# COMPARATIVE ANALYSIS OF THE EXAMINATION RESULTS OF GRADE 5 STUDENTS IN 2012 and 2013

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#### **SECTION 1: INTRODUCTION**

The main objective of this report is to present a comparison of the secondary analysis of the data arising from the 2012 and 2013 Grade 5 examinations. For this purpose, only descriptive statistics are used as inferential statistical techniques for longitudinal data requires more than just two point estimates. However, in future the scope of this analysis can be enhanced to cover the examination results from 2006 to 2015. Such an analysis will provide more meaningful insights into the trends in factors affecting learning achievement. Also, longitudinal analysis covering a longer time period will reflect on the efficacy of policy interventions and infrastructure investments.

In addition, the analysis connects the data generated by PMIU and PEC for the years 2012 and 2013 in an attempt to identify factors that significantly affect student performance in Punjab. PMIU maintains a rich database of public schools in Punjab that contains information on students, teachers and schools. Consequently, the scope of this analysis is confined to the performance of public schools only. For this purpose, multiple regression analyses were carried out that used overall and subject level school mean score as the dependent variable. Information on all the variables maintained in the PMIU database was used in an attempt to find potential predictors of students' performance.

# SECTION 2: COMPARISON OF STUDENT PERFORMANCE

This section aims to highlight the trends in students' performance in 2012 and 2013. However, this analysis is a mere comparison of the two year performance data as no statistical technique can be reliably used to infer meaningful results. PEC has now conducted grade 5 examinations in Punjab for 10 years in succession. In future, this entire data should be used to analyze trends and patterns in student performance. It is pertinent to mention here that, in general, student performance across districts, tehsils and other demographic variables is same in 2012 and 2013. The rest of this section contains comparison of 2012 and 2013 results data on different dimensions.

#### **Examination Statistics**

The 2013 exam had a candidature of 1.45 million compared to 1.4 million students in 2012. As a result 7143 centers were used in 2013 compared to 6955 centers in 2012. There was no difference in demographic breakup of the student body. However, the overall pass percentage went down from 53.97% in 2012 to 52.76% in 2013. The most notable decline is in pass rate of English medium students that decreased from 57.61% in 2012 to 52.80% in 2013. Table 1 provides a comparison of pass percentage in each subject for male and female students in both years.

Year	Sci	ence	Mathe	ematics	Eng	glish	U	rdu	Isla	miat	Social	Studies
Tear	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
2012	76.32	78.09	74.70	73.88	79.89	84.81	91.31	94.82	98.79	99.02	81.69	84.00
2013	78.29	80.52	71.38	68.92	82.84	88.14	87.27	92.58	98.49	98.82	77.17	80.92

**Table 1: Gender wise pass percentage for all subjects** 

#### **Performance by Subject**

Students secured the highest marks, on average, in Islamiat followed by Urdu and then English in both years while the mean score in Mathematics is lowest in both years. The range of difference in highest and lowest scoring districts reduced from 23%-30% in 2012 to 16%-19% in 2013 for different subjects.

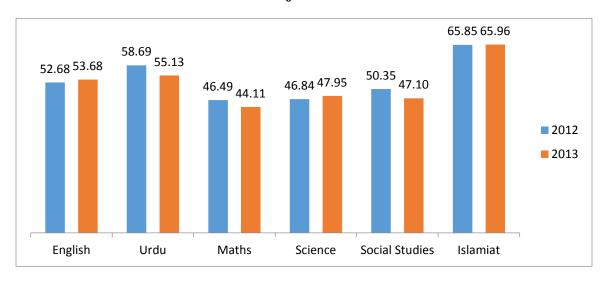


Figure 1: Comparison of performance by subject in 2012 and 2013

# **Performance by Language of Exam**

English medium students performed better in Islamiat, Urdu, English and Mathematics while Urdu medium students performed better in Science and Social Science in both years. The effect size of language of exam is significant for English in both years while it is significant for Islamiat in 2013 only. For all other subjects it is very small in both years.

