

## ANALYSIS OF GRADE 4 STUDENTS' PERFORMANCE IN MATHEMATICS

### *Abstract*

*The aim of the study was to investigate the analysis of grade 4<sup>th</sup> students' performance in Mathematics at 33 government schools of Punjab Province. The study was descriptive to find out the weaknesses and strengths of 4<sup>th</sup> grade students studying mathematics. A test was developed from a book published by Punjab textbook board. This test comprised of questions on seven basic concepts of Mathematics i.e. Numbers, Algebraic Operation on Natural Numbers, Measurement, Time, Money, Geometry and Information Handling. Population of this study comprised of male and female students of grade 4<sup>th</sup> of government schools. A sample of 798 students was randomly selected from 33 government schools. Data were collected from the related students. Data was analyzed by using mean and standard deviation. A large number of students were not able to do well with mathematics. It was also observed that students had less conceptual knowledge and they did not know about the mathematical terminologies properly.*

### *Keywords*

*Grade four, Performance, Mathematics, Students' achievement*

### *Introduction*

The purpose of the study was to examine the mathematical concepts of the grade 4 students because basic mathematical concepts (Number, Algebra on natural numbers, Measurement, Time, Money, Geometry and Information Handling) are the foundations to learn other mathematical operations such as algebra, algorithm, and geometry etc.

This study checked the general terminologies related to mathematical concepts because mathematical vocabulary is essential in learning and

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without the basics knowledge of terminologies, students cannot understand and solve mathematical problems easily.

This study provided useful information about the difficulties faced by students to learn mathematical concepts. It may provide useful guidance for teachers in order to deal with these learning problems of students.

According to Best (1982), any worthwhile research study in any field of knowledge requires an adequate familiarity with the work, which has already been done in the same area. A summary of the writings recognized authorities and of previous research provides evidence that the research is familiar with what is already known and what is still unknown and untested.

Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done, and provides useful hypothesis and helpful suggestions for significant investigation.

According to Sidhu (200), a mathematical approach is essential for any progress. Any approach devoid of mathematical consideration is likely to lead to failure. If anybody wants to make a success of his life, he must have to recourse mathematics. Day-to-day evaluation in life or daily self-evaluation and overall life-evaluation provide us assessment, judgment, guidance and direction for the future.

This evaluation will have to be mathematical in nature to a great extent. The entire atmosphere is surcharged with mathematics. The prices, rates, discounts, commissions, rebates, interests, taxes, shortages, production, distribution inflation, etc., are the issues with which everybody is intimately concerned. There is no escape from mathematical intricacies of life and livelihood.

Kumar & Ratnalikar (2003) have described that the aims of teaching Mathematics at primary level are; to provide a good start to the student in learning to provide mathematics. Provide pupil clarity about fundamental concepts and processes of mathematics. Create in pupils and enduring interest on the subject and to develop a love for it.

Introduce pupils to mathematical games, puzzles, recreations, hobbies and activities and to unfold before them the mysteries of the subject. Develop in pupils a taste for and confidence in mathematics. Develop in pupils' accuracy and efficiency in fundamental processes. Acquaint pupils with the relation of mathematics with their present as also with their future life.

Develop in them the habits such as regularity, practice, patience, self-reliance and hard work. Prepare pupils for the learning of those subjects which are intimately related with mathematics. Acquaint pupils with mathematical language and symbolism. Prepare pupils for the learning of mathematics of higher classes. And to initiate and develop required discipline in the learner's mind

### ***Students' attitude towards mathematics***

According to Barton (2004), attitude towards mathematics plays a crucial role in the teaching and learning processes of mathematics. It effects students' achievement in mathematics.

The teaching method, the support of the structure of the school, the family and students' attitude towards school affect the attitudes towards mathematics. Usually, the way that mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from mathematics.

Similarly Ma and Xu (2004) have described that researches concluded that positive attitude towards mathematics leads students towards success in mathematics. Attempt to improve attitude towards mathematics at lower level provides base for higher studies in mathematics. It also causes effect in achievement of mathematics at secondary school level.

### ***Achievement Test***

Freeman (1965) defines a test of educational achievement as a test designed to measure knowledge, understanding, skills in a specified subject or a group of subjects. Further, Freeman has the point of view that through educational achievement test, it is possible to ascertain

how much does a person after receiving education or training in a particular branch of knowledge.

The basic concepts in mathematics

- *Numbers*

The term 'numbers' is the important and basic area of mathematics because number sense refers to a person's general understanding of numbers and operations and along with the ability to use this understanding in flexible way to make mathematical judgments and to develop useful strategies for solving complex problems (Sworder, 1992; p.372).

- *Algebra*

Mason (1996) has given the concept of algebra and describes that the future of the researched mathematical development of students as an attempt to learn what algebra is all about. The two main parts of this section, which correspond to the principal uses of letter in basic courses in algebra (or in mathematics courses that include algebra), are expressing generality and using unknowns to arrive at problem solutions.

- *Measurement*

Measurement is the important topic in the elementary school mathematics program because of its extensive use in life and because of the numerous occasions when children are faced with measurement situations both in and out of school. In the primary grade the teacher introduces the meaning and the needed terms of measurement, acquaints the children with the important units of measure, and directs their efforts to use the common tools. As pupils move up in the grades, the teacher refines the acquired concepts, extends the vocabulary and leads the children from crude comparisons to more refined measurements (Churchill, 1961).

