

## Impact Of In - Service Teacher Training On Students' Learning Achievement In Mathematics

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**Abstract-**The main objectives of the study were; To compare the learning achievements of students in the subject of mathematics taught by male and female trained and untrained teachers and To compare learning achievement of students in rural and urban schools of Distt. Faisalabad. To achieve the objectives of the study, two null hypotheses were tested; There is no significant difference between the mean scores of male and female trained and untrained teachers on students' learning achievement; There is no significant difference between the mean scores of urban and rural schools on students' learning achievement. Sample of this study was comprised of the students of grade-4 and their teachers. 48 schools from district Faisalabad were selected conveniently. Teachers of 24 schools were imparted in-service training and others were not. 35 students were taken as sample from each school. An achievement test was constructed as research tool and validated through pilot testing by determining difficulty level, discrimination index and reliability. Test was further divided into 11 dimensions of Mathematics. Data were analyzed by calculating mean score and independent sample t-test by using SPSS to find out the difference between the selected variables. It was concluded that trained male and female teachers are significantly better than untrained male and female teachers, rural schools are significantly better than urban schools.

**Key words:** learning achievement, Mathematics, achievement test

### I. INTRODUCTION

Teaching of mathematics according to Mayor (2005), involves more than knowing and enjoying the subject. How teachers learn and develop is a question that has compelled teacher educators and researchers to think about it. Hammond, Darling & Bransford (2005) raised some questions about teaching. How do the teachers learn to use their understanding of content matter, their practices and strategies and improve learning environment? How do they learn to keep balance between the diversity of the learners and the needs of the curriculum? How teachers learn to be active members of the professional community that effort to work to improve the learning of the students? Different institutions play their role in different time at district and national level to train the teachers before starting their jobs

and during job. Directorate of Staff Development (DSD) is one of them fulfilling this responsibility. It aims at imparting the fundamentals of teachers' education with a view to qualify the trainee for the immediate employment in a school or to provide the basis for 'Specialization' in different subjects. Teachers can not be expected to do all this on their own. They need support and the certain environment for the purpose (Bansal, 2007).

It is misconception, according to Syed, (2008) that knowledge can be passed on like money from one person to another. Farooq and Shahzadi (2006) conducted a study to compare the effectiveness of teaching of professionally trained and untrained teachers and the effect of students' gender on achievement in Mathematics. The results of the study supported that the students taught by trained teachers showed better results in Mathematics. Moon, Mayes & Hutchinson (2004) explained in their study that Teachers' professional characteristics, their skill to teach mathematics and the environment they create to teach mathematics has significant influence on students' achievement. This research is also an effort to study the effectiveness of an in-service teachers' training at primary level.

### II. OBJECTIVES

The objectives of this study were as under:

1. To compare the learning achievements of students in the subject of mathematics taught by male and female trained and untrained teachers.
2. To compare learning achievement of students in rural and urban schools of Distt. Faisalabad.
3. To suggest measures to improve training program at primary level

### III. HYPOTHESES

**H0:** There is no significant difference between the mean scores of male and female trained and untrained teachers on students' learning achievement.

**H1:** There is a significant difference between the mean scores of male and female trained and untrained teachers on students' learning achievement.

**H0:** There is no significant difference

between the mean scores of urban and rural schools on students' learning achievement.

**H1:** There is a significant difference between the mean scores of urban and rural schools on students' learning achievement.

#### IV. SIGNIFICANCE OF THE STUDY

This study was:

- A considerable effort to find out the difference between male and female trained and untrained teachers regarding their performance in Mathematics
- Useful for primary school teachers to improve their teaching skills
- An important effort to help teacher training agencies and institutions

#### V. DELIMITATIONS OF THE STUDY

The study was delimited to:

- Primary schools' untrained teachers and trained teachers by DSD, being supervised by District teacher educators (DTEs) DSD.
- Study was conducted in District Faisalabad only

#### VI. PROCEDURE OF THE STUDY

##### a. Population and Sample

All public primary schools, students of grade-5 and their teachers in district Faisalabad, were considered as population of the study. Untrained teachers and DSD Trained teachers teaching Mathematics to grade-4 were the sample of this study. The respective students of these trained and untrained teachers who had passed their 4<sup>th</sup> grade examination were focused.

