

**SECONDARY ANALYSIS OF THE
EXAMINATION RESULTS OF GRADE 5
STUDENTS IN 2013**

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EXECUTIVE SUMMARY

This report presents secondary analysis of Grade 5 examinations held in 2013. PEC administered the exam for a candidature of approximately 1.45 million students in 7,143 examination centers across Punjab. The student body comprised mainly of public and private school students along with a small number of private students. The students were assessed on six subjects namely Urdu, English, Islamiyat, Mathematics, Science and Social Studies. The major findings of the secondary analysis are:

1. The overall pass rate is 52.76%. The pass rate is higher in females, private schools, urban areas and English medium schools compared to their respective counterparts.
2. There are staggering differences between districts in mean levels of student performance in all subjects. The difference between best and worst performing district, in different subjects, ranges from 16%-19%.
3. In most districts and tehsils, mean score of females is better in English, Urdu and Islamiyat while males performed better in Mathematics.
4. In most districts, English medium schools performed markedly better in English and marginally better in Urdu, Mathematics and Islamiyat. In Science and Social Studies, Urdu medium schools performed better.
5. Private students performed poorly in every subject compared to both public and private school students. In addition, private school students performed markedly better in all subjects compared to public school students.
6. The mean score of students from multi-gender schools is noticeably higher compared to single-gender schools in all subjects.
7. The students from urban areas performed well in English and Islamiyat while students from rural areas outperformed in the remaining subjects.
8. The performance of female students is adversely affected in rural areas and in public schools. The effect of area and school type is less pronounced for male students.
9. Muzaffargarh, Sargodha and Multan are the best performing districts while Attock, Nankana Sahib and Jhelum are among the worst performing districts.

10. Muzaffargarh, Sargodha and Multan hosts the largest percentage of best performing schools while Rawalpindi, Jhelum and Sialkot hosts the largest percentage of poor performing schools.

The following major recommendations are offered:

1. A longitudinal analysis should be undertaken to gain insights into the trends over time and contrasts over grouping factors.
2. Different examination versions were served in different districts. A better approach would be to serve all versions in all districts. This approach would allow a fair comparison of the difficulty of exam versions across all districts.
3. This report highlights the schools which have underperformed in a certain subject. The scope of such an analysis can be enhanced to link achievement on student learning outcomes (SLO) with school performance and teacher competence. PEC should share the school level analysis with respective schools, Directorate of Staff Development and other relevant bodies and agencies to explain and interpret findings of the secondary analysis to those schools which are in need of most urgent intervention.

SECTION 1: INTRODUCTION

The main objective of this report is to present a secondary analysis of the data arising from the 2013 Grade 5 examinations. The report compares mean levels of student performance between districts and between tehsils within districts. Additionally, the report highlights differences in student performance across subjects, gender, and area, language of examination, student type, and school gender along with interaction effect of these variables. The report also presents the findings of data mining and clustering analysis and identifies schools within each district whose students have performed poorly in different subjects.

Background

The Punjab Examination Commission (PEC) has been administering exams to the entire population of grade 5 students in government schools, a significant number of private school students and limited number of private candidates in Punjab since 2006. Grade 5 is the final year in primary school and represents a critical milestone for students in their academic career. Therefore, secondary analysis of grade 5 examination can provide valuable data on how well students have performed at the primary school level and the findings can be used to inform the Government of the Punjab's (GoPb's) quality education drive.

The examination conducted by PEC covered the following six subjects: Urdu, English, Islamiat, Mathematics, Science and Social Studies. Students are given a choice to take the exam of Science, Mathematics, Social Studies and Islamiat in English or Urdu language. All written exams were divided into two sections: an objective section containing multiple choice questions (MCQs) and a subjective section consisting of constructed response questions (CRQs). Both sections tested knowledge, understanding and application of different concepts. Multiple versions of examination papers were developed and used in different districts.

Methodological Issues

Mean scores are used to compare students' performance across districts, tehsils, gender and school system. Unless noted otherwise, all numbers reported in figures and tables in the analysis section represent respective category's mean score. Due to the large number of students and schools participating in the examinations, small differences in group means can be statistically significant when testing at a significance level of 5% or 1%. This should be borne in mind when considering mean score comparisons illustrated in the tables and figures presented in later sections of this report. Effect sizes are also reported in order to circumvent the problems associated with null hypothesis significance testing in large samples. The results of point-biserial correlation are used to comment on the effect size and the importance is determined using widely accepted suggestions by Cohen (1992)¹. Moreover, Analysis of Variance (ANOVA) technique is used to test for statistical significance of difference in levels of performance across subcategories at significance level of 5%, unless otherwise specified.

In addition, data mining was performed using centroid-based and model-based clustering methods² on the entire dataset to identify patterns in the results data. Clustering analysis was performed to differentiate the high performing districts, tehsils and schools from low performing districts, tehsils and schools. In the data mining and clustering analysis, if a school's level of performance, or that of a district, is said to be 'poor' that judgment refers only internally to the Punjab. This is because the examination papers were set to reflect the school curriculum of the Punjab, and the only candidates were those drawn from schools in the Punjab. Consequently, all comparisons apply only internally to students and schools in the Punjab.

The algorithm used for clustering of schools in different performance categories assumes normal distribution and systematically determines an appropriate value of z to set the criteria for cutoff points in relation to the underlying data using $\bar{X} \pm z\sigma$. The performance categories for school clustering correspond to an approximate value of

¹ Cohen, J. (1992). A power primer. *Psychological Bulletin*. 112 (1), 155–159.

$r=0.10$ (small effect), $r=0.30$ (medium effect), $r=0.50$ (large effect)

² Witten, Ian H., Eibe Frank, and Mark A. Hall. *Data Mining: Practical Machine Learning Tools and Techniques*. Amsterdam: Elsevier, 2011.

$\pm 1\sigma$, $\pm 2\sigma$, and $\pm 3\sigma$. In literature, researchers have frequently analyzed student performance using three to seven clusters³. Based on this data, using three categories resulted in too large clusters while using seven categories resulted in too small clusters. As a result the analysis employs five performance clusters to avoid this problem. With such a large sample size (approximately 90,000 schools) the assumption of normal distribution is reasonably satisfied and cutoff points for ‘poorly’ performing school for different subjects are set at:

English	Urdu	Mathematics	Science	Social Studies	Islamiat
21.19	27.33	12.98	19.01	19.45	44.19

The cutoff points for clustering schools into different performance categories are established using aggregate school average and are set at:

Poor	Below Average	Average	Above Average	Exceptional
Below 28.81	Between 28.81 – 39.86	Between 39.86 – 61.96	Between 61.96 – 73.01	Above 73.01

Examination Statistics

The 2013 examinations had a candidature of approximately 1.45 million students in grade 5 across all 36 districts of the Punjab. The candidate body comprised of students from public schools, private schools and private students. A total of 7,143 exam centers were set up for grade 5 students across the province. Figure 1 provides overall statistics of the student body based on demographic variables. Some of the notable observations are: students were mainly from the Urdu medium schools with higher number of male students and higher number of boys-only schools. Finally, student participation from rural areas is higher than urban areas.

³ Battaglia, Onofrio R., Paola, Benedetto D., and Claudio Fazio. *Cluster Analysis of Educational Data*. Cornell University Library. Available at <https://arxiv.org/>

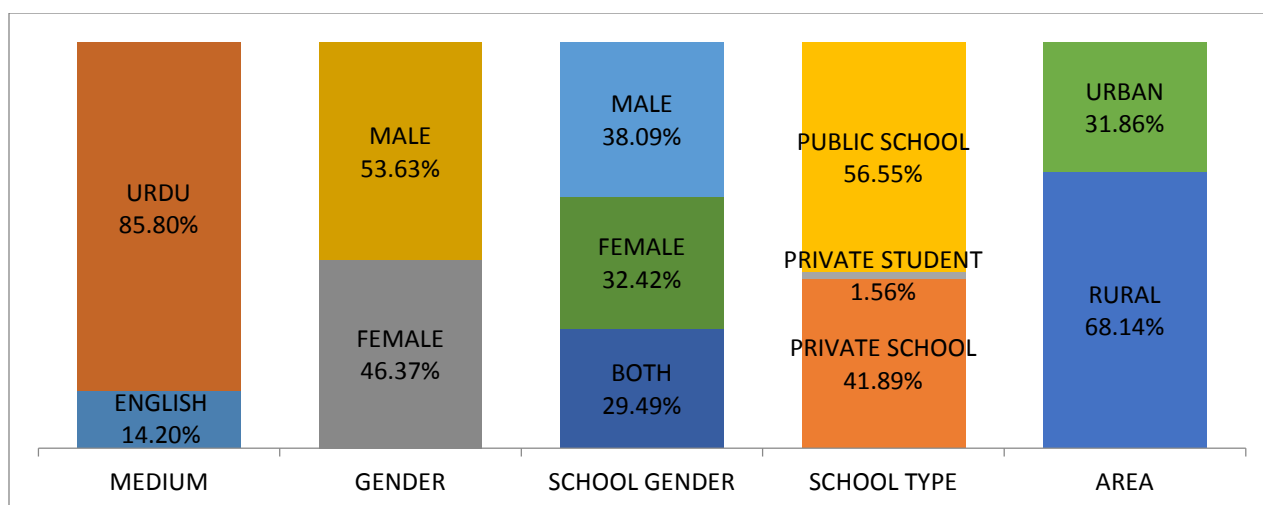


Figure 1: Demographic Breakup of Student Body

Table 1 below provides statistics for student participation and pass rates in 2013 examination across different categories. An analysis of pass percentages reveals that school going students, whether private or public, experience significantly higher pass rates compared to private students. Similarly, students from schools with both genders achieve significantly higher pass rates compared to single-gender schools. In 2013, there is no difference between pass rates of English and Urdu medium students.

		Appeared ⁴	Passed	Pass Rate ⁵
OVERALL		1,453,220	766,761	52.76
Gender	FEMALE	673,855	362,342	53.77
	MALE	779,329	404,393	51.89
Student Type	PRIVATE SCHOOL	608,774	334,940	55.02
	PRIVATE STUDENT	22,717	8,017	35.29
	PUBLIC SCHOOL	821,726	423,802	51.57
Area	RURAL	990,166	531,307	53.66
	URBAN	462,819	235,339	50.85
Medium	ENGLISH	206,327	108,943	52.80
	URDU	1,246,685	657,739	52.76
School Gender	BOTH	421,354	237,368	56.33
	FEMALE	463,252	237,554	51.28
	MALE	544,244	282,741	51.95

Table 1: Examination Statistics

⁴ Total students across categories may differ due to problems in data entry.

