Full Length Research Paper

A study on error patterns in "Addition" in primary school children (7 years old children)

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"Addition" is one of main basic mathematical concepts that children learn. This concept is learned by students at the preschools level both informally and formally. There are some research findings that show that students make mainly three types of errors, such as Systematic errors, Random errors and Careless errors. Students make these types of errors relation to the concept of "Addition". This paper examines the error patterns common with "Addition "in second years of schooling (grade 2/7 years old students). The gender wise differences in "Addition" are examined and analyzed; examined also patterns of "Addition" in the sample age group. The need for further in-depth research in the area of primary grade mathematics is highlighted.

Keywords: Addition Pre-school, Primary school, Essential Learning Competencies

INTRODUCTION

"Addition" is one of the basic mathematical concepts that children learn. According to Operations Edited by Jamessungjin.kim "Addition" is the mathematical process of putting things together. The plus sign "+" means that two numbers are added together. Children learn this concept both formally and informally through interaction with others in their environment. Some ground-breaking research undertaken by educationalists tried to identity errors made by pupils. According to Collins (1982) Dictionary an' error' is something we have done which is considered to be incorrect or wrong.

Literature has shown many classification of pupil errors in which they are grouped according to different criteria; groups such as Systematic errors, Random errors and Careless errors are found to be common .The Systematic errors are those that occur due to the lack of understanding or incorrect understanding of concepts and principals. Random errors show no discernible relationship to the given problems. Careless errors may be accidental (Cox. 1975, Engelhardle.1982, West

1971, Hollander 1978).

The research on Assessment of pupil Achievement in Primary Mathematics Sri-Lanka (A study on the assessment of pupil achievement in Primary Mathematics with special reference to analysis of errors diagnosed through interviews): Nanayakkara (2002) tried to contribute towards quality improvement of Mathematics education in Sri-Lanka. It focused on assessing pupils' achievements in primary Mathematics with emphasis on error patterns and underlying causes for unusual achievement patterns. The study focused on systematic errors which occur due to lack of understanding of concepts. Conceptual error patterns regarding the concept of Addition were identified in the research. They were;

- Recalls "Addition" basic facts incorrectly.
- Starts "Adding" from the left.
- Totals incorrectly when "0" is one of the numbers to be added.

- Commits errors due to lack of understanding of:
-The place value concept
-The carrying over concept (Page No; 384)

According to "Addition" Error Pattern by Gail Englert the sums for the place values can be recorded in a chart that has the places named, like this:

Hundreds	Tens	Ones
5	6	9
3	5	0
+3	2	3
16	13	12

(All of which need to be regrouped…)

If the problem is modeled, the student can see that there is a place for each digit in the sum. Of course, just doing one problem won't fix the misconception. If you let the student make the "discovery" about what happens by providing guided practice that involves discussing what the student notices, s/he will draw the appropriate conclusions eventually.

In the Sri-Lankan context, the primary school child is only expected to be taught "Addition" of two sets of numbers in second years of schooling (grade 2) and not to master the ability of two or more digits horizontally and vertically. In addition, it is expected for students to do sum of 2 digits not exceeding 99 in grade 2. Essential Learning Competencies (E.L.C) was one of the new features introduced by the Sri-Lankan government under the Education Reforms of 1997. What this means is that every child should achieved ELC and the mastery level which was introduced by curriculum developers. Teachers were trained for this and they had the responsibility to help the student to achieve that mastery.

And also, we see a body of findings that seem to indicate that children's understanding of "Addition" is impacted by differences between linguistic aspects of numeration systems in different countries, particularly as they relate to the structure of the number words, their similarity or dissimilarity to the numerals they represent) and the speed with which they can be spoken.

There are a few research findings that show that most of the primary school children face the problem of adding making mistakes in addition at the primary school. Primary school children have to be able to read numerals like 1…2…3…4…from memory. This is rote or mechanical learning. They are not aware of the fact that these numbers are arranged in a certain order or that each number has a definite positioning on the number sequence. Children are required to develop the ability to perform the "Addition" of 2 numerals such that no carry over is involved. Somehow, the main aim of the research was to identify error patterns in "Addition" made by grade two (age 7 years) child in performing "Addition" involving 2 digits where the sum is below 9 (Nine) in each column.

