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Effectiveness of Grid Technique on Enhancing Computation Efficiency and Achievement in Mathematics of Students at Upper Primary School Level

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Abstract

The study aimed to evaluate the effectiveness of the Grid technique in improving computational efficiency and academic Achievement in mathematics for upper primary students. The present study has been conducted on a sample of 70 upper primary school students. Lesson transcripts based on a Grid technique, Lesson transcripts based on a traditional method, and an Achievement test on mathematics were used to collect data. The statistical technique adopted is the t-test for Achievement in mathematics. The study revealed that the accomplishment of upper primary school students taught through the Grid technique is more effective than students taught through the traditional method.

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KEYWORDS: Effectiveness. Grid technique, computational efficiency, and Achievement in mathematics at the upper primary level.

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1. INTRODUCTION

Mathematical thinking is essential for all members of modern society, as it fosters a habit of mind for use in the workplace, business, finance, and personal decision-making. It is essential for public decision-making and for participation in the knowledge economy. The knowledge of the fundamental processes of mathematics and the skills to use them are the preliminary requirements of the human being in those days. Mathematics is the numerical and calculation part of man's life and knowledge. It helps the man to give an exact interpretation of his ideas and conclusions. It enables man to study various phenomena in space and establish multiple relationships between them. It is also the prime vehicle for developing students' higher-order cognitive skills.

Arithmetic encompasses a set of mathematical processes that include number sense, the understanding of mathematical principles like the associative and commutative properties, and computational skills. Specifically, computational skills are defined as the ability to calculate basic addition, subtraction, multiplication, and division quickly and accurately using mental methods, paper and pencil, and other tools such as a calculator. Mathematics is a challenging subject to learn and an even more challenging subject to teach effectively. Some aspects of mathematics require deep reflection and mental restructuring, while others require different approaches.

Some of the difficulties faced by the students

Incomplete Mastery of Number Facts: Number facts are the basic computations that students are required to memorise in the earliest grades of elementary school. Recalling these facts efficiently is crucial because it enables students to approach more advanced mathematical thinking without being hindered by simple calculations.

Computational weakness: Many students struggle with consistency in computation. They make errors because they misread signs or carry numbers incorrectly, or may not write numerals clearly enough or in the correct column. These students often struggle, especially in primary school, where basic computation and “right answers” are stressed. Frequently, they end up in remedial classes, even though they might have a high level of potential for high-level mathematical thinking.

Difficulty Transferring Knowledge: One fairly common difficulty experienced by people with math problems is the inability to easily connect the abstract or conceptual aspects of math with reality. Understanding what symbols represent in the physical world is essential to how well and how easily a child will remember a concept. Holding and inspiring an equilateral triangle, for example, will be much more meaningful to a child than being told that the triangle is equilateral because it has three equal sides. And yet, children with this problem find connections such as this painstaking at best.

Making Connections: Some students struggle to make meaningful connections within and across mathematical experiences. For instance, a student may not readily comprehend the relation between numbers and the quantities they represent. If this kind of connection is not made, math skills may not be anchored in any meaningful or relevant manner. This makes them harder to recall and apply in new situations.

Incomplete Understanding of the Language of Maths: For some students, a math disability is driven by problems with language. These children may also experience difficulty with reading, writing, and speaking. In mathematics, however, their language problem is confounded by the inherently complex terminology, some of which they hear outside of the maths classroom. These students have difficulty understanding written or verbal directions or explanations, and find word problems challenging to translate.

The Grid Technique is one of the essential techniques of teaching Mathematics. Furthermore, reading about the Grid Technique of teaching created a natural, genuine interest and directed the investigator to examine the effect of this teaching technique on Mathematics. The Grid Technique helps develop and arouse interest in Mathematics. The Grid Technique is a method used for performing mathematical multiplication with greater speed and accuracy. It is the most straightforward and practical way to learn arithmetic (multiplication) and develop one's brain power. The Grid Technique is based on mathematics. The grid method works. The worksheet includes a grid, and we split the number to be multiplied into the grids to perform the calculation easily. The number of grids depends on the numbers that are to be multiplied. The Grid Technique can be considered an ultimate brain development program for children. It is a foundation for multiplication, as well as a strong Mathematical aptitude, and improves concentration in all other areas.

