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CHAPTER III
RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter deals with the methodology of this study. It comprises of conceptual framework, objectives, hypothesis, study design, sample size, tools used for data collection, statistical analysis and limitations of this study.

3.2 SIGNIFICANCE OF THE STUDY

Diagnostic and Statistical Manual of Mental Disorders (DSM-V, 2013) defines, “Specific Learning Disorder (SLD) is a neuro developmental disorder of biological origin manifested in learning difficulty and problems in acquiring academic skills markedly below age level and manifested in the early school years, lasting for at least 6 months; not attributed to intellectual disabilities, developmental disorders, or neurological or motor disorders. The types of SLD are impairment in reading, written expression, and mathematics. The condition varies in its manifestations and in degree of severity—mild, moderate or severe.

Out of the researcher’s experience of working as an intervention specialist for children with SLD, it was observed that there is still lack of awareness in majority of schools and lots of misconceptions about specific learning disabilities among the school teachers and parents in Tamil Nadu, India. More over in India, many schools promote children until V grade, irrespective of their poor scholastic performance (No-detention Policy, National Policy on Education, Government of India, 2016). Finally, they get detained due to their inability to pass the board examination, which can adversely affect their education, vocation, daily living activities, socialization and self-esteem. Realizing their learning difficulties at that time may not be very effective. Hence, early identification and intervention helps to determine the children’s level of achievement, readiness to advance their academic skills and need for motivation.
Many children, who speak their native language but attend English medium schools, face difficulty because English is a second language. Children in Central Board of Secondary Education (CBSE) are expected to learn three languages (Language Policy, National Policy on Education, Government of India, 2016). Many children with dyslexia struggle to learn other languages because of this language processing problem. The evaluation pattern in most of our schools is also based on memory, so very often children with SLD struggle with retaining and recalling large volumes of information.

Hence, the earlier children with SLD are identified and intervention provided, better are the chances of improving their academic performance. Through intervention, children’s confidence and their inherent strengths can be enhanced at a much earlier stage.

A review of Indian studies by Johnson (2005) stated that learning disabled children often have psychological problems like anxiety, depression, or low self-esteem, other behavioural problems like substance abuse or juvenile delinquency. This could be because of repeated failures they experience as they fight their way through the educational system, which misunderstands or ignores their needs. Children’s academic struggles and failures are often met with disapproval by teachers and peers. Hence, early identification and intervention will help children with SLD to cope better, face life better and therefore make better social and emotional adjustments.

### 3.3 STATEMENT OF THE PROBLEM

This study aims to find out the effectiveness of early identification and early intervention of primary class with Specific Learning Disabilities. This study also aims to understand the level of awareness of SLD among primary school teachers and train them handling children with SLD and to create awareness among the parents of children with SLD.

### 3.4 SCOPE OF THE STUDY

Unlike physical disabilities, Specific Learning Disability is a hidden disability, which is hard to identify until the child enters formal schooling. This is because school focuses on various aspects that may be difficult for the child - reading, writing, and
mathematics, listening, speaking, and reasoning. Poor marks in examinations show that children face learning problems and they are labelled as underachievers. Some children in schools are unable to produce good marks because of their physical or cognitive impairments or behavioural problems. But, many children with normal or above Intelligent Quotient (IQ) could not get good marks. This difference between the children’s good or average intelligence and their poor academic performance is the major concept underlying SLD.

In any regular school a teacher can find children with SLD. It is the duty of the teachers to enhance children with SLD reading and writing skills and comprehension to cope with the latest technological advances and develop analytical skills and draw inferences in order to be able to fully participate in society and obtain jobs in any types of industry.

The teacher with good knowledge and skills of teaching SLD children can handle them better. It is important that the teachers be equipped to identify the children with SLD, teach them using intervention strategies and develop learning materials, apart from giving just guidance and counselling. Early intervention also serves as a guide to the teachers to design intervention programs to meet the specific needs of each student with SLD in an inclusive school.

Considering all the above factors, it is essential for all primary teachers to be well trained to identify and provide intervention to children with specific learning disabilities. If teachers and parents understand and support children with SLD, children would perform well in academics which would lead to positive self-image of themselves.

3.5 OBJECTIVES OF THE STUDY

Children
1. To study the socio-demographic details of the children with SLD in primary school.
2. To study the Academic Readiness skills of the children with SLD before intervention and after intervention i.e. visual discrimination, visual memory,
auditory discrimination, auditory memory, speech and language, visual-motor and basic writing skills and attention.

3. To study the Academic skills of the children with SLD before intervention and after intervention i.e reading, comprehension, spelling, writing and arithmetic skills.

**Teachers**

4. To study the socio-demographic details of the primary school teachers.

5. To understand the awareness of SLD among the primary school teachers before and after the training program.

**Parents**

6. To study the socio-demographic details of the parents of children with SLD.

7. To create awareness about SLD among the parents of children with SLD.

8. To prepare a manual on *Early Identification and Intervention of Children with SLD* to enable school teachers and parents understand the nature of SLD better.

