



# European Journal of Educational Research

Volume 10, Issue 1, 367 - 380.

ISSN: 2165-8714

<https://www.eu-jer.com/>

## Are Teachers Aware of Mathematics Learning Disabilities? Reflections from Basic Level Schoolteachers of Nepal

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*Received: September 23, 2020 • Revised: December 21, 2020 • Accepted: January 7, 2021*

**Abstract:** The study aims at investigating basic level schoolteachers' awareness of their students' mathematics learning disability (MLD) in the context of Nepal. It is based on a mixed-method research design in that it combines both qualitative and quantitative approaches as appropriate. Using the stratified random sampling technique, 300 basic level mathematics teachers were selected from 150 basic level (grades 1-8) community and institutional schools representing the three significant ecological regions (the Mountain, the Hill, and the Terai) and demographic variables (gender, place of residence, and school type) from Province 1 of Nepal. A Mathematics Learning Disability Awareness Scale (MLDA-Scale), was developed and used to measure the basic level schoolteachers' awareness of their students' MLD. Besides, a semi-structured interview was conducted with the purposively selected basic level schoolteachers for the qualitative data. The basic level schoolteachers' awareness of MLD factor categories was calculated using descriptive statistics. Similarly, *t*-tests were conducted to examine the effects of the demographic variables. The qualitative data, however, were analyzed thematically. The results reveal that the majority of the basic level schoolteachers' knowledge toward their students' MLD was inadequate and that the demographic variables had no significant effects on the teachers' knowledge of their students' MLD. Finally, the study recommends developing the managerial practices regarding the MLD issue further.

**Keywords:** *Mathematics learning disability, basic level teachers, demographic variables, teachers' awareness.*

**To cite this article:** Kunwar, R., Shrestha, B. K., & Sharma, L. (2021). Are teachers aware of mathematics learning disabilities? Reflections from basic level schoolteachers of Nepal. *European Journal of Educational Research*, 10(1), 367-380. <https://doi.org/10.12973/eu-jer.10.1.367>

### Introduction

Mathematics is an abstract subject. So by its very nature, it raises the problem of learning difficulty. The problem in mathematics learning is a global issue. Mathematics aims at linking school to everyday life. Hence, in school education, it has always been given special attention. In school education, teachers have a significant role in timely diagnosing the student's difficulties in learning mathematics. It is also necessary for the teachers to detect the problems situated on learners' neuropsychological and cognitive profile, absence of the required amount of prerequisite knowledge and skills for mathematics learning, and poor linguistic skills (Sharma, 2020). Learning difficulty is treated as situational, particularly, situated outside the child, and as the consequence of the specific causes, such as physical, educational, emotional, and environmental factors (Kunwar & Sharma, 2020). Hence, mathematics learners with learning disabilities require special instruction as well as interference to overcome the obstacles that lead beyond the existing teaching and learning of mathematics (Hornigold, 2015). Such interference should be helpful, efficient, well-designed, and focus on a sound principle of the best delivery for the intended outcome (Sharma, 2020). Yet, as a condition, the mathematics teacher needs to be aware of his/her students' learning difficulties, including disabilities, to bring about desired learning in the students suffering from it through special instruction.

In its general meaning, awareness refers to the knowledge or understanding of the existence of something, or a situation based on information or one's own experience. In this study, the term 'awareness' has been employed to conceptualize the basic schoolteachers' knowledge or understanding of the existence of their students' mathematics learning disability (MLD), specifically dyscalculia, dyslexia, and dysgraphia, based on some information or their experience in the course of teaching and/or being with the students.

In the context of Nepal, the Central Bureau of Statistics (CBS, 2014) has reported that 1.93 percent of the total population has a learning disability. Similarly, as reported by the Ministry of Education (MoE, 2018), 2.13 percent of the

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students of the basic level (grades 5-8) had some kind of learning difficulty. The Constitution of Nepal 2015 has provisioned the right to free and compulsory education at the primary level, and free education for the disabled person up to tertiary education. Likewise, Nepal has adopted the Disability Rights Act and legally envisioned inclusive and undiscriminating education for the disabled. Nepal Disability Rights Act (2017) has made a mandatory requirement for special teacher training to those who educate children with disabilities to ensure access to quality education. It has also focused on developing specialized teachers for managing proper discipline and classroom management. Instead, the report of the national assessment of student achievement conducted by Education Review Office (ERO, 2019) shows that a huge mass of students is at underperforming level, especially in mathematics, and a significant decline in mathematics achievement. As reported by the Department of Education (DoE, 2014), approximately 97 thousand children having disabilities are studying at schools in Nepal while the number of disabled school-age children who are out of school are unidentified. It means that the students who have learning disabilities in mathematics for different reasons are also treated as normal students. Thus, it is necessary that the learners from the primary level and onwards with general as well as specific learning disabilities should be identified and treated with special attention (Ghimire, 2017).

Different forms of learning difficulties are identified in learning mathematics at the basic level. Some of them relate to the fundamental concepts of mathematical terms and difficulties in learning procedures. Similarly, a number of learners have difficulty in certain topics in arithmetic, algebra, or geometry (Chinn, 2015) whereas some others exhibit common difficulties related to numerical and arithmetic deficiencies such as counting and calculation (Hornigold, 2015). Difficulty in mathematics learning is much higher due to environmental factors such as low attendance, lack of practice, poor teaching, poor curriculum, and low standard of mastery (Sharma, 2020). The children with troubles in learning mathematics, too, have a problem in visual-spatial perception resulting in difficulty to handle the problem with the graphical nature (Geary, 2004). Some children have learning difficulties in mathematics involving lagging numbers, confusion in digits, understanding mathematical language, problem-solving and recalling the basic concepts (Courtade et al., 2015; Doyle, 2010). The learners with difficulties in mathematics perform poorly in mathematics; however, such learners are not necessarily mathematical disability sufferers. It is assumed that the cause of innate weakness regarding the mathematical cognition is not caused by environmental or socio-cultural aspects (Soares et al., 2018). Such learners likely experience mathematics to be a frustrating subject and so they suffer from problems related to computation and their application (Chinn, 2015). The majority of such students find mathematics as an irrelevant, boring, and unrewarding subject (Colgan, 2014). Besides, MLD involves language difficulties, problems in following teachers' instruction and applying basic mathematical rules, and inability to understand verbal problems (Hanich et al., 2001).

