Research Paper

Effects of Certain Reading Strategies on Children with Reading Disabilities

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ABSTRACT

Learning disability and their remedial services are quite relevant issues in India. Since the last few years, awareness about the issue is being discussed across various schools in Kerala. Except a few provisions during examination, neither the Ministry of Education nor the school authorities has made any attempt to integrate or meet the need of disabled ones in the regular school system. The purpose of this study was to determine the effect of reading strategies to remediate reading deficits in learning disabled children. A total of seventy-two (72) students were identified as reading disabled which is equally distributed into control and experimental groups. The ANOVA examines the mean difference in the reading skills of LD students before and after the intervention program. The most significant finding of the present study was that there exists a significant difference in the reading skill of auditory, visual and applied learners after using the learning strategies.

Key words: Learning strategies, reading skills, learning style, learning disability, dyslexia, dyscalculia, dysgraphia, intervention strategies, learning style.

INTRODUCTION

Reading is a complex process which involves many cognitive activities. A child with learning disability experiences multiple difficulties in the reading process and thus makes remediation a big challenge. According to Hoover and Gough (1990), three basic group of reading disabilities were identified. They are children with decoding difficulties (developmental dyslexia), children with language comprehension problem and some students experience both decoding and comprehension difficulties. Early diagnosis and proper remedial measures are important to overcome these difficulties. Neurological and cognitive assessments are suggested to diagnose such difficulties and plan for appropriate remedial intervention (Hale and Kaufman, 2006).

This paper focuses on one of the sub-type of learning disability, which is dyslexia. Within the broader frame work of LD, several subtypes are seen. They are Dyslexia: children with reading difficulties; Dysgraphia: children with writing problems; Dyscalculia: children with difficulties in understanding mathematics concepts and Dysphasia, which is the inability to learn and understand language. It is estimated that about 60% of children diagnosed as learning disabled have specific reading disability (Wong, 1996). Children with learning difficulties face a host of non-academic and academic difficulties.

“Early identification may be the most crucial factor influencing the eventual school success of children with learning disability” (Koegh, 1977). A student or an adult with learning disability can achieve up to his or her full potential if he or she is taught using appropriate techniques designed to meet their learning style and educational need.

It should also be noted that there has been evidence on educational interventions focusing on developing phonological skills and linking phonological units of language (phonemes, word segments and words) to the corresponding written units can improve the word decoding and reading skills of children with reading disabilities (Ehri et al., 2001; Elbro and Petersen, 2004). One of the highlights of this study is learning strategies used to remediate the reading skill deficit in LD children which was chosen based on their corresponding learning...
style.

Learning style is an individual behavior, temperament and attitude in a learning situation. Some of the best-known learning styles are visual, auditory, applied or kinesthetic. Some experts argued that it is important to match an individual’s learning style with the style of instruction to make learning easier and effective. For example, an individual with a strong visual learning style should be taught to read with emphasis on the shapes of words.

There are many learning styles, but none are either ‘right’ or ‘wrong’. Although, a student may prefer one style over another, preferences develop like muscles and the more they are used, the stronger they become. Successful students have flexible and integrated learning styles. No one uses one of the styles exclusively and there is usually significant overlap in learning styles.

Visual learners relate most effectively to written information, notes, diagrams and pictures. Typically, they will be unhappy with a presentation where they cannot take detailed notes. Visual learners tend to be more effective in written communication. They make up about 65% of the population.

Auditory learners relate most effectively to the spoken word. They tend to listen to the lecture and then take notes afterwards, or relay on printed notes. Auditory learners make up about 30% of the population.