- 16 schools from each Tehsil were selected conveniently. There were 48 schools from District Faisalabad (24 trained, 24 untrained teachers from girls and boys schools).
- 35 students of each of the respective teachers were evaluated through achievement test.

Achievement test was used as a tool of this study

##### b. Findings

TABLE I. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN CONCEPTUAL UNDERSTANDING TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	32	5.4	3.65	2.2	.02
	Untrained	5	89	791	51	5
Female	Trained	32	4.8	3.19		
	Untrained	7	83	393	8	
Female	Trained	20	6.8	2.25	8.3	.00

	2	21	002	84	0
Un	31	5.2	2.06		
Trained	5	03	964		
		2			

Table.1 indicates that the mean score of male trained teachers is greater than the mean score of untrained teachers and p- value is less than .05 significant level. It can be concluded that trained male teachers are significantly better than untrained male teachers in developing conceptual understanding of the students in mathematics. On the other hand trained female teachers are significantly better than untrained female teachers because the mean score of trained teachers is greater than the mean score of untrained teachers and p- value is less than .05 which shows that trained female teachers are significantly better than untrained teachers regarding developing the conceptual understanding of the students in mathematics at grade-4.

TABLE II. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN PROCEDURAL KNOWLEDGE TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	32	3.	3.50	4.	.000
	Untrained	5	91	855	26	
Female	Trained	32	2.	2.15		
	Untrained	7	93	131	88	
Female	Trained	20	4.	2.02	2.	.018
	Untrained	2	27	229	38	
Female	Trained	31	3.	2.27		
	Untrained	5	81	792	59	

It is evident from the table. 2 that the mean score of the trained male teachers is greater than the mean score of untrained teachers and p- value is less than .05 which indicates that trained male teachers are significantly better than untrained male teachers in developing the ability of the students in understanding the procedures of sums in mathematics. On the other hand trained female teachers are significantly better than untrained female teachers because the mean score of trained teachers is greater than the mean score of untrained teachers and p- value is less than .05 which shows that trained female teachers are significantly better than untrained teachers regarding procedural knowledge of the students in mathematics at grade-4.

TABLE III. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN PROBLEM SOLVING TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	32	3.1	3.00	2.150	.032
	Untrained	5	75	873		
Female	Trained	32	2.7	1.98	.910	.364
		7	46	146		
	Untrained	20	3.1	1.55		
		2	08	113		
Trained	31	2.9	1.37			
	5	87	070			
	Untrained	3				

Table. 3 reveals that the mean score of trained male teachers is greater than the mean score of untrained male teachers and p- value is also less than .05 significant level. It shows that trained male teachers are significantly better than untrained teachers regarding problem solving abilities of the students in mathematics. On the other hand, the mean score of trained female teachers is greater than the mean score of untrained female teachers but p- value is greater than .05 which means that the difference is not significant. Trained and untrained female teachers are having almost same ability to develop students' problem solving skills.

TABLE IV. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN LOGICAL PART TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	325	1.9	1.729	-.874	.382
	Untrained	662	04	662		
Female	Trained	327	2.0	1.170	4.951	.000
		673	34	673		
	Untrained	202	2.4	1.078		
		406	48	48		
Trained	315	1.9	.9690			
	778	2	2			

Table. 4 exhibits that the mean score of untrained male teachers is greater than the mean score of trained male teachers but p- value is greater than .05 significant level. It can be said that untrained male teachers are better to develop logical ability of the students but the difference is not significant. On the other hand, the mean score of female trained teachers is greater than female untrained teachers and p- value is less than .05. it can be said that female trained teachers are significantly better than untrained female teachers in developing logical ability of the students in mathematics at grade-4.