### *Literature Review*

#### *Mathematics and the Nature of Mathematics Learning*

Mathematics is a very essential and important subject that encompasses numbers, measurement, probability, and algorithms (Nagavalli, 2015). It is mostly used to convey quantitative information in the shortest form meaningfully. Mathematics cannot be separated from the particular cognitive processes in operation whenever we apply our minds to a mathematical task (Sharma, 2020). Many people have mixed feelings about mathematics but the feelings about the subject do not usually exist in an inspiring or exciting way. It is sometimes articulated as a difficult subject that is inaccessible, boring, particularly for cool and engaged people, and girls (Boaler, 2016). Many students regard it as a boring and disengaging subject and they hate it and try to avoid it because of mathematics anxiety (Colgan, 2014). A huge number of students have difficulties in understanding the complex concept of mathematics (Brown et al., 2008). Likewise, several learners have extreme difficulty in learning mathematics (Butterworth, 2003). However, students can learn it better when they are encouraged and guided to develop the habit of thinking by making associations with ideas (Baiduri et al., 2020). Researchers have recommended the occurrence of mathematics difficulties to be at the range of 4 - 7 percent among school-age children (Lewis et al., 1994).

#### *Learning Disability and Learning Difficulty*

The term 'learning disability' generally focuses on the long-lasting and general type of learning difficulty which is related in general to special education (Cappelli, 2018; Lenhard & Lenhard, 2013). It occurs due to genetic and neurological differences in brain structure and function, and affects one's ability to receive, store, process, retrieve, or communicate information (Cortiella et al., 2014; Soares et al., 2018). The children with disabilities participate more frequently but in less varied activities in comparison to the normal children (Sanchez-Ferreira, 2019). It is estimated that mathematical learning disabilities can affect 5-14 percent of the school-aged population (Geary, 2013). Several researchers now accept learning disability as an umbrella term covering a number of learning problems or difficulties. Learning difficulty refers to a difficulty in learning that is situated outside the children but not globally and can be overcome by a little extra support and a proper intervention (Shalev et al., 2005). Learning difficulties are treated as situational, not universal but situated outside the child and resulted from specific causes, mainly such as physical, educational, emotional, or environmental (Kunwar & Sharma, 2020). It is neither disease nor any mental illness, but a

brain condition that affects the sufferer's learning skills, intellectual ability and has some developmental delays (Cortiella et al., 2014). However, if the sufferer gets proper support and intervention, he/she is likely to achieve success. Kunwar and Sharma (2020) conclude that, in the context of Nepal, learning disability must be considered in terms of managerial practices and instructional priority in schools. The common learning disabilities that impact reading, mathematics, and writing are dyslexia, dysgraphia, and dyscalculia (Cortiella et al., 2014) and these three learning disabilities that some students potentially face in mathematics are related to numbers (dyscalculia), reading (dyslexia), and writing (dysgraphia) (Re et al., 2014). Each of the key terms is conceptualized in the texts that follow.

### *Dyscalculia*

The meaning of the term dyscalculia is 'bad or not easy to count' (Berninger & Khing, 2016; Sousa, 2016; Swanson, 2013). It is the arithmetical incapability relating to 'number blindness' or trouble in mathematical calculation (Butterworth, 2005). Because of the inability and inefficient basic mathematical concepts and skills, the learners feel difficulty to learn mathematics (Price & Ansari, 2013). It is a "heterogeneous learning impairment affecting numerical and/or arithmetic functioning at behavioral, psychological, and neuronal levels" (Kucian & Aster, 2015). It is associated with procedural difficulties as well as neurological dysfunction in arithmetical calculation (Sharma, 2020). Thus, dyscalculic people show poor performance only in the arithmetic like specific mathematical operations, not in the non-numeric fields (Siegel & Ryan, 1989; Butterworth, 2010). A recent report calculates the figure in the school children to be about 6 to 8 percent (Sharma, 2020), although in general, it accounts for 6 percent of them (Robert & Sarah, 2014).

### *Dyslexia*

Dyslexia is simply word blindness. It negatively impacts students' learning mathematics by making reading mathematical texts, symbols/digits and facts difficult for them and hampering fluently due to the lack of grasping capacity. It is associated with the difficulties in reading and spelling. The main risk of dyslexia is that it makes the people fail to remember the things' names or to connect their name with the definition. It is often featured as difficulties with correct and/or fluent word recognition and very poor spelling and decoding abilities (Lyon et al., 2003). It is calculated that around 6 percent of the population have dyslexia (Robert & Sarah, 2014). Similarly, Sharma (2020) estimates that 6-17 percent of school-age children suffer from it. People with dyslexia have difficulty in reading with the accurate rate, written expressions and comprehension that is not constant with their cognitive ability. Children having dyslexia generally make mistakes about the place while reading because they can't make sense of a letter or word arrangement, not due to a tracking defect but because of the lack of intellectual capacity (Sharma, 2020). Sharma further claims that word reversal and skipping as a result of language deficits are also the characteristics of dyslexic learners. It is estimated that 40 percent of dyslexic children also face difficulty related to learning mathematics (Pollock & Waller, 1996). Such problems involved in reading lead to problems in mathematics resulting in problems in reading numerical symbols or multi-digit numerals (e. g. 19 is read as 91).