Many studies have been done across the world to check the effectiveness of reading strategies on improving the reading skill deficits in learning disabled children. Due to lack of proper research evidences in Kerala, it is quite difficult to convince parents on the effect of remedial education services which is offering in various LD centers. Even the educated parents are not having enough patience to complete an Individualized Educational Program (IEP), they all need immediate cure for their child’s learning problems, showing interest in only a quick fix solution to a complex challenge. A very few parents are willing to support their child in the class room as shadow teachers. Sensitizing the need of evidence based treatment programs the researcher identified some effective reading strategies which match the student’s learning style. These learning strategies were systematically used to train the child to remediate their skill deficits. This is developed as a program and more details are explained in the methodology.

The objective of this study is to compare the effectiveness of intervention strategies and techniques over nil treatment on academic skills of learning disabled children in terms of reading skills.

LITERATURE REVIEW

Dyslexia

“Everybody is a genius, but if you judge a fish by its ability to climb a tree, it will live its whole life thinking it is stupid.” - Albert Einstein.

Dyslexia is a term coined by Rudolf Berlin of Stuttgart, Germany in 1887. This is probably the most widely used form to describe a child who is unable to read. He found that 85 to 95% of all learning disabled children have reading problems, which does not have any biological basis and can be effectively remediated (Kolson, 1978). ‘Dyslexia is a disorder in children who despite conventional classroom experience failure to attain the language skills of reading, writing and spelling commensurate with their intellectual abilities. Dyslexia is described as having a neurological basis (International Dyslexia Association, 2002) and is difficult to remediate’.

Studies related to the effect of reading intervention strategies

A few studies related to the effect of reading interventions were further discussed. Lovett et al. (2012) implemented reading intervention designed on PHAST PACES which teaches word identification strategies, knowledge of text structures and reading gains on standardized tests of word attack, word reading, passage comprehensive experimental measures of letter sound, knowledge and multi-syllabic word identification enable experimental group to improve their learning than to control group students.

Bulkley et al. (2012) in this study assess the model, lead and test (MLT) procedure on the letter name and sound identification performance for two elementary students. The participants were diagnosed with learning disability in mathematics, reading, writing and communication. The study took place in a resource classroom located in a public school in the Pacific Northwest. A multiple-baseline across letter sets was employed to assess the effectiveness of the model, lead and test procedure. The behaviour measured was correct letter name and sound identification. The results showed mastery of all letters of the alphabet by the participants when the model, lead and test procedure was employed. The present outcomes replicate those of previous research and were easy to implement and assess by the classroom personnel.

Targeted reading intervention is a coaching model to help classroom teachers with struggling readers. The study of William et al. (2005) examined the effectiveness of a classroom teacher intervention and the Targeted Reading Intervention (TRI), in helping struggling readers in the kindergarten and first grade. This intervention used bi-weekly literacy coaching in the general education classroom to help classroom teachers use diagnostic strategies with struggling readers in one-on-one 15-min sessions. Five schools in low-income rural counties were randomly assigned to the experimental or control group. Five struggling and five non- struggling readers were randomly selected to participate in each experimental and
control classroom. There were 34 classrooms and 276 children. Experimental children achieved better gains in letter-word identification than did the control children. Significant interactions were found with word attack skills.

Children in the experimental group with poor rapid naming and better phonological awareness skills were more progressive as compared to the control group. The TRI appeared to be a promising classroom teacher intervention to help young struggling readers.

A study was conducted by Stefan et al. (2002) on the effect of intervention strategies on the reading skills of children with reading disabilities in Grade 2. The interventions consist of computerized training programs. One bottom of intervention aimed at improving word decoding skills and phonological abilities, the second intervention focused on top down processing on the word and sentence level, while the third was a combination of these two training programs (N=25 in each group). In addition, there were two comparison groups, 25 children with learning disabilities who received ordinary special instruction and with the age group of 30 matched typical readers. All reading disabled participants completed 25 training sessions with special teachers. All groups improved their reading skills. The group who received combined training showed higher improvement than the ordinary special instruction group and the typical readers. Different cognitive variables were related to treatment gains for different groups. Thus, a treatment combining bottom up and top down aspect of reading was the most effective in general, but individual differences among children need to be considered.