HYPOTHESES OF THE STUDY

1. The Achievement of Mathematics in Upper Primary School students taught through the Grid Technique will be significantly higher than that of those trained through the present method of teaching.
2. The computational efficiency of upper primary school students taught through the Grid Technique is expected to be significantly higher than that of those trained through the current instructional method.

2. OBJECTIVES OF THE STUDY

1. To prepare lesson transcripts based on the Grid Technique in the teaching of Mathematics to Standard V.
2. To find out the effectiveness of the selected Grid Technique on Achievement in Mathematics at the upper primary school level.
3. To compare the effectiveness of the Grid Technique with the present method of teaching on Achievement in Mathematics of students at the upper primary school level.
4. To compare the computational efficiency of students taught through the Grid Technique with the present method of teaching at the Upper Primary School level.

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3. METHODOLOGY IN BRIEF

An experimental method was selected for the present study. In that, the design chosen was a non-equivalent, pretest-posttest design. Lesson plans were prepared using the Grid Technique to cover the concept of multiplication from the prescribed Mathematics textbooks for Standard V. An achievement test was also prepared to assess the effectiveness of the technique. The study was conducted on a sample of 70 students of Standard V (English medium) of two divisions of the Government. H.S.S. Payippad, Kottayam district. One division was selected randomly as the experimental group and the other as the control group. The experimental group was taught according to the Grid Technique, and the control group was taught in the present method of teaching. The same tests were administered as both the pre-test and post-test for both groups.

Performance Of Students' Achievement in Mathematics in Experimental and Control Groups Before the Experiment. Before starting the experiment, an achievement test was administered to both groups. The same test was conducted on both groups. The pre-test scores obtained by the pupils in both groups were organised into frequency tables, and then the arithmetic mean, median, mode, standard deviation, quartile deviation, skewness, and kurtosis were calculated to obtain a clear picture of the performance of both groups. The scores obtained from the experimental group, along with the statistics calculated and the corresponding values, are presented in the table.

Table 1.1 Statistical measures of pre-test scores of the experimental group and the control group

Group	Mean	Median	Mode	Standard deviation	Skewness	Kurtosis
Experimental	11.74	11	12	6.970	0.319	0.147
Control	11.97	11	12	5.101	0.571	0.184

For the Experimental mean, median, and mode to coincide, they should be the same. Here, the mean, median, and mode approximately coincide. For a normal distribution, the value of kurtosis is 0.263. Here, the kurtosis is 0.147, which is less than 0.263; the curve is leptokurtic. The distribution is positively skewed, as indicated by a skewness value of 0.319. This shows that the number of students who scored low marks was comparatively higher than those who scored high marks in the group. For the Control group, the mean, median, and mode should coincide. Here, the mean, median, and mode is approximately equal. For a normal distribution, the value of kurtosis is 0.263. Here, the kurtosis is 0.184, which is less than 0.263; the curve is leptokurtic. The distribution is positively skewed, as indicated by a skewness value of 0.571. This shows that the number of students who scored low marks was comparatively higher than those who scored high marks in the group.

Comparison of pre-test scores of pupils in the experimental and control groups

The arithmetic mean of the experimental group is 11.74, and that of the control group is 11.97. The difference between the means is 0.23. This shows that the two groups do not differ much in their Achievement. The low values of the quartile deviation and standard deviation for both groups indicate that there are only slight variations in the scores of the pupils. The skewness obtained for the experimental group is 0.319, and that of the control group is 0.571, both of which are positive values. Skewness indicates that the students who scored low marks is more than those who scored high marks in the group. The significance of the difference between the mean score of the pre-test obtained by the experimental and control groups was found by calculating the critical ratio (C.R.). The data and result are given in Table 1.2.