**3.6 HYPOTHESIS**

**Hypothesis framed with regard to Children (Before Intervention and After Intervention)**

1. There is a significant difference with regard to the dimensions of Academic Readiness skills before intervention and after intervention in children with SLD i.e. visual discrimination, visual memory, auditory discrimination, auditory memory, speech & language, visual-motor & basic writing skills and attention.

2. There is a significant difference with regard to the dimensions of Academic skills before intervention and after intervention in children with SLD i.e reading, reading comprehension, listening comprehension, spelling, writing and arithmetic skills.


4. Children who develop good Auditory Discrimination develop good Speech & Language after intervention.
5. Children with SLD who have good Reading skills fare better in the other dimensions of Academic skills after intervention.
6. Better Writing skills increases Arithmetic skills after intervention.
7. When Visual Memory increases Listening Comprehension also increases after intervention.
8. When Auditory Memory increases Reading Comprehension also increases after intervention.
9. Children with SLD who have good Attention fare better in all dimensions of Academic skills after intervention.

Teachers (Before Training and After Training)
10. There is a significant difference with regard to the awareness of SLD among teachers before training and after training.

3.7 RESEARCH DESIGN

The present study focused on 43 children who had Specific Learning Disabilities. The purpose of the research was to study the effectiveness of early identification and intervention program by comparing the performance of children with SLD in academic readiness and academic skills before intervention and after intervention therefore the researcher adopted a quasi-experimental research design with a single group before and after-test design (Ranjith Kumar, 2005).
### 3.8 Conceptual Framework

**Primary school teachers who teach English, Language, Math & Science**

**Parents of children with SLD**

**Children II to V Grade with SLD**

**Parent-Teacher Meeting & Awareness Program**

### Phase I

**School screening & Pre-intervention assessment**

**Pre-training assessment on awareness of SLD**

**Awareness of:**
- General view of Specific Learning Disabilities (SLD)
- Characteristics of SLD
- Early identification and intervention of SLD
- Awareness of CBSE board provisions for students with SLD
- Classroom accommodations & techniques to handle children with SLD

**Academic Readiness skills**
- Visual Discrimination
- Visual Memory
- Auditory Discrimination
- Auditory Memory
- Speech & Language
- Visual-Motor & basic writing skills
- Attention

**Academic skills**
- Reading
- Reading Comprehension
- Listening Comprehension
- Spelling
- Writing
- Arithmetic

### Phase II

**Intervention**
through Individualized Education Program (IEP)

**Intervention Program for the children**

**Training & Awareness Creation**
by developing a Manual on "Early Identification and Intervention of Children with SLD"

**Training Program for the teachers**

**Awareness Program for the parents**

### Phase III

**Post-intervention assessment**

**Follow up Recommendations**

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**PHASE I**

**PHASE II**

**PHASE III**
3.9 UNIVERSE AND SAMPLING

- **Sampling design:** Since a number of stages were involved to select the sample size for children, a multi stage sampling technique was adopted by the researcher.

- **Schools:** There are approximately 14 schools affiliated to the Central Board of Secondary Education (CBSE) in Trichy district, Tamil Nadu. Out of which 5 English medium CBSE schools were selected based on the proximity of the schools in the urban limit (using simple random technique).

- **Children:** Children between 7 and 11 years and studying II to V grade were initially identified on the basis of poor scholastic performance as reported by their teachers (Teacher’s referral sample appended). 92 children out of 848 were found to be below average in their academic performance. Of them, 47 children were chosen after obtaining parents’ consent. These children were screened for sensory impairment and other disabilities and further screened using Brigance Diagnostic Assessment (Albert H. Brigance, 1977) to understand their basic skills. These children were assessed for IQ using Binet Kamat Test of Intelligence (Kamat, 1967) with the help of a recognized Rehabilitation Psychologist. Among them, 43 children had average or above average IQ, then they were further assessed for SLD using NIMHANS index (John and Kapur et al, 1989/1991/2011). The other 4 children were referred for necessary support.

- **Teachers:** Out of 52 teachers, 30 primary class teachers (handling these children who have been chosen for the study) teaching English, Mathematics, Science and Language (Tamil & Hindi) were recommended by the respective principal of the chosen schools, were taken for the training. Therefore, a purposive sampling was used.

- **Parents:** Initially parents of 92 children with poor scholastic performance were invited to come for a parent-teachers meeting at school. They were oriented on why children perform poor in academics, its possible reasons and the way forward. Of them, 47 parents (father or mother or both) gave a consent form to include their children in this study believing that they would be benefitted from
the intervention program. Among them, 43 children were found to suffer from SLD therefore only their parents were contacted further for awareness program and sessions.

**Inclusion Criteria**

- **Children:** primary class children with SLD in the age group of 7 to 11 years at the time of before-assessment, studying in an English medium CBSE school between II to V grade and whose parents were willing to include them in the study.

- **Teachers:** who have completed Bachelor of Education (B. Ed) and specialized in teaching English, Tamil, Math and Science were included in the study.

**Exclusion Criteria**

- **Children:** Children with any other disabilities such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Down Syndrome, Developmental Delays, or the children who are under medications for seizures or attending any other remedial classes were not included in the study.