The study on reading interventions with varying instructional emphasis for fourth graders with reading difficulties investigated the relative effects of three treatments with varying instructional emphasis in reading with a comparison condition. Eighty-seven (87) students in fourth grade with reading impairments were assigned through stratified random assignment to one of four conditions: (a) comprehension emphasis, (b) word study emphasis, (c) emphasis of either comprehension or word study based on the student’s pre-test reading profile, or (d) school-provided intervention comparison condition. Students in the three researcher-provided treatments received intervention in small groups with a trained tutor for 30 min daily for approximately 28 weeks. Results revealed no statistically significant main effects between conditions on measures of word reading, fluency, vocabulary or comprehension. Students with limited English proficiency performed significantly better at post-test in all conditions than other students. Discussion addresses the challenges of successfully remediating reading problems with older students with significant reading problems (Hillari and Francis, 2002).

All the aforementioned studies established the effect of various reading programs to remediate academic skill deficit in children with reading disabilities. Here, the investigator selected the strategies like Fernald method, visual imaginary, letter sound correspondence and automatic word recognition, story retelling, think pair share, neurological impress method and identified their matching learning style. Based on their learning style, these strategies were selected and the present study hypothesized the following:

**Hypotheses**

H1: There is a significant difference in the reading skill of visual learners after using the learning strategies, Fernald method, visual imaginary, letter sound correspondence and automatic word recognition.

H2: There is a significant difference in the reading of auditory learners after using the learning strategies, Fernald method, visual imaginary, letter sound correspondence and automatic word recognition.

H3: There is a significant difference in the reading of auditory and applied learners after using the learning strategies, story retelling, think pair share, neurological impress method, and letter sound correspondence.

**MATERIALS AND METHODS**

The current research study was experimental in nature. A "Two group Pre-test- post-test non-equivalent group design" (Table 1) was used in this study. In such a design, a double test group was selected and the dependent variable measured for both before and after the introduction of the treatment. The dependent variable is measured for both groups. The effect of the treatment would be equal to the academic achievement level of the students after the treatment minus the academic level of the students before the treatment that is, the difference in the measurement of dependent variable, if any, is computed and taken as the amount of change as a result of the application or treatment variable.

<table>
<thead>
<tr>
<th>Group (LD children)</th>
<th>Pre-test</th>
<th>Treatment</th>
<th>Mid test</th>
<th>Treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group = E (R)</td>
<td>O1</td>
<td>X</td>
<td>O2</td>
<td>X</td>
<td>O3</td>
</tr>
<tr>
<td>Control Group = C (p)</td>
<td>O1</td>
<td>-</td>
<td>O2</td>
<td>-</td>
<td>O3</td>
</tr>
</tbody>
</table>

R= Random assigned group; O1, O2, O3 = Pre-test, mid-test and Post-test and X = Treatment.
The researcher randomly assigned participants to experimental and control groups. Only the experimental group was administered with the treatment along their regular class room teaching. The experimental group was also called the variable group and the group in the experiment that gets the independent variable. In this study, the experimental group were Group A (N=36) who gets the remedial intervention program.

The control group is the group in the experiment that does not get the independent variable. The control group will be used as a comparison in order to figure out what kind of effect the independent variable had on the results. The control group (N=36) is ‘Group B’ who was attending only regular class room instruction and not getting any additional help.

Students with reading difficulties from the classrooms were identified through a two-step screening process and the remedial education program started during the third phase:

1) Class teachers were given the learning disability checklist to identify students with learning problems;
2) These nominated students were screened for inclusion using the NIMHANS index of learning disability to measure their reading. Learning style inventory used to find out their dominant learning style;
3) The remedial instruction covered in this study took place for a period of 14 weeks. The students attended the program for a 50 min session for 5 days weekly after the school hours. The first week was utilized for taking down the case history and giving pre-test. Those who did not complete both the pre-test and post-test were not considered for the data analysis.