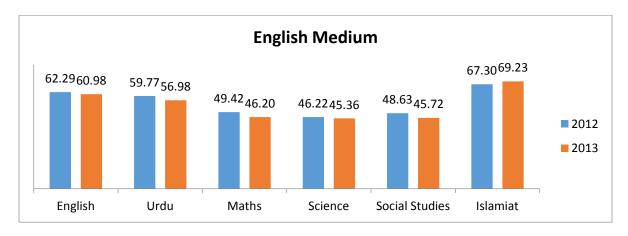


Figure 2: Comparison of performance by exam language in 2012 and 2013 (English Medium)

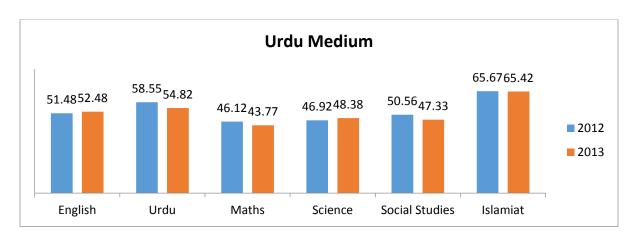


Figure 3: Comparison of performance by exam language in 2012 and 2013 (Urdu Medium)

#### **Performance by Gender**

Female student performed better in English, Urdu and Islamiat while male students performed better in Mathematics in both years. Male students performed better in Science and Social Studies in 2012 but females outperformed even in these two subjects in 2013. The effect size of gender is significant for Urdu in both years while it is

significant for English and Islamiat in 2013 only. For Science and Social Studies it is close to zero in both years.

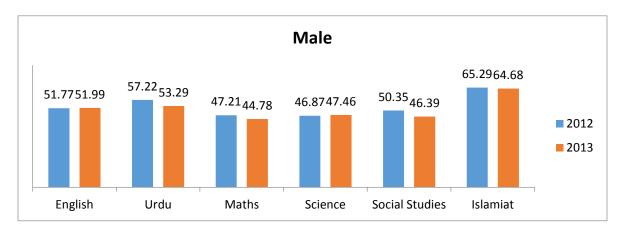


Figure 4: Comparison of performance by gender in 2012 and 2013 (Male)

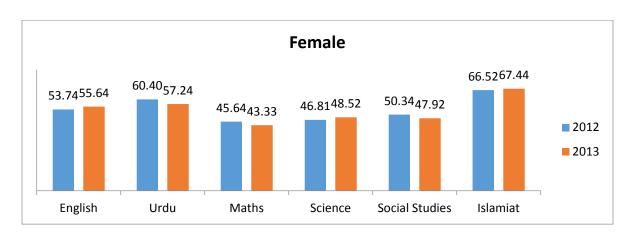


Figure 5: Comparison of performance by gender in 2012 and 2013 (Female)

## **Performance by School Type**

Private school student's secured highest means scores in all subjects in both years followed by public school students while private students performed the worst in both years. The effect size of school type is significant for English in both years while it is significant for Islamiat in 2013 only.

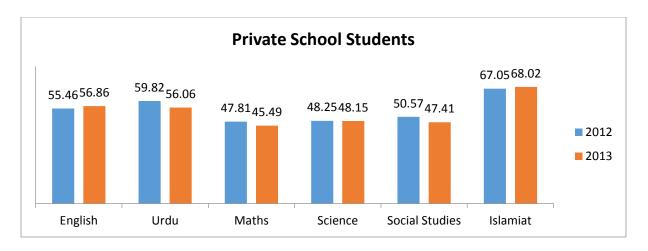


Figure 6: Comparison of performance by school type in 2012 and 2013 (Private School)

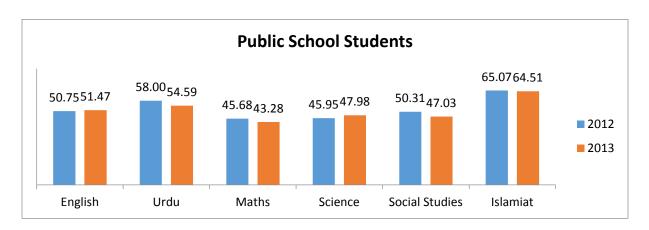


Figure 7: Comparison of performance by school type in 2012 and 2013 (Public School)

# **Performance by School Gender**

Students from multi-gender schools continue to outperform single-gender schools in all subjects in both years. Female-only schools performed better in English, Urdu and Islamiat in both years while male-only schools performed better in Mathematics and Science in the same period when single-gender schools are compared. The effect size of school gender is small for English, Urdu and Islamiat in both years.

