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# Impact of Skilled Intervention for Dyscalculia- An Academic skill disorder

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## Abstract

Students of today are the citizens of tomorrow and they are going to be the pillars of the country. It is therefore, of paramount importance to ensure that each pillar is as strong as the other. A high degree of human resource development cannot be accomplished without uplifting backward students like learning disabled, slow learner, etc., realizing this importance an attempt was made to understand the difficulty associated with acquisition skills among learning disabled, specifically with arithmetic. Children classified as learning disabled very often have disabilities in mathematics. However, a considerable amount of research on mathematics is focused upon curriculum, attitude of students & parents and teacher training. The interaction between student and material is rarely the focus of research. The paucity of research in this field as noted by Miles and Miles (1992) very clearly emphasis the need to through light on the skill-based intervention rather than the most traditional approaches to mathematics instruction. Traditional approaches to mathematics instruction emphasis arithmetic computation, computation is an empty skill if conceptual ability is lacking. The objectives of our study were to primarily identify the nature of difficulty in solving mathematical problem, specifically the concept of fraction and to study the impact of remedial teaching. Hypothesis of the study was to find the significant difference between the interventional and non-interventional groups. Wechsler's Intelligence scale for children was used to assess the IQ, math questionnaire and Achievement test developed by the author was used on a purposive sample of 40 male and 40 female students of state government school. The results of the study have been found to be significant and imply that the skill-based intervention has positive impact in understanding the math concept and enhanced better learning. Thus, the Endeavour of this paper was to emphasize importance of skill-based teaching as well as learning through cognitive approaches where the child is viewed as central, active figure in learning.

**Key Words**: Dyscalculia,

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## Introduction

Dyscalculia indicates specific or special learning difficulties in mathematics. It refers to difficulties with counting or to learning disabilities that involve arithmetic comprehension or computation. Dyscalculia is a wide range of lifelong disabilities involving maths. There is no single form math disability and difficulties vary from person to person and affect people differently in school and through out life. Kirk and Chalfant (1984) suggests two types of learning disabilities: developmental learning disabilities and academic learning disabilities. Developmental learning disabilities include the prerequisites skills that a student needs to achieve in academic subjects like attention, memory, perceptual skills, thinking skills etc. many of these skills are typically acquired by the children who do not have learning problems before they enter school, but learning-disabled pre-schoolers often need to be taught these skills. Developmental learning disabilities can affect the child's academic learning. Deficits in prerequisites skills contribute to later disabilities in learning academic subjects. Academic learning disabilities refer to school acquired learning like reading spelling arithmetic etc.

Students with difficulties in mathematics are specifically included under the definition of learning disabilities, seldom do math learning difficulties cause children to be referred for evaluation. Even after being identified as learning disabled few students are provided substantive assessment and remediation for there arithmetic difficulties. This relative neglect might leave parents and teachers to believe that math learning problems are not very common or serious. However approximately 6 to 9 percent students have significant math deficits. The effect of math failure through out years of schooling, coupled with math illiteracy in adult life, can seriously handicap both daily living and vocational prospects. In today's world, mathematical knowledge, reasoning and skills are no less important (Kate Garnett, 1988). Math-related learning disabilities are complex and require skilled intervention by skilled teachers to help students achieve success. Several attempts have been made in this regard in terms of scientific research. The body of research on dyscalculia is not developed enough to describe a specific and comprehensive set of well researched practices, but it is sufficient for defining a set of procedures and issues as clearly associated with effective intervention strategies and increased student achievement. Those student with dyscalculia spends a substantial portion of their academic time working on mathematics (carpenter, 1985), severe deficits in mathematics achievement are apparent and persistent. MacLeod and Armstrong (1982) surveyed junior high, middle school, and high school math teachers regarding mathematic achievement. The teachers reported that skill deficits in basic computation and numeration were common. Specifically, MacLeod and Armstrong found that students with learning disabilities had difficulty with basic operation, percentages, decimals measurement and the language of mathematics. Compared to their general class peers, the adolescents with learning disability demonstrated substantially lower levels of mastery across all sub-tests. National assessment of education progress (cited in Carpenter, Matthews, Linquist and Silver,

1994) clearly indicated that too many students in the elementary grades failed to acquire sufficient skills in operation and applications of mathematics. These persistent skill deficits, combined with limited fluency of basic fact recall, will hinder the development of higher-level mathematic skills and will compromise later achievements (Hasselbring, Coin, Bransford, 1988).