Learning strategies are tools and techniques used to help ourselves understand and learn new material or skills. All the learning strategies are not suitable for learning disabled child. Some strategies works well with some students, but does not work with other students of same disabilities. The researcher made modifications in the procedure to meet with the participant students’ needs. The strategies were modified in the simplest and easiest way for teachers to teach and students to follow. The following strategies were planned and implemented for the remedial education program.

**Teaching letter sound correspondence**

The teaching of letter names and letter sounds employs association between visual, auditory and kinesthetic inputs. Each new sound-symbol relationship or phonogram is taught by having the students make three associations.

Students learn to first associate the written letter with the letter name followed by the letter sound and the oral sound with the name of the letter. Students also learn words using the same association.

**Automatic word recognition**

Automatically recognized high-frequency and less phonically regular words, regardless of their letter sound predictability, words need to be taught so that they are automatically recognized. 200 most frequently occurring words were listed to do this practice. With struggling readers the teacher should first teach the words that students encountered more frequently.

**Neurological Impress method**

This approach uses a system of union reading, whereby the student and the teacher read aloud simultaneously at a rapid rate. If the student is not comfortable in reading along with the teacher, they are assigned with a peer buddy.

The disabled reader is placed slightly to the front of the teacher with the student and the teacher holds the book together. As the student and the teacher read the material together, the teacher’s voice is directed into the student’s ear at close range.

**Fernald method**

Fernald (1943) believed that most spelling approaches were useful for the extremely visual student. Poor spellers are characterized as having poor visual imagery, and many may need to be taught through multisensory approaches.

**Visual imagery**

Visual imagery is a learning technique for visual learners, where the students imagine or visualize the learned material to enhance their memory and comprehension (Berninger et al., 1997).

**Story retelling**

Story-retelling strategies provide students with a frame work for retelling the key points of narrative texts. Here, the students have to read small printed stories together and the students who recollect the whole stories get the reinforcement.

**Think pair share**

Think-pair-share (TPS) is a collaborative learning strategy in which students work together to solve a problem or answer a question about an assigned reading. This
technique requires students to (1) think individually about a topic or answer to a question; and (2) share ideas with classmates. Discussing an answer with a partner serves to maximize participation, focus attention and engage students in comprehending the reading material.

Paradigm for the design: Two group pre-test – posttest design

The target group of 483 students from grades 3 and 4 were included in the initial screening and the demographic data collected from all the students in grades 3 and 4. The class teachers used learning disability inventory to obtain the list of students with reading, writing and comprehension difficulties. However, only 82 students were identified as learning disabled and out of that 72 students were chosen using purposive sampling.

Once the learning disabled children were identified, the researcher then examined their existing academic achievement level by using NIMHANS Index of learning disability. Based on their performance reported on the academic achievement test and the identified learning style an IEP (Individualized educational program) was planned for each child with appropriate learning strategies. The sample was then randomly divided into 2 groups (Group A and B). The participants who cleared all the initial procedures like obtaining permission from the parents and willing to participate in the intervention program were sorted by age and gender and the below guidelines also followed:

- Children from grades 3 and 4;
- Children who are fluent with their mother tongue while reading and writing in English were found to be below their grade level;
- Studying in regular school following CBSE curriculum;
- Scholastically backward;
- No visual and hearing impairment;
- No primary emotional and behavioral problems;
- Normal in IQ, above average, below average and Average category;
- Children who do not have other assistance or remediation for academic areas outside school;
- Severe discrepancy between intellectual ability and achievement in one or more of the following academic areas: listening comprehension, written expression, basic reading skills and reading comprehension;
- The discrepancy is not due to a disorder in one or more of the basic psychological processes and is the result of environmental, cultural or economic disadvantage, and
- The discrepancy cannot be corrected through other regular or categorical services offered within the regular instructional program.

Tools

Standardized tools were used to evaluate the academic achievement level and learning style. In the present study, the investigator used the following tools:

1) NIMHANS index of learning disability;
2) Learning style inventory;
3) A personal case history blank.