⁵ Candidates who obtained 33% marks were considered pass.

Table 2 provides the gender-wise pass rates in each subject. The subject-wise pass rates reflect the percentage of students with at least 33% marks in the respective subject.

Science		Mathematics		English		Urdu		Islamiat		Social Studies	
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
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 2: Gender wise pass percentage for each subject

SECTION 2: ANALYSIS OF STUDENT PERFORMANCE

Overall analysis of student performance shows that students have performed better in language, social and religious studies compared to Mathematics and Science. In general, female students have performed better than male students and students from English medium schools have performed better than students from Urdu medium schools⁶. Private schools have outperformed both public schools and private candidates. Students from urban areas performed better in English, Mathematics and Science while students from rural areas performed better in Urdu and Social Studies.

Performance by Subject

Figure 2 compares the performance of entire student body across the six subjects examined at primary level. Comparison of mean scores shows that students performed best in Islamiyat followed by Urdu but the performance in Science and Mathematics is comparatively poor.

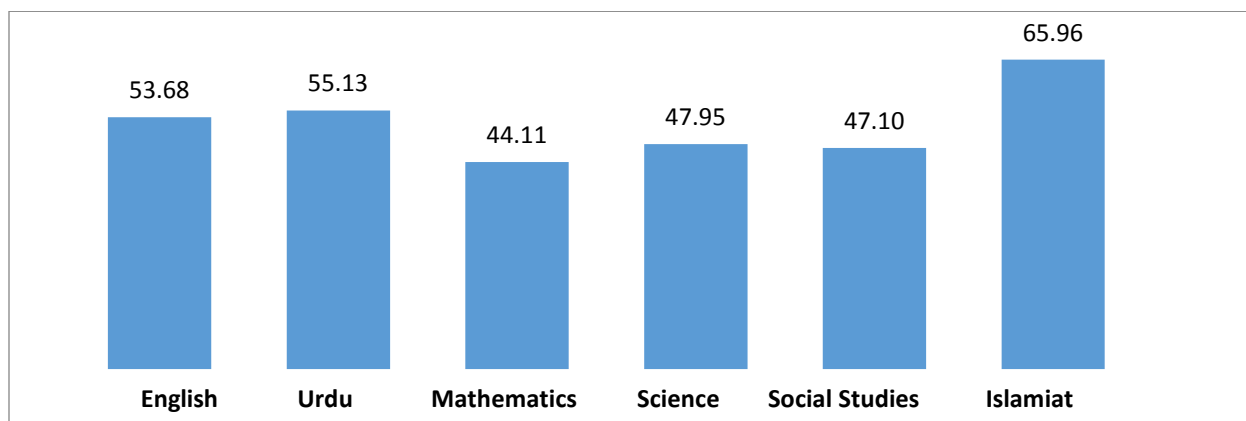


Figure 2: Mean scores across subjects

The same pattern prevails at district level where mean score of students in all districts is highest in Islamiyat followed by Urdu (Table 21). On the other hand, mean score of Science and Mathematics is lower than Islamiyat, Urdu and English in every district of Punjab. Similarly, subject mean score is highest in Islamiyat in 97.7% tehsils and second highest in Urdu in 71.8% tehsils across all districts (Table 22). On the other hand, in 84.7% tehsils student performance in Science is ranked either at 4 or 5 out of the six

⁶ Medium of instruction is assumed to be the same as language of exam.

subjects examined. Similarly, in 96.9% tehsils student performance in Mathematics is ranked either at 5 or 6 out of the six subjects examined. There is not a single tehsil where students' performance is better in Mathematics or Science compared to languages and Islamiat. Appendix A contains distribution curve of subject scores.

Performance by Language of Exam

Figure 3 highlights the differences in student performance by language of exam across subjects. The most notable difference is in the score of English where English medium schools performed markedly better than their Urdu medium counterparts. For Urdu, Mathematics and Islamiat the performance of English medium school is marginally better while in Science and Social Studies Urdu medium schools performed better. The differences, though small, are statistically significant for all subjects ($P\text{-value} < .001$), however, the effect size of language of exam is significant only for English ($r=0.16$) and Islamiat ($r=0.11$) while for all other subjects it is very small ($r \leq 0.06$). Also there is a significant variation among the Urdu medium schools and English medium schools. This is understandable as schools are at geographically distant locations with different resources and teaching methods.

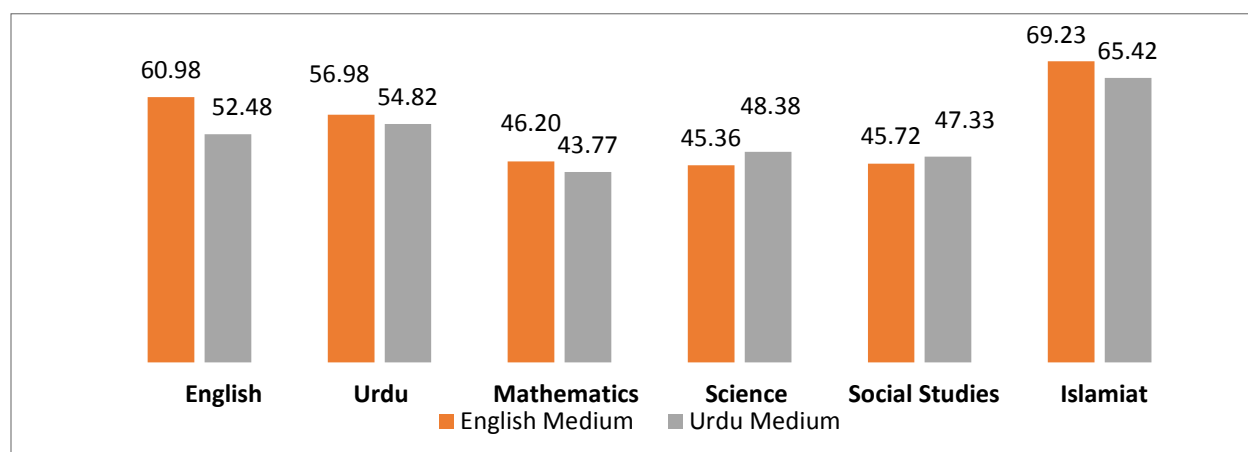


Figure 3: Mean scores across subjects by language of exam

Also, the mean score of English medium schools was higher in English in all 36 districts while it was higher for Mathematics in 32 districts and Islamiat in 35 districts and for Urdu in 31 districts. For Science, English medium schools performed better only in 13 districts. Overall, it can be concluded that the English medium schools outperformed, in

most subjects except Science, regardless of their geographical location within the province.

Performance by Gender

Figure 4 highlights the differences in student performance by student gender across subjects. Overall, females performed markedly better in the subjects of English, Urdu and Islamiat ($P\text{-value} < .001$) while males performed better in Mathematics ($P\text{-value} < .001$). The differences in mean scores across gender in the subjects of Science and Social Studies are also statistically significant ($P\text{-value} = 0.001$). The effect size of gender is significant only for English, Urdu and Islamiat ($r \geq 0.10$).

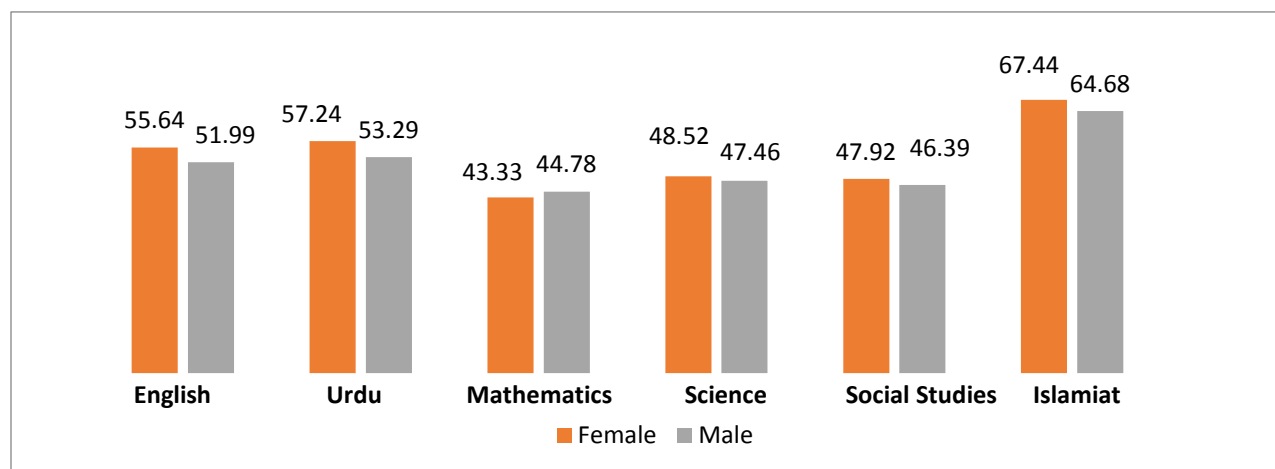


Figure 4: Mean scores across subjects by gender

The number of districts where mean score of females is better in Urdu and Islamiat is 35 while males performed better in Mathematics in 31 districts out of 36 districts in Punjab. For English, females outperformed males in all 36 districts. The same pattern is observed in tehsil level analysis where females performed better than males in English, Urdu and Islamiat in 90%, 95% and 93% of the tehsils while males performed better in Mathematics in 71% tehsils of Punjab. Overall, it can be concluded that females performed better in language, social studies and Islamiat while males performed better in Mathematics.

Performance by School Type

Figure 5 highlights the differences in student performance by school type across subjects. Private students performed poorly in every subject compared to both public

and private school students. In addition, private school students performed markedly better in all subjects compared to public school students ($P\text{-value} < .001$) except Social Studies where the difference is marginal and statistically insignificant between private schools and public schools. The effect size of school type is significant for English ($r=0.15$) and Islamiat ($r=0.14$) only.