Review of research articles indicate very few numbers of research done in the Indian context. There is paucity of research in this specific field as noted by Austins (1982), Sharma 1980 and Miles and Miles (1992). Very limited works has been reported in the area of intervention strategies for dyscalculia. Dyscalculic are slow to acquire abstract reasoning skills that are very necessary for problem solving in the higher classes. A study by Skrtic (1980) indicated that these students show significantly denied formal reasoning and concept development. Research reveals that interventional strategies are of most traditional approaches to mathematics instructions emphasising arithmetic computation. Computation is an empty skill if conceptual abilities lacking. Without an understanding of number as a property of objects, meaning of classes and relations, of order and magnitude, of form and arrangement the computation and comprehension of math is impossible. Cognitive approaches to in mathematics consequently emphasise the development of the mathematical concepts that render computation meaningful.

Psychologists and educators like Anderson, Bandura, Bruler, Cronbach, Dewey who have been active in cognitive movement in education believe that it is important to consider what happens internally to student who is learning and to view learning as construction. It is learner who is most important element in the teaching learning situation but not the materials, the lessons, teachers or other external factors. Effective instruction provides activities to facilitate the learner's ability to construct meaning from experience. Students learn not only from by acting and experiencing the consequences of their actions. Students learn by observing others by imitating models by seeing a demonstration etc. cognitive elaborations such as inferences, images, memories and analogies influence their learning and understandings. Students often construct meaning and create their own reality (Inhelder, Sinclair, and Bovet, 1974; Wittrock, 1978). Learning is a process of elaborating what the child already knows (Reid, 1978), not a process of accumulating bits of information of skills. Students learn by successive approximations by coming closer and closer to what is accepted as objective reality by consistently enriching and elaborating past knowledge. Executive processes affect our perception and comprehension of new information from the very beginning. Many educational innovations have been directed toward capitalising on their usefulness. Much emphasise has been put on considerations of context and relevance in teaching. Consequently, more and more educators and psychologists are calling for the holistic presentation of material to be learnt. A cognitive approach assumes that student posses an "umbrella" concept so that when details are presented the students have a way of

organising them into overall concept. The assumption is that the immediate goals will change as the student acquires new information or skills or interests Iano, (1978).

With the cognitive theoretical approach, to overcome the paucity of systematic research and to provide the skilled intervention strategies for dyscalculic, the following hypothesis was formulated:

- Intervention strategy on dyscalculia students significantly reduces errors in fractions.
- There will be differential gain after intervention in experimental than in control group

## METHOD

### Sample:

The sample for the study was selected from three different schools located in Mysore city, based on the achievement test scores 120 students were identified as learning disabled. Finally, 80 students were selected for the study based on the major areas of difficulty in mathematics problems. Purposive sampling was adopted. The selected 80 students were further randomly assigned into experimental and controlled group. The experimental group consisted of 40 students between the age group of 5 to 9. The controlled group was matched accordingly.

## TOOLS

Weschsler's intelligence scale for children (WISC) was used to measure IQ (Weschsler 1974). WISC yields a score for verbal IQ one for performance IQ and a full-scale quotient. WISC is helpful in making certain type of predictions, particularly who have been educationally deprived. WISC is one of the most widely used test for assessing the potential of learning-disabled students between the ages of 6 to 16. thus, WISC can be used, along with other information, for assessment of students who are experiencing difficulties in school (Reddy, Ramar and Kusuma, 2000).

Achievement test developed by investigator was used to assess the grade of disparity or age lag and problem of learning disability in mathematics among the students. The goal was to construct the test in which each item could be related to the mathematics curriculum and the first step was to acquire an understanding of the content of mathematics curricula. Math questionnaire developed by investigator was used to asses the difficulties in specific area of mathematics.

