

Identification and development of instructional strategies to accelerate mathematics learning among slow learners

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ABSTRACT

The study was carried out with the objectives to identify, develop instructional strategies, see the impact of strategies developed and promote the best instructional strategy to teach the slow learners. The study was undertaken in one Government and one private school of Dharwad taluk which were within 10km radius from Dharwad city. First standard students were selected to teach maths subject. Questionnaire was developed to carry out the pre test. Instructional strategies *i.e.* materials, picture book, peer tutoring and individualized instruction were developed and their impact was seen by conducting the post test. The results revealed significant difference between pre-test and post-test scores of control and experimental group students taught using different strategies. The different strategies *i.e.* materials, picture book, peer tutoring and individualized instruction were significantly effective in improving the ability of learning mathematics of slow learners. Students of the experimental groups performed significantly better than the students from the control group after the intervention programme.

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Slow learners are not mentally retarded. They are normal like other children in many aspects. However, they differ from average children in rate of learning. They are unable to cope with the work normally expected of their age group. It is noticed that about 18-20 per cent of school going children are slow learners. It is a considerable figure and not ignorable. No doubt every nation is investing in the education of its young but strategies have not been developed to the fullest extent for the dull students or slow learners. Hence, it is essential to identify the slow learners and strengthen them in order to develop strong nation.

Bhadwal and Sood (1991) reported that the underachiever students can be improved in the subject of arithmetic by making effective use of the teaching skills. Srivastava (1983) reported that number games improved the performance of the studies in arithmetic achievement. The video assisted instruction facilitated male and female underachievers to have better performance and immediate retention than conventional learning group. There are some studies carried out on low-achieving and under achieving children for teaching various subjects using special strategies like computer assisted instruction (Reddy and Kumar,1996) and video assisted instruction (Soundaraja Rao and Rajaram,1996). However, the simple practically possible and feasible strategies suitable particularly to Indian situation like using low-cost materials and picturization of the subject matter have not been popularized.

METHODOLOGY

A preliminary survey was carried out to collect information regarding the total number of Government and private schools prevailing in Dharwad city (Karnataka,India). There were 38 Government and 25 private schools in Dharwad taluk at the time of survey. It was decided to take schools located within 10 km radius from Dharwad city and postal addresses of these schools were taken from the BEO office. Further, an introductory letter along with the self-addressed envelop was sent to all the heads of the schools. The timely reply was received only from four schools. Though there was willing co-operation of the head of the institution, two schools were dropped because the timings of the school overlapped with the other which were selected for the study. First standard students were selected to carry out the study. There were total of 82 students in the two schools. The real slow learners were identified using four screening methods.

Teachers assessment:

Teacher assessed the overall intelligence and skill of students during question and answer session, playing puzzles, solving simple problems, sports, games and other extra curricular activities. The teacher tested the memory power, attention span, reasoning ability, abstract thinking, leadership qualities etc in day to day activities.

Academic performance:

Based on the previous formal examinations like

monthly, mid-term and annual examinations, the level of academic achievements was assessed. Those who scored continuously low marks were considered as slow learners.

Intelligence tests:

There are many standardized and validated tools to assess intelligence of children. Some of the simple and reliable tools like Raven's standard and coloured progressive matrices was used to assess intelligence. The children who scored continuously 'below average' were categorized as slow learners.

Achievement tests:

Sometimes, children due to exam fear and nervousness, score less in formal examinations. Informally, some simple tests were conducted based on the previous portion they had studied in relaxed atmosphere. Those who scored 'below-average' even in this form of informal test were considered as slow learners. Children those who scored below average in all these four screening tests were considered as real slow learners. Finally, 61 students were identified as real slow learners.

Development of instructional strategies:

Materials:

This instructional strategy consisted of locally available, less expensive indigenous materials such as rita nut seeds, arithrana seeds, tamarind seeds, small and smooth wooden blocks, marbles and plastic beads to teach mathematics.

Picture book:

The subject matter was illustrated with the help of different pictures and designs. The help of the drawing teachers was taken to colour the pictures. Suggestions of the teachers were taken to modify and improve the clarity of pictures. Further, the pictures which were confusing and not clear to the students were modified as per the suggestions after the pre-test.

Peer tutoring:

Here students taught the other students. The student who received instruction is called tutee and the one who taught the subject is the tutor. The tutors who had aptitude for teaching were selected by the teachers.

Individualized instruction:

The researcher taught the portion according to the needs of each slow learners. The portion was taught repeatedly using all the instructional strategies developed.