"Addition" is considered here as crucial to the present research because it is the most basic elementary concept that has a vital effect on the development of several other concepts related to Mathematics, such as problem solving, computation, subtraction in the primary as well as secondary grade child.

Objectives

This research was carried out in order to;
1. Examine the patterns of the mathematical concept of "Addition" applied in seven years old (grade 2) children,
2. Identify the differences in "Addition" patterns in boys and girls in the sample
3. Identify the error patterns of mathematical concept of "Addition" made by seven years old (grade 2) children,

Research questions

1. What are the patterns of "Addition" applied by grade two children in the primary classroom?
2. Is there any difference between boys and girls with regard to these patterns in the sample?
3. What are the common "Addition" errors made by children in grade two?

RESEARCH METHODOLOGY

A simple addition test paper and participatory observation methods were used to collect data from three schools in Sri Jayawardhanapure Zonal education office in the Colombo district, Western province in Sri-Lanka. Descriptive statistical methods were used to analyze data. The researcher was totally engaged in collecting data. The representation of data was implemented through statistical analysis using percentages, charts and tables.

Population and Sample

The target population for the study comprised primary school children. A Representative sample was selected from the Sri Jayawardhanapure Zonal education office in Western province in Sri-Lanka. The following Table 1 illustrates the selected sample of primary schools from the Colombo district in the Western province, number of children, and gender (boys and girls). Stratified random sampling method was used on the selection of the sample of preschools and simple random sampling method was used for selecting 25 children from each class.

Table 1. Sample

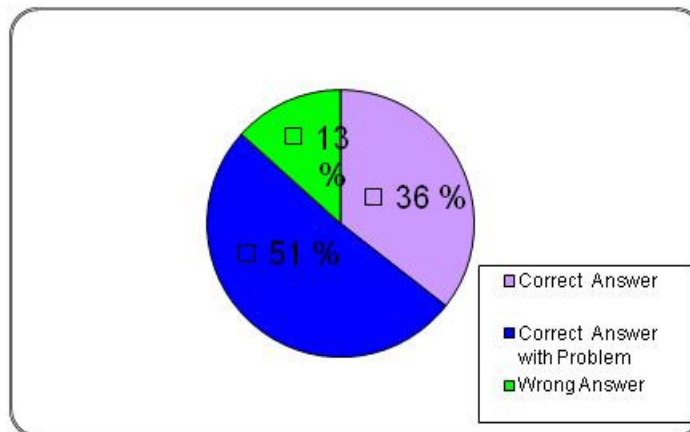| District Colombo	Type of primary-schools (Sri Jayawardhanapure)		
	Boys	Girls	Total No of Students
1C Type	15	15	30
2 Type	15	15	30
3 Type	15	15	30
Total	45	45	90

Chart. The student performance.

DISCUSSION OF FINDINGS

1. What are the patterns of "Addition" applied by grade two children in the primary classroom?

In searching for the answers to the question 'whether there are any patterns of "Addition" in the primary-school children' the study came up with an affirmative answer. We identified some "Addition" patterns in primary school children.

1. The answers given by the students do not give a comparative picture of the performance of the students in the 3 schools in the sample. But they are applicable to the general situation obtaining in all schools, at the grade level, in Sri-Lanka.

Performance

- 32 out of 90 students were correct, irrespective of gender
- 46 out of 90 answers were correct, but subject to problems of presentation
- 12 out of 90 have wrong answers.

Chart

1. The student performance.

2. 36% showed capability of abstract thinking.

3. All the students were aware of what the sign "+" implies.

4. Some students did not appear to have understood the significance of the equals (=) sign. Their use was arbitrary.

5. Most students use their fingers or draw lines as aids to "Addition" displaying paucity at abstraction, but still there were a few capable of abstract concept-ualization.