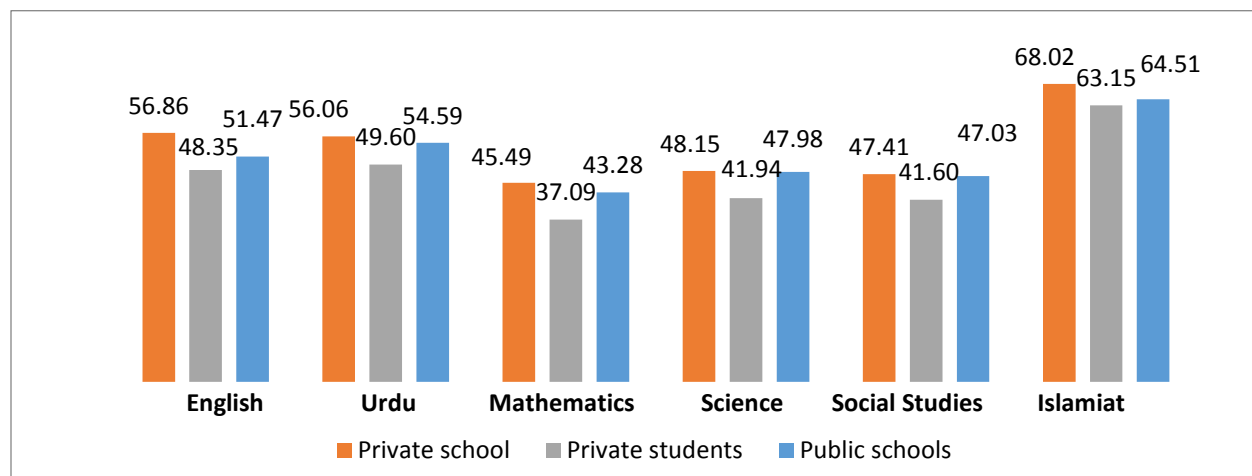


Figure 5: Mean scores across subjects by school type

Overall, the mean score of private school students compared to public school students is higher in 30 districts. Similarly, private school students have outperformed in 81% of the tehsils in Punjab. The six districts where mean score of public school students is higher include: Rawalpindi, Gujranwala, Lahore, Sargodha, Sheikhupura and Sialkot. Interestingly, public school students in Gujranwala, Lahore, Sheikhupura and Sialkot outperformed in 2012 also.

Appendix B contains list of tehsils where mean score of public school students is higher. At tehsil level, private schools outperformed private students as well as public schools. Overall, it can be concluded that schooling, whether public or private, has a significant positive impact on the performance of the student. In addition, the quality of education in private schools is generally better than public schools in Punjab.

Performance by School Gender

Figure 6 highlights the differences in student performance by whether school is only for males, females or both (multi-gender). Schools which are categorized as multi-gender include co-education as well as those having separate classes for male and female

students. The results show that the mean score of students from multi-gender schools are noticeably higher ($P\text{-value} < 0.001$) compared to single-gender schools in all subjects. The effect size is small for Islamiyat ($r = 0.10$) while for other subjects it is negligible.

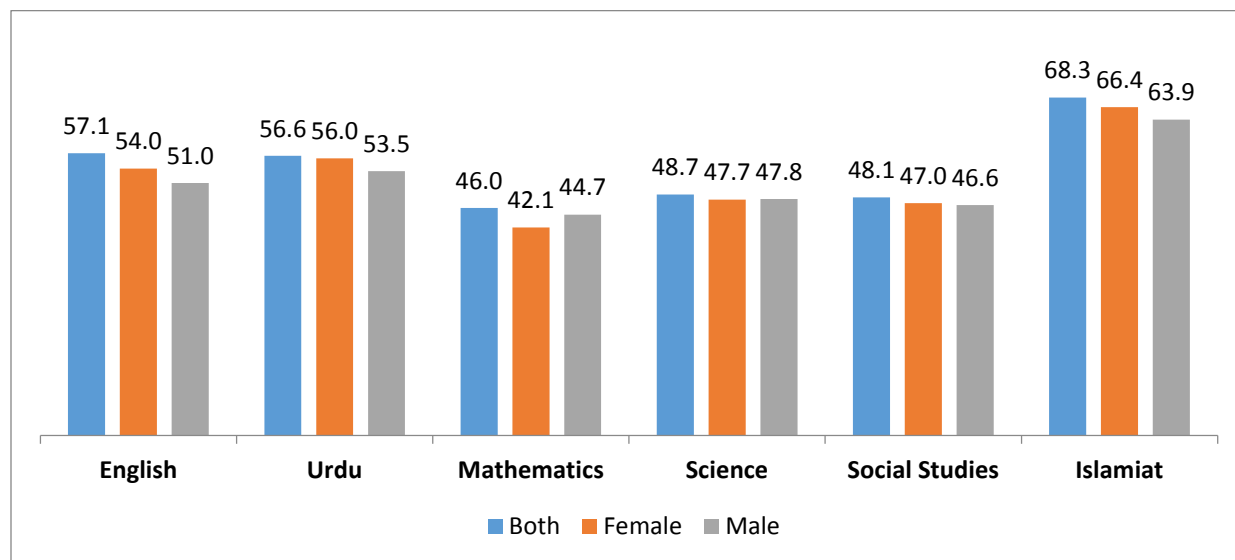


Figure 6: Mean scores across subjects by school gender

The results at district level analysis show that multi-gender schools performed better than male-only schools in all 36 districts for Islamiyat, 34 districts for English, 26 districts for Mathematics and 22 districts for Social studies. They performed better than female-only schools in 24 districts on overall score. Multi-gender schools outperformed female-only schools in 30 districts each for English and Mathematics, and 19 each for Urdu and Science. Overall, the mean score of students from multi-gender schools was higher compared to female-only schools in 65% of the tehsils. Similarly, the overall mean score of students from multi-gender schools was higher compared to male-only schools in 81% of the tehsils. This shows that the effect of school gender on student performance is not limited to certain geographical locations.

Performance by Area

Figure 7 highlights the differences in performance of students from rural and urban areas. The analysis shows mixed results with students from urban areas performing well

in English and Islamiat while students from rural areas outperformed in the remaining subjects. The difference, though small, is statistically significant ($P\text{-value} < 0.001$).

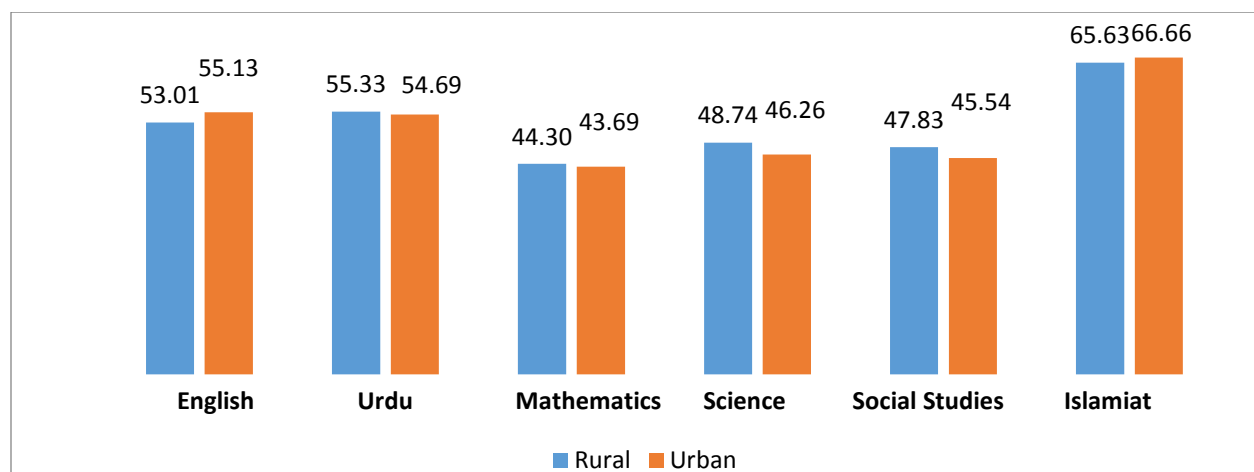


Figure 7: Mean scores across subjects by Area

Students from urban areas outperformed in English and Islamiat in 73% and 83% of the tehsils respectively. This number falls to a proportionate 53%, 46% and 47% for the subjects of Urdu, Science and Social Studies. However, the effect size of area is very small for most subjects ($r \leq 0.07$).

Performance by Student Learning Outcome

Figure 8 provides a comparison of students' performance in multiple choice questions (MCQs) and constructed response questions (CRQs) for all subjects except Islamiat. The average scores in MCQs are much higher than the average scores in CRQs in all subjects. The difference is highest in Social Studies (30.54%) and smallest in Mathematics (14.91%). This shows a general weakness in writing abilities of the students. The mean total scores reported in this section differ from the earlier analysis. This is due to discrepancies in response data and results data. For a full explanation of these issues in data refer to the 'Note on Quality of Data' section of this report.

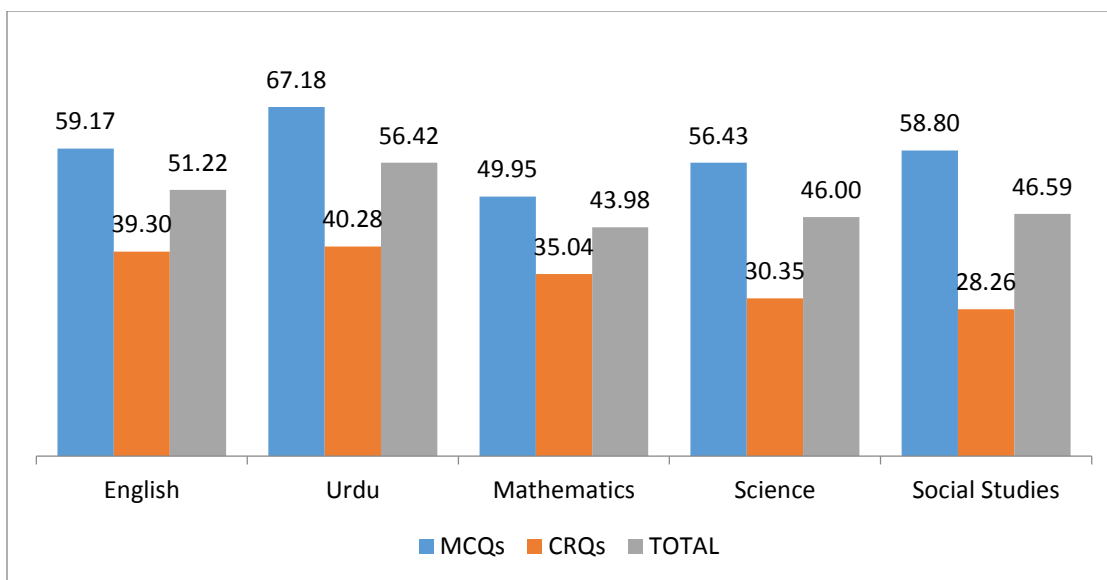


Figure 8: Mean % score by question type

Figure 9 provides comparison of students' performance in MCQs, CRQs and Nazra for Islamiyat. The results show that students have performed much better in oral examination compared to written examination.

