

Identifying Learning Difficulties & Types Of Error Patterns In Basic Arithmetic Skills Made By Primary School Students

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Abstract

The objectives of teaching Mathematics at primary level, clearly aim at solid foundation of the subject as the subject is sequential in nature. Unless mastery is achieved in, fundamental abilities like computational skills, interpretation of the problem and integration of the problem no learning can take place at high school level. Therefore it is essential that children developed competency in basic skills and wherever the competency has not been achieved, appropriate remedial steps are taken. "Students" learning can be improved through diagnosis of their performance, by identifying specific inadequacies in mastering the required basic skills.

The investigator decided to find out the learning difficulties in basic arithmetic skills. The study was aimed at answering following questions.

· What learning difficulties do the students carry forward from I to V standard in Basic Arithmetic Skills. (BAS).

· What are the percentages of prominent errors, students make in solving Basic Arithmetic Skills.

A competency based test was developed & administered on 143 students. Learning difficulties were analyzed using error patterns. According to findings of the study .The students were considerably weak in basic arithmetic skills. The average achievement score of class VI students was found to be 52.7% far below mastery. The learning difficulties varied across students & areas of BAS. The students had problem in arithmetic operations with three & more digits. High percentage of error was observed in attention to sign, placement error & regrouping error. Feedback from the teachers suggests they are sensitized to the learning needs of these students & ready to follow reflective practices.

Key terms –Learning difficulty, Basic Arithmetic Skills (BAS), Error patterns.

Introduction

The basic arithmetic operations are very important to a child's basic understanding of numeracy and key to mathematical life skills. Many students struggle with these skills in primary school years & get frustrated to understand further math concepts without having a sound prior understanding of basic arithmetic operations. The teachers need to thoroughly evaluate students in these areas of learning prior to moving onto more complex concepts and those they should offer further assistance to those students that are exhibiting any level of difficulty.

These operations are the foundation of basic problem solving skills hence they need special attention to ensure students are proficient in them. These skills are generally used in daily life more than other aspects of like geometry and algebra. Computational skills are the essential root of mathematical understanding from which all other concepts may be learned.

This has aptly recognized by Lindquist (1988) who while

writing the practical value of the subject states "The need of a good command of arithmetic by a skilled mechanic, by the up-to-date farmer, by the progressive professional man, by the successful merchant and by the efficient housewife, is so obvious as to need no discussion". Satisfaction of the demands of society is the important function of the arithmetic curriculum. With the back to basic movement in education once again the study of 'arithmetic' has received a special importance. The fact that, anyone who does not attain mastery of arithmetic, at least at the minimum levels to some extent, will be a disadvantage in the present society of computer technology. Logical thinking should be developed through using & understanding different operations of number system.

There is a need to assess how well students have acquired mastery in basic Arithmetic Skills(BAS) & also the 'where & why ' of learning difficulties. It is important to understand the learners hence it becomes necessary for a teacher to understand the difficulties of learners as well as the kinds of mistakes they do.

Study of Computational skills and problem solving ability was carried out by Nancy Potempa, Allan M. Voelra,(1989) Northern Illinois University. Results from that study indicate that computational skills and problem solving are related. This study shows that the students who are able to correctly answer the computation problems are more likely to correctly solve the word problems.

Piaget's metacognition theory acts as a base to how concepts in mathematics are learnt. The child, who had faced a deadlock in learning addition of single-digit numbers, ended up being able to divide multi-digit numbers and, through their learning.

Addition.....single digit.....two digits.....three digits.....?????

Subtraction.....single digit.....two digits.....three digits.....?????

Multiplication.....single digit.....two digits.....??

Division.....single digit.....???

Fails to understand further math concepts

Background of error detection. Errors in mathematics have been intensively studied in recent years (Sleeman 1982, 1983, 1984 a, 1985 a, Brown and Burton 1978, Davis 1984, Engelhardt 1977, Matz 1982, Young and O'shea 1981). Some errors however have been found to be stable & theories have been formulated to explain them. According to them the purpose of diagnostic tests is to help a teacher, student & parent to identify specific learning difficulties which a child may encounter. But the test will indicate only that a child is having difficulty. It will not identify the precise nature of difficulty. For example, suppose a child shows difficulty with multi-digit addition problems involving regrouping or placement, the test will only focus there is a difficulty as the answer to the problem has come wrong. In order to know the exact nature of difficulty categorisation of the difficulty in to regrouping error &/or placement error needs to be done as

the problem involves regrouping &/ or placement. These difficulties need to be categorised further into errors, so that remediation may be planned and implemented. How to remediate the arithmetic difficulties is a problem to a class room teacher.

A categorization of student's difficulties into errors, guides teacher's understanding of computational error and computer program can be developed to diagnose and remediate students errors.

Research is needed to establish and verify a classification scheme for frequent errors. With this purpose in mind to study the most frequent errors made by students researcher analyzed many examples of the child's work (test papers) as possible. Examination of the students work revealed several mistakes or missteps of a given pattern or errors directly traceable to a common difficulty. Operational definitions:

1. Learning difficulty: The word 'learning difficulty' means the mistakes, obstacles, errors made by students in solving the items of the BAS test.

2. Errors: A mistake or miss step in Arithmetic computation that results in an incorrect answer. It is an incorrect step in a process of solving problems in basic arithmetic skills..

3. Error pattern: Categorization of errors having significant element in common. Error patterns taken for study are namely Regrouping, Directional, Attention to sign, Placement, Omission, guessing.