### *Dysgraphia*

A specific type of learning difficulty that affects the learner's written expression is dysgraphia. It is the learning disorder featured by difficulty with handwriting, spelling and thinking and writing simultaneously (Mayo Clinic, 2016). Problems such as spelling, pitiable handwriting and difficulty in logical argument appear in dysgraphic children. It is a language-based learning disability that affects one's capability to generate or writing language, numbers, symbols, and letters in diverse situations (Sharma, 2020). People having dysgraphia can write to some extent, but they find it more problematic than performing other motor skills, such as lacing shoes although it does not affect the other fine motor skills. Dysgraphic people generally have remarkable trouble with handwriting and spelling, sometimes leading to writing fatigue and usually it appears at the early stage of writing (Berninger & Wolf, 2009). Dysgraphic children's handwriting may include reversals, spelling errors, sometimes causing the writing to be unreadable. As cited by Sharma (2020), the occurrence of writing disorders lies in the range of 7-15 percent among school-age children and male students are found as much as 2-3 times more affected than female students.

### *Significance of the Study*

In the context of Nepal, there has been no research, institutionally, about the specific learning difficulties in mathematics, especially difficulties in writing, difficulties in mathematical operations, reading and spelling in mathematics and specifically writing of mathematical language. This kind of difficulty has not been studied or implemented in the related field by the concerned authority. Earlier researchers in this area showed that 47.33 percent of primary schoolteachers have inadequate knowledge regarding learning disabilities (Ghimire, 2017). In general, 5 percent of the teachers had adequate information about mathematics learning disabilities (Moothedath & Vranda 2015). This indicates a huge gap between the realities and the problem. On the other hand, not only have various studies found comparatively low achievements in mathematics at schools (ERO, 2019; Mahato et al., 2019; Panthi & Belbase, 2017) but also the situation is moving towards a rather decreasing direction (ERO, 2017). This also means that the mathematics teachers may have been doing with students having mathematics anxiety and learning difficulties.

Therefore, such a downfall in achievement in mathematics demands for further inquiry pointing to the root of the fact. Contrary to this situation, the most relevant reason frequently pointed out and questioned to low-quality education is mainly concerned with teachers' professional development or teacher's performance (Bakhshi et al., 2017; Carew et al., 2018; El-Saheli et al., 2016). On this backdrop, it is highly necessary to redirect research into students' learning disabilities in mathematics and to develop awareness among the teachers about it so that it can be expected that they improve the situation by implementing the proper strategies to cover their students learning difficulties and maximize their learning outcomes in school (Siregar et al., 2020). So, to address the students' learning difficulties and promote their achievement level in mathematics, it is necessary to investigate the condition of the teachers' awareness towards the students' mathematics learning disabilities from various parameters.

### *Objective of the Study*

The study was set out to investigate the condition of the basic level schoolteachers' awareness of their students' MLD in Nepal, specifically in terms of the place of residence, gender and school type.

### *Hypotheses of the Study*

The study was conducted with the following hypotheses.

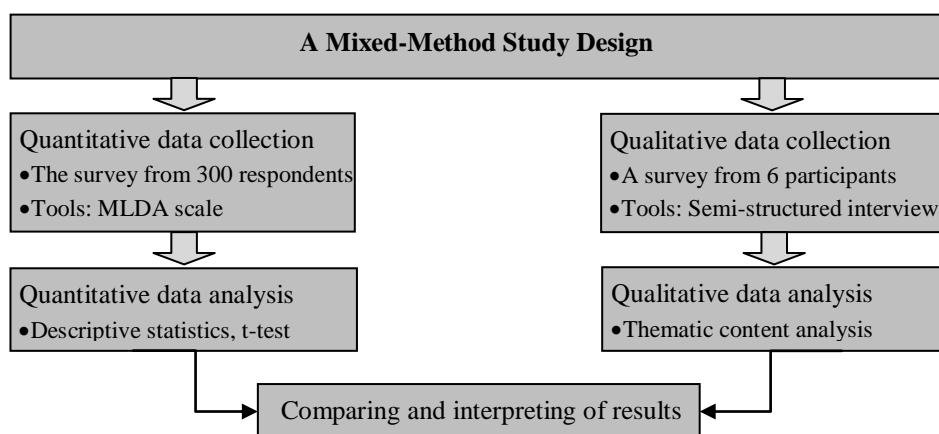
- i) There is no significant difference among the basic level schoolteachers' awareness of their students' MLD, concerning the place of residence.
- ii) There is no significant difference among the basic level schoolteachers' awareness of their students' MLD, concerning gender.
- iii) There is no significant difference among the basic level schoolteachers' awareness of their students' MLD, concerning school types.

## **Methodology**

This study combines both quantitative and qualitative approaches to research. The quantitative approach was applied to the collection of the numerical data from the respondents and for their statistical analysis later. On the other hand, the qualitative approach was used to obtain information from participants through the interview and to analyze the information obtained thus verbally. The study design is presented in greater detail under the following headings.

### *Research Design*

This research followed the mixed-method survey research design. Both quantitative and qualitative methods have been used to gather the data. In the quantitative part of the study, a survey instrument was used to measure the teachers' awareness of mathematics learning disabilities. Similarly, in the qualitative part, a semi-structured interview was employed to investigate the condition of the basic level schoolteachers' awareness towards MLD. The thematic approach was applied to the analysis of the data. Figure 1 displays an outline of the methods used.



*Figure 1. Methodological Design of the Study.*

### *Sample and Data Collection Procedures*

In this study, the sample was drawn from 300 teachers of mathematics teaching at basic level schools locating in Province No. 1, of Nepal. Considering the variation of the geographic structures, languages, ethnic groups, religions, culture, occupation and its unique geographical position and altitude variation, the area of study was categorized as having three main ecological regions viz. the Mountain, the Hill, and the Terai so that the representativeness of the

sample could be established even for the whole country. A total of 150 schools, 50 from each ecological region, were selected. Similarly, 75 schools were selected from municipalities and the same number of them was selected from rural municipalities. In doing so, the stratified random sampling technique was applied. Two teachers were chosen randomly from each selected school. Out of the selected schools, 40 were institutional (private) and 110 were community (government-funded) schools. From the gender perspective, 178 male teachers and 122 female teachers were selected. The demographic information of the selected sample has been presented in Table 1.