TABLE V. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN NUMBER SENSE PROPERTIES AND OPERATIONS TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	32	4.4	3.16	1.842	.066
	Untrained	5	36	616		
Female	Trained	32	4.0	2.56	4.885	.000
		7	21	023		
	Untrained	20	4.8	1.96		
		2	51	935		
Trained	31	3.9	2.13			
	5	55	209			

It is evident from the table. 5 that the mean score of trained male teachers is greater than the mean score of untrained male teachers and p- value is greater than .05 which reflects that the difference between both types of the teachers is not significant on the parameter; Number and Arithmetic Operations. On the other hand, the mean score of trained female teachers is greater than untrained female teachers and the p- value is less than .05 significant level. It can be concluded that female trained teachers are significantly better than untrained female teachers on teaching the students' number and arithmetic operations of mathematics.

TABLE VI. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN FACTORS AND MULTIPLES TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

Gender of Teacher	Category of Teacher	N	Mean	Std. Deviation	t-value	p-value
Male	Trained	32	1.	1.5	4.798	.000
	Untrained	5	16	034		
Female	Trained	32	.6	.94	.536	.592
		7	91	285		
	Untrained	20	1.	1.0		
		2	23	698		
Trained	31	1.	1.2			
	5	17	312			

Mean score of trained male teachers is greater than the mean score of untrained male teachers ( table. 6) and p-value is less than .05 significant level. It can be said that male trained teachers are significantly better than male untrained teachers regarding factors and multiples in mathematics. On the other side, the mean score of trained female teachers is greater than the mean score of untrained female teachers but p- value is greater than .05 which shows that the difference is not significant. Trained and untrained female teachers are having almost same ability to teach students factors and multiples in mathematics.

TABLE VII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN FRACTIONS

<i>Gend er of Teach er</i>	<i>Categ ory of Teach er</i>	<i>N</i>	<i>Me an</i>	<i>Std. Devi atio n</i>	<i>Std. Er ror Me an</i>	<i>t- val ue</i>	<i>p- val ue</i>
Male	Train ed	32 5	2.5 26	3.00 464	.16 66	2.0 43	.04 2
	Un Train ed	32 7	2.1 10	2.11 773	.11 71		
Femal e	Train ed	20 2	2.6 08	1.46 281	.10 29	4.7 14	.00 0
	Un Train ed	31 5	2.0 34	1.15 463	.06 50		

The table.7 indicates that the mean score of male trained teachers is greater than the mean score of male untrained teachers and p- value is less than .05 significant level which means that male trained teachers are significantly better than male untrained teachers on different types of fractions in mathematics. On the other hand, female trained teachers are significantly better than female untrained teachers on; fractions because the mean score of trained female teachers is greater than female untrained teachers and p- value is also less than .05 significant level.

TABLE VIII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN MEASUREMENT TAUGHT BY TRAINED AND UNTRAINED MALE AND FEMALE TEACHERS

<i>Gend er of Teach er</i>	<i>Categ ory of Teach er</i>	<i>N</i>	<i>M ea n</i>	<i>Std. Dev iati on</i>	<i>St d. Er ror M ea n</i>	<i>t- va lu e</i>	<i>p- va lu e</i>
Male	Train ed	32 5	2. 21	1.07 366	.0 59	2. 38	.0 17

			85		56	9	
Femal e	Un Train ed	32 7	2. 02	.963 68	.0 53		
	Train ed	20 2	2. 49	.904 65	.0 63	4. 27	.0 00
			50		65	3	
	Un Train ed	31 5	2. 15	.821 80	.0 46		
			87		30		

The table. 8 shows that the mean score of male trained teachers is greater than the mean score of male untrained teachers and p- value is less than .05 significant level, which states that male trained teachers are significantly better than male untrained teachers on measurement in mathematics. On the other hand, female trained teachers are significantly better than female untrained teachers on; measurement because the mean score of trained female teachers is greater than female untrained teachers and p- value is also less than .05 significant level.