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**PROCEDURE.**

The procedure of the present study was carried out under five stages.

1. **Screening-** Screening was done using achievement test to assess the students developmental lag and to identify students with learning difficulties.

2. **Selection-** Students identified as Dyscalculic was selected for further studies. A total of 80 students were selected who showed major difficulties in fraction for the pre test assessment. A very high percent of the dyslexic and non-dyslexic children has felt threatened by fractions. children are been introduced to fractions very early in their education but still find them a mystery when they are older. Hart (1981) stated there may be a care for postponement of all work involving fractions until the secondary school stage, lately re-teaching causes frustration and boredom on the part of the learners.

3. **Grouping-** 80 children identified as having difficulties in mathematics, specifically in fractions were randomly grouped under experiment and controlled group, that is 40 under experimental group and 40 under controlled group.

4. **Formulation and implementation**- After the identification of the specific area of difficulty on mathematics the intervention strategies were planned based on the nature of difficulties. The students were further interviewed to find out the difficulty in specific area and it was found out that the problem was in understanding "the concept" of the mathematical problem basically. So, our planning for intervention strategy was to help them understand the concept of mathematic problem at the easiest level.

5. **Skilled intervention strategies**- One of the principal objectives of education is the understanding of concepts. To consolidate a concept in a learner's cognitive structure. It is necessery to develop problem solving skills for that concept. Hajine, Yoshida (1979) suggested that effective skill practice is important to learn the concept of mathematics. The development of problem-solving skills is a major goal of most mathematic curricula (Robinson,1977: Taylor,1977). The first recommendation of the national council of teachers of mathematics for school mathematics in the 1980s was the development of problem-solving skills (Nctem,1980). Review of literature reveals a few methods of psycho educational programs like drill method, paper pencil method, learning through computer and so on. But this present study involves the teaching strategies through practical demonstrations which helps the students to understand the concept practically and learn the math concept.

6. **Phases of intervention**-

a) Establish rapport-Rapport was established with the students by casual interaction. Further the intervention classes were explained to them and also informed that these classes would be

in a week and their co-operation was requested. They were also motivated for the best performance.

b) Start from where the student knows-Learning is a process of elaborating what the student already knows (Reid,1978), not a process of accumulating bits of information or skills. Students learn by successive approximation, by coming closer and closer to what is accepted as objective reality, by consistently enriching and elaborating past knowledge. Helping a student identified is or her strengths and weakness is the first step to getting help. When a teacher or trained professional evaluates a student, the student is interviewed about a full range of math related skills, that is it is meant to reveal how a student understands and uses numbers and math concepts to solve advanced level as well as everyday problems. This problem further helps us to plan intervention strategies

c) Oral Instruction or direct teaching-According to Bezuk and Biack(1993) instructions is crucial to strengthen student understanding before processing to operations on fractions. Hiebert and Behr 1998 recommended that increased attention be devoted to developing the meaning of fractions, symbols, developing concepts and helping students connecting their intuitive understandings and strategies to more general, formal methods. Studies from both cognitive development (Shrager and Siegler, in press; Siegler.1998; Griffin et al.,1994) and instructional research (Case,1998; Griffin,1998) are beginning to provide a deeper understanding of mathematical strategies that students often naturally developed for handling problems. These studies are also providing some insights into means for developing these strategies in students with mathematical disabilities through well designed instructions. The students were taught the meaning of the term fraction. Its definition and basic information were also taught. After that the math language used specifically for fractional problem was also taught, i.e., the words the students should know like, half, quarter, divided by share, one by third, one fourth, and so on. They were asked to practice these terms and meaning for the next session.