Table 1. Descriptive Statistics of the Demographic Variables of Basic Level Schoolteacher

| Demographic Features | Ecological Regions | Mountain Region |       | Hill Region |       | Terai Region |       | Total |
|----------------------|--------------------|-----------------|-------|-------------|-------|--------------|-------|-------|
|                      | Category           | Urban           | Rural | Urban       | Rural | Urban        | Rural |       |
| Age                  | (20-30)Yrs         | 6               | 8     | 8           | 4     | 2            | 2     | 30    |
|                      | (31-40)Yrs         | 14              | 12    | 14          | 16    | 24           | 26    | 106   |
|                      | (41-50)Yrs         | 18              | 24    | 20          | 24    | 20           | 18    | 124   |
|                      | (51-60)Yrs         | 10              | 8     | 8           | 6     | 4            | 4     | 40    |
| Gender               | Male               | 29              | 30    | 31          | 29    | 31           | 28    | 178   |
|                      | Female             | 21              | 20    | 20          | 20    | 21           | 20    | 122   |
| Experience           | (0-5)Yrs           | 3               | 4     | 3           | 2     | 1            | 1     | 28    |
|                      | (6-10)Yrs          | 6               | 6     | 7           | 7     | 11           | 10    | 94    |
|                      | (11-15)Yrs         | 7               | 10    | 3           | 10    | 2            | 6     | 76    |
|                      | (16-20)Yrs         | 4               | 3     | 11          | 3     | 10           | 5     | 72    |
|                      | (21-Above)Yrs      | 5               | 2     | 1           | 3     | 1            | 3     | 30    |
| Qualifications       | SLC level          | 8               | 6     | 12          | 3     | 4            | 4     | 37    |
|                      | Intermediate level | 16              | 20    | 25          | 18    | 27           | 25    | 131   |
|                      | Bachelor's level   | 5               | 6     | 24          | 18    | 20           | 25    | 98    |
|                      | Master's level     | 2               | 2     | 8           | 6     | 12           | 4     | 34    |
| School type          | Community          | 20              | 22    | 18          | 21    | 13           | 16    | 220   |
|                      | Institutional      | 5               | 3     | 7           | 4     | 12           | 9     | 80    |
| Place of residence   |                    | 50              | 50    | 50          | 50    | 50           | 50    | 300   |

Yet, in the qualitative part of the study, six schoolteachers who were not included in the quantitative survey were selected. They were chosen from six different schools purposively considering the ecological regions (the Mountain, the Hill, and the Terai), school type (community/institutional), gender (male/female), and place of residence (urban/rural) so as to represent each of the demographic variables. Likewise, two teachers were chosen from each ecological region. Three teachers were chosen from institutional schools and the other three were from community schools. Similarly, gender representation from each of the ecological regions was also considered. Accordingly, there were three male and three female participants for this part of the study. Thus, a semi-structured interview was used to obtain the qualitative data as per the spirit of the study.

#### Instrumentation

The basic level schoolteachers' awareness towards their students' MLD was surveyed using an MLDA-Scale developed by the researcher. The Scale was developed on the basis of the guidelines given by DeVellis (2017): (a) define the construct, (b) generate an item pool, (c) determine the format for measurement, (d) expert review of the initial item pool, (e) consider the inclusion of validation items, (f) administer items to a development sample, (g) item evaluation, and (h) optimize scale length. While setting the questions for the Scale, the area of MLD was partitioned into six factors. Thus, the Scale, which was developed in parallel with the 5-points Likert type scale ranging from 'strongly disagree' to 'strongly agree' carrying the numerical values 1, 2, 3, 4, 5 respectively, consists of 25 items from six different factors related to MLD. It consists of two parts: the first incorporating the socio-demographic information of the basic level schoolteachers and the second integrating the 25 items covering the six different factors of MLD.

The content validity of the scale was established with the help of two subject experts' reviews considering their consistency in the form of remarks and suggestions about the coverage of the content area and the item consistency in the related field. A pilot survey was conducted with a sample of 20 basic level schoolteachers, not chosen for the study in the sample. After the piloting, some items on the Scale were modified in consideration of the feedback from the pilot study. The internal consistency of the six factors (Cronbach's  $\alpha$  coefficient) was calculated and found in the range from 0.78 to 0.85. Following Brown (2006), a correlation coefficient of less than 0.85 between the factors was considered as good discriminant validity. So, the  $\alpha$  value of the six factors has been found at good discriminant validity in the Scale, correlating in the range from 0.78 to 0.85.

The overall reliability coefficient of the MLDA-Scale (Cronbach's  $\alpha$  coefficient) was found to be 0.85. Because the Cronbach's alpha value higher than 0.7 is regarded as high internal consistency and the values between 0.6 to 0.7 are regarded as satisfactory internal consistency (Streiner & Norman, 2008), the overall reliability coefficient (0.85),

confirms the high level of internal consistency. The six different factors with their corresponding items and Cronbach's alpha value are given in Table 2.

*Table 2. MLD Factors Category and Items Distribution of the MLDA - Scale*

| <b>MLD Factors Category</b>                         | <b>No of Items</b> | <b>Chronbach's Alpha</b> |
|---|--------------------|--------------------------|
| 01 Poor reading and comprehension                   | 4 (1-4)            | 0.78                     |
| 02 Motor disability                                 | 3 (5-7)            | 0.81                     |
| 03 Low organizing numbers & counting                | 5 (8-12)           | 0.84                     |
| 04 Bad handwriting & reversals                      | 5 (13-17)          | 0.79                     |
| 05 Poor remembering of mathematical facts & symbols | 4 (18-21)          | 0.85                     |
| 06 Difficulties in mathematical calculations        | 4 (22-25)          | 0.74                     |

Descriptive as well as inferential statistics were used to analyze the data, using the SPSS Version 22 in particular. The mean of the item responses obtained from the Likert type scale was interpreted using the range of interpretation given in Table 3, adapted from Al-Mutawah and Fateel (2018).