TABLE IX. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN GEOMETRY

<i>Gend er of Teac her</i>	<i>Categ ory of Teac her</i>	<i>N</i>	<i>M ea n</i>	<i>Std. Devi atio n</i>	<i>St d. Er ror M ea n</i>	<i>t- val ue</i>	<i>p- val ue</i>
Male	Train ed	32 5	1. 71	1.46 139	.0 81	3. 65	.0 00
	Un Train ed	32 7	1. 33	1.20 666	.0 66		
Femal e	Train ed	20 2	2. 36	1.12 611	.0 79	3. 20	.0 01
	Un Train ed	31 5	2. 05	1.06 954	.0 60		

It is evident from the table.9 that the mean score of male trained teachers is greater than the mean score of male untrained teachers and p- value is less than .05 significant level which reflects that male trained teachers are significantly better than male untrained teachers on geometry and its rules in mathematics. On the other hand, female trained teachers are significantly better than female untrained teachers on; geometry because the mean score of trained female teachers is greater than female untrained teachers and p- value is also less than .05 significant level.

TABLE X. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN CONCEPTUAL UNDERSTANDING BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	4.8013	2.33641	.09468	-8.075	.000
Rural	560	6.2036	3.44515	.14558		

Table. 10 shows that mean score of rural schools is greater than urban schools and p- value is also less than .05 which indicates that the performance of students in rural schools is significantly better than urban schools in understanding mathematical concepts and principles.

TABLE XI. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN PROCEDURAL KNOWLEDGE BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	3.099	2.18972	.08873	-7.889	.000
Rural	560	4.3005	2.95487	.12487		

The mean score of rural schools is greater than urban schools ( table.11 ) and p- value is also less than .05 which shows that the performance of students in rural schools is significantly better than urban schools in understanding the procedural mathematical operations and they have understanding to adopt proper procedure to solve mathematical situations.

TABLE XII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN PROBLEM SOLVING BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	2.6158	1.47573	.05980	-6.275	.000
Rural	560	3.4036	2.61234	.11039		

It is evident in the table The mean score of rural schools is greater than urban schools (table .12) and p- value is also less than .05 which shows that the performance of students in rural schools is significantly better than urban schools in

understanding the procedural mathematical operations and they have understanding to adopt proper procedure to solve mathematical situations.

TABLE XIII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN LOGICAL PART BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	1.8719	1.14421	.04637	-5.71	.000
Rural	560	2.3054	1.41976	.06000	6	

Mean score of the students of rural schools is greater than the students of urban schools (table. 13) p-value is also less than .05 significance level. It reveals that the students of rural schools are significantly better than the students of urban schools in having logical ability in the subject of Mathematics at grade-4.

TABLE XIV. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN NUMBER SENSE PROPERTIES AND OPERATIONS BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	3.6831	2.23380	.09052	-8.193	.000
Rural	560	4.8929	2.76043	.11665	93	

It is described in the table.14 that the mean score of the students of rural schools is greater than the students of urban schools and p-value is less than .05 level of significance. It defines that the students of rural schools are significantly better in understanding the number system and other arithmetic operations in mathematics.

TABLE XV. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN FACTORS AND MULTIPLES BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error Mean	t-value	p-value
Urban	609	.7176	.88799	.03598	-9.699	.000
Rural	560	1.4054	1.44610	.06111	99	0

Table. 15 shows that the mean score of the students belonging to rural schools is greater than the mean score of the students of urban schools. P-value is also less than .05 level of significance. It states that the performance of the students of rural schools is significantly better than the performance of the students of urban schools in understanding factors and multiples in mathematics.