NIMHANS index for specific learning disability (Kapur et al., 1991)

The NIMHANS index of specific learning disability was developed in the department of clinical psychology, NIMHANS Bangalore. It was first developed by Kapur et al. (1991) to screen children with SLD. The NIMHANS Index for specific learning disability consists of tests of reading, writing, spelling and arithmetic abilities to identify children with disabilities in these areas. It consists of two levels. The NIMHANS index of SLD comprises tests on attention, language, arithmetic, visual-motor skills and memory. Both level 1 for children aged 5 to 7 years and level 2 for children aged 8 to 12 years.

Level 1: This consists of tests of attention, visual discrimination, visual memory, auditory discrimination, auditory memory, speech and language, visuo – motor skills and writing skills.

Level 2: This consists of tests of attention, language (Reading, writing and comprehension), spelling, perceptual motor abilities, memory and Arithmetic.

Attention: Number cancellation or letter cancellation test can be used to test the student's ability to sustain attention. The scoring can be done by subtracting the right letters cancelled from the number of wrong letters cancelled.

Reading, Writing, and Spelling and Comprehension: If the child’s performance on any of the academic skill is more than two standards below the standard he is studying in currently, it indicates presence of learning disability. If the child’s performance is just one standard or two below, it indicates a learning ‘difficulty’.

The norms of this battery for children in standard 1 to V were published. This tool is used in several studies to compare the psychosocial characteristics of children having SLD and normal children. It has also been used for the assessment of improvement after remediation. The NIMHANS Index of learning disability has high test-retest reliability and criterion validity.

For the purpose of the present study, the researcher did few modifications in the test items, since the current study is focused on improving reading skills of the LD children. Therefore, test of language was used to understand the reading level. One more sub-test of learning style assessment test was included, while the test of perceptual
motor abilities, memory and arithmetic are omitted.

**New scoring procedure formulated for NIMHANS index for specific learning disability**

The students were administered with NIMHANS SLD index (Pre-test and Post-test) by special educators to measure their academic levels. Along with SLD, learning styles were assessed.

**Scoring for reading skill**

The reading skill score was evaluated through 3 stages: (1) Successful level of completion, (2) Number of errors committed and (3) Time taken for completing the level. As per the test procedures, 3 min are allotted to complete reading and up to 5 errors are permitted in each level. If a student read the passage within 3 min and has only up to a maximum of 5 errors, they are considered to have successfully completed the level and allowed to read for the next level.

For each completed level, a score of 10 was given and half score was deducted for each error committed above the permitted level of 5. An additional reduction of 1 score for every additional minute taken over the permitted time of 3 min in the last level was also included. High score indicates better reading.

**Validation of the test**

The investigator gave special attention to the content validity. It was determined from careful examination of *The Dyslexia Adult Screening Test* (DAST) by Dr. AJ Fawcett and Prof. R.J Nicolson, DEPT: of Psychology University of Sheffield and the judgments from the subject matter specialists.

**Reliability**

The investigator gave *The Dyslexia Adult Screening Test* (DAST) to the same students. The coefficient of correlation between the scores of two tests was found using product moment correlation. The correlation coefficient obtained through this method was 0.86 and this indicates the good reliability of the test.

**Learning style inventory (LSI) (Anila, 2008)**

Some of the best-known learning styles are visual, auditory, applied or kinesthetic. Some experts argued that it is important to match an individual’s learning style with the style of instruction to make learning easier. For example, an individual with a strong visual learning style should be taught to read with emphasis on the shapes of words. Visual learners relate most effectively to written information, notes, diagrams and pictures. Typically, they will be unhappy with a presentation where they cannot take detailed notes. To a degree, information does not exist for visual learners unless it has been seen written down. This is the reason some visual learners take notes even when they have printed notes in front of them. Visual learners tend to be more effective in written communication. They make up about 65% of the population.