*Table 3. Mean Interpretation Range for Likert's Scale*

| <b>Range of Interpretation</b> | <b>Level of Interpretation</b> |
|--------------------------------|--------------------------------|
| $1.0 \leq M < 1.8$             | Very Low                       |
| $1.8 \leq M < 2.6$             | Low                            |
| $2.6 \leq M < 3.6$             | Moderate                       |
| $3.6 \leq M < 4.2$             | High                           |
| $4.2 \leq M < 5.0$             | Very High                      |

On the other hand, to collect the qualitative data, questions were prepared for the interview. The teachers' awareness was examined by administering the open-ended interview questions. The draft of the interview questions was verified by a research expert. After the approval by the expert, the question was piloted over two of the teachers at the basic level school. After finalizing the question, the interviews were conducted. Considering the six MLD factor categories, six open-ended questions were formed. Thus, with the interview question form in mind, a semi-structured, face-to-face interview was arranged with the six basic level schoolteachers individually in their free time at school. The questions asked in the interview and their answers were recorded as the interview data, and later the record of the interview was transcribed.

#### *Data Analysis Procedures*

The quantitative data were analyzed using the SPSS Software Version 22. Further, descriptive statistics such as mean and standard deviation were used to examine the basic level schoolteachers' awareness towards MLD in terms of the MLD factor categories. The test of Kolmogorov-Smirnov was used for  $n \geq 50$  to check the normality of the data and was found to be normally distributed. The independent sample *t*-test was used to examine the relations of the teachers' knowledge regarding MLD concerning their demographic variables, particularly gender, place of residence, and the school types. Similarly, the qualitative data obtained from the semi-structured interview were analyzed using the thematic analysis approach. The validity of the research value, tools and techniques, and processes including data collection was determined by means of theoretical triangulation. Notably, to overcome the personal bias, the researcher himself had taken part as the interviewer for an effective moderation.

### **Results**

In this section, the collected data and information have been categorized systematically into quantitative and qualitative groups, and presented accordingly. To analyze the qualitative data, descriptive and inferential statistics were used, thereby addressing the objectives and the hypothesis of the study. The descriptive statistics of the socio-demographic variables of the study were calculated. Next, the qualitative data were tabulated and analyzed. Thus, having obtained the materials separately, each result was discussed at a time, and at last triangulation was established with the results from the MLDA-Scale and the interview results.

#### *Results from the Quantitative Data*

The results relating to the basic level schoolteachers' awareness towards MLD obtained from the MLDA-Scale are presented in this section. To address the hypothesis of the study, the descriptive as well as inferential statistics have been presented with a focus on the demographic variables. Moreover, the relationship between the MLD factors and their demographic variables has also been calculated.

Table 4. Descriptive Statistics Relating to Schoolteachers' Awareness towards MLD Factors Categories

| MLD Factors Categories                  | No. of Items | Maximum Score | Factor-wise Mean | Factor-wise SD* |
|---|--------------|---------------|------------------|-----------------|
| 01 Poor reading and comprehension       | 4 (1-4)      | 60            | 1.80             | 1.19            |
| 02 Motor disability                     | 3 (5-7)      | 45            | 2.84             | 1.41            |
| 03 Low organizing of numbers & counting | 5 (8-12)     | 75            | 2.30             | 1.24            |
| 04 Bad handwriting & reversals          | 5 (13-17)    | 75            | 1.97             | 1.10            |
| 05 Poor remembering of facts & symbols  | 4 (18-21)    | 60            | 2.64             | 1.17            |
| 06 Difficulties in calculations         | 4 (22-25)    | 60            | 2.27             | 1.27            |
| Overall mean and SD of MLD factors      |              |               | 2.30             | 1.18            |

SD\*- Standard deviation

In Table 4, the factor-wise mean scores of teacher awareness towards MLD has been presented. The factor-wise mean of each of the categories was 1.80 (poor reading and comprehension), 2.30 (low organizing of numbers & counting), 1.97 (bad handwriting & reversals), and 2.27 (difficulties in calculations). Thus, all of the factor-wise mean scores lie at a low level. As a standard, the mean scores from 1.0 to 1.8 lie at a very low level, and 1.8 to 2.6 lie at a low level (Table 3). Thus, the mean scores show that the teachers' awareness of all of the factors lies at a low level. Only two factors, namely, 'motor disability' (mean 2.84) and 'poor remembering facts & symbols' has (mean 2.64) shown a moderate level of teacher awareness towards MLD. Thus, the overall mean score of the factors (2.30) indicates that the teachers teaching mathematics at the basic level have a low level of awareness towards MLD.

Table 5. Descriptive Statistics of MLD Factors Categories and their Demographic Variables

| MLD Factors                             | Demographic Variables |            |           |             |                |                    |
|---|-----------------------|------------|-----------|-------------|----------------|--------------------|
|   | Urban Mean            | Rural Mean | Male Mean | Female Mean | Community Mean | Institutional Mean |
| 01 Poor reading and comprehension       | 1.82                  | 1.78       | 1.81      | 1.84        | 1.80           | 1.80               |
| 02 Motor disability                     | 2.83                  | 2.85       | 2.81      | 2.84        | 2.86           | 2.81               |
| 03 Low organizing of numbers & counting | 2.29                  | 2.31       | 2.30      | 2.29        | 2.27           | 2.32               |
| 04 Bad handwriting & reversals          | 2.01                  | 1.93       | 2.01      | 1.98        | 2.08           | 1.93               |
| 05 Poor remembering of facts & symbols  | 2.66                  | 2.62       | 2.67      | 2.61        | 2.68           | 2.56               |
| 06 Difficulties in calculations         | 2.20                  | 2.18       | 2.27      | 2.25        | 2.28           | 2.29               |
| Total                                   | 2.30                  | 2.27       | 2.31      | 2.30        | 2.32           | 2.28               |

Table 5 depicts the relationship between the MLD factors and their demographic variables regarding teachers' awareness. The mean scores of the factors 'poor reading and comprehension', 'low organizing of numbers and counting', 'bad handwriting and reversals', and 'difficulties in calculations' in relation to the demographic variables were found at the range of 1.78-2.32, which lies at a low level. Similarly, the mean scores of the factors 'motor disability', and 'poor remembering of facts and symbols' were found at the range of 2.56-2.86, which lies at the moderate level. This shows that, the mean scores of the different MLD factors in terms of each demographic feature were found at a low level. However, there are no significant variations to the means of the MLD factors and each of the demographic variables.

