



## TEACHING OF MATHEMATICS AT ELEMENTARY LEVEL THROUGH MAKING CONNECTION BETWEEN PREVIOUS KNOWLEDGE IN MATHEMATICS AND ITS USE IN EXISTING SITUATION

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### Abstract

In Pakistan, the main aim of teaching mathematics as a compulsory subject at school level is to prepare such students who may survive in information and technological society. By applying mathematics students can check the reality of the things by themselves and gain confidence for future. With the changing scenario, teaching with traditional methods is losing its credibility. New innovations are empowering teaching methods and are producing better results. For the present study, two classes of grade 8 students were selected and named: experimental group and control group. Experimental group was taught through connecting the present situation with the previous knowledge in mathematics, while control group was taught with traditional method. Pretest-posttest method was used. Results were analyzed by applying z-test. On the pretest both the groups were equal in performance. After pre test, experimental group was taught by the researcher while control group was taught by the equally qualified teacher. The experiment duration was eight weeks and on post-test it was found that the experimental group performs better as compared to control group.

**Key Words:** Mathematics, Prior Knowledge of Mathematics, Traditional Teaching.

### INTRODUCTION

In Pakistan, Textbook boards are established for publishing books of school level. In addition, there are some other registered private and government agencies, which publish books of different subjects of school level. To large extent, the topics of books published by textbook boards or other agencies are same. Almost all public sector schools follow the books published by textbook boards while private sector schools use books published by textbook boards as well as books published by other private agencies.

In Pakistan, at school level the aim of teaching mathematics is to produce such students, who have ability to cope with the real world challenges. School level mathematics provides such basic knowledge on which learning of higher level mathematics depends. Following are the objectives described in the textbook of mathematics for grade 8, published by National Book Foundation:

- To enable the child acquire elementary knowledge of number system.
- To develop skills in the application of numbers and other mathematical structures in relevant situations.
- To develop understanding of modern mathematical concepts.
- To enable the child solve mathematical problems which have a practical value in real life situations.
- To enable the child develop the ability to measure and construct geometric figures.

Mathematics opens the window of clarity for better understanding and conclusions. Mathematics is a powerful learning tool .... They [Students] gain the ability to use mathematics to extent and apply their knowledge in other curriculum areas, such as science and language (Riffat, 2007).

At school level the cognitive development of the students is not at the level where they understand the abstract ideas of mathematics, but connecting the existing situation with previous knowledge of mathematics may help the students for better understanding of mathematics. In Pakistan, it is a common view that mathematics is a rather hard subject; students come to mathematics class with some confusion about mathematics which affects them psychologically. In mathematics classroom, generally teachers solve a question on board and same type of questions becomes the responsibility of the students. In this way teachers



try to complete syllabus before time, so that in remaining time students do questions again and again. In the whole scenario, students remain mum and put their energies in doing questions without mentioning his/her difficulties in mathematics. Mathematics is a subject in which every new concept depends on the previous learning related to that concept. The students who have poor previous knowledge remained failed in building strong concepts for coming situations in mathematics.

### Literature

It is said that Mathematics is a fun but at the same time mathematics is a problem for the students. Majority of the students try to pass mathematics till secondary level and leave it at college level. The overall performance of students in mathematics and English is low throughout the country [Pakistan] (Saeed, 2007):

School level mathematics provides base stone for the higher mathematics. Kumar (1993) states that:

Higher mathematics has a lot of bearing upon the elementary rules and regulations of mathematics. If a student of higher mathematics is not well aware of the rules and regulations of mathematics, he shall not be able to solve the problems of higher mathematics.

At present, in the information and communication's society mathematics is essential for many jobs. A strong background in mathematics is critical for many careers and job opportunities in today's increasingly technological society. However, many academically capable students prematurely restrict their educational and career options by discontinuing their mathematical training early in high school (Meece, Wigfield and Eccles, 1990).

Meece, Wigfield and Eccles by giving reference of NAEP and NCES further describe about the enrollment in mathematics beyond grade 10<sup>th</sup> "Several recent surveys (National Assessment of Educational Progress [NAEP], 1988; National Center for Educational Statistics [NCES], 1984) indicate that only half of all high school graduates enroll in mathematics courses beyond the 10th grade".

The utility of this subject [mathematics] is not confined to the classroom or the school only. It has an important bearing on various aspects of life (Kumar, 1993). While teaching mathematics in the classroom teacher must define strategies related to "how to organize and orchestrate the work of the students \_\_ and how to support students without taking over the process of thinking for them" (NCTM, 2000, p. 19). How to teach? It is very important and a difficult problem for teachers. While teaching in the classroom, teacher tries his/her best to teach in such a way that all the students understand what is being taught, but it is not necessary that all the students understand at the same rate, because every class is a combination of children with different cognitive abilities. Simpson (2003) describe that a mathematics teacher should kept in mind that what links are there to previous work? A student who is able to make connection of present situation with previous knowledge and utilize previous knowledge can produce good results in mathematics. . It is not productive simply to try and pour facts into their brains. Each student must assimilate and make sense of new ideas by connecting them to what they already know (Fisher, 2004). Learning mathematics requires construction of concepts based on prior knowledge, not simply passive reception of facts....teaching can only be effective if it causes students to respond to and link their own prior knowledge, to new discovered knowledge (Hoffman, 2002). Solving one or two questions on the board or given out exercise tot the students cannot inculcate understanding of mathematics among the students. Understanding comes from an interactive process within the student as they use prior knowledge, present instructional strategies and activities, and dynamically interact with and engage the new information (Zulnaidi & Zakaria, 2010). Schwartz, Sears & Chang (n.d, p.4) states:

People learn by building on prior knowledge and abilities. This suggests it is important to design educational activities that are relevant to students' prior knowledge so they can treat lessons meaningfully. By the same token, students need the right prior knowledge to start with. If students do not have useful prior knowledge, then there is a strong risk that they will build new knowledge on a faulty foundation; they may develop misconceptions or brittle behavioral routines.