- *Time*

According to Spitzer (1967), the three main units of time are the year (the period of time needed for one revolution of the earth around the sun); the month (the period of time needed for one revolution of the moon around the earth); and the day (the period of time needed for one rotation of the earth on its axis). Clocks and watches were gradually improved and equipped with an hour hand, and often with a second hand.

- *Money*

According to James (1986), the use of mathematics in the handling of Money is the focus of this subset. Among the areas is assessed identification of coins, counting coins and currency, making change and knowledge of banking services such as checking account.

- *Geometry*

Geometry is the branch of mathematics. The word, literally, means "land measurement". Geometric ideas were developed by early man when he observed and compared different shapes in his environment and when he was faced with the problem of measuring land.

These ideas were gradually developed and organized into an orderly and logical pattern. In modern elementary school mathematics programs, more geometry is being introduced than has been the case of traditional programs.

In primary and intermediate grades, informal geometry is emphasized. In informal geometry, properties of geometric figures are studied by inductive reasoning through measurement and experimentation. Formal geometry, in which deductive reasoning is employed, and which leads to logical proofs, is predominantly dealt with in the secondary school (Piaget & Szeminska, 1960).

### *Objectives of the Study*

The objectives of this study were to:

- Examine the conceptual problems of students in mathematics.
- Find out the level of achievement of grade 4 students in mathematics.
- Compare the performance of students in mathematics on different variables.

### *Methodology and Design*

This study used the Mathematical Achievement Test as tool of data collection. The population of this study consisted of 4<sup>th</sup> Grade Students of Government Schools of Punjab Province. 798 Grade 4 students were randomly selected from 33 Government schools.

### *Development of Instrument*

For the purpose to develop the achievement test of Mathematics, Textbook of grade 4 was taken which is commonly used in government sector schools published by Punjab Textbook Board.

The concepts of this book were Numbers, Algebraic Operation on Natural Numbers, Measurement, Time, Money, Geometry and Information Handling.

All the questions were made plausible in order to find out the difficulties, problems faced by students during the solutions of the operations. In order to make plausible questions all the confusions related to those questions were considered, which usually were done by students during solving them.

### *Procedure for Data Collection*

To collect data regarding these concepts of mathematics' study, district coordinators visited 33 government schools of Punjab. An authority/permission letter from the institute was obtained for

visiting schools for data collection. A meeting was made possible one day before visiting schools with the Principal/Administrator of the concerned school for permission and his/her cooperation.

An equal amount of time and attention had been given to all students of the schools. While conducting the mathematical test, coordinators visited each class on already decided schedule and conducted their test in their presence. It was made sure that the extent of explanation related to attempt the test and expected behavior of students remained same in order to avoid any type of biasness and favor in each class visited.

### ***Data Analysis and Interpretation***

The organization, analysis and interpretation of data and generalization are necessary to get a meaningful picture out of the raw information collected. The analysis and interpretation of data involve the objective material in the possession of the researcher and his subjective reactions and desires it derive from the data inherent meaning in their relation to the problem. The district coordinators have made efforts to identify the conceptual problems experienced by students to learn mathematics concepts at grade 4<sup>th</sup>. The data were collected from the 798 students of Government Schools. Responses of each student of the test were analyzed through SPSS version 15.

### ***Level of Achievement and Conceptual Problems of the Students***

#### ***Concept 1 (Numbers)***

Interpretation: In question 1 the average (53.33%) shows that students have some concept of numbers sequence that what comes after? And what comes before? In question 2 only 30% students' responses are correct that shows students feel difficulty to change the numbers into words form. In question 3, 48% students attempted the question correct so it concludes that they know the concept of the number's value. In question 4(a), 55% students attempted the question correct so it concludes that they have the concept of roman counting and question 4(b) shows that 58% students have attempted correct so it concludes that they have the concept of converting roman counting into simple numbers.

In question 5, very few students have the concept of fractions. Question 6 shows that students have weakest concept of differentiating between small fraction, equal fraction and big fraction. Question 7 responses are so poor that students have no concept of changing decimal into fraction.

### *Concept 2 (Natural Numbers)*

Interpretation: Question 8 is based on the concept of simple addition and almost 75% of the students have attempted it correct. Question 9 shows the concept of simple subtraction and almost 76% of the students have attempted it correct. In question 10 students responses' average is 45% that shows students are weak in that concept.

This concept is basically based on subtraction. In question 11 students' responses average is 35% that shows students are weaker in the concept of division. Responses of question 12 show that students are weaker in fraction addition and subtraction.

Responses of question 13 that students are not so much clear about decimal addition and subtraction because the average of students who have done correct this question is only 36%. From question 21 to 26 the average is not so good because students may be confuse the statements of the questions.

### *Concept 3 (Measurement)*

Interpretation: The overall percentage shows that the students are weak in measurement concept that only 19.75% students have done the question 14 correct and 16.5% have attempted the question 15 and the students who have attempted the question 27 their percentage is 34%.

### *Concept 4 (Time)*

Interpretation: In question 16, average shows that students have the concept of time that 52.75% students have attempted this question right. In question 18,19,28 the students are confused by the statements therefore in question 18 only 20% students, in 19 question only 20% students, and in q28 only 16% students have attempted these

questions correct. Overall conclusion is that students are weaker in time concept.