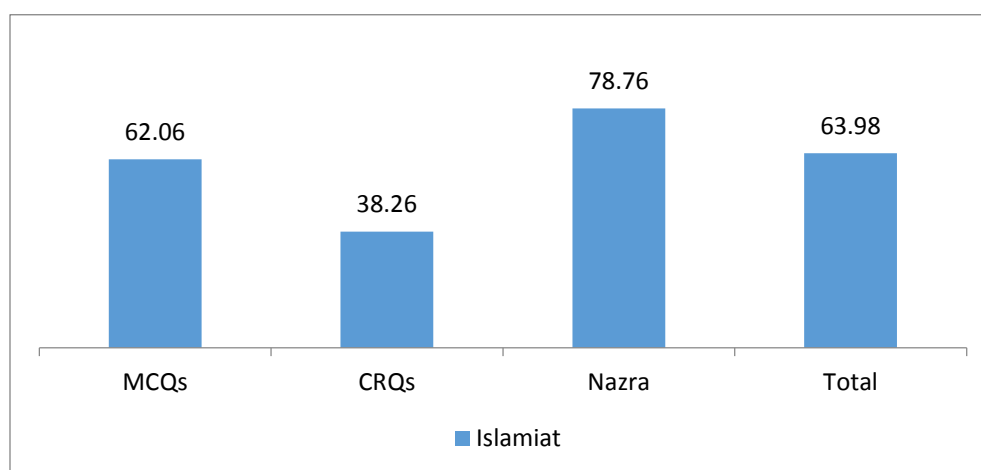


Figure 9: Mean % score by question type for Islamiyat

Figure 10 provides a comparison of student performance by the cognitive domain i.e., knowledge, comprehension and application/high order thinking. The results show that students performed better in knowledge questions compared to comprehension and application/high order thinking questions in all subjects.

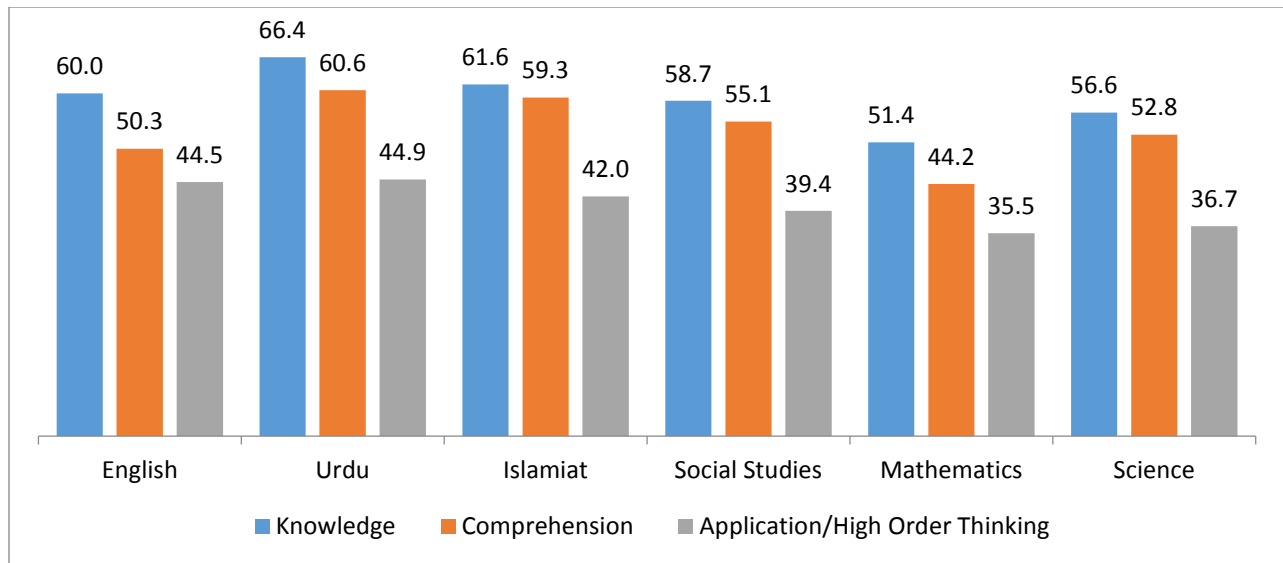


Figure 10: Performance by cognitive domain

Analysis of student performance by content is provided in Table 14 in Appendix C. In addition, a complete analysis of students' performance on each student learning outcome (SLO) for every subject is provided in Appendix C in separate tables. The SLOs in which student performance is generally weak (less than 40%) are also highlighted.

SECTION 3: ANALYSIS OF INTERACTION EFFECTS

The preceding analysis in section 2 categorizes students into sub-groups based on just one variable such as gender or language of exam. Although these analyses have shown that, for example, private schools performed better than public schools and female-only schools performed better than male-only schools, it is still unclear whether the students from female-only schools performed better in public or private schools. This section is focused on analysis of student performance based on such interaction effects between two grouping variables.

Interaction Effect of Gender and Area

Analysis of performance by gender in section 2 shows that, in general, female students perform better than male students. However, the analysis of interaction effect reveals that this differential is augmented in urban areas compared to the rural areas. Figure 11 shows that rural male students performed better in Mathematics only while rural female students performed better in all other subjects.

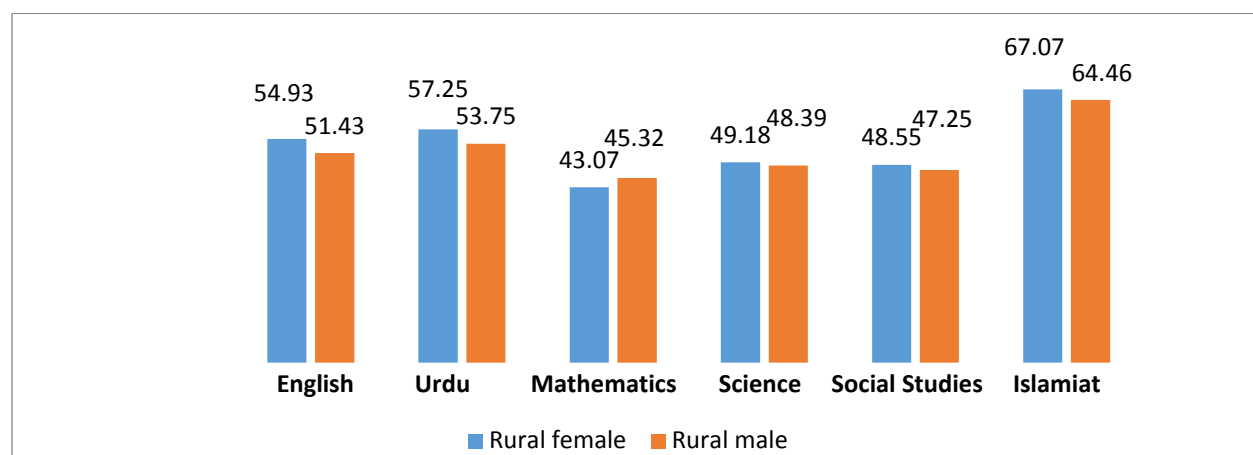


Figure 11: Interaction effect of gender and rural area

From Figure 12 it is evident that urban female students performed better than urban male students. The differential was quite profound for all the subjects and contrary to the general trend females performed better even in Mathematics. A comparison of rural and urban females revealed that females from rural areas performed better in Science and Social Studies.

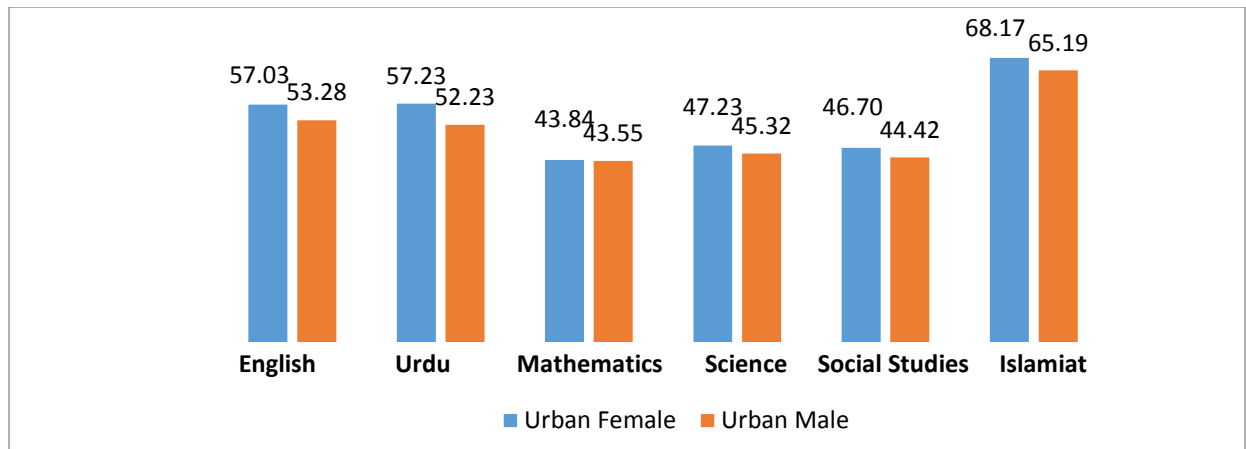


Figure 12: Interaction effect of gender and urban area

Interaction Effect of Gender and Language of Exam

Figure 13 shows that females of English medium schools performed better in all subjects. Overall male students performed better in quantitative subjects but here female students scored better in Mathematics as well.