4. Basic Arithmetic Skills: (BAS) They are four computation operation, Addition, Subtraction, Multiplication, Division.

Objectives of the study

1. To find out student's learning difficulties in basic arithmetic skills.
2. To identify errors committed by students in basic arithmetic skills.
3. To study error patterns in basic arithmetic skills.

Research methodology – To achieve the objectives 'Survey Method' was used.

Sample-

A total of 143 Class VI students from school in Pune city were selected based on a incidental sampling method.

Research Tools –

1. A competency based test of 32 items on BAS that contained items familiar to the students from their earlier mathematics classes and their textbooks was developed by researchers.
2. Error Analysis

Procedure-

The assessment was carried out at the level of Class VI, as all the arithmetic operation namely Addition, Subtraction, Multiplication, Division concepts outlined in the syllabus for primary school are learned by students by the time students complete Class V

The test was pretested on a small representative sample and was finalized after making necessary changes based on children's responses, comprehensibility, enquiries and teachers' suggestions.

Before the administration of the test, specific instructions were given to students as to how to respond to each item. They were categorically instructed to do all the calculations in the space available against each question and this was ensured with constant supervision. There was no time limit in responding to the test items. The average time taken for responding to the mathematics test was found to be a little more than one hour. The papers of all students were assessed carefully to find the learning difficulties. Data was collected which was used for error analysis.

Statistical technique- Mean, Percentage

Analysis of data & interpretation-

Mean correct percent attainment of the students on competency based BAS test was = 52.70. This implies 43.3% students faced the learning difficulties in basic Arithmetic skills. They were unable to get the correct solutions to the problems due to errors made. The finding indicates that the performance of students in basic arithmetic skills is far below mastery.

Error Patterns- Error analysis of students wrong answers was carried out, gave more details of learning difficulties. Following % of error patterns were observed. Table (1.1) Percentage of Error patterns in Basic Arithmetic skills

Error Pattern	Addition	Subtraction	Multiplication	Division
Regrouping	14.74	12.80	15.66	37.05
Directional	1.33	.92	1.24	1.8
Placement	23.86	50.44	47.81	-
Attention to sign	26.7	13.0	0.56	-
Omission	3.69	2.56	3.46	4.03
Guessing	29.39	20.56	36.2	56.11

Based on the results of Quantitative data & the Qualitative data which was obtained from different sources like informal interaction with students to understand 'errors' that were made, dialogue with teachers, classroom observations and personal observations of investigators the following conclusion

Were drawn Conclusions

The 'guess work' on the part of students was found more, reflecting indirectly the interest and attention the students have in mathematics. The lack of involvement and motivation in solving the problems may be the main cause of the hidden fear in solving problem. The fear seem to be that even if we try solving the problem, it is 1. going to be wrong so why take pains? Instead easiest way is to write something using easiest method of addition and write the answer.

2. Attention to sign error reflects carelessness on part of students.

3. Placement and regrouping is a major problem for some students. They didn't know how to carry over the number or where to add that number. In case of regrouping error the students were not aware of place value of number to be added.

4. Students memorised the tables well from 1 to 10. Due to drill, practice and law of frequency the students could solve the multiplication problem mentally using these tables. When multiple and multiplier both were between 1 to 10.

5. The multiplication tables after 10 were not memorised well by many. Therefore as the number of digits in multiplication operation were increased the attainment decreased. Students made computation errors.

6. Place value concept was not very clear which resulted into wrong Algorithms resulted in to computation error.

7. Increase in numbers of digits also promoted guessing, or careless error may be as an attempt to complete the test.

8. The teachers tend to ascribe learning difficulties of students due to lack of ability, interest, practice & home support.

Educational implications-

By pinpointing the pattern of an individual student's error in BAS, teacher can directly provide specific learning experience & monitor to assist the student to use an effective procedure for solving specific types of computation

problems. Some errors are individual specific while some are common that students with learning difficulties make. Teachers teaching young children have a very important and demanding role to perform while teaching arithmetic. This study proposes the early identification of children having difficulties in computation in arithmetic. Early detection permits specialized treatment in the most immediate years and in least complicated fashion. The child who develops mastery in basic skills begins to like learning and to like himself. Teacher's role is thus pivotal to push children intellectually in arithmetic by meeting his or her needs.

References:

- Adms. S. (1997). Teaching mathematics with emphasis on the diagnostic approach, Harper & row publishers New York:
- Agarwal, J.C. (1993). A Course of teaching of Modern Mathematics. Dhangat Raj & Sons. Nai Sarak, Delhi:
- Banmann and Stevenlon (1982). Achievement scores for the diagnosis of specific instruction needs in Arithmetic. The Journal of Educational Research. Vol 13.NJ:
- Clements M. A. P 1(1982). Careless errors made by VI grade children on written mathematical task. Journal for research in Mathematics Education. vol 13, No 2.NJ:
- Clements, M.A. (1982). Careless errors made by sixth-grade children on written mathematical tasks. Journal for Research in Mathematics Education, vol.13, No.2, 136-144.
- Indian Educational Reviews, (1979). Diagnosing the difficulties experienced by class V students in learning Arithmetic. N.C.E.R. T. New Delhi:
- Pal, Gobind C. (2006) Teaching and Learning Mathematics in Primary School- Some Concerns. WORKING PAPER SERIES 1 VOLUME 1 NUMBER 01
<http://www.jstor.org/pss/748804>