# **Performance by Area**

Urban students outperformed in English and Islamiat in both years while rural students outperformed in all other subjects in this period. However, the effect size of area is negligibly small for all subjects in both years.

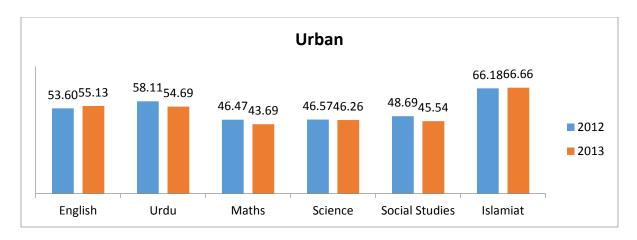


Figure 8: Comparison of performance by area in 2012 and 2013 (Urban)

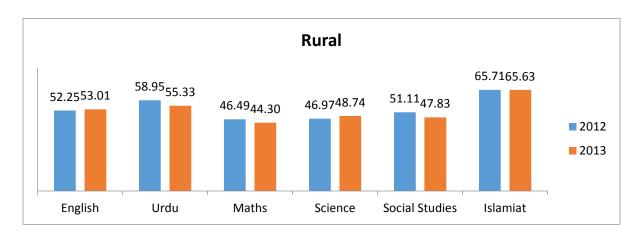


Figure 9: Comparison of performance by area in 2012 and 2013 (Rural)

#### **Interaction Effect of Gender and Area**

Females from urban areas performed the best in both years. The performance of females was much better compared to males in urban areas than in rural areas. The gender disadvantage in rural areas is evident in both years.

# **Interaction Effect of Gender and Language of Exam**

Females in English medium schools outperformed males in English medium schools in all subjects in both years. In Urdu medium schools, females outperformed in English, Urdu and Islamiat while males outperformed in Mathematics in both years. The only change is in Science where in 2012 Urdu medium males performed better but in 2013 Urdu medium females fared better.

#### **Interaction Effect of Gender and School Type**

Female students from private schools performed the best in all subjects in both years.

#### **Interaction Effect of Area and School Gender**

Students from multi-gender schools of urban areas performed better in English and Islamiat while students from multi-gender schools of rural areas performed better in all other subjects in both years.

#### **Interaction Effect of School Type and Area**

Private school student from urban areas performed better in English while private school students from rural areas outperformed in all other subjects in both years.

#### **Interaction Effect of School Type and School Gender**

This is the only interaction effect where there is no clear winner category across all or most subjects. In addition, the best performing category has changed in most subjects from 2012 to 2013.

#### **Performance by District**

Except for Muzaffargarh, which is the top performing district in both years, all other districts experience slight changes in the performance ranking from 2012 to 2013. Seven of the top ten performing districts in both years remain unchanged. Their names are as follows: Muzaffargarh, D.G.Khan, Jhang, Sargodha, Bhakkar, Multan and Chiniot. On the other hand, six of the ten worst performing districts in 2012 were also in the worst ten performers of 2013. These districts include: Attock, Jhelum, Hafizabad, Mandi Bahauddin, Nankana Sahib and Rawalpindi.

# **Performance by Tehsil**

Table 2 shows a list of tehsils which maintained their position in a certain cluster in both years. It is interesting to note that about 57% of the tehsils in Punjab continued to perform in the same cluster in 2012 as well as in 2013. This shows that there is no material difference in performance category of most of the tehsils from 2012 to 2013. Ali Pur, Jalalpur Pirwala, Jatoi, Kot Adu, Mankera, and Muzaffargarh have ranked in the top 10 performing tehsils in both years. On the other hand, Dina, Hassan Abdal, Hazro,

Jhelum, Sarai Alamgir, and Taxila have ranked in the last ten tehsils in both years. Appendix A provides a comparison of the overall mean score of these tehsils in 2012 and 2013.