d) Demonstration or Model-Lead-Teaching - A math class should teach practical experiences in mathematical skills that are a bridged to the real world of jobs and adult responsibilities. The demonstration step is critical, especially if students are learning a new concept or skill. It should be brief and should explicitly indicate the critical aspects of applying the strategies. After demonstration step, the students are lead through few examples. Construct a problem with actual objects or with manipulative. To teach fraction concept demonstrate how to make parts out of a whole (1/3) i.e., to develop fraction concept, use some thermocoal, card board or some clay objects in different geometrical shapes to demonstrate how 3 equal parts can be made out of 1.

e) Self Practice- Practice activities are essential components of mathematics instructional programmes. Several prompted trials are usually necessary before students can be expected to

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respond independently. The transition from prompted trials to independent trials can take place with few or no errors (Cybrywsky and Schuster,1990; Koscinski and Gast;1993; Stevens and Schuster 1998). Independent practice should therefore be carefully selected so that students can actually complete successfully without assistance from a teacher or parent.

f) Evaluation and Feed back-Students learning should be reviewed, what was learnt during last session, where they may have difficulties and where performance may have been particularly good, provide feedback and positive reinforcement for correct responding or correct errors as they occur (Archer and Isaacson,1989) independent sheet work and homework provide important opportunities for students to apply knowledge and practice skills that they have already learnt thus increasing fluency and retention.

## RESULTS AND DISCUSSION

**Table 1 Comparison of Mean and SD of pre-test and post test for intervention strategy**

| | Mean | | SD | | | |
|---|---|---|---|---|---|---|
| Total | Pre | post | Pre | post | Gain | F |
| | 0.74 | 2.53 | 0.81 | 1.85 | 1.79 | 358.085<br>P<.000 |

When overall gain from pre test to post test was considered a significant 'F' value was observed (F= 358.085; P < .000). in pre test the mean total score was found to be .74 and in post test it was found to be 2.53, where a significant gain of 1.79 units were found to be highly significant.

**Table 2 Comparison of experimental and control group over intervention strategy**

| | Mean | | SD | | | |
|---|---|---|---|---|---|---|
| | Pre | post | Pre | post | Gain | F |
| Experimental | 0.68 | 4.20 | 0.92 | 0.88 | 3.52 | 338.972 |
| control | 0.80 | 0.85 | 0.69 | 0.62 | 0.05 | P<.000 |

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When gain in the scores with respect to each group was considered, again a significant 'F' value was observed (F= 338.972; P< .000) indicating that there was a differential gain for experimental group and control group. In experimental group the gain was 3.52units where as in control group the gain was only 0.05 units. From this, it can be found that experimental group has gained more significantly which can be attributed to impact of skilled intervention strategies.

Thakore, B (1980) conducted as study on Construction of Diagnostic Tests and Preparing Remedial Material as well as testing it effectiveness on Fractions and Decimals Fractions for the students of Grade V of Gujarati medium schools in Greater Bombay. The major aim was construction of diagnostic tests followed by preparation of Remedial material and testing its effectiveness. The tests and the follow-up remedial material were prepared for students of class V on two topics, fractions and decimals fractions. In all, ten diagnostic tests were prepared. Tests were administered to the students of schools of Bombay, selected randomly. They were analyzed for errors. The remedial teaching material was prepared and was used with the same students. The post test, which was also like the pretest, was given to find out the effectiveness of the remedial material prepared. The major findings were: (i) The students of class V did not have clear concept of fractions. It was difficult for them to convert one type of fractions in to another; (ii) As for decimal fractions, the students did not understand the place values of respective figure in decimal fractions, (iii) They did not understand subtraction, multiplication and division of decimal fractions and (iv) The remedial teaching can affect significant improvement in achievements. Bharadwaj, R.P. (1987) conducted a study standardization of a comprehensive diagnostic test preparation of remedial material in maths for middle standard students of Haryana. The major findings of the study were, there was a significant improvement in achievement of the students after they had gone through the remedial exercises. Irrespective of the pre and post test situation, male and female students did not differ significantly in their scores. (F = 1.944; P< 0.168).

## Conclusion

In the present study it was found that skilled intervention strategies have a very positive impact on Dyscalculia. Using skilled strategies along with cognitive approach to teach the math concept, will be very effective in improving the acquisition of mathematical skills.

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