TABLE XVI. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN FRACTIONS BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Urban	609	1.8	1.499	.06	-7.5	.00
Rural	560	2.7	2.566	.10		
		424	38	076		
		804	46	845		

The mean score of the students of rural schools is greater than the mean score of the students of urban schools ( table. 16). P-value is less than .05 level of significance. It clarifies that the performance of the students of rural schools is significantly better than the performance of the students of urban schools in understanding different types of fractions in the subject of mathematics.

TABLE XVII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN MEASUREMENT BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Urban	60	2.1	.902	.03	-1.8	.07
Rural	56	2.2	1.02	.04		
	9	47	03	65		
	8			5		
	50	124	31	6		
	0					

It is evident in the table above ( table.17 ) that the mean score of rural schools is greater than the mean score of urban schools but p-value is also greater than .05 level of significance. It indicates that the performance of the students in both types of schools is almost same and there is no significant difference between the results of the two regarding measurement in mathematics.

TABLE XVIII. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN GEOMETRY

Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
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Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Urban	609	1.6	1.071	.04	-5.7	.00
Rural	560	2.0	1.456	.06		
		043	18	341		
		375	72	156		

Table. 18 defines that mean score of the rural schools is greater than the mean score of urban schools and p-value is also less than .05 which shows that there is a significant difference between the results of both types of schools regarding their students' performance in geometry. The students of rural schools are better than urban schools.

TABLE XIX. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN DATA ANALYSIS, STATISTICS, PROBABILITY, INFORMATION HANDLING BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Urban	609	.51	.5620	.02	-.75	.45
Rural	560	.54	.6724	.02		
		89	0	277		
		64	8	842		

Results in the table. 19 describes that the mean score of the rural schools is greater than urban schools but p-value is greater than .05 that is why it can be said that the difference is not significant. Results of both types of the schools are indicating the same level of understanding of the students to handle information or other data presented in form of graphs or charts in mathematics.

TABLE XX. SHOWING THE DIFFERENCE IN THE ACHIEVEMENTS OF THE STUDENTS IN OVERALL INCLUDING LOGICAL PART BY LOCATION

Location of School	N	Mean	Std. Deviation	Std. Error	t-value	p-value
Urban	609	12.	5.498	.22	-8.6	.00
Rural	560	16.	9.051	.38		
		385	85	282		
		9				
		217	38	249		
		9				

Comparison of urban and rural students (table.20) shows that rural schools are significantly better to develop students' abilities in overall mathematics including logical ability as compared to urban schools in the subject of mathematics.

## VII. CONCLUSIONS

- Trained male teachers are significantly better than untrained male teachers on: conceptual understanding, procedural knowledge, problem solving, factors and multiples, fractions, measurement, geometry and data analysis, statistics, probability, information handling. No significant difference was found on two parameters; logical part and number sense properties and operations.
- Trained female teachers are significantly better than untrained female teachers on: conceptual understanding, procedural knowledge, logical part, number sense properties and operations, fractions, measurement and geometry. No significant difference was found on three parameters; problem solving, factors and multiples and data analysis, statistics, probability, information handling.
- Rural schools are significantly better than urban schools on: conceptual understanding, procedural knowledge, problem solving, logical part, number sense properties and operations, factors and multiples, fractions and geometry. No significant difference was found on two parameters; measurement and data analysis, statistics, probability, information handling.
- Overall rural schools are significantly better than urban schools in teaching mathematics including developing logical ability of the students in mathematics.

## VIII. RECOMMENDATIONS

- Curriculum should be need- based instead of overloading of concepts.
- Rural schools performed better according to this study. If they are provided with proper facilities their performance can be further increased.
- Training program should more focus on methodology rather than contents
- Contents of mathematics are not relevant to the practical life according to the views of the teachers. It should be revised with the help of primary school teachers as they know the actual needs of the learners at this stage.
- Teachers need training in weak areas highlighted in this study
- Further research should be conducted to find out the reason of low achievement level of students in urban areas.

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