### **Concept 5 (Money)**

Interpretation: If we see the question 19 then it is concluded that 67.33% students have attempted the currency question correct. In question 29 students are confused the statements therefore only 9.5% students have done this question correct.

### **Concept 6 (Geometry)**

Interpretation: The average shows that students have a good concept of geometry that almost 73% students have attempted the geometry question correctly.

### **Concept 7 (Information Handling)**

Interpretation: The average shows that students are weak in the information-handling concept that only 19.2% students have attempted this question. Overall conclusion is that students are weaker in information-handling concept.

Table 1 Comparison of the Performance of Schools in Mathematical Concepts

School names	Numbers	Natural Numbers Operation	Measurement	Time	Money	Geometry	Information Handling
GPS BastiAwan	50	54	8	35	68	87	0
GGPS Ghulwan	62	34	13	29	32	94	6
GGPS SukherWala	43	27	0	14	23	37	0
GOVT.G.P/S JinahAbadi	51	55	8	35	67	87	0
GPS Latkran	18	49	28	20	36	58	9
GPS KoylaBukhsh	97	81	78	83	60	72	64
GGPS BammayWala	54	56	10	38	60	92	4
GGPS TibbiWala	46	53	30	36	52	69	25
GPS Syed Farm Ihsanpura	41	55	29	35	51	63	33
GPS SairWala No.1	34	44	15	23	35	54	6
GGPS Chak No. 116	52	50	11	32	64	85	3
GGPS Teacher Colony	52	50	11	32	64	85	3

Govt. P / S Rahim Abad	52	54	8	35	68	87	0
GGPS Basti Allah Bakhsh	60	44	52	46	40	89	32
GPS #1,Shaher Sultan	17	27	10	14	30	68	19
G.G.P/S BastiMalook	84	74	64	70	60	75	59
Govt.Primary School No.1 KotAdu	49	54	30	38	53	66	29
GPS Dogar Town	17	27	11	14	32	71	19
GPS NabiPura	10	13	1	12	24	52	3
GPS Mujahid Nagar	27	25	6	8	34	84	10
GPS Thakha	19	15	4	5	33	78	39
GPS ChhapaMinara	42	37	12	24	39	36	20
GPS Longowal	7	13	3	8	30	47	11
GPS Peer Bahar Shah	47	34	8	14	34	78	0
GPS Nadeem Colony	29	48	32	29	45	76	10
GPS No.1 Sharakpur	21	40	24	33	49	91	47
GPS Dhamkay	52	37	31	28	42	74	52
GPS AbualKhair	17	17	5	15	28	67	13
GPS Rachna Town	65	47	60	47	40	90	34
GPS MuzaffrabadNarang	31	27	13	17	28	93	6
GPS MarhiKalan	6	8	5	6	21	62	3
GPS Mehta Suja	32	37	26	17	44	60	10
GPS Pura Muhammad	38	42	31	22	40	52	40
Average %	39.88	40.24	20.36	26.58	43.21	70.61	18.45

Table 1.1 Gender-wise comparison in Mathematics

Gender	N	Mean	S.D	df	t	Sig.
Boys	392	51.0574	25.88055	787.238	2.635	0.006
Girls	399	46.0426	27.62124			

Following analysis attempts to answer the objective i.e. "To compare the achievement in mathematics of boys and girls". In order to find out the difference between boys and girls the Independent Sample t-test had been applied. In the table, the results are showing that boys performance was better in the mathematics achievement test than girls.

### Findings

A summary of the significant findings that emerge from the analysis of the data is as follows:

1. It is found that students of Punjab are weak in time, measurement and information handling concepts.
2. There is a significant difference between boys' and girls' performance in mathematics because t value 2.635 and significance level is 0.006, which is less than 0.05.
3. The research shows that majority of the students of Punjab are better in the concept of money, geometry, number etc.
4. It is found that the students who are better in money, geometry and number, they are not better in information handling, measurement and time concept.
5. In the concept of number the average% 39.88 shows that the 18 schools show good performance so they are above the average and 15 schools show low performance so they are below average.
6. In the concept of number operation the average% 40.24 shows that the 17 schools show good performance so they are above the average and 16 schools show low performance so they are below average.
7. In the concept of measurement the average% 20.36 shows that the 12 schools show good performance so they are above the average and 21 schools show low performance so they are below average.
8. In the concept of time the average% 26.58 shows that the 17 schools show good performance so they are above the average and 16 schools show low performance so they are below average.
9. In the concept of money the average% 43.21 shows that the 14 schools show good performance so they are above the average and 19 schools show low performance so they are below average.

10. In the concept of geometry the average% 70.61 shows that the 19 schools show good performance so they are above the average and 14 schools show low performance so they are below average.
11. In the concept of information handling the average% 18.45 shows that the 16 schools show good performance so they are above the average and 17 schools show low performance so they are below average.

### ***Conclusion and Discussion***

The results of this research concluded that majority of the students had conceptual problems in seven areas of mathematics (Numbers, Algebraic operation on Natural numbers, Measurement, Time, Money, Geometry and Information Handling).

According to the performance of the students in mathematical achievement test, it had been observed that students had less conceptual knowledge and they did not know about the mathematical terminologies properly. The observed problems of the students are in these concepts; word problems, measurement and information handling.

They are so much weak in these concepts. The most encouraging findings were that students are aware of their nature of conceptual problems which they faced but still it seems that awareness hardly contributes resolving this problem which is quite hard to comprehend the possible reason may be varied, but we can safely say that teachers seemed not have sufficient training with students' conceptual problems.