- **Teachers:** who have attended any orientation program or courses on SLD were not part of the study.

**Ethical clearance**

- Informed written consent was sought from the principal of schools, teachers and parents of children with specific learning disabilities who took part in this study.

- As the researcher is always aware, one must respect the client’s right to maintain confidentiality (VT IRB Policy, 2010). Therefore, as in common practice, no reference had been made to the name of the school, students, teachers and parents.

**Setting**

- Chosen CBSE schools in Trichy district, Tamil Nadu state, India
- PG & Research Department of Rehabilitation Science, Holy Cross College, Trichy, Tamil Nadu, India
3.10 VARIABLES

Independent Variables

Children
- Age, Gender, Grade of study, Mother tongue, Place of residence, Laterality, Types of SLD, Ordinal position, Associated problems observed in the classroom and Number of intervention sessions attended

Teachers
- Educational Qualification, Age, Teaching experience, Subjects taught

Parents
- Educational qualification and Occupation of parents, Annual Income, Type of family, Parental consanguinity and Family history of disability

Dependent Variables

Children
- Academic Readiness skills: visual discrimination, visual memory, auditory discrimination, auditory memory, speech and language, visual motor & basic writing skill and attention.
- Academic skills: reading, reading errors, reading comprehension, listening comprehension, writing, writing errors, spelling, and arithmetic.

Teachers
- Dependent variables related to the teachers were awareness of general view of SLD, characteristics of SLD, early identification and intervention of SLD, awareness of CBSE board provisions for students with SLD and classroom accommodations & techniques to handle children with SLD.

Parents
- Parents’ understanding, Parents’ acceptance and Parents’ participation.
3.11 PHASE I

TOOLS

Class observations and rapport building sessions were conducted before assessing the children to make them feel comfortable and co-operative. They were motivated to answer their best in the assessments.

- **Self-prepared questionnaire (A):** was used to collect the students’ socio-demographic data. It was an interview form that consists of the name of the student, date of birth, age, gender, grade of study, ordinal position, mother tongue, laterality, academic concerns, social and behaviour characteristics of the student, educational qualification and occupation of the parents, annual income, family type, parental consanguinity, birth and medical history of the child and family history of disability. The questionnaire served as a case history and helped the researcher to understand more about the child and their parents’ understanding, acceptance and participation in child’s learning.

- **Brigance Diagnostic Assessment of Basic Skills** (Albert H. Brigance, 1977): A screening device used to assess and evaluate academic performance and to identify learning difficulty in children studying I to V grade. The inventory has a total of 24 items to test readiness, reading, and vocabulary and math concept. The present study adopted to measure only the readiness as given in NIMHANS Psychological Assessment manual which measures colour recognition, visual discrimination, visual motor skills, visual memory body image, gross-motor coordination, identification of body parts, directional/positional skills, fine motor skills, verbal frequency, verbal direction, articulation of sounds, personal data response, sentence memory, counting, alphabets, numeral recognition, number comprehension, recognition and dictation of lower case letters and upper case letters, writing name and numbers in sequence. A score of one point was given for each correct response. A child who was unable to pass items from 19 to 24 considered suffering from learning difficulty and he/she was referred to undergo an IQ test.
- **Binet-Kamat Test of Intelligence** (Kamat, 1967): is the Indian adaptation of Stanford-Binet scale (1934) which is used to assess the IQ level. The test consists of 6 tests at each age level which includes both verbal and performance tests which include vocabulary, language development, comprehension, sentence building, similarities and differences, analogies sentence repetition, auditory perception, social reasoning and visual motor co-ordination ability. It is useful to evaluate the basal age – the ability to pass all the test items at the particular age and the terminal age – the inability to pass any of the items on a particular age level. IQ is calculated by $IQ = \frac{MA}{CA} \times 100$  
  MA- Mental Age,  
  CA- Chronological Age

After the assessment, children who had an IQ of greater than 90 were been considered to have learning disabilities therefore they were further referred for SLD assessment using NIMHANS Index.

- **NIMHANS Index for SLD** (Adopted from NIMHANS Index, John and Kapur et al, 1989/1991/2011): is used for confirming an initial diagnosis of SLD as well as for certification of these children to enable them avail benefits from the State Government of India. This index has high test-retest reliability (0.53) and criterion validity (0.75 and 0.61). It is also used for assessing improvement after remedial intervention. It consists of 2 tests. Academic Readiness skills (Level I) test consists of tests for visual discrimination, visual memory, auditory discrimination, auditory memory, speech and language, visual-motor skills, basic writing skills and attention. Scoring was given based on the correct responses. Each correct response was given a score of one. Academic skills (Level II) test consists of tests of reading and comprehension (English passages of I to V grade levels), writing on a topic, spelling (based on words from reading passage and grade I to V Schonell’s list of words, Fred J Schonell, 1932) and arithmetic test (adopted from Diagnostic Arithmetic test, F. J. Schonell, 1957). Scoring was given based on the number of correct responses given at that grade level. If a child’s performance in any of the academic skills (reading, writing or arithmetic) is more than two grades below the present grade (age appropriate grade) the child is studying, he/she is found to have Specific
Learning Disabilities (SLD). This could be either in reading, arithmetic, writing or mixed learning disabilities. For example, a child of grade V performs appropriately only at grade II level in reading test indicates reading disability.