6. When the 2 quantities of numbers/objects are given,

a. Some students assume the bidder/smaller lot and continue counting from where the first lot ends.

b. Some students count the whole of the first lot and continue counting till all the items in the 2 lots were covered e.g. 1, 2,3,4 (first lit) 5,6 (second lot)

7. The performance of girls is found to be better than that of boys.

8. Number (Numeral) representation was faulty in the instance of certain numbers (No. 2, No.3, No.4. No.5, No.6, No.8)

9. Some students failed to make judicious use of the space provided confining themselves to a tiny area in the inch- square given while others took full advantage of the available space.

10. Some students fail to represent their numerals along a straight vertical line or strait horizontal line or both.

11. Some students have not understood their answers.

Table 2. Gender wise "Addition" Differences

Responses	Gender	Number of Children	Percentage
Correct answers (with out problems)	Boys	14	16%
	Girls	18	20%
Correct answers (with problems)	Boys	24	26%
	Girls	22	24%
Incorrect answers	Boys	07	08%
	Girls	05	06%

Table 3. Writing error patterns' of "Addition"

Response	Number of Children	Percentage
Putting symbols incorrectly	12	21%
Using space incorrectly	14	25%
Writing straight vertically and horizontally incorrectly	15	18 %

Table 4. Writing Numbers

Response	Number of Students	Percentage
Writing Number 2 in incorrect form	06	10 %
Writing Number 3 in incorrect form	05	09%
Writing Number 4 in incorrect form	11	19%
Writing Number 5 in incorrect form	06	10%
Writing Number 6 in incorrect form	09	16%
Writing Number 8 in incorrect form	08	14%

2. Is there any difference in "Addition" in Mathematics between boys and girls?

The figures in the Table 2 indicate clearly that the gender wise difference in "Addition" exists to a certain extent. However, this difference for correct "Addition" is minimal and incorrect "Addition" is only 12%. Thus we can conclude on a clear difference between the male and female ability of "Addition". According to this research the ability can be put on a similar scale as for the gender. However, the findings of the study establish that girls have better capability than boys in "Addition" in Mathematics. Further 07 boys and 05 girls of the sample did not appear to have understood their concept of "Addition".

3. What are the common errors children made in the primary school years?

The above Table 3 shows that 12 out of 58 (46+12) students who gave correct answers to the problems were not able to write" +" "=" correctly. And also 25% of students had space problems. Those students did not

know or practice use of the writing paper in their classrooms.18%in the sample did not know how to write numbers vertically and horizontally correctly.

This Table 4 shows that students have faced the main problem students faced was writing Number 4 at grade2 level of the correct sample (with problems). Some students had made more than one mistake.

We can hypothetically come to several assumptions on the school teacher, family and the environmental factors affecting the socialization process of the children. Reasons for errors made by children could be either due to psychological or incorrect guidance by parents or family. Also the teacher was not aware of the students in the classroom. Further, the reasons could be related to the social and economic background of parents which this study has not paid attention to at this stage.

CONCLUSION

The research has established some major facts which need to be tested on a fair sample from one district. On the other hand, this sample researched only the areas in the Western province which records a higher stage of

development in human and physical capital which other provinces of the country have achieved unevenly. And therefore, the findings should not be taken for granted for the whole country. According to the findings we can sate that teaching instruction procedure has to be designed to eliminate the problems encountered by the primary school child with "Addition "of numbers. Further, the teacher has to pay individual attention to children and he/she should provide practice sessions to children on the representation of numerals. Further the study points at the parental and teacher caring aspect when guiding children to acquire the basic mathematical and language skills by using the correct language with children and preparing necessary environmental factors.

There is accountability on the part of the teacher in ensuring that a particular primary grade child is capable of coping with work meant for that grade. This is exemplified by the student where the students of grade 2 could not cope with a question paper (Math) designed for grade 1. It is necessary that all children of a particular grade under the Essential Learning Competencies prescribed for that grade.

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