The results show that there is a significance difference among the performance of schools as well as the results also shows in this study that the performance of boys in achievement test was better than girls.

The results also show that majority of the students are weak in mathematical concepts. According to the performance of the students in mathematical achievement test, it had been observed that students had less conceptual knowledge and they did not know about the mathematical terminologies properly.

They know about the problems they face in mathematics but still it seems that awareness hardly contributes in solving the problem. The reason is that the teachers seemed not have sufficient training with students' conceptual problems. The results show that there is a significant difference among the performance of schools. Teachers should notice the problems of the students and should try to solve them by using different methodologies.

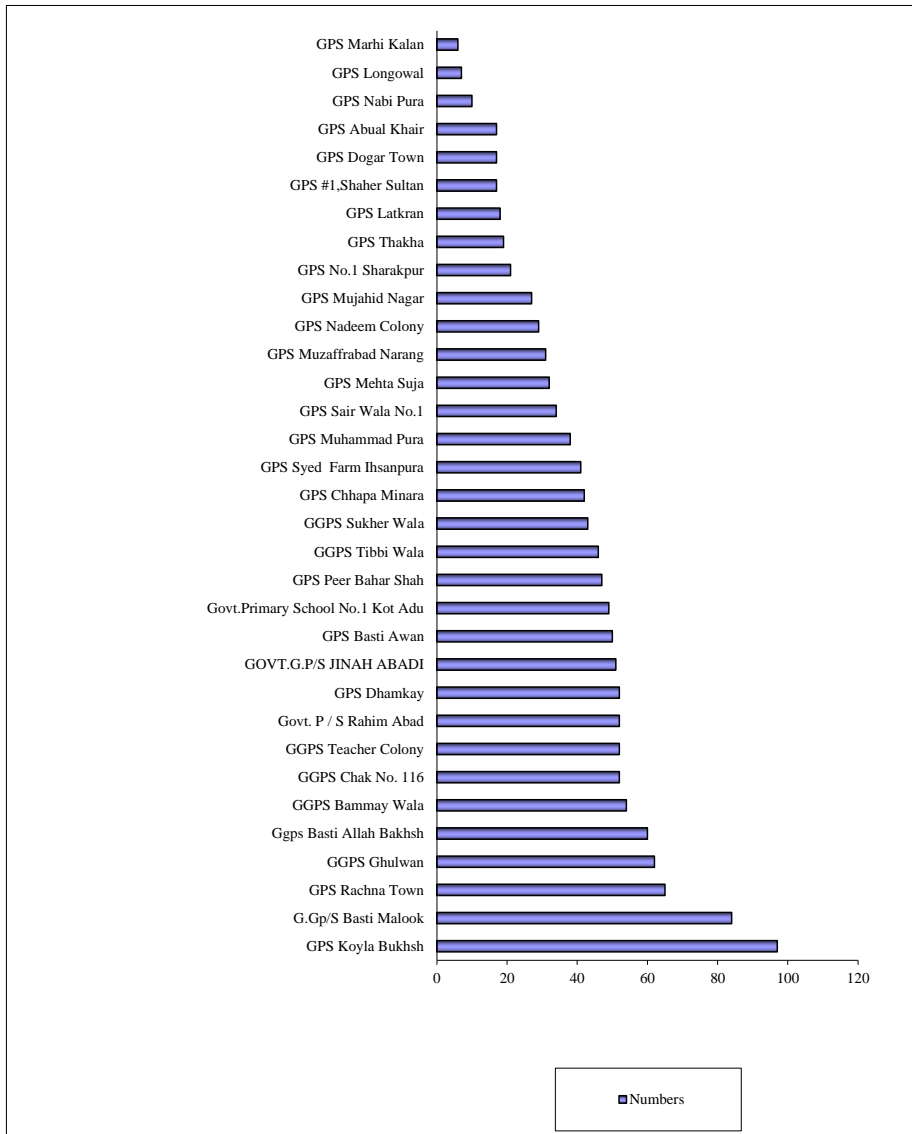
Teachers must have practical oriented teaching and explore the best ways to convey the topic in order to handle the conceptual problems of the students properly. Therefore, teacher training programs need to be focused on training related to the explanation of the topics rather than training of different teaching methodologies.