RESULTS AND DISCUSSION

After carrying out the four screening tests, 61 students were identified as real slow learners. In order to improve the capacity of students, intervention was carried out using the four strategies developed. In the beginning of the academic year when school reopened, teachers of the particular classes highlighted the important basic points of the portion covered in previous year for two weeks. After 15 days, investigator conducted pre-test with the help of teacher using the question paper which covered the portion of the previous class. Further out of 61 slow learning students identified, 13 were treated as control group and the other 4 groups of 12 students each were treated as experimental groups to teach maths subject using 4 different strategies (1' materials, 2' picture book, 3' peer tutoring and 4' individualized instruction).

The intervention programme was initiated separately during mathematics class hours. All the experimental groups received one hour instruction daily for 6 months using the respective instructional strategies. The observation of Table 1 revealed significant difference between pre-test and post-test scores of control and experimental group students taught using different strategies. From the gain scores obtained by the students of all the groups it is clear that performance of the students taught using materials was the highest followed by picture book, individualized instruction, peer tutoring and the least score was obtained by the control group taught using normal teaching method (Table 1). It was also observed that there was significant difference between the post-test scores of students in the control group taught through the normal teaching method in the class room and the students of the experimental group taught using the different instructional strategies (Table 2). Further, the

Table 1: Impact of teaching through different strategies for mathematics

Type of instruction	Mean scores		Gain scores
	Pre-test	Post-test	
Norman teaching method	10.25	17.20	6.95
Materials	11.40	22.90	11.50
Picture book	11.25	21.35	10.10
Peer tutoring	10.85	18.25	7.40
Individualized instruction	10.90	20.00	9.10

Table 2 : Comparison of Pre-test and post-test mean scores of control and experimental group slow learners in mathematics

	Pre-test		Post-test	
	Control	Experimental	Control	Experimental
Mean	11.25	11.34	18.20	25.27
SD	3.41	3.58	5.04	7.62
't'	0.171 ns		4.25*	

values of ‘t’ test revealed that the different strategies *i.e.* materials, picture book, peer tutoring and individualized instruction were significantly effective in improving the ability of learning mathematics of slow learners. Students of the experimental groups performed significantly better than the students from the control group after the intervention program (Table 3).

The instructional strategy which consisted of locally available indigenous materials was found to be the excellent device that fosters concrete learning. It is a kind of play way method of self learning. Materials along with

Conclusion:

In most of the schools, learning process involves more oral explanation as method of teaching. But learning through pictures, seeing live examples, concrete models create interest among children, develops curiosity and increases concentration which enables them to grasp easily and quickly. Materials, models and pictures provide an excellent clarity to the spoken words. Of the five senses eye is the most efficient one that helps for seeing, perceiving and conceptualization. This supports the axiom ‘One picture worth a thousand words’ and ‘Seeing is

Table 3 : Comparison of mean scores in mathematics of control and different experimental groups after the intervention programme

Group	Mean scores of experimental group	Mean scores of control group	SD-1	SD-2	‘t’ value
Materials-control	22.90	17.20	12.20	6.04	8.49**
Picture book-control	21.35	17.20	12.20	6.04	7.12*
Peer tutoring- control	18.25	17.20	12.20	6.04	5.62
Individualized instruction-control	20.00	17.20	12.20	6.04	6.10*

* and ** indicates significance of values at P=0.05 and 0.01, respectively

verbal instruction certainly increases the speed of comprehension, improves the capacity of retention of knowledge, enhances the power of understanding and also arouses the sensations for self activity as almost all the sensory organs are involved in the learning process. The main principle behind is the importance of sense of touch as emphasized by Montessori in the curriculum for teaching young children. Learning by using various sensory stimuli, too difficult task or problem, can be made easy, increases thinking power, fosters mental activity and helps in exploration. Developed instructional materials were found to enhance significantly both verbal and non verbal creativity of students (Bhadwal and Sood, 1991). Secondly it is observed that the picturisation of the subject matter developed interest among the children and increased concentration and curiosity which enabled students to grasp the subject matter easily. Pictures having different colours help imprint the subject matter in the mind of the students. Usually children enjoy pictures and more over visual aids are better than only verbal explanation. Peer tutoring is also found to be an effective measure in learning. In peer-tutoring, the learner is generally more relaxed and stress free atmosphere help to grasp more in learning. Though peer tutoring increased the rate of learning however, the result was found to be non-significant. Overall the strategies were found to be interesting and useful than mere verbal teaching.

believing”. United Nations Educational, Scientific and Cultural Organization (UNESCO) study proved that people retain 20 per cent of what they hear, 30 per cent of what they see, 50 per cent of what they hear and see and 70 per cent of what they actually do by themselves. Thus the instructional strategies having combination of all these certainly makes teaching and learning effective.

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