#### Associations of Teachers' Knowledge about MLD in Relation to Demographic Variables

The associations of the teachers' knowledge about MLD concerning their demographic variables types were calculated and tested by using the test statistics, independent sample *t*-test at 0.05, significance level (Table 6).

Table 6. Sample *t*-test of Teacher Awareness and Demographic Variables

| Demographic Variables | N   | Mean | SD   | df  | <i>t</i> -value | <i>p</i> -value |
|-----------------------|-----|------|------|-----|-----------------|-----------------|
| Urban                 | 150 | 3.82 | 0.61 | 298 | 1.892           | 0.059*          |
| Rural                 | 150 | 3.68 | 0.67 |     |                 |                 |
| Male                  | 178 | 3.75 | 0.44 | 298 | 0.193           | 0.847*          |
| Female                | 122 | 3.76 | 0.44 |     |                 |                 |
| Community             | 220 | 3.61 | 0.54 | 298 | 1.031           | 0.303*          |
| Institutional         | 80  | 3.68 | 0.46 |     |                 |                 |

\*  $p > 0.05$ .

As can be seen in Table 6, the mean awareness of the basic level schoolteacher towards MLD by school location (urban, rural), gender (male, female), and school types (community, institutional) are more or less equivalent. The calculated *p*-value on the variables school location, gender, and school type came out to be (0.059), (0.847), and (0.303) respectively where, in all cases, the *p*-value is greater than  $\alpha = 0.05$ . Hence, the hypothesis that there is no significant difference

among the basic level schoolteachers' awareness towards MLD concerning the school location, gender, and school type gets accepted. The results of the above *t*-test indicate that the demographic variables (school location, gender, and school type) have no effect on the teachers' awareness towards their students' MLD. Thus, the null hypothesis (i), (ii), and (iii) that there is no significant difference among the basic level schoolteachers' awareness towards MLD concerning school location, school type, and gender exists.

#### *Result from the Qualitative Data*

The results from the semi-structured interview (Table 7) were obtained by analyzing the data using the conceptual content analysis technique. The teachers who participated in the interview were coded as T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, and T<sub>6</sub>. The question-wise opinions given by the teachers were tabulated at first and then truncated (opinion theme) considering the conceptual content analysis technique for comparisons. The truncated opinions have been listed in Table 7.

*Table 7. Basic Level Schoolteachers' Opinions about their Students' MLD*

| <b>Semi-structure Interview Questions</b>  | <b>Semi- structure Interview Responses (truncated)</b>   |
|--|--|
| 1) What do you mean by mathematics learning disabilities? Please explain.        | T <sub>1</sub> : The students who cannot learn normally as other students due to their physical and mental inabilities are classified as learning difficulties.<br>T <sub>2</sub> : It is mainly due to the mental retardation and physical inabilities, other factors like poor teaching, irregularities of students in the class and home environment are also responsible.<br>T <sub>3</sub> : The child who is not able to learn as an average student and doesn't take interest in learning is classified as learning disabled.<br>T <sub>4</sub> : It is the difficulty to learn and solve the mathematical problems.<br>T <sub>5</sub> : The students who do not know mathematics and always fail in this subject.<br>T <sub>6</sub> : The students who dislike mathematics and feel anxiety towards mathematics.   |
| 2) Do you have any idea about dyscalculia?                                       | T <sub>1</sub> : I have not heard the term dyscalculia, but I fully agree with the fact that some children have an inability particularly in mathematics although they found it normal in all other fields.<br>T <sub>2</sub> : Students who used their fingers for counting to solve simple arithmetic tasks and were confused with simple additions and subtractions.<br>T <sub>3</sub> : I have never heard about dyscalculia. Neither this topic was dealt with in my academic course nor was it included in any professional training.<br>T <sub>4</sub> : The students who are normal in all areas but have a problem in mathematics and they take help of something for the simple arithmetic task of addition and subtraction.<br>T <sub>5</sub> : I have no ideas. I have not heard it before.<br>T <sub>6</sub> : It means calculia ... may be a problem-related to some mathematical calculation.     |
| 3) How does dysgraphia affect students' learning of mathematics? Please explain. | T <sub>1</sub> : It affects the child physically and mentally. This factor cannot be minimized for MLD.<br>T <sub>2</sub> : I fully agree that I have no ideas about dysgraphia. I have not studied yet at the level of bachelor with majoring mathematics.<br>T <sub>3</sub> : It makes students harassment and the children may cause anxiety in mathematics which may result in mathematics learning difficulty.<br>T <sub>4</sub> : It is just like a phobia and effects resulting negative experiences about mathematics it plays a vital role in dyscalculia<br>T <sub>5</sub> : It affects the students in writing. It makes difficulties in spelling and poor handwriting.<br>T <sub>6</sub> : I have no idea about dysgraphia and its effects on students.  |
| 4) What is the concept of dyslexia? Please explain.                              | T <sub>1</sub> : Dyslexia is one kind of learning disability by which students gets a low score in mathematics test.<br>T <sub>2</sub> : I think it is one kind of mathematics phobia that students neither like to solve mathematics problems nor think to do homework.<br>T <sub>3</sub> : Dyslexia is the problem of counting and calculating simple arithmetic tasks and it makes confused the students in simple additions and subtractions.<br>T <sub>4</sub> : I have never heard about dyslexia. This topic neither was in my academic course nor taught in any professional training.<br>T <sub>5</sub> : It is a kind of learning problem so that some children have an inability particularly in mathematics problem solving and calculating but they are normal in all other subjects.<br>T <sub>6</sub> : It is especially the problem of reading, word spell out and comprehension in mathematics. |