POOR	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	EXCEPTIONAL
DINA	ARIFWALA	AHMADPUR EAST	BAHAWALNAGAR	ALIPUR
GUJAR KHAN	CHAK JHUMARA	BAHAWALPUR	BHAKKAR	DARYA KHAN
HASSANABDAL	FAISALABAD CITY	BUREWALA	BHOWANA	JALALPUR PIRWALA
HAZRO	GUJRAT	DASKA	JAMPUR	JATOI
JHELUM	HAFIZABAD	DUNYAPUR	JHANG	KOT ADU
MALIKWAL	JAHANIAN	FATEH JANG	LIAQATPUR	MANKERA
NANKANA SAHIB	JAND	FORT ABBAS	MULTAN	MUZAFFARGARH
PINDI BHATTIAN	JARANWALA	HAROONABAD	SHAKARGARH	SAHIWAL
RAWALPINDI	KAHUTA	ISA KHEL	SHORKOT	TAUNSA
SARAI ALAM GIR	KHARIAN	KAMOKE		
TAXILA	LAHORE CANTT	KAROR LALISAN		
	MANDI BAHUDDIN	KHANEWAL		
	NAROWAL	KHANPUR		
	PATTOKI	KHUSHAB		
	PHALIA	KOT RADHAKISHAN		
		LALIAN		
		MAILSI		
		MIAN CHANNU		
		MIANWALI		
		NOORPUR THAL		
		NOSHERA VIRKAN		
		PASRUR		
		PIPLAN		
		SAHIWAL		
		SHAHKOT		
		SHARAQPUR		
		TANDLIAN WALA		
		VEHARI		
		WAZIRABAD		
		ZAFARWAL		

Table 2: Tehsils in same performance cluster in both years

#### **SECTION 3: MULTIPLE REGRESSION ANALYSIS**

To further explore the effect of system level factors that might impact on learning performance at the school level, a multiple regression analysis was carried out - for public schools only - that used school mean score as the dependent variable. In order to identify predictors of learning achievement the entire set of relevant variables from PMIU database<sup>1</sup> was used. A list of all the variables that are used in this regression analysis is given in Table 3 Appendix B. In terms of unit of analysis, the predictor variables can be divided into school level, teacher level and student level variables. In addition, the PMIU database contains information on infrastructural, administrative, academic and extra-curricular variables. The results of regression analysis show that the significant factors remained unchanged in both years i.e., 2012 and 2013. Further, the significant factors were same regardless of whether the dependent variable is overall mean score or subject mean score of the school<sup>2</sup>.

It should be emphasized here that the factors in these regression analyses accounted for only a minor proportion of variance in student mean scores (R-square = 0.036). This implies that there are other factors which were not taken into account in these regression analyses that exert more potent influences on learning achievement. However, the factors which have a statistically significant effect on learning achievement are reported hereunder:

#### **School Characteristics**

School Level (primary, middle, high etc.) significantly effects the performance of students with a positive relationship between level of school and student performance i.e., performance of students from higher secondary schools is better than those from primary schools. Location of school (urban or rural) also affects the performance of students significantly with students from urban areas performing better than students from rural areas. All other school level variables like School Status, School Shift, School Gender and Building Ownership are insignificant.

<sup>&</sup>lt;sup>1</sup> PMIU database contains only public school data. Hence, these results apply only to public schools.

<sup>&</sup>lt;sup>2</sup> For robustness testing, logistic regression was performed using a dummy (pass/fail) dependent variable. There is no difference in the significant explanatory variables in both forms of regression.

# **Teaching Facilities**

Unfilled Teaching Posts were found to be highly significant factor in negatively affecting the performance of the students. The standardized beta showed the importance of 9.5% at 99% confidence level. So, the higher the unfilled posts of teachers in a school, lower will be the performance of students and vice versa. Female Teacher Ratio also affected performance of the students negatively suggesting that the schools with higher ratio of female teachers actually performed poorly. However, surprisingly, the student teacher ratio does not significantly affect students' performance.