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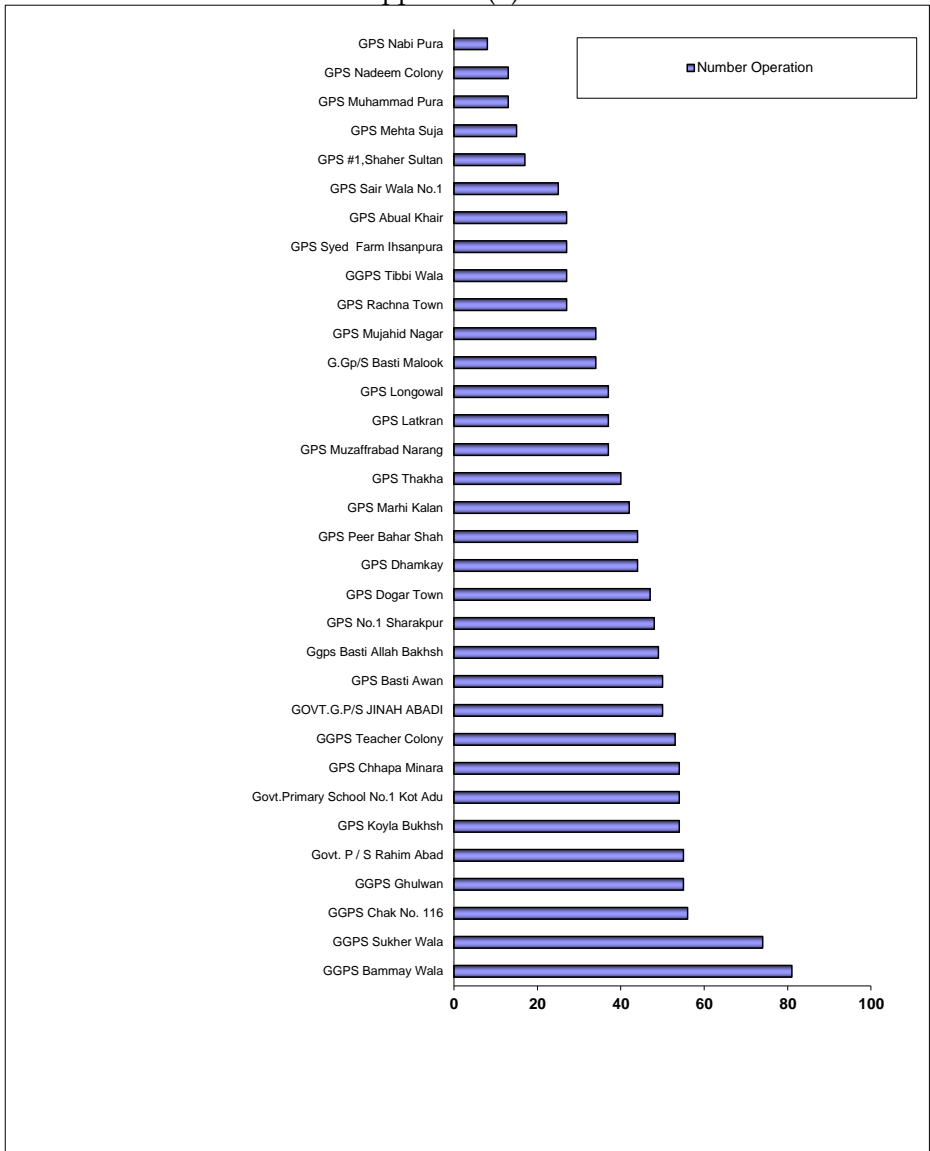
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Appendix (A)



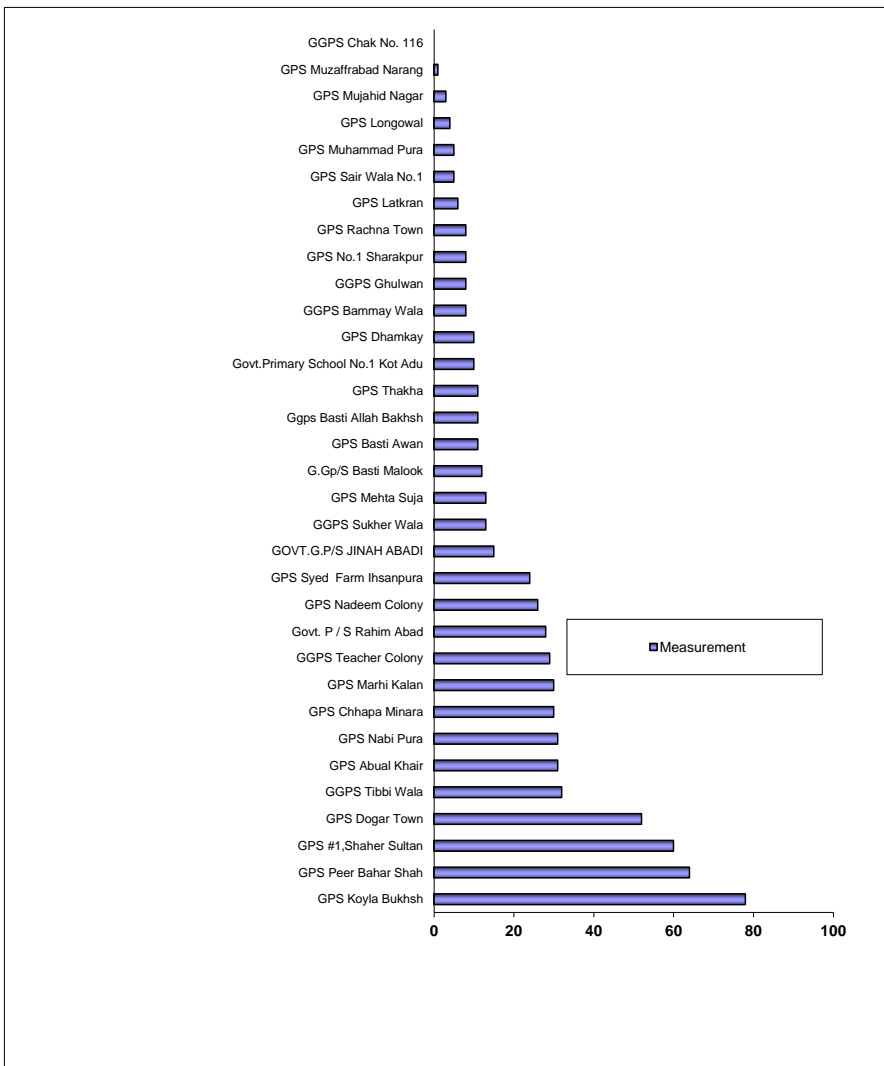
The bar chart shows that the highest performance was of GPS KoylaBukhsh School in number concept and the lowest performance was of GPS Longowal School and GPS Mari Kalan School. We can say that there is a variation in the performance of students' performance but the result is opposite there is great variation in the performance of schools that shows teachers do not teach number concept properly.