- **Self-prepared questionnaire (B):** was used to collect the teachers’ sociodemographic data that consists of the name, age, educational qualification, subject specialization and number of years of teaching experience. The questionnaire also contained questions to understand the level of awareness of SLD. This consisted of 25 questions divided under 5 sub dimensions such as i) General view of SLD, ii) its characteristics, iii) Early Identification and Intervention of SLD, iv) Awareness of CBSE board provisions for students with SLD and v) Classroom accommodations & techniques to handle the children with SLD. Each question carried one point. At last, a blank space was given for the teachers to express their viewpoints and feedbacks.

### 3.12 PHASE II

**Intervention for Children with SLD**

- **Individualized Education Plan**
  
  On the basis of pre-assessment scores of the chosen children, intervention program was planned. Individualized Education Plan (IEP) (sample appended) was developed for each child and the targets that were set for intervention was to improve (1) Academic readiness skills such as Visual discrimination, Visual memory, Auditory discrimination, Auditory memory, Speech & language, Visual motor & basic writing skills and Attention (2) Academic Skills such as reading skills, reading and listening comprehension, writing and spelling and arithmetic skills.

- **Grouping of children for intervention**
  
  Though individual characteristic of each child was taken into consideration, intervention was mainly focused in group settings, where all the children were divided into groups-Grade II & III and IV & V. Group Intervention Plan (Sample appended) was used for these groups to record the learning targets and strategies. The close relation and effective communication among children in
the intervention sessions were effectively maintained. They felt more comfortable with their peer group and felt free to give feedback and positive reinforcements among themselves like clapping hands, hand shaking and social praising based on their work done, so their motivational level was found to be high.

- **Schedule of the intervention**
  The intervention program was planned and carried out for 140 sessions in 5 schools using various teaching strategies for academic readiness and academic skills. Each session was for 45 minutes with 3-5 sessions per week. The groups were taken out for intervention sessions after school hours and during school periods (English, Art, Library, Yoga and Music). Children who required one to one support were called during school hours to work on specific academic skills and behaviour expectations. They were counselled and monitored timely.

- **Intervention Strategies**
  The multi-sensory strategies included Phonics-letter sounds (Orton Gillingham & Stillman, 1968), Neurological Impress Method (Heckelman, R.G, 1969) for reading, sight words (Fernald Method, 1943), Consonant-Vowel-Consonant words (Linguistic Approach, Bloomfield & Barnhart, 1942/1961), decoding, syllabification & spelling rules, Cloze procedure for passage comprehension (Bormuth, 1968), every day writing practice (Language based teaching, Newhall, P. W. 2012), math online games and card games for arithmetic skills. Their reading and writing errors were noted down and corrected. Each group was given stars (reward) for their co-operation; they were motivated through social and material reinforcements. Throughout the intervention sessions, they were given feedback on the groups’ performance at the end of the session to correct their mistakes. *The details of intervention strategies is given below.*

- **Resources & Materials for intervention**
  The intervention was developed as games and exercises to increase their interest and motivation to learn academic readiness and academic skills. Words, sentences, phrases and passages were presented to the children in the form of
pictures, flash cards, visual charts, story books and worksheets. The researcher used available school resources, ICT (Information & Communication Technology) materials and also prepared low cost teaching materials. Therapy balls, highlighters, crayons, colour papers, rattles, play links, pencil and pens, books, sand, rice, play cards, maze, abacus, and puzzles were used as teaching learning materials. Information and Communication Technology was used such as Power Points, Smart board, Audio-Visual materials, computers and online games. Timer was used to encourage the children to finish the given task on time.

- **Progress Monitoring**

Monthly tests were conducted to review the children’s performance and to monitor their progress. The outcome of the test was recorded in the Monthly Review Plan (Sample appended) of their IEP. Each student’s Monthly Review Plan was reviewed and the strategies and/or materials were modified as per the needs of the children to ensure their progress.