#### **Classroom Facilities**

The ratio of open-air classrooms to total classrooms has a significant negative relationship with student performance. This implies that students from schools with open-air classrooms will underperform compared to schools having proper classrooms. Surprisingly, students to classroom ratio significantly negatively affected the performance of the students with a contribution of 9.8% at 99% confidence level. This result is counter intuitive and not consistent with studies in the field of education research.

#### **School Administration**

PMIU database provides information regarding composition and working of school committees. The analysis shows that the ratio of females on school committee has a significant positive relationship with students' performance. However, all other variables related to school committee like number of meetings, size of the committee, and parent and/or teacher representation in the committee are insignificant.

#### **School Infrastructure**

The variables related to school infrastructure like Building Condition, Playgrounds, Library etc. do not have a significant effect on students' performance.

# **School Gender and Location wise Analysis**

The preceding analysis provides results of regression analysis for overall public schools. Subsequently, regression analysis was conducted separately for urban schools, rural

schools, male schools and female schools. Unfilled teaching posts and student to classroom ratio are significant predictors in overall analysis as well as in each of the subcategory analyses. School level is significant in rural schools, male schools and female schools but insignificant in urban schools indicating that the level of school has no significant impact on students' performance in urban areas. Female teacher ratio is significant in case of rural schools but insignificant in urban schools. School location is a significant predictor of performance for male school but insignificant for female schools. Finally, ratio of females in school committee significantly effects student performance in the case of rural areas and female schools while the effect of composition of school committee is insignificant in case of urban schools and male schools.

#### **SECTION 4: CLUSTERING ANALYSIS**

The lists of schools that have performed poorly in a subject in either 2012 or 2013 are merged to give a picture of stability of group membership. The comparison provides a list of schools<sup>3</sup>, for each subject, which has underperformed consistently in grade 5 examinations in the period under study and could be the starting point for strategic interventions. However, it should be borne in mind that this analysis is based on only two years performance data and a much more meaningful list can be obtained if a similar analysis is conducted for multiple year performance data.

# **SECTION 5: NOTE ON QUALITY OF DATA**

The PEC has maintained two separate databases related to grade 5 examinations held in 2012 and 2013. The first database contains only student roll number, responses to MCQs and marks in CRQs. This database was generated by a third party as a result of scanning students' answer sheets and is referred to as 'Responses Data' hereafter. The second database was generated internally by the PEC staff and contains students' registration information and final score in each subject referred to as 'Results Data' hereafter. Results data is used for preparation of students' result cards.

<sup>&</sup>lt;sup>3</sup> List of schools that performed poorly in both years is available in Appendix C.

#### The most glaring discrepancies in Responses Data are:

- Students' subject marks in results data and responses data do not match in many
  cases. For example, students were sorted by roll number in Chakwal district and
  the marks were compared for Social studies in results data and responses data.
  The marks were different for 10 students out of the first 25 students in the list.
  Within this list, marks of one student were different in all subjects except for
  Islamiat.
- Students' responses in certain subjects are missing in few districts. For example, responses for Social Studies are missing in Attock district in 2012.
- There are instances where student roll number is not available in the responses data but subject marks are available in results data. Roll Number 15-101-169 is a case in example.

#### The major issues with Results Data are:

• There is hardly any field in results data which is populated with 100% accuracy. Even the subject marks are entered wrongly. For example, some students are given negative marks and some students are given more than 100 marks in some subjects both in 2012 and 2013. Given the significance of this information, the data should be absolutely error free at least for the subject marks.

#### In addition, there are some minor issues in the results data:

- Multiple spelling errors are frequently encountered in the fields like Tehsil Name,
   Gender, Area etc. However, these errors can be easily controlled by small changes in the interface of registration database.
- There are fields which are not at all populated for some students. These fields frequently include Medium, Gender, Tehsil Name etc.
- Some fields are wrongly populated. For example, 32,264 male students are
  registered in female-only schools and 45,177 females are registered in male-only
  schools in 2012. These numbers are similar in 2013 with 39,529 male students
  registered in female-only schools and 48,622 female students registered in maleonly schools.