## Appendix (B)



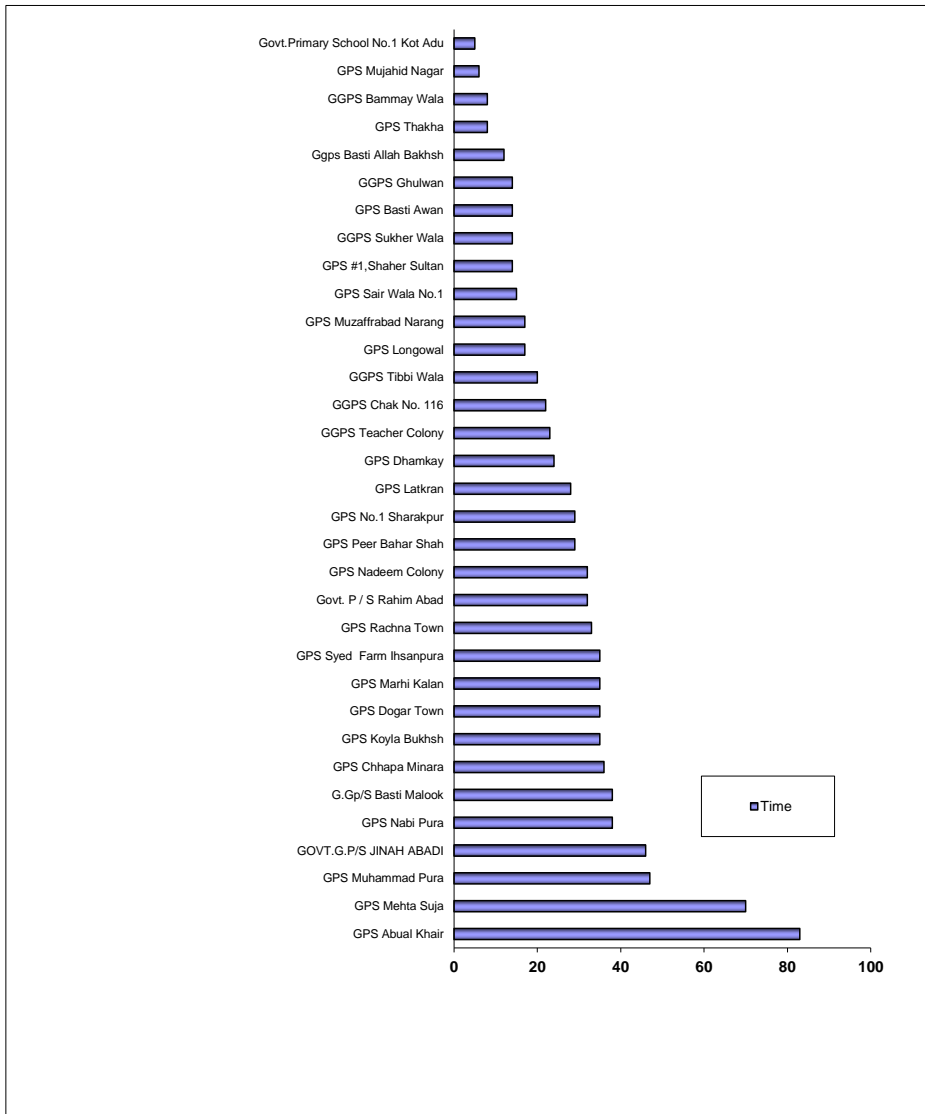
In the concept of Number Operation the highest performance was of GPS BammayWala School and the lowest performance was of GPS NabiPura School. The results show that there may be variation in the teaching method that effect on the schools' performance.

