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Impact of Project Based Method on Performance of Students

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Abstract

The study was aimed to investigate the effectiveness of project method in teaching mathematics at secondary school level in Pakistan. For this purpose a review of literature was undertaken to describe the nature of project method and lecture method.

The main objective of the study was to examine the impact of project method on the performance of students in mathematics in Pakistan. It was an experimental research and was conducted in the model colleges for girls Islamabad. Pre-test, post-test design was used in the study. 40 students participated in the study. Students were equally divided into control and experimental group. Experimental group was taught with project method along with lecture while control group was taught with lecture method.

The results of post-test revealed that students taught with project method performed better than students taught by lecture method. The study recommended that project

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method may be adopted in teaching of mathematics. It was also recommended that project method may be included in the teacher training curriculum.

Key words: Project method; performance in mathematics; impact; experimental study

Literature Review

The philosophy of mathematics program in classes IX and X is reflected in its goals, as provided for in the national curriculum of secondary level in Pakistan. The goal is to provide the students with the information and skills necessary for advanced work in mathematics and the sciences, and the information and skills necessary to become sensible and responsible individuals in a highly technological society of the 21st century.

Objectives of Teaching Mathematics at Secondary Level

1. To enable students to acquire understating of concepts of Mathematics and to apply them to the problems of the world they live in.
2. To provide the students with sound basis for specialization in Mathematics at higher stages or to apply it in scientific and technical fields.
3. To enable the students to reason consistently, to draw correct conclusions for given hypotheses; and to inculcate in them a habit of examining any situation critically and analytically.
4. To enable the students to communicate their thoughts through symbolic expressions and graphs.
5. To develop sense of distinction between relevant and irrelevant data.
6. To give the students basic understanding and awareness of the power of mathematics in generalization and abstraction.
7. To foster in students the spirit of exploration and discovery.

Teaching is a dynamic and well-planned process. Its objective is to acquire maximum learning experiences. In order to achieve this great objective, various methods and techniques based on psychological researches are used. Teaching methods are directly linked with teaching objectives. Hence each teaching method decides the direction and speed of the teaching (Saxena & Oberio, 1994). How to teach mathematics has always been an issue among the researchers. Teaching of mathematics at any level is affected by the methodology with which it is taught.

Researchers in math education are in the first instance concerned with the tools, methods and approaches that facilitate practice or the study of practice. However mathematics education research, known on the continent of Europe as the didactics of mathematics, has developed into a fully fledged field of study, with its own characteristic concepts, theories, methods, national and international organizations, conferences and literature.

This article describes some of the history, influences and recent controversies concerning math education as a practice.

According to Klien (2000), mathematical learning, like all learning, takes place in social environment which are influenced by, and in turn influence, individual identities. For example, in the classroom, the teacher's and students' identity affects the learning processes have a constitutive effect on the students (and the teacher).

Children at primary and secondary level are curious, imaginative and creative by nature. So the basic aims and objectives of science teaching at these levels especially at secondary level are to help the young children to increase their power of observing things, expressing experiences, taking decisions and thereby developing a positive attitude towards nature and society (Tayler, 1987).

Fleming (1973) says that style of teaching differs from topic to topic and with the situation. Teachers are the central point in teaching learning process. Maximum learning could be obtained through the use of suitable and effective style of teaching only. There is no single style, which can be said to be the most effective one. Fleming also emphasized that the teacher should not utilize a variety of methods and techniques each fulfilling certain special purpose. The good teachers of Biology adopt a flexible method and change their patterns as per situation.

Methods of Teaching

There are different teaching methods used by a teacher such as:

- 1 Lecture method
- 2 Demonstration method
- 3 Heuristic method
- 4 Assessment method
- 5 Project method
- 6 Discussion method
- 7 Inductive method
- 8 Deductive method
- 9 Inquiry method

The theme of the present study is project method *versus* lecture method. Therefore, these two methods are focused of this section.

Project Based Method

According to Rai (1994) the project Method was introduced by W.H. Kilpatrick, an eminent educationist of America and a Professor in the Columbia University. A pupil of

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Dewey, Kilpatrick believes in Pragmatism. The Project Method is based on Pragmatism. The ordinary meaning of project is plan or scheme. According to Project Method, a plan or scheme is made employing which Education is imparted.

Project method of teaching is based on simplicity, yet sound principle: we learn physical or mental skills by actually performing those skills under supervision. An individual learns to write by writing, to weld by welding, and to fly an aircraft by actually performing flight maneuvers. Students also learn mental skills, such as speed reading, by this method. Skills requiring the use of tools, machines, and equipment are particularly well suited to this instructional method.