Auditory learners relate most effectively to the spoken word. They tend to listen to the lecture and then take notes afterward, or relay on printed notes. Because written information will often have little meaning until it is heard, it may help auditory learners to read out written information loud. Auditory learners may be sophisticated speakers and may specialize in subjects like law or politics. Auditory learners make up about 30% of the population.

Kinesthetic learners learn best through touch, movements and space and learn skills by imitation and practice – kinesthetic learners can appear slow because information is usually not presented in a style that suits their learning methods. Kinesthetic learners make up about 45% of the population.

**Description of learning style inventory**

It is the test or questionnaire that tries to assess the way a person learns, that is, learning style. Understanding a person’s learning style can help a teacher to develop appropriate ways to teach.

Interest in learning style inventories increased since the growth in popularity of a multiple intelligence perceptive to learning. Fernald’s VAK (Visual, auditory and kinesthetic) method analyzed the learning style of the individuals. The current test is an adapted version. The researcher modified the administration of the test to explain the items to the subject and note down their responses. Reliability was estimated by inter-rater reliability method and found to be 0.74 and content validity estimated at 0.55.

**Test administration and scoring**

The students chose an appropriate component from three of each item, which is more apt for his/herself about their learning. There was no right or wrong response. The students could indicate their response at their own time limit for completing the test. The total score was found by counting ‘a’s, ‘b’s and ‘c’s which indicated his or her learning style preference. The highest score showed the individual preferred learning style.
Table 2. Distribution according to writing strategy used.

<table>
<thead>
<tr>
<th>Reading strategy used</th>
<th>Count</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernald method and simultaneous oral spelling</td>
<td>18</td>
<td>50.0</td>
</tr>
<tr>
<td>Fernald method and visual imagery</td>
<td>10</td>
<td>27.8</td>
</tr>
<tr>
<td>Fernald method, simultaneous oral spelling and visual imagery</td>
<td>8</td>
<td>22.2</td>
</tr>
</tbody>
</table>

Table 3. Distribution according to comprehension strategy used.

<table>
<thead>
<tr>
<th>Comprehension strategy used</th>
<th>Count</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-questioning, story retelling and think pair share</td>
<td>24</td>
<td>66.7</td>
</tr>
<tr>
<td>Self-questioning, story retelling and paraphrasing</td>
<td>2</td>
<td>16.7</td>
</tr>
<tr>
<td>Paraphrasing and think pair share</td>
<td>6</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Table 4. Distribution according to reading strategy used.

<table>
<thead>
<tr>
<th>Reading strategy used</th>
<th>Count</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter sound corresponding, Neurological impress method (auditory learner)</td>
<td>18</td>
<td>50.0</td>
</tr>
<tr>
<td>Letter sound corresponding, Phonological awareness and Automatic word recognition (Visual learner)</td>
<td>11</td>
<td>30.6</td>
</tr>
<tr>
<td>Letter sound corresponding, Phonological awareness, Automatic word recognition( auditory and applied)</td>
<td>7</td>
<td>19.4</td>
</tr>
</tbody>
</table>

Personal case history blank

A personal data blank for taking the case history was prepared by the investigator for collecting firsthand information about all the students from grades 3 and 4. The items included in the blank were demographic data, present complaints, family history and psychological tests results. Unstructured interviews were also conducted with the parents and teachers to get more information regarding each child.

The parametric tests to treat the data are 't' test and Wilcoxon. The 't' test was used to examine the mean difference in reading of LD students before and after the intervention program. The effectiveness of learning strategies based on different learning styles were also tested using Wilcoxon.

RESULTS AND DISCUSSION

Effectiveness of selected intervention strategies on improving the skills of learning disabled children with different learning style

Distribution of different learning strategies used

As shown in Table 2, 50% of the students were auditory learners and the strategies used to improve their writing skills are Fernald method and Simultaneous Oral Spelling. 27.8% of the students were visual learners and the strategies used to improve their reading skills are automatic word recognition, phonological awareness and letter sound correspondence. Phonological awareness and letter sound correspondence can be taught by both oral and visual method. 22.2% of the students were both auditory and applied learners for them and same strategies were used but different activities and methods followed.