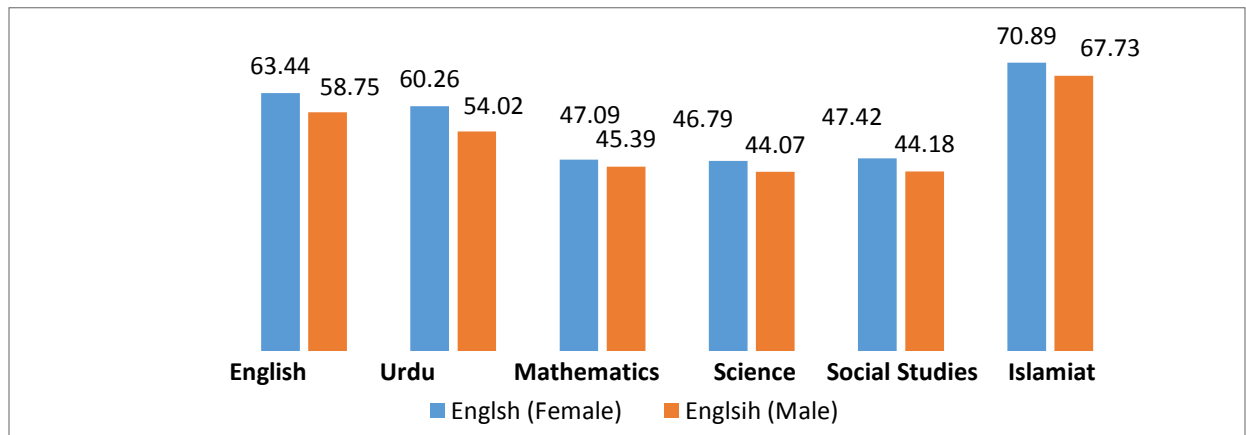


Figure 13: Interaction effect of gender and English

Figure 14 presents comparison of Urdu medium male and female students' performance. Female students were better in English, Urdu and Islamiat but male students performed better in Mathematics. There difference between English medium and Urdu medium students' performance is significant in all subjects except for Science where the difference is not significant (p-value = 0.88).

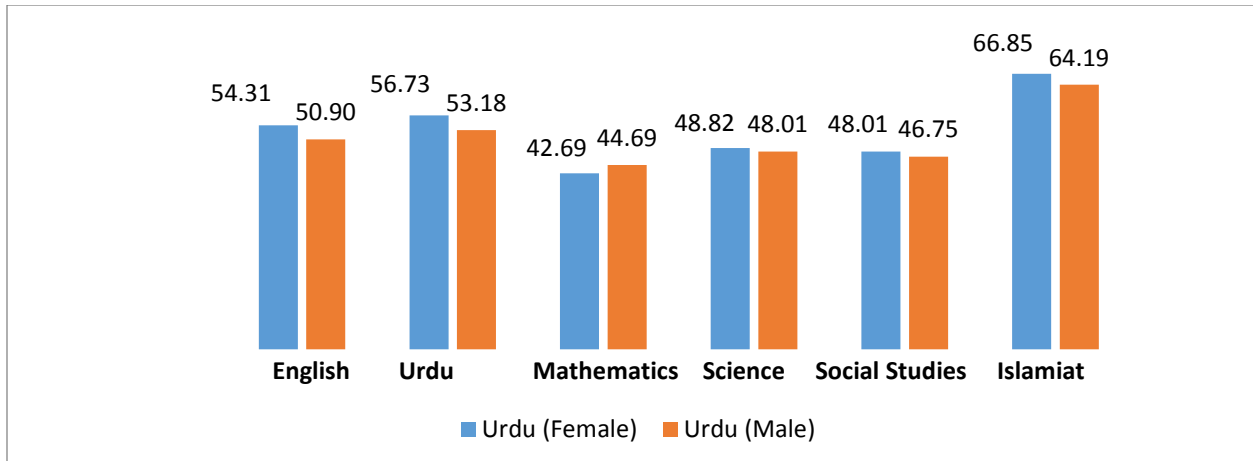


Figure 14: Interaction effect of gender and Urdu

Interaction Effect of Gender and School Gender

Multi-gender schools confirm the overall trend in student performance. Female students were better in all subjects except for Mathematics in which male students performed better (Figure 15).

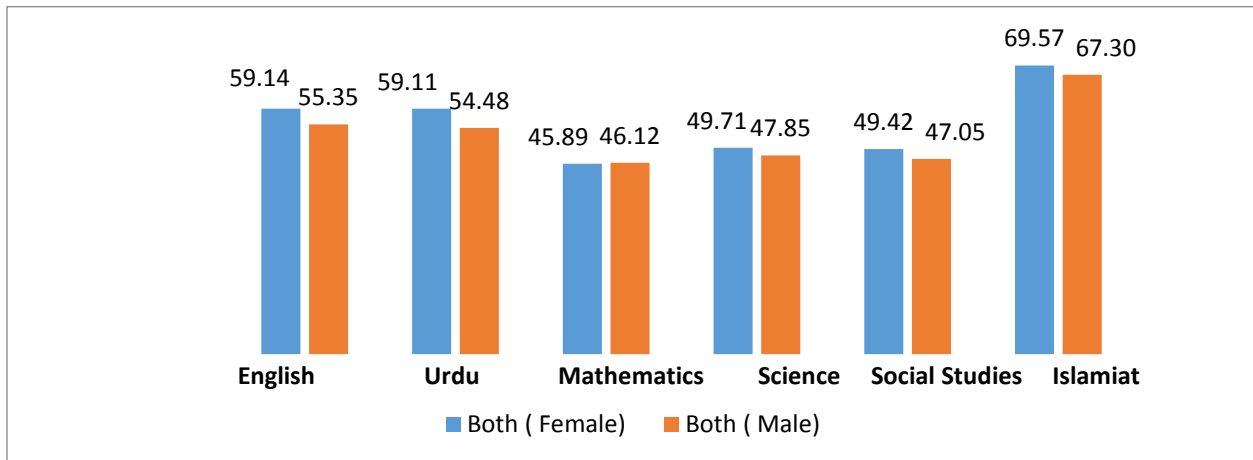


Figure 15: Interaction effect of gender and multi-gender schools

Figure 16 provides a comparison of male-only and female-only schools' performance. Male-only school students have higher mean scores in Mathematics while in all other subjects female-only school students have higher mean scores. In addition, overall average of female-only schools (52.48) is significantly better than the average of male-only schools (51.02).

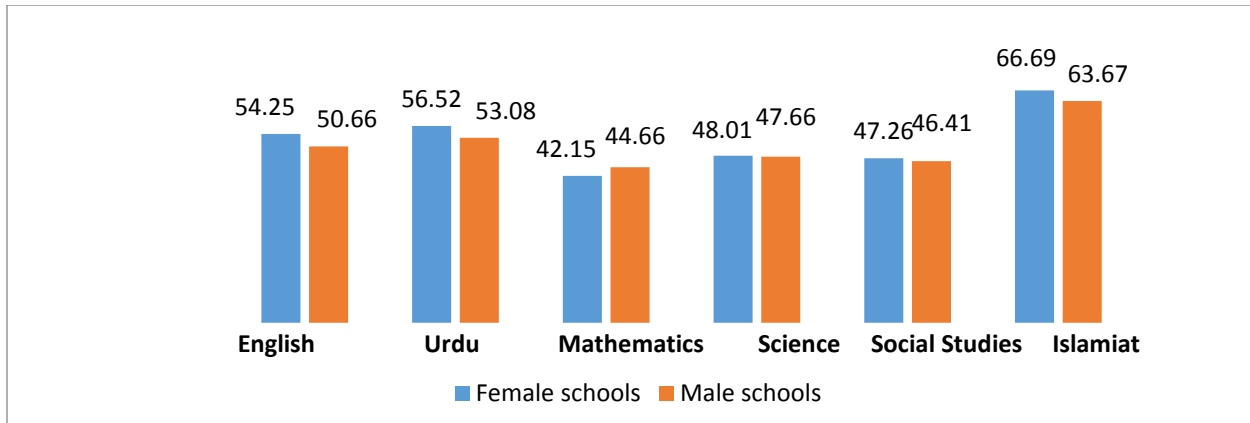


Figure 16: Comparison of single gender schools' performance

Interaction Effect of Gender and School Type

Table 3 shows that female students of private schools performed exceptionally better in all the subjects compared to other students. They were also better in Mathematics compared to other categories except for the male students of private schools who performed at par in this subject. The performance of private school female students is significantly better than all other categories (p-value < 0.001).

SCHOOL TYPE	GENDER	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T
PRIVATE SCHOOL	FEMALE	59.02	58.80	45.51	49.32	48.79	69.41
PRIVATE SCHOOL	MALE	55.00	53.70	45.47	47.13	46.21	66.82
PRIVATE STUDENT	FEMALE	50.56	51.78	37.18	42.95	43.00	64.61
PRIVATE STUDENT	MALE	46.71	47.99	37.03	41.19	40.56	62.06
PUBLIC SCHOOL	FEMALE	53.27	56.24	41.88	48.07	47.40	66.06
PUBLIC SCHOOL	MALE	49.91	53.15	44.50	47.89	46.70	63.17

Table 3: Interaction effect of gender and student type

Interaction Effect of Area and Language of Exam

Figure 17 shows a drastic difference in performance of students in the subject of English in urban areas. Urdu medium students performed rather poorly in English. The difference in mean scores is significant except for the subject of Social studies (p-value = 0.864).

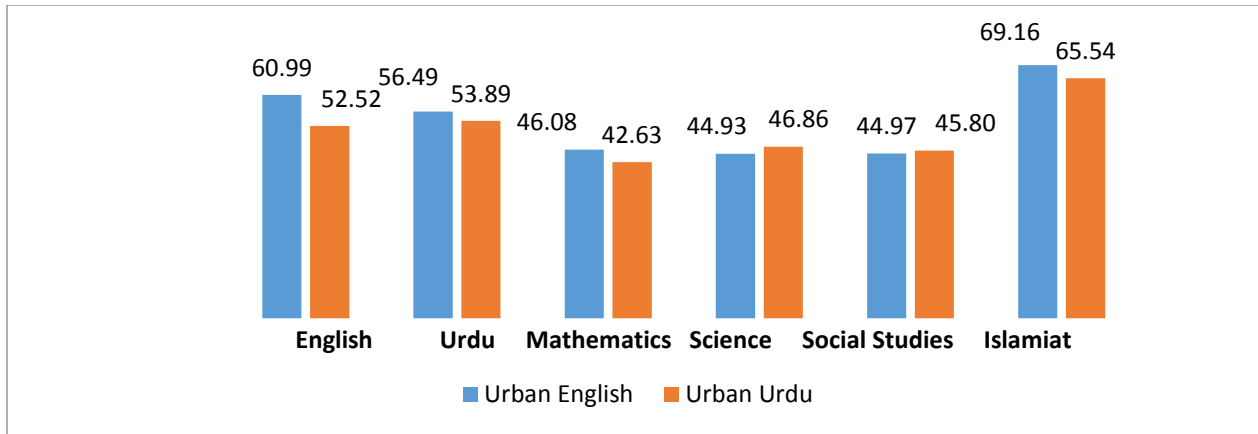


Figure 17: Interaction effect of urban area and language of exam

Same trend is apparent in rural English medium schools and rural Urdu medium schools. Rural English medium schools performed better in English, Urdu and Mathematics while Urdu medium students performed better in Social Studies and Science.