The project method of teaching involves assigning a particular work to students or group of students to work on and complete at his/her/their spare time and report back to the teacher as when demanded. The project method provides an excellent opportunity for the complete act of thinking by the students. Rogus (1985) saw it as a mean of teaching the students self-discipline. In project method students have occasion to define the problem, plan his work, find appropriate resources, carryout his plan and draw conclusion.

Comparison of Lecture Method and Project Method

The traditional passive view of learning involves situations where material is delivered to students using a lecture-based format. In contrast, a more modern view of learning is project-based method, where students are expected to be active in the learning process by participating in discussion and/or collaborative activities (Fosnot, 1989). Overall, the results of recent studies concerning the effectiveness of teaching methods favor constructivist, active learning methods.

The findings of a study by de Caprariis, Barman, & Magee (2001) suggest that lecture leads to the ability to recall facts, but discussion produces higher-level comprehension. Further, research on group-oriented discussion methods has shown that team learning and student-led discussions not only produce favorable student performance outcomes, but also foster greater participation, self confidence and leadership ability (Perkins & Saris, 2001; Yoder & Hochevar, 2005). Hunt, Haidet, Coverdale, and Richards (2003) examined student performance in team learning methods, finding positive learning outcomes as compared to traditional lecture-based methods. In contrast to these findings, a study by Barnes & Blevins (2003) suggests that active, discussion-based methods are inferior to the traditional lecture-based method. A comparison of lecture combined with discussion versus active, cooperative learning methods by Morgan, Whorton, & Gunsalus (2000) demonstrated that the use of the lecture combined with discussion resulted in superior retention of material among students.

Mereku (2000) investigated a wide range of methods – observation of classroom practice, content and discourse analyses of lessons in mathematics. He found that the sequence of

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presentation in Mathematics classroom generally followed the pattern that can be described as teacher led class discussion using situations and examples.

Similarly, Sola and Ojo (2007) examined the effects of project, inquiry and lecture demonstration teaching methods on senior secondary students' achievement in separation of mixtures practical test. This study assessed and compared the relative effectiveness of three methods for teaching and conducting experiments in separation of mixtures in chemistry. A pre test post test experimental design with a control group was used. The findings of this study revealed that lecture demonstration method, inquiry method and project method can be used for teaching and learning process depending upon the topic but project method is more effective because it affords the students to study on their own.

On the other hand; Capon (2004) says that lecture method allow more material to be covered, in particular the multiple and varied exemplars that have been associated with superior acquisition and transfer. It is the most economical method of transmitting knowledge, but it does not necessarily hold the student's attention or permit active participation. However, lectures can be effective, if supported by texts and other references but it is significantly less common in primary and secondary schools. He opined that discussion sessions are more effective in stimulating the students' interests and assessing their understanding of the material.

Further lectures also communicate the intrinsic interest of the subject matter. The speaker can convey personal enthusiasm in a way that no book or other media can. Enthusiasm stimulates interest and interested people tend to learn more. However, it may be kept in mind that only well prepared and well presented students welcome lectures. It cannot be used in teaching higher cognitive and effective processes such as attitude. As a means of teaching, it is suitable only for mature students and only in specific subjects. It can be used where the teacher does not require establishing each and every point in his lecture during instruction. But it is generally not suitable for younger students, as in teaching them the teacher must know that each point is understood before proceeding to the next.

Hussain (1994) quotes Bloom as the value of lecture method depends on the specific objective of the teacher. If the teacher wishes to communicate information, the lecture method is reasonably efficient, but if the teacher desires to develop the power of critical thinking, problem solving ability and attitudinal change, the discussion method is superior. Nacino, Oke, and Brown (1982) say that there are many studies which compare one general teaching method to another, but the results are so difficult to interpret that the evidence to date gives little or no encouragement to hope that there is a single, reliable, multipurpose approach which can be regarded as the best. Instead of searching for a single right way, we should therefore focus on the possibility of combining a variety of teaching methods to improve learning.

Presently, there is no known single approach that can succeed with all kinds of students or all instructional goals. Teaching has to be approached in a variety of ways that facilitate learning or development. Teachers in the teaching of social studies at secondary level used different methods. These include lecture method, textbook method, discussion method, and study tour etc. The traditional methods are lecture method and book recitation method. However, some of the teachers use a combination of both lecture and project method.

Objectives of Study

The objectives of the study were:

1. To examine effectiveness of project method and lecture method in mathematics
2. To assess the impact of project method on students performance

Research Hypothesis

Hypothesis: Mean score of the students taught by project method is significantly higher than mean score of students taught by lecture method.

Alternate Hypothesis: Mean score of the students taught by lecture method is significantly higher than mean score of students taught by project method.

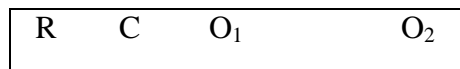
Null Hypothesis: There is no difference between the mean score of the students taught by project method and lecture method.