As shown in Table 3, a total of 66.7% of the students were auditory learners and the strategies used to improve their comprehension skills are self-questioning, story retelling and think pair share. 16.7% of the students were visual learners and used strategies such as self-questioning, story retelling and paraphrasing to improve their comprehension skills. 16.7% of the students were both auditory and applied learners for them and same strategies were used but different activities and methods followed.

Table 4 shows a total of 50% of the students were auditory learners and the strategies used to improve their reading skills are letter sound correspondence, phonic analysis, automatic word recognition and neurological impress method. 30.6% of the students were visual learners and the strategies used to improve their reading skills are automatic word recognition, phonological awareness and letter sound correspondence. Phonological awareness and letter sound correspondence can be taught by both oral and visual method. 19.4% of the students were both auditory and applied learners for them and the same strategies were used but different activities and methods followed.

The mean pre-test score is 11.7 and post test score 28.1 and the obtained paired 't' is 9.22** significant at 0.001 level which shows that there is a significant difference between post-test score and pre-test score of the reading skill (Table 5).
Table 5. Effectiveness of intervention strategies on reading skill score of learning disabled children for visual learning style.

<table>
<thead>
<tr>
<th>Reading skill score</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean difference</th>
<th>Paired t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>11.7</td>
<td>5.8</td>
<td>11</td>
<td>16.4</td>
<td>9.22**</td>
<td>0.000</td>
</tr>
<tr>
<td>Post</td>
<td>28.1</td>
<td>5.9</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**: Significant at 0.001 level.

Table 6. Effectiveness of intervention strategies on reading skill level of learning disabled children with visual learning style.

<table>
<thead>
<tr>
<th>Reading level</th>
<th>Pre</th>
<th>Post</th>
<th>Z#</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percent (%)</td>
<td>Count</td>
<td>Percent (%)</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>36.4</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>27.3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>27.3</td>
<td>2</td>
<td>18.2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>36.4</td>
<td>3</td>
<td>27.3</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>27.3</td>
</tr>
</tbody>
</table>

# Wilcoxon signed rank test.

Table 7. Effectiveness of intervention strategies on reading skill score of learning disabled children for auditory and applied learning style.

<table>
<thead>
<tr>
<th>Reading skill score</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean difference</th>
<th>Paired t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>13.0</td>
<td>4.8</td>
<td>7</td>
<td>20.7</td>
<td>17.27**</td>
<td>0.000</td>
</tr>
<tr>
<td>Post</td>
<td>33.7</td>
<td>4.9</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**: - Significant at 0.001 level.

Table 8. Effectiveness of intervention strategies on reading skill level of learning disabled children for auditory and applied learning style.

<table>
<thead>
<tr>
<th>Reading level</th>
<th>Pre</th>
<th>Post</th>
<th>Z#</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percent</td>
<td>Count</td>
<td>Percent</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>14.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0.0</td>
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<td>14.3</td>
</tr>
<tr>
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<td>14.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>71.4</td>
<td>1</td>
<td>14.3</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>71.4</td>
</tr>
</tbody>
</table>

# Wilcoxon signed rank test.

Table 6 shows comparison of the effectiveness of intervention strategies on reading skills of learning disabled children with visual learning styles. A total of 36.4% of the participants followed visual learning style and used visual learning strategies were in levels 4 and 5 during the pre-test and 54.6% of students reached levels 4 and 5 during the post-test, whereas none of the students were in level 1 as compared to the pre-test, where 36.4% were in level one before the intervention program. The Wilcoxon Signed Rank Test indicate that (p<0.001) showing there is a significant difference in the effectiveness of learning strategies based on their dominant learning styles.