### Objectives of the Study

The objectives of the study were:

1. To find, whether prior knowledge of mathematic works in advance form of the same concept of mathematics.
2. To find, whether teaching mathematics with connecting the existing situation with prior knowledge helps students in understanding the concept of mathematics.

### The Study

#### Research Design and Target Population

For this study pretest-posttest equivalent group design was used (as used by Watenable, Hare and Lomax, 1984). For this design pretest was taken by both the groups (Experimental group and control group) before the treatment and post test at the end of the treatment. Target population for the study was the students of grade 8.

#### Sample

Students of two classes of grade 8 were selected from a model college of Islamabad, as a sample for the present study. There were 40 students in each group. One class was treated as experimental group while the other as control group.

### METHODOLOGY

In changing scenario, students' involvement in classroom, teaching method and teachers' commitment are the factors which affect the teaching learning process. The traditional aspects of educational outcomes are based on pure (factual) subject knowledge and its memorization. On the other hand, modern aspects of educational outcomes concentrate on the progressive side of knowledge and its applications with individual involvement (Dogan, 2011). Mathematics was the subject selected for the present study. The duration of the study was eight weeks. Two Chapters entitled "Sets" and "Factorization" was selected for the study. Students had basic knowledge about the concepts in these chapters as they had learnt basics of these topics in grade 6<sup>th</sup> and 7<sup>th</sup>. A pre test of 25 marks was developed from the chapters which have been selected for the study. In question No.1, there were five multiple choice (one mark for each part), in question No.2, there were 5 short questions (Two marks for each question) while in question No.3, there were two parts (five marks for each part).

#### Validation of Pre Test

For validation pre test was given to five expert teachers of mathematics for their input. After their suggestions some changes were made in the test. After pre-test, experimental group was taught the researcher, while the control group was handed over to another teacher who was equally qualified.

Experimental group was taught by the researcher and the researcher explains each topic in the start and connected it with the exercise of grade 6 and grade 7, while control group was handed over to an equally qualified teacher who taught through traditional chalk and talk method and often solve a question on the board and sometimes gave practice work in the class.

#### Data analysis

The significance difference between the mean scores on pre test and post test of experimental and control group were found by using z-test. The following tables illustrate the results on pretest and posttest of experimental and control group.

Table 1: Significance of difference mean scores of experimental and control group on Pre-test

Group	N	Mean	SD	z-value	
				Calculated value	z-value at 0.05
Experimental	40	27.33	9.64	0.53	2.00
Control	40	26.28	7.84		

Not significant

Table 1 reveals that the mean score of experimental group was 27.33 and that of the control group was 26.28 on the pretest. The difference between the two means was not statistically significant at level 0.05. It means that both the groups were equal on the outset of the experiment.

Table 2: Significance of difference mean scores of experimental and control group on Post-test

Group	N	Mean	SD	z-value	
				Calculated value	z-value at 0.05
Experimental	40	37.90	7.79	5.01	2.00
Control	40	28.98	7.95		

Not significant

Table 2 reflects that the mean score of experimental group was 37.90 and that of the control group was 28.98 on the post-test. The difference between the two means was statistically significant at level 0.05. It provides the effectiveness of the steps taken for the better achievement for the students of the experimental group.

Table 3: Comparison between scores of pre-test and post-test of Experimental group

Test	N	Mean	SD
Pre-test	40	27.33	9.64
Post-test	40	37.90	7.79

Table 3 indicates that experimental group improves its mean score after the treatment. The mean score was 27.33 on pre-test which becomes 37.90 on post-test.

Table 4: Comparison between scores of pre-test and post-test of Control group

Test	N	Mean	SD
Pre-test	40	26.28	7.84
Post-test	40	28.98	7.95

Table 4 tells that control group also improves its mean score after eight weeks. The mean score was 26.28 on pre-test which becomes 28.98 on post-test. Although control group increase its mean score but not at the rate of experimental group.

## DISCUSSION

Mathematics is compulsory subject at school level. Mostly students feel mathematics anxiety as compared to other subjects. By defining different strategies for mathematics teaching and learning process of mathematics can be improved. For the present study both the groups were tested on the base of pre-test. After applying the statistics test it was become to known that there was no significant difference between the mean scores of both the groups. Hence both the groups were treated equally.

Experimental group was taught by connecting the existing situation with the prior knowledge in mathematics while the control group was taught through traditional method. After eight weeks both the groups were tested from the selected chapters. The scores were arranged, mean and standard deviation were calculated, it was found that the students of experimental group improve their mean score while the control group also make their mean score slightly better but comparatively at low rate with respect to experimental group. These results provide evidence that by connecting the existing topic with prior knowledge of mathematics help students in understanding the advance concept which they have learnt in the previous classes.



### FINDINGS AND CONCLUSIONS

1. On pre test both the groups were equal in performance and students of experimental group perform better on posttest, hence teaching through connecting with prior knowledge of mathematics may produce good results.
2. Through connecting with prior knowledge of mathematics , better understanding of mathematics can be achieved
3. With practice, achievement level can be increased, control group improve their efficiency by doing practice.

### RECOMMENDATIONS

1. Teachers must use new techniques of teaching.
2. New innovations may be included in the curriculum.
3. Teachers may arrange their lessons before going to class by connecting the present situation with the prior knowledge in mathematics.
4. Concept of the topic may be introduced in the start and some previous knowledge may be introduced for refreshing the memory of the students. .

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