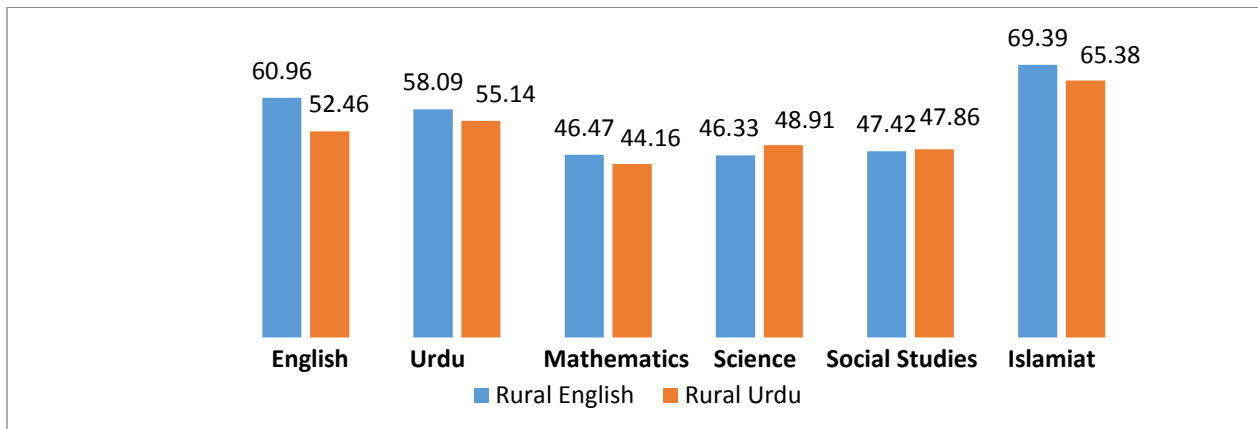


Figure 18: Interaction effect of rural area and language of exam

Interaction Effect of Area and School Gender

Overall schools with both male and female students performed much better than male-only and female-only schools. Rural schools with both genders were better than urban schools with both genders in most subjects. In case of English and Islamiat, urban schools with both genders have marginally high mean scores but the difference is not significant.

SCHOOL GENDER	AREA	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T	OVERAL L
BOTH	RURAL	57.05	57.34	46.73	50.17	49.44	68.23	54.83
BOTH	URBAN	57.10	55.61	45.10	46.79	46.43	68.45	53.25
FEMALE	RURAL	53.40	56.07	41.72	48.31	47.53	66.14	52.20
FEMALE	URBAN	55.22	55.92	42.85	46.35	45.72	66.90	52.16
MALE	RURAL	50.52	53.72	45.12	48.41	47.26	63.82	51.47
MALE	URBAN	52.74	52.59	43.19	45.87	44.54	64.12	50.51

Table 4: Interaction effect of area and school gender

Interaction Effect of School Type and Area

Overall private schools performed better in terms of mean score and that trend is shown in Table 5 also. Private schools in rural areas performed exceptionally well and were even at par in English with urban schools. The difference in mean scores of English for rural private schools and urban private schools is not significant (p-value=0.67). Private students of rural and urban areas performed rather poorly.

AREA	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T
RURAL	PRIVATE SCHOOL	56.69	57.01	46.23	49.81	49.09	68.19
RURAL	PRIVATE STUDENT	48.50	51.25	38.07	43.71	43.63	63.60
RURAL	PUBLIC SCHOOL	51.31	54.59	43.50	48.32	47.31	64.44
URBAN	PRIVATE SCHOOL	57.06	55.01	44.67	46.31	45.55	67.84
URBAN	PRIVATE STUDENT	48.15	47.35	35.76	39.56	38.87	62.54
URBAN	PUBLIC SCHOOL	52.13	54.56	42.43	46.58	45.91	64.81

Table 5: Interaction effect of area and student type

Interaction Effect of School Type and Language of Exam

English medium students from private schools performed better in English, Urdu, Mathematics and Islamiyat while Urdu medium students from private schools performed better in Science and Social Studies. In case of private students, Urdu medium students performed better than English medium students in all subjects except for English.

MEDIUM	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T
ENGLISH	PRIVATE SCHOOL	62.01	57.49	47.21	46.18	46.21	69.87
ENGLISH	PRIVATE STUDENT	52.49	49.32	36.73	38.36	38.96	63.56
ENGLISH	PUBLIC SCHOOL	55.12	54.61	40.63	40.71	43.37	65.63
URDU	PRIVATE SCHOOL	54.76	55.47	44.78	48.95	47.90	67.26
URDU	PRIVATE STUDENT	47.51	49.67	37.18	42.69	42.15	63.06
URDU	PUBLIC SCHOOL	51.36	54.58	43.37	48.21	47.15	64.48

Table 6: Interaction effect of student type and language of exam

Interaction Effect of School Type and School Gender

Students from multi-gender school performed better in English, Mathematics, Science and Social Studies while female students from private schools performed better in Urdu and Islamiat. The differences in performance between different student types are statistically significant (p -value < 0.001).

SCHOOL GENDER	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T
BOTH	PRIVATE SCHOOL	57.07	56.58	46.02	48.69	48.13	68.33
BOTH	PUBLIC SCHOOL	58.09	55.05	45.84	52.46	43.66	61.80
FEMALE	PRIVATE SCHOOL	57.97	56.98	44.34	47.82	46.75	68.37
FEMALE	PUBLIC SCHOOL	52.96	55.79	41.50	47.70	47.05	65.87
MALE	PRIVATE SCHOOL	54.89	52.82	44.25	45.97	44.75	66.28
MALE	PUBLIC SCHOOL	50.24	53.58	44.75	48.20	47.01	63.39

Table 7: Interaction effect of student type and school gender

SECTION 4: DATA MINING & CLUSTERING ANALYSIS

Clustering analysis is used to classify districts and tehsils according to levels of performance, and then to classify schools within tehsils according to performance. The district level classification should be useful for Punjab level policy and planning, and the tehsil and school classifications for decentralized planning and operational management. The results are reported in a slightly different manner for district, tehsil and school level clustering owing to the differences in population size.

Performance by District

Table 8 contains a list of the district ranks according to students' mean score in each subject. The list is arranged in descending order on the overall mean student score with Muzaffargarh being the best performing district overall and in most subjects. Since each district represents an important entity in provincial level planning, therefore, district level analysis provides individual rank for each district in every subject in relation to the other districts in the province. The corresponding subject mean score of each district is provided in Appendix D in Table 21.

DISTRICT	Overall	English	Urdu	Math	Science	Social Studies	Islamiat
MUZAFFARGARH	1	3	1	1	1	1	2
SARGODHA	2	4	2	9	3	6	5
MULTAN	3	10	3	5	5	2	4
BHAKKAR	4	6	4	4	2	3	10
T.T.SINGH	5	2	8	6	6	11	1
LAYYAH	6	8	5	12	4	13	9
JHANG	7	1	11	2	13	14	25
CHINIOT	8	13	13	8	15	4	11
SHEIKHUPURA	9	11	6	14	8	5	24
D.G. KHAN	10	22	14	7	17	12	6
LODHRAN	11	7	23	3	7	18	12
KHANEWAL	12	20	16	11	14	7	16
VEHARI	13	21	10	13	10	26	3
CHAKWAL	14	18	12	15	9	9	27
GUJRANWALA	15	9	7	21	12	17	22
BAHAWALPUR	16	12	9	17	11	28	8
BAHAWALNAGAR	17	26	15	10	22	8	13
NAROWAL	18	5	21	18	21	10	28
SAHIWAL	19	19	17	20	19	25	7
MIANWALI	20	14	18	19	18	20	14
RAJANPUR	21	15	29	16	20	16	18

DISTRICT	Overall	English	Urdu	Math	Science	Social Studies	Islamiat
RAHIMYAR KHAN	22	29	20	23	24	15	15
KHUSHAB	23	30	19	25	16	21	20
OKARA	24	31	26	24	26	19	17
PAKPATTAN	25	24	33	22	25	22	19
KASUR	26	28	22	27	23	27	21
SIALKOT	27	25	27	28	27	24	29
LAHORE	28	16	25	30	30	33	32
FAISALABAD	29	27	32	31	28	30	23
MANDI BAHA UD DIN	30	34	31	26	32	23	31
HAFIZABAD	31	33	28	33	29	32	26
GUJRAT	32	23	35	32	31	34	30
RAWALPINDI	33	17	34	29	36	29	36
ATTOCK	34	32	24	34	33	31	34
NANKANA SAHIB	35	35	30	35	35	35	33
JEHLUM	36	36	36	36	34	36	35

Table 8: District ranks according to mean scores

Performance by Tehsil

The analysis at tehsil level yielded five distinct clusters of tehsils presented in Table 9. Tehsils in each cluster are similar in terms of mean scores and standard deviations for each subject and significantly different from those in other clusters. The reporting provides a list of tehsil names in each cluster. The corresponding subject mean score of each tehsil is provided in Appendix D in Table 22.