Overall, there are many substantial issues both in results data and responses data. The issues in registration information are of trivial nature and can be eliminated through an improved interface for registration system. However, the discrepancies in responses and subject scores are extremely vital and reflect heavily on the need to improve the systems for scanning answer sheets and preparation of results.

#### **SECTION 6: SUMMARY**

The comparison of the secondary analysis of grade 5 examinations in 2012 and 2013 reveals that the trends in performance at district, tehsil or school level remain unchanged from year to year. Similarly, the effect of gender, language, area, school type and the interaction effect of these variables on student performance is also consistent in 2012 and 2013.

#### **Findings**

The following major observations are made:

- 1. In general, teaching facilities and classroom characteristics have a more profound effect on student performance compared to school administration and general infrastructure facilities of the school.
- 2. School Level and Ratio of Females on School Committee are positively related to student performance.
- 3. Unfilled Teaching Posts, Ratio of Female Teachers and Open-Air Classrooms are negatively related to student performance.
- 4. General infrastructure facilities of the school do not have a significant effect on student performance.

#### Recommendations

The analysis reveals that teaching and classroom facilities have the most relevance with students' performance. Accordingly, the policy interventions and investments should be mainly directed on development of these facilities. In addition, the sanctioned teaching posts should be filled at the highest priority to bridge the gap.

### **APPENDICES**

# **Appendix A: List of Tehsils with Mean Score**

Appendix A contains a list of tehsils that belong to the same performance cluster in both years. The last column provides the change in mean score of each tehsil from 2012 to 2013. It is pertinent to note here that the overall mean score of the province fell by 1.16% from 53.48% in 2012 to 52.32% in 2013.

Tehsil Name	Mean Score 2012	Mean Score 2013	Change				
Performance Cluster: <b>POOR</b>							
DINA	43.09	42.20	-0.89				
GUJAR KHAN	47.35	46.55	-0.80				
HASSANABDAL	44.77	43.67	-1.10				
HAZRO	45.33	41.94	-3.39				
JHELUM	45.76	42.07	-3.69				
MALIKWAL	45.66	47.76	2.10				
NANKANA SAHIB	47.55	44.67	-2.88				
PINDI BHATTIAN	45.16	46.85	1.69				
RAWALPINDI	47.32	47.56	0.24				
SARAI ALAM GIR	43.66	42.71	-0.95				
TAXILA	43.84	43.91	0.07				
	Performance Cluster: <b>BEI</b>	LOW AVERAGE					
ARIFWALA	48.06	48.16	0.09				
CHAK JHUMARA	50.47	48.38	-2.09				
FAISALABAD CITY	50.63	48.08	-2.55				
GUJRAT	50.32	48.23	-2.09				
HAFIZABAD	49.50	48.96	-0.54				
JAHANIAN	49.70	48.75	-0.95				
JAND	48.69	49.01	0.32				
JARANWALA	50.49	49.96	-0.53				
KAHUTA	48.04	48.24	0.19				
KHARIAN	50.66	48.80	-1.86				
LAHORE CANTT	50.04	47.86	-2.18				
MANDI BAHUDDIN	47.74	48.60	0.86				
NAROWAL	50.65	49.86	-0.78				
PATTOKI	48.84	48.84	0.00				
PHALIA	48.32	48.85	0.53				
	Performance Cluster:	AVERAGE					
AHMADPUR EAST	56.70	52.40	-4.30				
BAHAWALPUR	53.47	51.37	-2.10				
BUREWALA	54.28	54.23	-0.05				
DASKA	51.94	51.13	-0.81				
DUNYAPUR	55.84	51.21	-4.63				
FATEH JANG	53.20	52.61	-0.59				
FORT ABBAS	55.98	50.98	-5.00				
HAROONABAD	53.21	52.98	-0.23				