### Appendix (C)



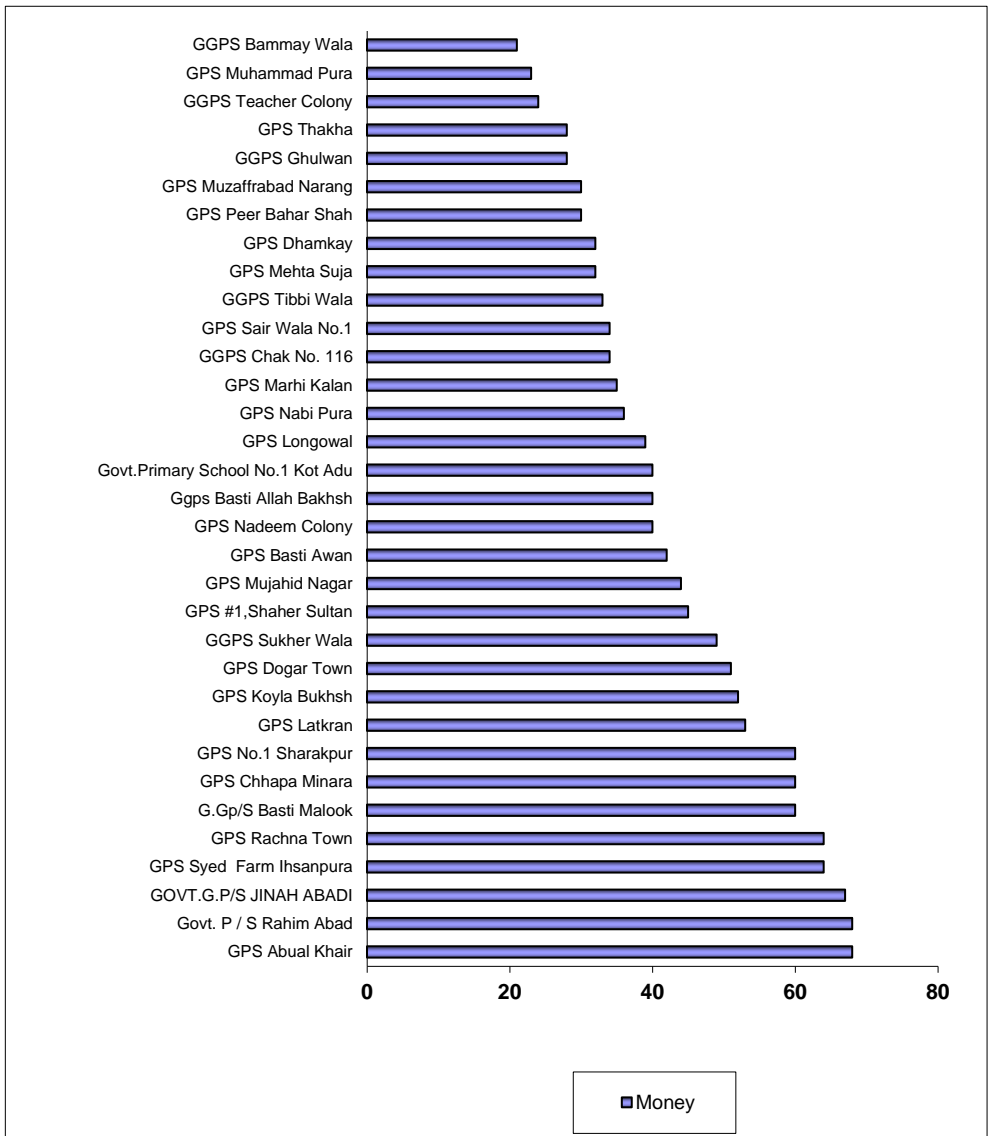
The diagram shows that all the schools are weak in the concept of measurement. Anyway highest performance was of GPS KoylaBukhsh School in that concept and the lowest performance was of GPS MuzaffarabadNarang and GPS Mujahid Nagar. In this concept one of the school shows zero performance i.e. GPS Chak No. 116 that shows teachers has no proper knowledge of measurement on there may be possibility that the teacher who is teaching mathematics in that school he/she is not of the mathematics teacher.

## Appendix (D)



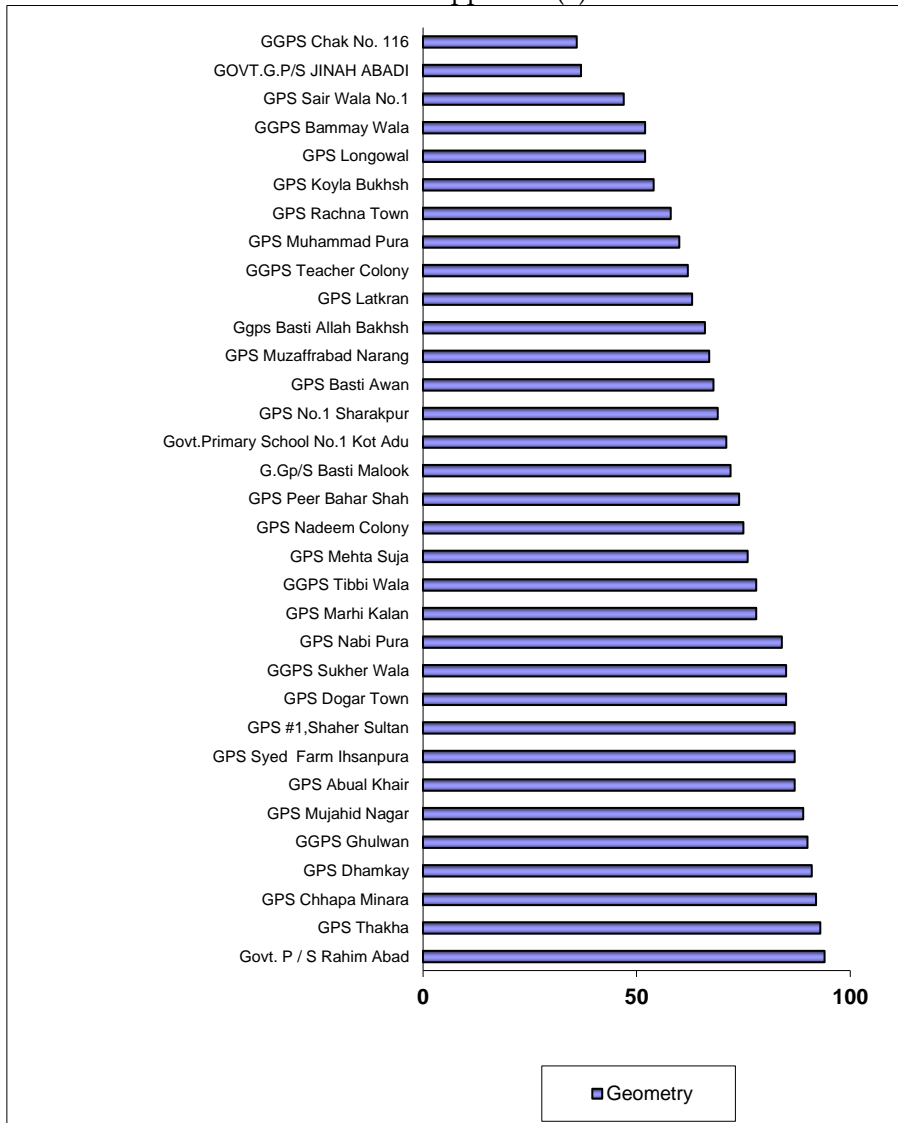
In the concept of time the highest performance was of GPS Abdul Khair School and the lowest performance was of GPS Mujahid Nagar, GPS BammayWala and Govt primary School No.1 KotAdu. There is also great variation in the schools' performance that shows teachers do not tell the concept properly to the students so students' performance effect on the school very much.