POOR	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	EXCEPTIONAL
HAZRO	LAHORE CANTT	KASUR	KHAIRPUR TAMEWALI	SARGODHA
JHELUM	FAISALABAD CITY	RENALA KHURD	JAMPUR	LAYYAH
DINA	ARIFWALA	LAHORE CITY	SAFDARABAD	KABIRWALA
SARAI ALAM GIR	GUJRAT	SHAHKOT	JHANG	CHINIOT
HASSANABDAL	KAHUTA	SADIQABAD	SHEIKHUPURA	TAUNSA
TAXILA	KOTLI SATTIAN	CHOA SAIDAN SHAH	GUJRANWALA	KALLUR KOT
CHICHAWATNI	CHAK JHUMARA	MURREE	TOBA TEK SINGH	DARYA KHAN
SOHAWA	SANGLA HILL	CHUNIAN	BHAKKAR	SHAHPUR
NANKANA SAHIB	MANDI BAHUDDIN	FORT ABBAS	BAHAWALNAGAR	KAMALIA
QUAIDABAD	JAHANIAN	DASKA	LIAQATPUR	HASILPUR
SIALKOT	KHARIAN	DUNYAPUR	GOJRA	KALLAR KAHAR
GUJAR KHAN	PATTOKI	ISA KHEL	AHMAD PUR SIAL	KOT ADU
SAMUNDARI	PHALIA	BAHAWALPUR	BHOWANA	SILLANWALI
PINDI BHATTIAN	HAFIZABAD	TANDLIAN WALA	SHAKARGARH	MANKERA
ATTOCK	JAND	OKARA	SHORKOT	MUZAFFARGARH
RAWALPINDI	PIND DADAN KHAN	SAHIWAL	BHALWAL	SHUJA ABAD
RAHIMYAR KHAN	PINDI GHEB	FEROZWALA	MURIDKE	JALALPUR PIRWALA
MALIKWAL	KALLAR SYEDAN	NOSHERA VIRKAN	MULTAN	JATOI
	RAJANPUR	ROJHAN	LODHRAN	SAHIWAL
	DEPALPUR	KHUSHAB		ALIPUR
	FAISALABAD SADDAR	PAKPATTAN		

	NAROWAL	KAMOKE		
	SAMBRIAL	AHMADPUR EAST		
	JARANWALA	LALIAN		
		FATEH JANG		
		WAZIRABAD		
		MINCHINABAD		
		HAROONABAD		
		TALAGANG		
		D.G.KHAN		
		KHANEWAL		
		PIPLAN		
		KOT RADHA KISHAN		
		MIANWALI		
		CHISHTIAN		
		VEHARI		
		NOORPUR THAL		
		MULTAN SADAR		
		KHANPUR		
		ZAFARWAL		
		PASRUR		
		SHARAQPUR		
		CHAKWAL		
		MIAN CHANNU		
		BUREWALA		
		MAILSI		
		YAZMAN		
		KAROR LALISAN		
		CHAUBARA		
		MULTAN CITY		
		KAROR PACCA		

Table 9: Tehsil cluster analysis

Performance by Schools

The above sections provide clustering analysis of districts and tehsils according to student performance. However, it is pertinent to mention here that there is a vast difference in schools' performance within a particular tehsil or district but the clustering is based on aggregated performance of all the schools within an administrative boundary. Consequently, even though the analyses provide useful insights for provincial level policymakers, it does not contain any information for school level users. The focus of this section shifts from aggregation to school level analysis. The results are relevant for school level users and can be employed for training needs identification.

The candidature for 2013 examination represents about 89,000 schools spread across 36 districts in Punjab. The reporting of clustering analysis at school level is adjusted to cater for such a large number of schools. Table 10 provides the number of schools in each performance category from each district. In addition, the percentage

representation of every district in each performance category is also reported in Table 23 in Appendix D.

DISTRICT	POOR	%	BELOW AVER- AGE	%	AVER- AGE	%	ABOVE AVER- AGE	%	EXCE- PTIO- NAL	%	TOTAL SCHO- OLS
ATTOCK	67	3.32%	439	21.75%	1326	65.71%	177	8.77%	9	0.45%	2018
BAHAWALNAGAR	43	1.46%	341	11.61%	2039	69.40%	475	16.17%	40	1.36%	2938
BAHAWALPUR	48	1.74%	419	15.23%	1973	71.72%	287	10.43%	24	0.87%	2751
BHAKKAR	18	0.91%	183	9.25%	1134	57.33%	565	28.56%	78	3.94%	1978
CHAKWAL	21	1.17%	191	10.61%	1282	71.22%	288	16.00%	18	1.00%	1800
CHINIOT	3	0.27%	80	7.32%	752	68.80%	218	19.95%	40	3.66%	1093
D.G. KHAN	19	0.88%	183	8.45%	1390	64.20%	487	22.49%	86	3.97%	2165
FAISALABAD	59	1.09%	1044	19.32%	3885	71.90%	393	7.27%	22	0.41%	5403
GUJRANWALA	39	1.19%	418	12.71%	2197	66.80%	548	16.66%	87	2.65%	3289
GUJRAT	62	2.34%	580	21.90%	1850	69.84%	154	5.81%	3	0.11%	2649
HAFIZABAD	41	3.12%	319	24.24%	891	67.71%	64	4.86%	1	0.08%	1316
JEHLUM	97	6.75%	423	29.46%	862	60.03%	52	3.62%	2	0.14%	1436
JHANG	24	0.92%	303	11.60%	1737	66.48%	473	18.10%	76	2.91%	2613
KASUR	33	1.26%	459	17.56%	1855	70.96%	256	9.79%	11	0.42%	2614
KHANEWAL	29	1.29%	218	9.66%	1511	66.98%	431	19.10%	67	2.97%	2256
KHUSHAB	38	2.55%	274	18.40%	1002	67.29%	162	10.88%	13	0.87%	1489
LAHORE	62	1.28%	870	18.01%	3524	72.95%	356	7.37%	19	0.39%	4831
LAYYAH	50	2.06%	311	12.81%	1444	59.47%	501	20.63%	122	5.02%	2428
LODHRAN	36	2.74%	226	17.20%	848	64.54%	189	14.38%	15	1.14%	1314
MANDI BAHADIN	32	1.92%	349	20.90%	1163	69.64%	119	7.13%	7	0.42%	1670
MIANWALI	14	0.80%	170	9.67%	1263	71.84%	286	16.27%	25	1.42%	1758
MULTAN	47	1.47%	284	8.88%	2064	64.56%	640	20.02%	162	5.07%	3197
MUZAFFARGARH	35	1.22%	255	8.86%	1354	47.06%	901	31.32%	332	11.54%	2877
NANKANA SAHIB	52	4.13%	372	29.57%	787	62.56%	42	3.34%	5	0.40%	1258
NAROWAL	28	1.29%	235	10.83%	1532	70.60%	335	15.44%	40	1.84%	2170
OKARA	48	2.05%	473	20.25%	1512	64.73%	263	11.26%	40	1.71%	2336
PAKPATTAN	28	1.94%	276	19.10%	994	68.79%	135	9.34%	12	0.83%	1445
RAHIMYAR KHAN	77	2.18%	552	15.64%	2396	67.88%	457	12.95%	48	1.36%	3530
RAJANPUR	68	4.71%	326	22.56%	881	60.97%	143	9.90%	27	1.87%	1445
RAWALPINDI	77	2.51%	694	22.63%	2111	68.83%	178	5.80%	7	0.23%	3067
SAHIWAL	30	1.22%	316	12.80%	1695	68.68%	384	15.56%	43	1.74%	2468
SARGODHA	9	0.26%	179	5.27%	2040	60.02%	996	29.30%	175	5.15%	3399
SHEIKHUPURA	26	1.03%	292	11.61%	1531	60.90%	572	22.75%	93	3.70%	2514
SIALKOT	122	2.79%	868	19.87%	2881	65.94%	434	9.93%	64	1.46%	4369
T.T.SINGH	6	0.27%	125	5.69%	1477	67.26%	488	22.22%	100	4.55%	2196
VEHARI	31	1.14%	324	11.87%	1866	68.38%	460	16.86%	48	1.76%	2729

Table 10: School clustering analysis

Table 10 provides information on total number of schools in each performance category from every district. Table 11 provides break up of public and private schools in the ‘poor’ performing category showing that 55% of the schools in this category are public schools while 45% are private schools. At district level, the number of public schools in poor performing category is more than private schools in 21 out of total 36 districts.

DISTRICT	No. of Schools in Poor Category	Public Schools	%	Private Schools	%
ATTOCK	67	56	83.58	11	16.42
BAHAWALNAGAR	43	34	79.07	9	20.93
BAHAWALPUR	48	34	70.83	14	29.17
BHAKKAR	18	9	50.00	9	50.00
CHAKWAL	21	19	90.48	2	9.52
CHINIOT	3	3	100.00	0	0.00
D.G. KHAN	19	16	84.21	3	15.79
FAISALABAD	59	29	49.15	30	50.85
GUJRANWALA	39	26	66.67	13	33.33
GUJRAT	62	54	87.10	8	12.90
HAFIZABAD	41	17	41.46	24	58.54
JEHLUM	97	67	69.07	30	30.93
JHANG	24	11	45.83	13	54.17
KASUR	33	26	78.79	7	21.21
KHANEWAL	29	8	27.59	21	72.41
KHUSHAB	38	21	55.26	17	44.74
LAHORE	62	2	3.23	60	96.77
LAYYAH	50	28	56.00	22	44.00
LODHRAN	36	12	33.33	24	66.67
MANDI BABA UD DIN	32	21	65.63	11	34.38
MIANWALI	14	11	78.57	3	21.43
MULTAN	47	6	12.77	41	87.23
MUZAFFARGARH	35	25	71.43	10	28.57
NANKANA SAHIB	52	38	73.08	14	26.92
NAROWAL	28	13	46.43	15	53.57
OKARA	48	29	60.42	19	39.58
PAKPATTAN	28	16	57.14	12	42.86
RAHIMYAR KHAN	77	40	51.95	37	48.05
RAJANPUR	68	45	66.18	23	33.82
RAWALPINDI	77	43	55.84	34	44.16
SAHIWAL	30	10	33.33	20	66.67
SARGODHA	9	4	44.44	5	55.56
SHEIKHUPURA	26	8	30.77	18	69.23

DISTRICT	No. of Schools in Poor Category	Public Schools	%	Private Schools	%
SIALKOT	122	52	42.62	70	57.38
T.T.SINGH	6	2	33.33	4	66.67
VEHARI	31	2	6.45	29	93.55
	1519	837	55.10	682	44.90

Table 11: Breakup of Public and Private Schools in Poor Category

The preceding analysis classifies schools on the basis of their performance into different categories from poor to exceptional. The schools that fall in poor performance category need to be analyzed further to identify specific training needs. Table 12 provides in-depth analysis of the number of schools that fall in the poor performing category in each subject. The districts in which a large number of schools have performed poorly in a subject are highlighted.