Tehsil Name	Mean Score 2012	Mean Score 2013	Change
ISA KHEL	51.65	51.32	-0.33
KAMOKE	54.48	52.39	-2.09
KAROR LALISAN	54.25	54.66	0.41
KHANEWAL	53.39	53.05	-0.34
KHANPUR	53.32	53.56	0.25
KHUSHAB	51.21	52.12	0.91
KOT RADHAKISHAN	51.77	53.16	1.39
LALIAN	52.84	52.49	-0.35
MAILSI	54.89	54.33	-0.56
MIAN CHANNU	54.70	54.20	-0.50
MIANWALI	52.02	53.20	1.18
NOORPUR THAL	56.33	53.37	-2.96
NOSHERA VIRKAN	53.92	51.89	-2.02
PASRUR	53.30	53.61	0.32
PIPLAN	53.45	53.09	-0.36
SAHIWAL	55.49	51.76	-3.73
SHAHKOT	52.50	50.52	-1.98
SHARAQPUR	55.27	53.77	-1.50
TANDLIAN WALA	53.15	51.63	-1.52
VEHARI	52.42	53.22	0.80
WAZIRABAD	54.53	52.71	-1.82
ZAFARWAL	55.78	53.60	-2.18
Pe	rformance Cluster: <b>AB</b>	OVE AVERAGE	
BAHAWALNAGAR	59.43	56.19	-3.24
BHAKKAR	57.09	55.92	-1.17
BHOWANA	57.49	56.55	-0.94
JAMPUR	59.17	55.11	-4.06
JHANG	59.34	55.23	-4.11
LIAQATPUR	58.63	56.28	-2.35
MULTAN	57.01	56.86	-0.14
SHAKARGARH	57.65	56.57	-1.08
SHORKOT	58.46	56.64	-1.83
I	Performance Cluster: <b>E</b>	KCEPTIONAL	
ALIPUR	74.12	65.21	-8.91
DARYA KHAN	60.47	58.83	-1.64
JALALPUR PIRWALA	64.37	62.34	-2.03
JATOI	70.67	62.45	-8.21
KOT ADU	67.87	60.40	-7.47
MANKERA	64.46	61.25	-3.21
MUZAFFARGARH	71.00	61.55	-9.45
TAUNSA	70.01	57.87	-12.14

# **Appendix B: Multiple Regression Analysis**

**Table 3: Description of Variables used in the Regression Analysis** 

Variable	Description
School Code	EMIS Code for Public Schools
ENGLISH	Average Marks in English
URDU	Average Marks in Urdu
MATHS	Average Marks in Mathematics
SCIENCE	Average Marks in Sciences
SOCIAL STUDIES	Average Marks in Social Studies
ISLAMIAT	Average Marks in Islamiat
TOTAL	Overall Average Marks
Total Teachers	Number of Teachers in the School
Vacant Teaching Posts	Unfilled Teaching Positions as a Percentage of Total Positions
Female Teacher Ratio	Female Teachers as a Percentage of Total Teachers
Total Students	Total Number of Students in the School
Female Student Ratio	Female Students as a Percentage of Total Students
Student Teacher Ratio	Number of Students per Teacher
School Status	Functional/Closed/Merged/Transferred/Consolidated/New
School Shift	Morning/Evening
School Location	Urban/Rural
School Gender	Male/Female
School Level	Primary/Middle/High/High Secondary
Building Ownership	Education Deptt/Rented/Local Community/School Council Etc.
Building Condition	Satisfactory/Need Minor Repair/Needs Renovation/Building Dangerous
School Committee Meetings	Number of Meetings of the School Committee in a Year
School Committee Members	Number of Members in the School Committee
SC Female	Percentage of Females in the School Committee
SC Parent	Percentage of Parents in the School Committee
SC Teacher	Percentage of Teachers in the School Committee
Student Class Ratio	Number of Students per Class Room
Classroom	Number of Class Rooms in the School
Open Air Classroom	Open Air Classrooms as a Percentage of Total Classrooms
PlayGround	Availability of Play Ground
Library	Availability of Library
Total Books	Total Number of Books Available in the School

# Appendix C: List of schools that performed poorly in both years

# Table 4: List of schools that performed poorly in both years

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