<table>
<thead>
<tr>
<th>Intervention Strategies &amp; Activities</th>
<th>Materials &amp; Resources used</th>
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<tbody>
<tr>
<td><strong>ACADEMIC READINESS SKILLS</strong></td>
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<tr>
<td><strong>Visual Discrimination &amp; Memory</strong></td>
<td>• Objects, Beads</td>
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<tr>
<td><em>(Adopted from Children’s Occupational Therapy, Calderdale &amp; Huddersfield NHS Foundation Trust)</em></td>
<td>• Puzzle</td>
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<td>• Complete the picture</td>
<td>• Pictures</td>
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<td>• Picture description</td>
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<td>• I Spy</td>
<td>• Activity sheets</td>
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<td>• Differentiating similar and odd patterns, symbols, letters and numbers</td>
<td>• Short Videos</td>
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<td>• Spot the difference</td>
<td>• Newspaper and Magazines</td>
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<td>• One minute observation game</td>
<td>• Online games</td>
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<tr>
<td>• Pattern drawings</td>
<td><a href="http://www.turtlediary.com">www.turtlediary.com</a></td>
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<td>• Book preview</td>
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<td>• Spell check</td>
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<td>• Identifying the missing object</td>
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<td>• Grouping items</td>
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<td>• Sequencing objects, sentences, pictures</td>
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<td>Auditory Discrimination &amp; Memory</td>
<td>Activity sheets with similar &amp; different sounding words and sentences</td>
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<td>• Tongue twisters</td>
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<td>• Odd one out</td>
<td>• Microphone, Earphone, Recorder</td>
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<td>• Chaining Games</td>
<td>• Balloons</td>
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<td>• Story building</td>
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<td>• Differentiating letters and words</td>
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<td>• Learning by heart using audio inputs</td>
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<td>• Drawing as per instruction</td>
<td>• Audio CDs – rhymes, stories, songs</td>
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<td>• Recalling of story, sequence of a sentence</td>
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<td>• Self-correction</td>
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<td>• Writing as dictated</td>
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<td>• Riddles</td>
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<td>• Whisper game</td>
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<td>Speech and Language</td>
<td>Pictures or Objects</td>
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<td>• Talk on a topic</td>
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<td>• Brain storming on a topic</td>
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<td>• Story building</td>
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<td>• Picture description</td>
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<td>• Sharing memories</td>
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<td>Visual Motor &amp; basic writing Skills</td>
<td>Activity sheets</td>
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<td>• Drawing and colouring</td>
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<td>• Scrap work</td>
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<td>• Play using Clay</td>
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<tr>
<td>• Hopping and skipping activity</td>
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<td>• Matching activity</td>
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<td>• Letter &amp; number recognition and writing activities</td>
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<tr>
<td>• Letter tracing</td>
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<tr>
<td>• Joining the dots to form letters and numbers</td>
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<tr>
<td>• Write the letters and numbers in clay or sand</td>
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<tr>
<td>• Copy the letters &amp; numbers from a note</td>
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<tr>
<td>• Write the letters &amp; numbers from memory</td>
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### Attention
- Joining the dots
- Matching the pictures
- Sorting the objects
- Letter, Colour and Numbers cancellation
- Solving puzzles and mazes
- Scrap work
- Drawing and Painting
- Meditation
- Threading beads
- Online video games,
- Listening to story and answer to questions

### ACADEMIC SKILLS

#### Reading skills
- Word to word matching
- Blending
- Syllabification
- Sight words, nouns, phrases, sentence, passage reading
- Words in context
- Read aloud along with the teacher, Reading of stories in groups
- Poems/Rhymes
- Rhyming words
- Reading from left to right for English
- Choral reading
- Word wall
- Tracking
- Identification of letters, both vowels and consonants
- Identification of letters and their sounds (Letter-sound association)
- Decoding and encoding of words using CVC words
  Eg: /p/ + /a/ + /t/ - pat  /m/ + /a/ + /t/ - mat
- Consonant blends including initial and final such as cl-, br-, st-, and –st, -ch, -mp) and Digraphs (ar, or, er, ir etc)

- Activity sheets
- Maze, Puzzles
- Play links
- Timers
- Beads, Play cards
- Building blocks
- Colour balls
- Colouring sheets
- Stationary materials needed for scrap work
- Online games

- Phonics worksheets & Sound cards
- Dolch list of sight words (Edward William Dolch, 1948)
- Activity sheets
- Blends worksheets
- Story books
- Flash cards
- Use of pictures/dolls/objects/activities
- Reading practice books
- Power point presentations
- Text books
- Online educational games
  www.turtlediary.com
- E-books
  www.freekidsbooks.com
  www.firststepreading.com
- Computers
- Encoding units for example /sh/ + /o/ + /p/ - ‘shop’ and decoding units for example ‘Must’- /m/ + /u/ + /st/

**Reading Comprehension**
- Reading stories/passage and retell the content in his/her own words
- Quiz/answer the questions
- Predicting theme/outcome
- Summarize the key points
- Illustrate the passage read
- Fill in the blanks / Choose the best answer
- Matching
- Express his/her opinion about the story/value learnt
- Jumbled sentences

**Listening Comprehension**
- The child listens as the teacher reads and answers questions. He/she can answer orally, in writing or using illustrations.
- Start with one word answers to line sentences and proceed to complex passages.

**Writing skills**  
(Adopted from Rozario et al, 1991)
- Handwriting practice
- Recognition of sentences and its structure – Nouns and verbs
- Simple sentence making
- Picture description – oral and written
- Webbing of simple topics using question words such as what, when, where, why, who, whom, how many, how much, etc.,
- Writing on topics: School, Friend, Football, Picnic, Zoo
- Picture/story/object description
- Analyse passages from books, magazines
- Teach basic sentence structure
- Encourage to write events in the diaries and write letters
- Jumbled words/sentences
- Question & Answers

- Story books
- Practice Makes Perfect grade level comprehension books
- Reading practice books & worksheets
- Audio-videos
- Use of pictures/dolls/objects/activities
- Online educational games www.turtlediary.com
- E-books www.freekidsbooks.com
- Computers
- Newspapers
- Magazines