Table 7. Continued

| Semi-structure Interview Questions  | Semi- structure Interview Responses (truncated)   |
|---|---|
| 5) How do you treat students suffering from MLD? Please explain.  | <p>T<sub>1</sub>: It is very important to help them to study. They need guidance about what and how to start mathematics. It is also important to develop a positive feeling about mathematics.</p> <p>T<sub>2</sub>: They can be helped through a child-centered learning activity. Like introducing games, using learning materials as a child's needs, child active participation, and encouraging for doing something.</p> <p>T<sub>3</sub>: Storytelling of a successful person after more repeated attempts can be the way. Convincing them that the best results can be achieved with repeated attempts and everybody can successes.</p> <p>T<sub>4</sub>: Encourage at every small learning step and provide extra help and encouragement and use of multimedia for effective learning. Providing a pleasurable feeling atmosphere in the classroom at the time of teaching.</p> <p>T<sub>5</sub>: Making friendly relationships with students in the classroom. Appreciating them for every work and always providing help as they need it. Using child-centered method and materials.</p> <p>T<sub>6</sub>: Providing proper guidance and motivation to the student. Use of child-centered teaching method and materials. Involving in extracurricular activities.</p>  |
| 6) Do you have ever encountered students with MLD in your school? If yes, what are the causes of MLD and the way to deal with the problems? | <p>T<sub>1</sub>: In my school, some students had also problems related to reading, listening, and comprehension skills. I am also bored with teaching them mathematics. I don't have any proper ideas about teaching disabled students.</p> <p>T<sub>2</sub>: No. I have not found any students having learning disabilities. But the student in my class also doesn't try to understand and learn mathematics because they have already full of negative attitudes towards mathematics that mathematics is very hard and they can't do mathematics. These students even think that "I cannot do mathematics. They always keep silent in the classroom.</p> <p>T<sub>3</sub>: No. But in my class, some students always come late, untidy and mismatched with their friends too. S/he doesn't like to talk to each other in the class. I think they have lower self-confidence in mathematics.</p> <p>T<sub>4</sub>: I think, I have not found it till now. My school is located in a remote area and the parents don't come to school even in a meeting. The students in mathematics are very poor and they do not do their homework because of their house workload.</p> <p>T<sub>5</sub>: It may have. Some students are very good at mathematics. I always try to inspire and motivate them by asking a simple question and I try to provide the reward for their every action. I start the lesson with simple and easy problems which they can understand.</p> <p>T<sub>6</sub>: I cannot say anything about it. I have got a bachelor's degree in education with a major in mathematics. I have 10 years of teaching experience, but I have not heard this term in any in-service training yet and even in the academic course. So, I don't have any idea about the cause of disability and way of It has pressured me to learn these terms and I think it is necessary for every basic level teacher in the teaching field.</p> |

The question-wise opinions given by the teachers in the semi-structured interview (Table 7) indicate that most of the teachers somehow knew what mathematics learning was. T<sub>5</sub>, however, had no actual idea of MLD. Similarly, T<sub>1</sub>, T<sub>3</sub>, and T<sub>5</sub> had no idea, not even heard, about dyscalculia yet. T<sub>4</sub> and T<sub>6</sub> tried to answer by guessing the concept of 'dyscalculia' but could not arrive at the right answer. T<sub>2</sub> only had the right answer to the question. Likewise, four of the teachers, excepting T<sub>2</sub> and T<sub>6</sub>, attempted to explain the concept of dysgraphia, although three of them (T<sub>1</sub>, T<sub>3</sub> & T<sub>4</sub>) were limited to guesswork. Only one teacher (T<sub>5</sub>) responded with the right answer in this respect. Regarding question No. 4 (the concept of dyslexia), T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>5</sub> responded with wrong answers. Some of them were also guessing the answer to the question. T<sub>4</sub> said that he had not heard of the term dyslexia before while studying or/and in any professional training course. Only T<sub>6</sub> gave the right answer to the question. All the teachers responded to the right answer to question No. 5 (treatment to MLD sufferers). This indicates that the teachers were found a little aware of the way of treatment for MLD suffering students, but they didn't know the symptoms and cause of learning disability. Regarding question No. 6 (MLD sufferers' problems), the responses were mixed. As they reported, those who had been with MLD sufferers had not paid any special care/attention to them.

To our interest, most of the teachers agreed that most of their students were poor in mathematics and had a negative attitude towards the subject. Only one teacher (T<sub>6</sub>), who was qualified up to the Bachelor's degree in mathematics Education, responded that he had not heard of such terms related to a mathematical learning difficulty or disability in

the academic or even in the training course. He had no idea about the causes and ways of dealing with the problems of MLD.

### Discussion

The results about the basic level schoolteachers' awareness of the MLD category factors achieved by applying the descriptive statistics show that, the teachers' awareness of MLD was at a low level. This indicates that the teachers are operating with a low level of awareness towards MLD. The earlier researchers in this field had found that the majority of the teachers at the basic level had a moderate level of awareness or knowledge about particular learning capability (Alahmadi et al., 2019; Ghimire, 2017; Shari & Vranda, 2016). As stated by Moothedath and Vranda (2015), very few (5 percent) of the teachers had adequate information about learning disabilities, as in this study. This shows that a very small number of teachers had enough knowledge about students' learning disabilities. Similarly, a study conducted in Kerala, India by Basim Ali et al. (2019) found that a large number of teachers had some understanding about the result and dealing with learning disabilities. However, they did not have enough information about the concept and their cause-and-effect relationships. In conclusion, the teachers had no adequate knowledge about MLD to address the real problem of the students in the classroom situation. The results further affirmed the result from Graves' (2018) study revealing that the teachers did not have sufficient knowledge as well as training regarding MLD.

