cell run by the qualified and trained counsellors. Student of severe Learning Difficulties need special education in specialized schools where special education and learning specialists train the students to develop life skills. After assessing the child's strength and weaknesses, the special education teacher designs an Individualized Educational Programme (IEP). The IEP should outline the specific skills of the child and develop appropriate learning activities that build on the child's strength.

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