- Flash cards
- Lined and Square notebooks
- Highlighters, Crayons and colour pencils
- Story books
- Newspapers
- Magazines
- Timers
- Articles
- Writing guide
- Typing game
- Worksheets
- Writing Practice books
- Online educational games www.turtlediary.com www.k12reader.com
- Computers
- Story writing
- Redraft the story/passage in his/her own words
- Writing/copying skills (punctuation, spatial orientation, speed of writing)

**Vocabulary** (Jerome Rosner, 1993)
- Word within word
- Word to word matching
- Picture to word matching
- Puzzle activity
- Boggle word game
- Use new words in sentences
- Generate more ideas about the word
- Use of pictures/objects/actions represents the word
- Use of contextual clue
- Synonymous/Antonymous of words
- Use of dictionary

**Spelling skills**
- Teach basic alphabets
- Letter Sound association
- Sight words
- Blending
- Syllabification
- Rhyming
- Visualization
  (Colour coding/Underlining/Increasing font size)
- Crossword
- Word Search puzzles
- Mnemonics techniques
- Word sorting
- Word building
- Word shapes & word boxes
- Dictation of words
- Spelling rule
- Encourage to maintain spelling book
- Online computer activity
- Grouping words based on the Structure of the word – prefixes, suffixes, root words
- Multi-sensory method

**Use of pictures/dolls/objects/actions**
- Lesson organizers –
  Writing web, mind map, Venn diagram

**Phonics worksheets & Sound cards**
- CVC work sheets
- Blends worksheets
- Story books
- Work sheets
- Rhymes & Songs
- CDs and Power point presentation
- Typing game
- Word scrabble
- Flash cards
- Word bank
- Spelling rules
- Online educational games
  www.turtlediary.com,
  www.jollyphonics.com
  www.howmanysyllables.com
- Words work book
- Look-say aloud- cover-write-check
- Use kinaesthetic prompt to trace the letters while writing spelling
- Repetition and regular practice
- Writing on sand, in the air, on the table

**Arithmetic**  
(Jean Piaget & Inhelder 1969)  
- Card games for basic mathematical operations  
- Practice math key words  
- Concrete, Semi concrete an then Abstract level math concept teaching  
- Board Games with dice  
- Adding and sorting objects  
- Math Quiz  
- Counting activities – skipping, climbing stairs, counting coins  
- Visual style – pictures, charts, highlighters, colour coding, square and lined note books  
- Use of Abacus  
- Snake and Ladder game  
- Online games  
- Use of symbols and its meanings  
- Use of calculator to check the answer, proof reading and self-correction  
- Enactment  
- Constant rehearsal of multiplication tables and formulae using rhymes and fingers

- Play cards  
- Practice worksheets  
- Math key terms charts  
- Math symbol charts  
- Math Online Quiz  
- Abacus  
- Marbles, Dice, Beads, Building blocks, sticks and objects  
- Snake and ladder chart  
- Calculator  
- Colour highlighters  
- Note books  
- Online games  
  - www.k12reader.com  
  - www.turtlediary.com

**Training program for primary school teachers**

The training program for 4 days of 6 hours each day was conducted for the primary school teachers on “Early identification and Intervention of Children with SLD in the general classroom”. Feedbacks received from the teachers. The teachers observed the intervention sessions that was given to the children with SLD. They were empowered to implement the intervention strategies for children with SLD (Training program PowerPoint presentation is appended).
• **Awareness program for parents of children with SLD**
  
  An awareness program was conducted for the parents of children with SLD to make them understand their children’s difficulties and to encourage them to co-operate and participate in their children’s learning (Awareness program PowerPoint presentation is appended).

• **A manual for teachers and parents**
  
  Developed a manual on *“Early Identification and Intervention of Children with SLD”* to enable school teachers and parents understand the nature of SLD better (Manual is appended).

3.13 **PHASE III**

**DATA COLLECTION AND ANALYSIS**

The students’ performance scores were calculated before intervention and after intervention with the chosen tools and analyzed using Statistical Package for the Social Sciences (SPSS). The level of awareness of SLD among the primary school teachers was evaluated before training and after training. Suggestions were given to teachers and parents for further follow up of the children with SLD (Sample appended). The actual findings of the study were depicted in the form of tables and figures.

**STATISTICAL MEASURES APPLIED**

The statistical design comprised of the frequency distribution mean, standard deviation, ‘t’ test, paired ‘t’ test, chi-square, Karl Pearson’s co-efficient of correlation and inter correlation matrix.

• **Paired ‘t’ test**

\[
  t = \frac{\bar{d}}{\sqrt{\frac{S^2}{n}}} = \frac{\sum d}{\sqrt{n(\sum d^2)-(\sum d)^2/n-1}}
\]

\[d= \text{Mean difference between two samples}
\]
\[S^2 = \text{Sample variance}
\]
\[n= \text{Sample size}
\]
\[t= \text{Paired sample t-test with n-1 degrees of freedom}\]
A paired sample t-test was used in this study to compare children’s academic readiness and academic skills before intervention and after intervention. This test was applied to compare the teachers’ awareness with regard to SLD before and after the training program.