Similarly, the results obtained from the inferential statistics also reveal that the associations of teachers' knowledge about MLD were not significantly associated with the demographic variables, i.e. school location (urban, rural), gender (male, female), and school types (community, institutional). The results obtained from this study corroborate the findings that there was no considerable association between basic level teachers' knowledge about students' learning disabilities and gender, school type, and place of residence (Ghimire, 2017). The research on basic level schoolteachers' MLD concerning school type conducted in Saudi Arabia (Alahmadi et al., 2019), however, stands against the result that the teachers of government schools had a better and statistically considerable level of knowledge about learning disabilities. Inconsistent with Alahmadi et al. (2019) and Paula Sousa et al. (2017), there is no significant difference between male and female teachers' level of knowledge about students' learning disabilities. The cause of the opposite results may be the unequal school facilities, training and teachers' educational qualification and the issues related to teacher education and the training curriculum. Similarly, a study concluded by Acharya (2016) in Arunachal Pradesh, India supports this result concerning the schoolteacher's awareness of dyslexia in that there was no considerable difference between urban and rural teachers of secondary schools. The cause might be rooted into the similarity between the schools in the two countries.

On the other hand, the results obtained from the conceptual content analysis of the semi-structured interview indicated that the basic level schoolteachers' awareness of MLD was poor. Most of the teachers were found to be unaware of the questions related to MLD basic level students. Only a few teachers were aware and some were simply guessing the answers and some of them realized their absence of knowledge regarding the matter. The results corroborate with the results from studies conducted in Kashmir, India, by Arifa and Siraj (2019). They found that most of the teachers (73.3 percent) had moderate knowledge of learning disability, 20 percent of teachers had inadequate knowledge and only 6.7 percent of them had adequate knowledge regarding learning disability on the subject. Similarly, the study conducted in Haridwar, India by Shukla and Agrawal (2015) found that 67 percent of teachers had no knowledge regarding learning disabilities; 20 percent of them had a very low level of awareness and only 11 percent of them had a satisfactory level of awareness concerning learning disabilities. The important fact drawn from the comparison of the quantitative and qualitative results is that results resonate with each other.

It was also found that the demographic variables (school location, school type, and gender) had no effect on teacher awareness towards MLD. Arifa and Siraj (2019) also found that the association of the knowledge of the teachers with gender, a demographic variable, was not significant. Some of the teachers also claimed that they neither got the chance of studying this topic in academic courses nor in any professional training courses. This claim establishes the uniform results achieved from both quantitative and qualitative approaches applied. Thus, in this study, triangulations could be established both theoretically as well as methodologically.

### Conclusion

The study was carried out to find out the status of teacher awareness towards basic level students' MLD. As per the objective, the study attempted to investigate the condition of the mathematics teachers' knowledge, understanding, perceptions and responsibilities to address the MLD issues. Therefore, the results of the study would help to widen teacher awareness toward MLD and ultimately help the teachers to address learners who are suffering from MLD by applying a differentiated developmental teaching-learning process. The earlier researchers in this area indicated towards the deficiency of knowledge and practice of identifying basic level students with MLD and use appropriate pedagogical approaches to suit students' disabilities. In the case of Nepal, there was little research into teachers' awareness towards MLD and classroom pedagogical practices to facilitate students having MLD. The results of this study obtained from descriptive as well as inferential statistics (*t*-tests) provide a clear picture of basic schoolteachers' awareness and their practice to address the MDL issues, which is is very low. This situation raises a genuine question

over the teacher education and training system of Nepal in general. Concerning school location, gender, and school type, the basic level schoolteachers have an equal degree of awareness towards MLD. This justifies that these variables have no effect on the teachers' awareness of MLD, and this level of awareness and existing practices further imply that the basic level students can be observed being at the risk zone of learning mathematics and promoting their mathematics achievement levels. The inadequate knowledge of the teachers regarding student MLD can also impact the learners in creating negative feelings and attitude towards learning mathematics.

This study is important for different strata of people involved in mathematical pedagogy. First, it brings to the fore how effectively the teachers are delivering their classes to the learners at hand. The results, therefore, are expected to help the concerned teachers to plan the best instructional practices as well as to implement the proper intervention strategies for the students with MLD and thus it helps them to think and plan for providing additional student support for their learning and promote their achievement levels so far. This study also enlightens the real situation of the teachers' awareness towards MLD with regard to the place of residence, gender and school type. Importantly, the overall finding is supposed to enforce the concerned educational authority to provide essential support and training to the teachers to strengthen their pedagogical competencies required to teach learners suffering from MLD and rethink mathematics teacher education and training from a novel perspective.

### Limitations

This study had some potential limitations. It assumed that the participants' responses regarding their awareness of students' MLD were unbiased and truthful. The proper representations of the teacher in terms of gender and school type were also limited due to their unequal prevalence. Specifically, in the rural areas of the Hill and the Mountain regions, the numbers of institutional schools and female teachers were both very small. The data used in this study can be limited to the characterization of the whole population due to the diversified nature of the study area by social factors such as geography, economy, culture, ethnic groups, religion, etc. The participation was volunteering-based so that their attention during the survey might have been low, a factor that might have affected the results.

### Recommendations

Based on the conclusion, it is recommended that the basic level schoolteachers in Nepal should be equipped with the wide range of knowledge regarding MLD. Similarly, the students' MLD screening test instrument should be developed by the concerned educational authority and provided to all basic level mathematics teachers so as to manage the problem regarding their MLD awareness so that the real sufferers will ultimately be benefitted. Moreover, it is essential that the basic level schoolteachers are competent to implement an effective intervention technique for the students regarding MLD. It is also recommended that the study could be extended to the broader perspective and a greater sample in terms of districts, schools, and the students from the other Provinces, too.

### Acknowledgment

The research is supported by University Grant Commission (UGC), Nepal. We would like to acknowledge UGC, Nepal for its financial support for the study.

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