Appendix (E)



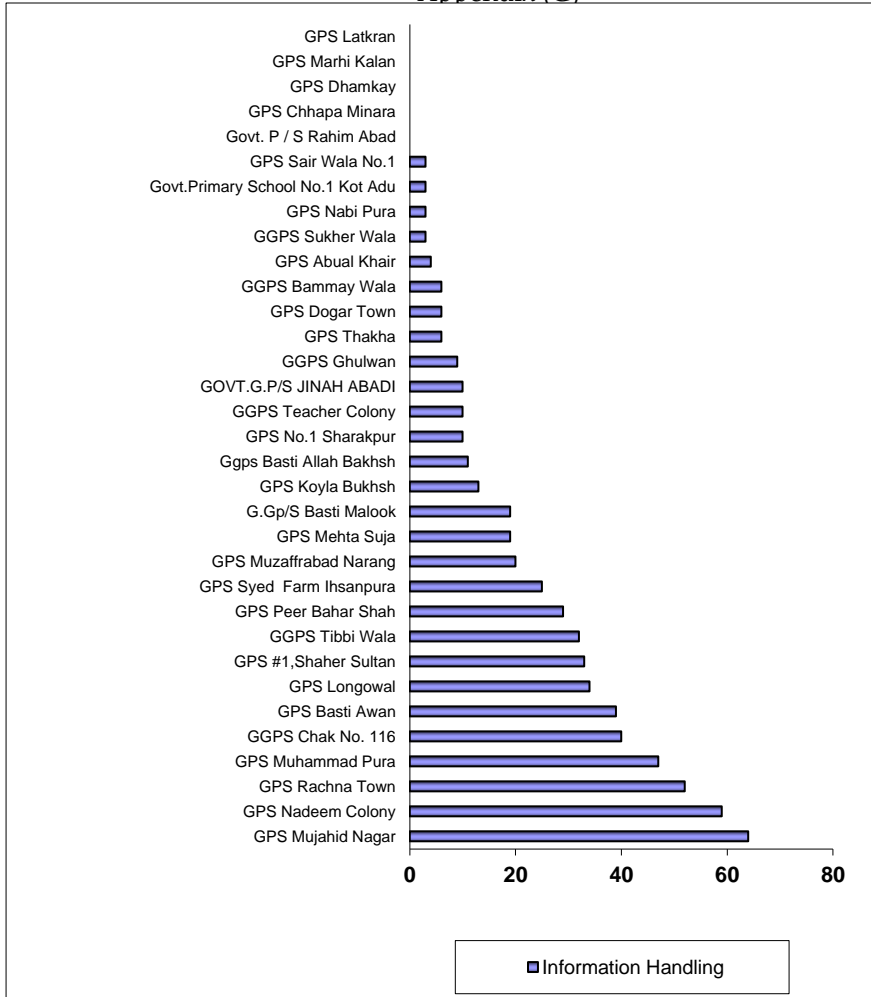
In the concept of money though there is a variation in the performance of schools but it also shows that all schools performed better than above concepts that students have the concept of money and teachers are also giving that concept properly. The highest performance was of GPS Abdul Khair School and the lowest performance was of GPS Bammay Wala GPS Muhammad Pura and GPS Teacher Colony School in the concept of money.

## Appendix (F)



In the concept of geometry almost all the schools performed better than all concepts. It means that teachers teach this concept with great clarity that affects the schools performance. The highest performance was of Govt P/S Rahim Abad School in that concept and the lowest performance was of Govt GPS Jinnah Abadi and Govt GPS Chak No.116.

Appendix (G)



The bar chart shows that teachers are not trained to teach information handling concept that most of the schools show low performance in that concept and most schools show '0' performance in this concept. The highest performance was of GPS Mujahid Nagar School. And lowest performance was of GPS Abdul Khair, GPS NabiPura, and GPS SukherWala School. And '00' performance was of Govt GPS Rahim Abad, GPS ChhapaMinara, GPS Dhamkay, GPS Mari Khan and GPS Latkran.