- ‘t’ test

\[
t = \frac{X_1 - X_2}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}
\]

\(X_1\) = Mean of group 1
\(X_2\) = Mean of group 2
\(S_1\) = Standard Deviation of group 1
\(S_2\) = Standard Deviation of group 2

In this study, ‘t’ test was used to find out the extent of variance between gender, mother tongue, and place of residence of children with SLD with regard to the dimensions of academic readiness and academic skills.

- ‘f’ test (One way analysis of variance)

\[
f = \frac{S_B^2}{S_W^2}
\]

\(S_B^2\) = Sums of squares between groups
\(S_W^2\) = Sums of squares within groups

The ‘f’ test was used to find out the variance with in groups and the variance between groups namely the grade of study and the dimensions of academic readiness skills.

- Chi square (\(X^2\))

\[
\sum \frac{(O - E)^2}{E}
\]

\(O\) = Observed frequency
\(E\) = Expected frequency
The chi-square was used to study the degree of association between independent and dependent qualitative variables – grade of study and the dimensions of academic skills.

- **Correlation**

\[
\sum \frac{Exy}{\sqrt{\sum x^2 \times \sum y^2}}
\]

\[
\bar{X} = \text{mean } \sqrt{\sum x}
\]

\[
\bar{Y} = \text{mean } \sqrt{\sum y}
\]

Where \( x = (x - x) \) \( \bar{y} = (y - \bar{y}) \)

Karl Pearson’s co-efficient of correlation is used to find out the relationship between independent and dependent variables, quantitative in nature. It can indicate the direction of the independent and dependent variables. In this study, this test was used to find out the extent of relationship between age of the children and the dimensions of academic readiness skills and academic skills.

### 3.14 DEFINITION OF TERMS

(Adopted from Jaquie Buttriss & Ann Callendar 2010 and Onita N, 1996)

- **Academic skills**: refer to a student's ability to perform age-appropriate school activities related to writing, reading, and mathematical problem-solving. In this study it includes reading, reading comprehension, listening comprehension, spelling, writing, and Arithmetic.

- **Academic readiness skills**: is the grade to which a student is prepared for further learning experience. In this study it includes visual discrimination, visual memory, auditory discrimination, auditory memory, speech and language, visual motor & basic writing skills and attention.

- **Age**: The child’s age in years at last birthday. The child’s age was calculated and mentioned in the pre and post assessment sheet.
• **Arithmetic**: Arithmetic is the act of calculating numbers and addition, subtraction, multiplication and division.

• **Assessment**: is a test or process to identify initial indicators of a disorder in a particular person or in people in general.

• **Attention**: refers to the ability to concentrate. It is the cognitive process of focusing on a selected stimulus while ignoring other things in the environment.

• **Auditory Discrimination**: refers to the difficulty in perceiving differences between speech sounds and blending these sounds into meaningful words, which affects reading and speaking skills.

• **Auditory Memory**: refers to the ability to retain information which has been presented orally.

• **Auditory learning style**: Children who are auditory learners do best when they are involved in speaking and listening tasks.

• **Awareness**: refers to a consciousness of internal or external events or experiences. A person with awareness would likely be able to report on his or her internal and external states.

• **Comprehension**: is the level of understanding of a text/message by reading and/or listening.

• **Counselling** allows children and young people time to discuss their problems and concerns.

• **Buddy systems** are used by schools, trained peers support the needy children in reading, and taking notes during class hours and break times.

• **Diagnostic Statistic Manual of Mental Disorders (DSM)**: is the manual used by clinicians and researchers to diagnose and classify mental disorders developed and revised its 5th edition in 2013 by The American Psychiatric Association (APA).

• **Decoding** is the process of identifying phonemes in words and blending them to read the words.
- **Developmental delay**: describes children who have not mastered the skills expected for their age. Developmental delays can be across a range of areas - social, emotional, physical, intellectual and self-help skills. The term can also be used when describing difficulties experienced by children with severe sensory, congenital or mental conditions.

- **Differentiation** requires teachers and teaching assistants to adapt the curriculum to meet the individual learning needs of pupils.

- **Etiology/Causes**: The causes or origins of a disease.

- **English as a Second Language (ESL)**: The teaching of English to children who speak a different language and who live in a country where English is the main language spoken.

- **Grade of study**: The current class/standard/grade the child is studying. The grades are mentioned in Roman numbers in this study such as grade 1 as I, 2 as II, 3 as III.

- **Grammar** is about organizing words into sentences using the correct grammatical word structure.

- **Group Intervention Plan**: Group targets are set for a group of children who have similar learning difficulties.

- **IDEA, 1990**: The Individuals with Disabilities Education Act (IDEA) is an American legislation that ensures children with a disability are provided with Free Appropriate Public Education based on their special needs. It was previously called as the Education for All Handicapped Children Act.

- **Inclusion** is about creating an appropriate learning environment for all children.

- **Individualized Education Plan (IEP)**: A program designed by a special educator or profession of experts for children with SLD. It includes assessment findings, strengths of the child, goals to achieve and intervention strategies. Their progress monitored through monthly intervention plan attached to IEP.