The Wilcoxon test of statistics (p<0.001) shows that the students who followed visual learning style and strategies differ statistically in their pre-test and post-test scores, therefore, the hypothesis is accepted and the strategies, Fernald method, visual imaginary, letter sound correspondence, automatic word recognitions effective for students with visual learning style (Table 7).

The mean reading skill score of auditory learners during the pre-test is 13.0 and post-test is 33.7. The obtained paired ‘t’ is 17.27** which is significant at 0.001 level. This shows that there is a significant difference in the reading score of auditory learning. Consequently, the hypothesis is accepted.

Table 8 shows comparison of the effectiveness of intervention strategies on reading skills of learning
disabled children with different learning styles. The pre-test score of the auditory learners was 71.4 at level 4 and 0 at level 5, the post-test scores was 14.3 at level 4 and 71.4 at level 5. Wilcoxon test shows (p>0.001) indicating that the students who followed auditory learning style and strategies differ statistically with their pre-test and post-test scores. This shows that the auditory learning strategies used for improving their reading skills are effective. The Wilcoxon Signed Rank Test (p<0.001) indicates that the learning strategies are significantly effective if learning strategies are chosen based on their dominant learning styles.

Conclusion

The study concluded that there is a significant difference in the reading skill of auditory learners after using the learning strategies, letter sound correspondence, neurological impress method and phonic analysis. The results revealed that, the Intervention strategies are effective in enhancing the reading (t'= 13.12**) skill score of auditory learners. Hence, the hypothesis was accepted.

It was hypothesized that there is a significant difference in the reading skill of visual learners after using the learning strategies, Fernald method, visual imagery, letter sound correspondence and automatic word recognition. The pre and post-test scores of the reading (t= 9.22**) shows that the intervention strategies used for the learning disabled students such as letter sound corresponding, phonological awareness and automatic word recognition are effective to enhance the reading strategies of visual learners. Therefore, the final hypothesis was also accepted.

The hypothesis also states that there is a significant difference in the reading skill of auditory and applied learners after using the learning strategies story retelling, think pair share, neurological impress method and letter sound correspondence. The interventions strategies used for the applied and auditory learners are effective to enhance their reading t (= 17.27**) skills. Therefore, the hypothesis was accepted.

Since all the hypotheses were accepted, the intervention program was found effective for remediating academic skill deficit in reading disabled children from the experimental group. After the study, the students from control group were also trained with learning strategies to improve their reading skills.

Previous researches are repeatedly showing the positive link between learning strategies and improved reading skills. Some of the researches supporting the findings are:

- Hornsby and sheer (1980) who suggested that various phonics programs are useful in training of auditory-visual learners with learning disabilities.
- Lemmon (1985) found that the hyperactive students showed high test scores in elementary school reading and mathematics when they are permitted to learn and or take tests by responding to their learning style preference.

All the earlier mentioned results revealed that choosing learning strategies based on their learning style is highly effective to improve the reading skills of students with reading disabilities.

The famous quote from O. Ivar Lovaas is very much momentous here. "If they cannot learn the way we teach, we teach the way they learn."

In summary, the present research revealed that using appropriate reading strategies based on students’ learning style is more effective to remediate the reading skill deficits of reading disabled students and the current study statistically proved this fact which is again supported by other previous researches earlier mentioned.

IMPLICATIONS AND LIMITATIONS OF THE STUDY

This research has important implication for school authorities, ministry of education, teachers, special educators and parents interested in the remediation and rehabilitation of students with learning disabilities. Identifying the dominant learning style and teaching strategies enable the student to be independent in their academic life.

The study was limited to the learning disabled pre-primary students of grades 3 and 4. As it was difficult to obtain the school permission, only 72 students were involved in the intervention program.

SCOPE OF FURTHER STUDY

- This study can be extended with learning disabled students in all other grades;
- Computerized instructional remedial programs can be used to make it more interesting for the new generation.

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