The researcher devoted great care to manipulation and control of variables and to the observation and measurement of results. The study had three basic characteristics:

- 1) An independent variable was manipulated.
- 2) All other variables except the dependent variable were held constant.
- 3) The effect of the manipulation of the independent variable was observed.

Research Design

Nature of the study was experimental. This study used a pretest/posttest control group design that included the matching of participants prior to random assignment to control group or experimental group.



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Source: (Best & Kahn, 1993)

1. The Pre-test-Post-test Control Group Design was used as research design.
2. Two tests were developed to test the student achievement.
3. Pre-test was taken for equating the two groups' i.e., for the formation of groups.
4. Lesson plans were developed for two methods of teaching.
5. Actual teaching was done for two days.
6. A post-test was taken in order to notice the effect of two methods. The test was administered on the third day.
7. Data was analyzed using means to find out the effective method of teaching mathematics.

Sample of the Study

Sample of the study consisted of 40 students of secondary level classes of Islamabad Model College for Girls.

Instrumentation

Two tests were developed to conduct the research one for pre test and other for posttest. And two lesson plans were developed to teach a topic using lecture method.

Pre-Test

Students were given a pre test on which they were equated into two groups. The test was composed of questions from general mathematics to test their ability. The test was developed using questions from a Practice Placement Test Generated by Quiz Maker 2.0 for Quiz Center authored by Richard Shadian. The test comprised of 25 questions Time given to each group was 25 minutes.

Actual Activity

Two lesson plans were developed for the two groups. Control group was taught with lecture method while the experimental group was taught with project method along with lecture. Each group was taught for two days for 45 minutes. Same topic" concept of average and its finding" was taught to both groups with different methods.

A lecture of 45 minutes was given for two days to both groups. In the lecture basic concept of average was explained and then examples from daily life were quoted. The

formula of average was explained followed by related examples. Students were given some questions as homework assignment.

However, the students in experimental group worked in groups as part of their project. The students first found their pulse rate, blood pressure, temperature, height and weight. After that, each groups calculated their groups' average pulse, B.P. temperature, height and weight.

Post-Test

After the actual teaching both groups were given a test. The test completion time was 25 minutes.

Analysis of Data

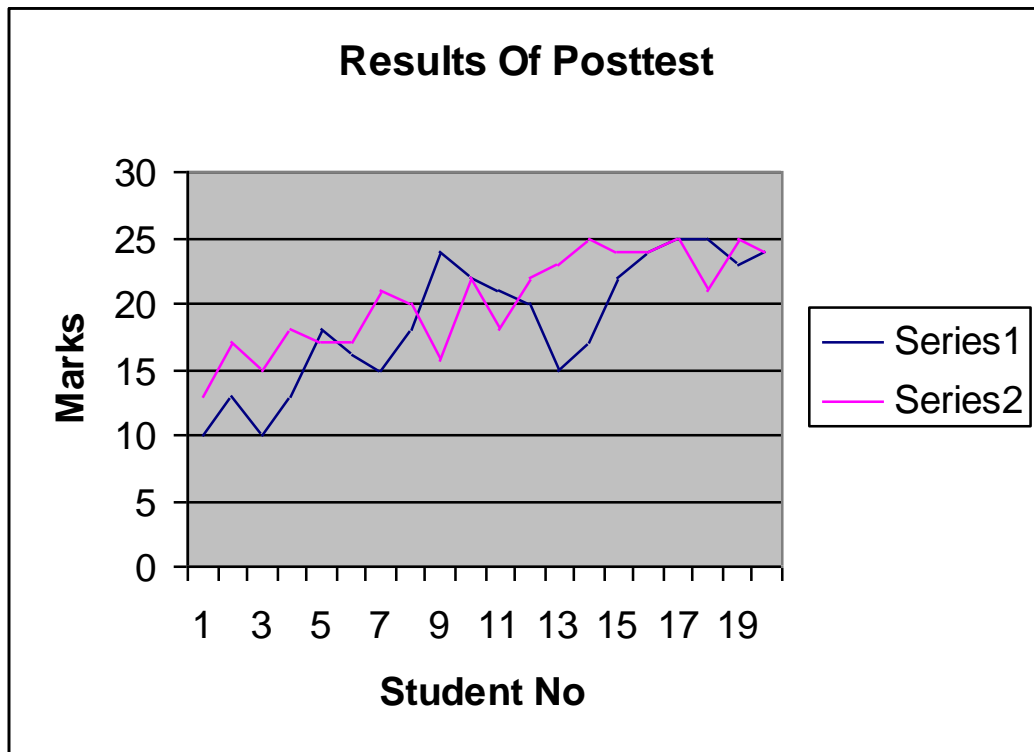
The data was collected through tests taken at the end of the course. Mean of both groups test score was used to compare the performance of both the groups. Score of both groups is shown in the table:

Table 1 Results of Pretest and posttest

S.No.	Group1 Pretest (Lecture Method)	Group1 Posttest (Lecture Method)	Group2 Pretest (Project Method)	Group2 Posttest (Project Method)
1	3	10	5	13
2	9	13	8	17
3	12	10	12	15
4	14	13	4	18
5	14	18	15	17
6	14	16	16	17
7	15	15	16	21
8	17	18	17	20
9	18	24	17	18
10	18	22	18	22
11	18	21	18	18
12	18	20	18	22
13	19	15	19	23
14	20	17	20	25
15	21	22	20	24

16	21	24	21	24
17	22	25	21	25
18	23	25	22	21
19	24	23	23	25
20	24	24	24	24

Below charts generated for the marks of both groups 1 shows the results of student taught by lecture method and series 2 shows the marks taught by project method.



Similarly the results of both groups have been shown through bar diagram as indicated below:

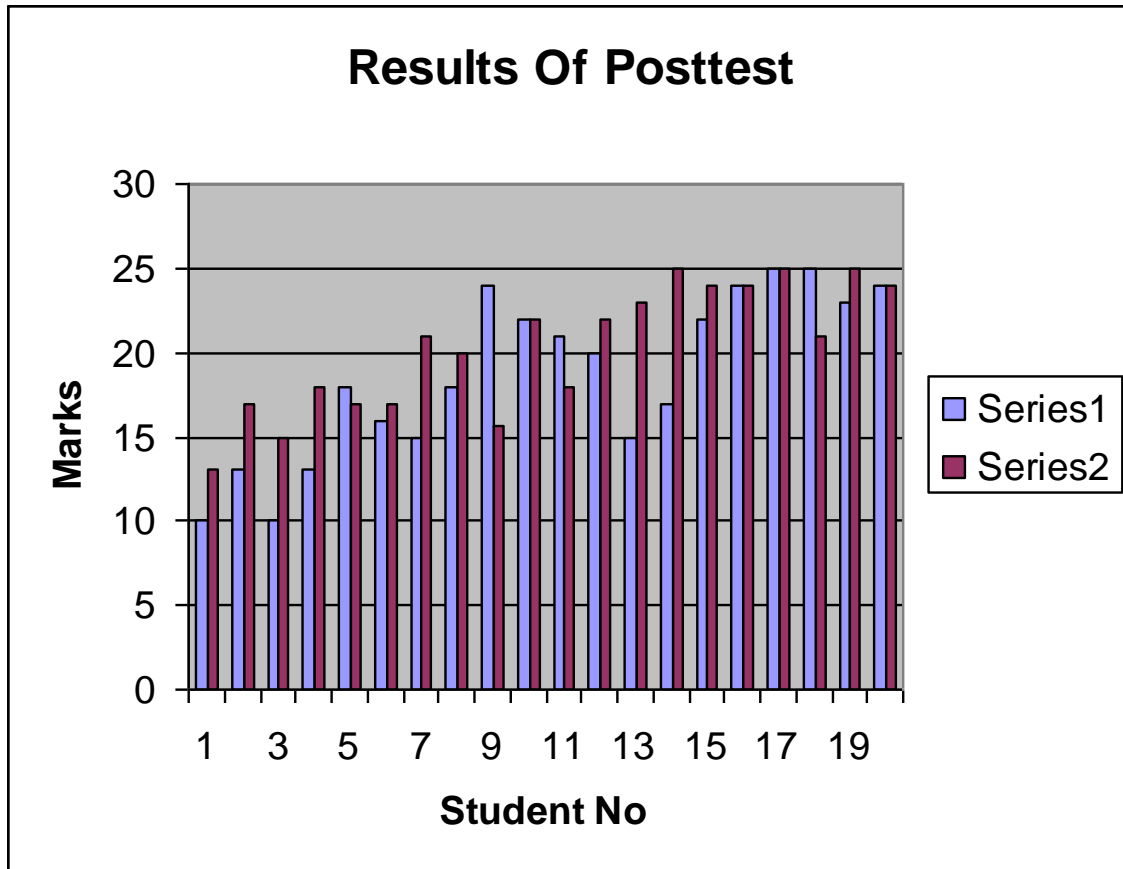


Table2

Mean score on pre-tests/Post-test						
Experimental Group (N=30)				Control Group (N=30)		
Pre-test	Mean	SD	Variance	Mean	SD	Variance
	16.7	5.6	31.1	17.2	5.2	27.5
Post-test	20.5	3.6	13.2	28.8	4.9	24.5

Results & Recommendations

Results of the post-test revealed that students taught by project method performed better than students taught by lecture method. It was recommended that for the effective teaching of mathematics project based method must be followed in order to increase the leaning level of students. It may be included in the teacher training curriculum. However,

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it is also recommended that further study may be conducted in other subjects at different level.

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