- **Intelligence Quotient (IQ)** is a theoretical construct used by psychologists within standardized tests as a means of describing
one's intelligence level. Children with SLD in inclusive schools and who had an IQ of greater than 90 have been considered to have Specific Learning Disabilities for the purpose of the study.

- **Intervention**: is any activity/strategies used to bring about change in students.

- **Kinesthetic learning style**: Children who are predominantly kinesthetic learners do best when they are actively involved in practical tasks that rely on the use of movement and touch.

- **Laterality**: The unconscious use of one side of the body over the other for certain functions such as writing, eating, and movement. It is also known as handedness-right or left.

- **Math disability (ICD-10 and DSM-IV) / dyscalculia**: involves difficulties such as learning math concepts such as place value, time, difficulty memorizing math facts, difficulty organizing numbers, and understanding how problems are organized on the page.

- **Mind-mapping**: is a technique used to help pupils organize known information or ideas visually in order to understand how new knowledge is or could be related.

- **Mnemonics**: is a strategy to help learners remember important facts using prompts, initial letters and clue sentences.

- **Multi-sensory**: is a method of learning where activities are designed to enable pupils to learn by using two or more senses together.

- **Phoneme**: is a single speech sound. It can be represented by a grapheme (see above) of one or more letters.

- **Phonological awareness skills**: The ability to hear and recognize sounds in spoken words.

- **Reading disorder (ICD-10 and DSM-IV) / dyslexia**: is the most common learning disability. Of all children with SLD, 70–80% have deficits in reading. A reading disability can affect any part of the reading process, including
difficulty with accurate word recognition, or both, word decoding, reading rate, oral reading with expression, and reading comprehension.

- **Reading**: is a cognitive process of decoding symbols to derive meaning from text.

- **Response to Intervention (RTI)**: involves early identification of children who are at risk for learning problems. Result based interventions are conducted and closely monitored the children with learning difficulties through 3 tier system as follows i) with in classroom instruction and quality teaching, ii) pull-out sessions or small-group instruction, and iii) individual support or intensive special education.

- **Self-esteem**: defines how positively or negatively children perceive themselves within their environment. We can classify this as high or low self-esteem.

- **Self-concept**: is the perception of children involving their attitudes, feelings, and knowledge about their skills, abilities, appearance, and social acceptability.

- **Sight words**: Words that children can recognize as whole words on sight.

- **Specific Learning Disabilities (SLD)** by DSM V: is a neuro developmental disorder of biological origin manifested in learning difficulty and problems in acquiring academic skills markedly below age level and manifested in the early school years, lasting for at least 6 months; not attributed to intellectual disabilities, developmental disorders, or neurological or motor disorders. The types of SLD are impairment in reading, written expression, and mathematics. The condition varies in its manifestations and in degree of severity-mild, moderate or severe.

- **Speech and Language**: Speech refers to the communication or expression of thoughts, desires and intentions via spoken words. Language is a means to communicate messages, verbally or non-verbally.

- **Spelling**: is the ability to spell those specific words needed for written communication.

- **Sound blending**: The ability to blend phonemes into whole words.
• **Teaching strategies**: refer to methods used to help children learn the required skills, the desired course contents and be able to develop achievable goals in the future.

• **Universe**: The collection of all units of a specified type in a given region at a particular point or period of time is termed as a universe.

• **Visual Discrimination**: refers to the ability to detect similarities and/or differences in materials which are presented visually.

• **Visual Memory**: refers to the ability to retain information which is presented visually.

• **Visual Motor integration**: is the ability to draw or copy forms or to perform constructive tasks integrating both visual perception and motor skills.

• **Visual learning style**: Children who are visual learners achieve their best when they are involved in tasks using written language and visual materials.

• **Word recognition**: The ability to read or pronounce a word, without necessarily understanding its meaning.

• **Writing**: is a form of communication that allows children to put their feelings and ideas on paper, to organize their knowledge and to express meaning through well-constructed text.

• **Written Disorder (ICD-10 and DSM-IV)**: Disorder of Written Expression / dysgraphia is writing skills that fall substantially below those expected based on the individual's chronological age, measured intelligence, and age appropriate education, (Criterion A). This difficulty must also cause significant impairment to academic achievement and tasks that require composition of written text (Criterion B), and if a sensory deficit is present, the difficulties with writing skills must exceed those typically associated with the sensory deficit, (Criterion C).

**3.15 PROBLEMS ENCOUNTERED BY THE RESEARCHER**

The researcher faced difficulty in the initial phase for getting permission from schools to observe the children and meet their parents. Intervention program was
conducted at five schools so it was time-consuming. The parents had to be made to assemble in the schools at a particular day and time for parent-teachers meeting. But not all parents came as specified, so the researcher had to then make more visits to meet them in school.

3.16 LIMITATIONS OF THE STUDY

1. The tests used for educational assessment were administered to children attending only English medium schools because these tests are not available in Tamil language.

2. The present study targets children with SLD who attend only CBSE schools in Trichy located only in the urban limit.

3. The present study included only children with SLD whose parents gave consent on behalf of their children.