Table 1.2: Test of significance difference between the means of the pre-test scores of both groups

Group	Number of pupils	Mean	Standard deviation	Critical ratio	Level of significance
Experimental	35	11.74	6.970	0.156	$p > 0.5$
Control	35	11.97	5.101		

From the tabled value, it is inferred that the two groups, experimental and control, do not differ significantly in their pre-test scores. (since the calculated value 0.156 is less than the tabled value at the 0.01 level and 0.05 level).

Performance Of Students' Achievement in Mathematics in Experimental and Control Groups After the Experiment

A post-test was administered to groups to measure Achievement after the experiment. The statistical measures obtained by the pupils are presented in Table 1.3 below.

Table 1.3: Statistical measures of post-test scores of the experimental group

Group	Mean	Median	Mode	Standard deviation	Skewness	Kurtosis
Experimental	30.06	31	35	7.16	-0.394	0.206
Control	22.6	21	20	7.14	0.671	0.28

The mean score of the experimental group in the post-test is 30.06, and the median is 31. The standard deviation of the scores is 7.16. The distribution is negatively skewed, as indicated by a skewness value of -0.394. Therefore, the students

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who scored high marks were comparatively more numerous than those who scored low marks in the group. The curve is leptokurtic because kurtosis is 0.206, which is less than 0.263. The mean score of the control group in the post-test is 22.60, and the median is 21. The standard deviation of the scores is 7.14. The distribution is positively skewed, as indicated by a skewness value of 0.671. Therefore, we can infer that the number of students who scored low marks was fewer than those who scored high marks in the group. The curve is platykurtic because kurtosis is 0.280, which is greater than 0.263.

Comparison of post-test scores of pupils in the experimental and control groups

The arithmetic mean of the experimental group is 30.06, and that of the control group is 22.60. The difference between the means is 7.46. This indicates that the students in the experimental group achieved higher scores on the post-test than those in the control group. The skewness obtained for the experimental group is -0.394. The negative symbol indicates that the number of students who scored high marks is more than those who scored low marks in the group. However, the positive value of skewness (0.671) suggests that the number of students who scored low marks is greater than the number of students who scored high marks in the group.

Significance of the Difference between the pre-test means of the two groups.

The significance of the difference between the mean scores of the post-test obtained by the groups was determined by calculating the critical ratio (C.R.). The data and result is given in Table 1.4.

Table 1.4: Test of significance difference between the means of the post-test scores of the groups

Group	Number of pupils	Mean	Standard deviation	Critical ratio	Level of significance
Experimental	35	30.06	7.167	4.359	P<0.01
Control	35	22.60	7.144		

Table values at 0.01 and 0.05 levels are 2.58 and 1.96, respectively. Here, C.R. obtained is 4.359. C.R. is significant since it exceeds the table values at both levels. Therefore, the experimental and control groups differ significantly in the post-test results.

MAJOR CONCLUSIONS BASED ON FINDINGS

The conclusion based on the analysis of the test scores is classified into the following heads. The study of data reveals that teaching based on the Grid Technique is more effective than the present method for students' Achievement in Mathematics and Computational Efficiency at the upper primary level. The study has shown that the Grid Technique is superior to the present method of teaching in terms of Achievement in Mathematics. Hence, teachers must be encouraged to apply this method while teaching. The students should be made aware of the necessity of the Grid Technique. Since the application of the Grid Technique in the classroom will facilitate better learning and development in computational ability, this technique should be introduced in schools in Kerala. Teachers should receive an orientation to the Grid Technique through in-service training, enabling them to apply it effectively in the classroom. Curriculum designers should also develop an awareness of the Grid Technique so that they can effectively implement it in the curriculum. The Grid Technique is more effective in improving computational speed for students. Hence, this technique should be introduced in schools in Kerala. Computation efficiency is a necessary mathematical ability for higher education and is also very important in practical life. Teaching using the Grid Technique enhances computation efficiency. Hence, it should be included in the primary school curriculum.

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