DISTRICT	ENG	%	URDU	%	MATH	%	SCI	%	SOC	%	ISL	%
ATTOCK	82	4.16%	40	1.85%	11	1.61%	38	4.16%	51	5.27%	135	4.88%
BAHAWALNAGAR	55	2.79%	56	2.59%	20	2.93%	25	2.74%	15	1.55%	85	3.07%
BAHAWALPUR	47	2.38%	40	1.85%	19	2.78%	33	3.61%	37	3.83%	36	1.30%
BHAKKAR	55	2.79%	19	0.88%	25	3.66%	11	1.20%	10	1.03%	29	1.05%
CHAKWAL	27	1.37%	27	1.25%	9	1.32%	14	1.53%	10	1.03%	70	2.53%
CHINIOT	18	0.91%	24	1.11%	5	0.73%	10	1.10%	3	0.31%	10	0.36%
D.G. KHAN	80	4.05%	22	1.02%	16	2.34%	22	2.41%	20	2.07%	45	1.63%
FAISALABAD	44	2.23%	133	6.16%	10	1.46%	16	1.75%	32	3.31%	88	3.18%
GUJRANWALA	57	2.89%	40	1.85%	18	2.64%	15	1.64%	24	2.48%	134	4.85%
GUJRAT	54	2.74%	82	3.80%	6	0.88%	29	3.18%	54	5.58%	58	2.10%
HAFIZABAD	39	1.98%	57	2.64%	8	1.17%	15	1.64%	24	2.48%	44	1.59%
JEHLUM	56	2.84%	122	5.65%	26	3.81%	23	2.52%	46	4.76%	160	5.79%
JHANG	21	1.06%	45	2.08%	14	2.05%	23	2.52%	36	3.72%	104	3.76%
KASUR	71	3.60%	81	3.75%	12	1.76%	9	0.99%	27	2.79%	52	1.88%
KHANEWAL	55	2.79%	51	2.36%	21	3.07%	20	2.19%	19	1.96%	45	1.63%
KHUSHAB	53	2.69%	61	2.82%	12	1.76%	8	0.88%	15	1.55%	60	2.17%
LAHORE	19	0.96%	63	2.92%	25	3.66%	62	6.79%	86	8.89%	146	5.28%
LAYYAH	89	4.51%	50	2.31%	24	3.51%	33	3.61%	37	3.83%	101	3.65%
LODHRAN	53	2.69%	69	3.19%	20	2.93%	21	2.30%	30	3.10%	50	1.81%
MANDI BAHU UD DIN	47	2.38%	49	2.27%	3	0.44%	17	1.86%	9	0.93%	53	1.92%
MIANWALI	21	1.06%	39	1.81%	9	1.32%	8	0.88%	17	1.76%	26	0.94%
MULTAN	41	2.08%	65	3.01%	36	5.27%	64	7.01%	16	1.65%	51	1.84%
MUZAFFARGARH	84	4.26%	35	1.62%	52	7.61%	23	2.52%	19	1.96%	55	1.99%
NANKANA SAHIB	58	2.94%	31	1.44%	15	2.20%	26	2.85%	25	2.59%	48	1.74%
NAROWAL	31	1.57%	65	3.01%	11	1.61%	12	1.31%	8	0.83%	80	2.89%
OKARA	57	2.89%	91	4.21%	23	3.37%	35	3.83%	16	1.65%	81	2.93%
PAKPATTAN	54	2.74%	52	2.41%	10	1.46%	14	1.53%	9	0.93%	22	0.80%

DISTRICT	ENG	%	URDU	%	MATH	%	SCI	%	SOC	%	ISL	%
RAHIMYAR KHAN	155	7.86%	102	4.72%	49	7.17%	60	6.57%	36	3.72%	53	1.92%
RAJANPUR	92	4.66%	140	6.48%	35	5.12%	37	4.05%	28	2.90%	162	5.86%
RAWALAPINDI	48	2.43%	104	4.81%	22	3.22%	57	6.24%	42	4.34%	338	12.22%
SAHIWAL	34	1.72%	45	2.08%	11	1.61%	17	1.86%	24	2.48%	63	2.28%
SARGODHA	25	1.27%	9	0.42%	12	1.76%	11	1.20%	10	1.03%	27	0.98%
SHEIKHUPURA	41	2.08%	22	1.02%	30	4.39%	21	2.30%	13	1.34%	71	2.57%
SIALKOT	120	6.08%	174	8.06%	43	6.30%	61	6.68%	81	8.38%	160	5.79%
T.T.SINGH	13	0.66%	21	0.97%	3	0.44%	4	0.44%	11	1.14%	7	0.25%
VEHARI	77	3.90%	34	1.57%	18	2.64%	19	2.08%	27	2.79%	16	0.58%
	1,973		2,160		683		913		967		2,765	

Table 12: District wise breakup of poorly performing schools

In order to further the above analysis a list of poor performing schools in each subject is prepared. The list of schools that have underperformed in each subject is provided separately in an auxiliary report.⁷

Performance by Centers

Data mining algorithms were run on the entire examination data to identify meaningful patterns in the data. This analysis was carried out using WEKA. Most of the findings in this analysis were consistent with the observations made in the analyses presented earlier. In 2012, a notable pattern was regarding difference in students' performance where examination center is same as student's school. In order to further investigate, the overall mean score at district level is computed for students with same school and examination center. In 2013, the increase in overall mean score when computed for students with same school as examination center is not significant. Overall for 61% districts the district average is higher when computed for only those students whose school is same as center. While for 39% districts this average drops under same circumstances. The highest increase is observed for the following districts:

DISTRICT	AVERGAE (School = Center)	AVERGAE (Overall)	INCREASE
MULTAN	72.70	58.00	14.70
GUJRANWALA	59.24	53.81	5.42
NAROWAL	57.93	53.47	4.46

⁷ For details, refer to the Auxiliary Report for Secondary Analysis of Grade 5 Exam in 2013.

SECTION 5: COMPARISON OF EXAM VERSIONS

Figure 19 depicts the degree of uniformity in different examination versions for all subjects.

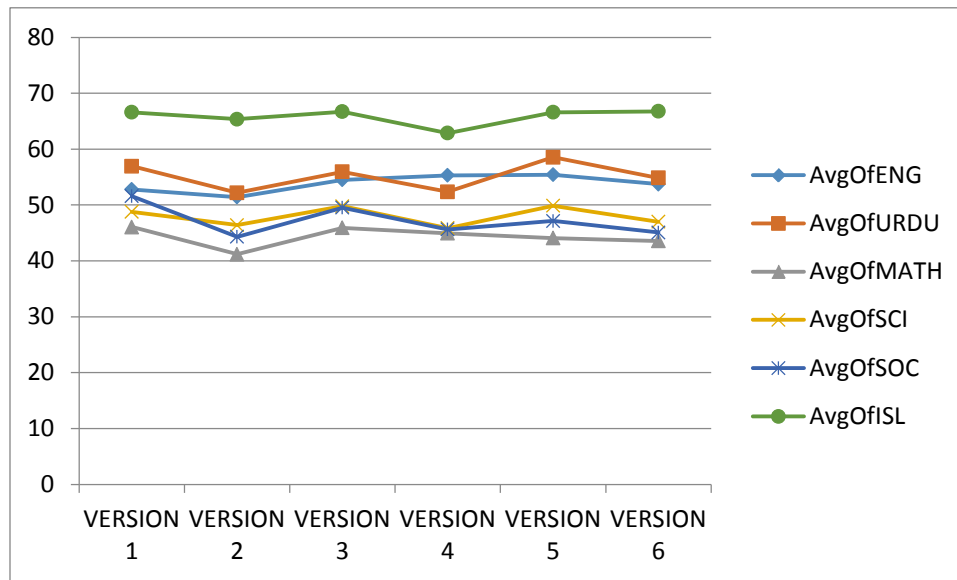


Figure 19: Mean scores of exam versions

The analysis shows that highest mean score for Science, Urdu, English and Mathematics is in version 5, 5, 3 and 1 respectively. PEC ensures uniformity in difficulty level of exam versions through the use of items with pre-assigned difficulty level. Each exam version of a given subject contains same number of items from the ‘easy’, ‘medium’ and ‘difficult’ test item bins. Hence, it cannot be concluded that the difference in mean scores of different exam versions is due to the difference in difficulty level of the exam. Moreover, the different examination versions were distributed in different districts. As a result, the difference in subject mean scores of different exam versions is attributed to the difference of students’ performance in various districts.

For the 2013 examination, six versions were prepared, for each subject, which were distributed in different districts according to the following scheme. Table 13 provides the district names along with the overall rank as well as rank within version of that district in terms of student mean score performance. In addition, version average for each subject and correlation between version average and district performance are provided in Appendix E.

VERSION NO.	DISTRICT RANK WITHIN VERSION					
	1	2	3	4	5	6
1	MULTAN 3	SHEIKHUPURA 9	CHAKWAL 14	BAHAWALNAGAR 17	OKARA 24	MANDI BAHAUDDIN 30
2	NAROWAL 18	SAHIWAL 19	MIANWALI 20	KASUR 26	FAISALABAD 29	JEHLUM 36
3	MUZAFFARGARH 1	BHAKKAR 4	CHINIOT 8	KHANEWAL 12	SIALKOT 27	GUJRAT 32
4	JHANG 7	LODHRAN 11	RAJANPUR 21	PAKPATTAN 25	HAFIZABAD 31	RAWALPINDI 33
5	SARGODHA 2	LAYYAH 6	GUJRANWALA 15	BAHAWALPUR 16	ATTOCK 34	NANKANA SAHIB 35
6	TOBA TEK SINGH 5	D G KHAN 10	VEHARI 13	RAHIM YAR KHAN 22	KHUSHAB 23	LAHORE 28

* District names and overall rank of each district is provided in the table data.

Table 13: List of Districts for Exam Versions

SECTION 6: SUMMARY

The secondary analysis of grade 5 examinations in 2013 reveals a diversity and complexity that mirrors the diversity and complexity of the human and physical geography of the Punjab. This means that it is not prudent to make generalized statements about performance levels for the Punjab as a whole, and for districts, because they may well mask underlying patterns of diversity and complexity that should be taken into account in policy formulation and education planning. Moreover, the analyses that looked at the effect of factors such as school type, gender, area and medium of instruction amply illustrate that these factors interact to produce varying levels of learning attainment. Again, policy formulation and education planning must take account of these interactions so as to design interventions that are locally appropriate.

Findings

The following major observations are made:

1. The 2013 examination candidature comprises of significant number of students from each of the 36 districts of Punjab. However, the students' performance across these districts is not comparable. The difference between best and worst performing district, in different subjects, ranges from 15%–19%. This is an astoundingly huge difference considering that the number of students in each district is very large. This highlights the pronounced difference in students' achievement and quality of education that exist across districts and tehsils within Punjab.
2. Students exhibit highest learning achievement in Islamiyat followed by languages (Urdu and English) and then Sciences and Mathematics. This pattern remains substantially similar even when the unit of analysis is changed either geographically (district, tehsil or area) or demographically (gender, student type, medium of instruction or school gender) at student or school level.
3. Female students generally exhibit higher levels of learning attainment compared to their male counterparts. However, their performance is negatively affected in learning environments which are perceived to be potentially discriminating against females. For example, females performed much better in urban areas and in private

schools compared to rural areas and in public schools. The effect of school location and school type is less profound for male students.

4. The level of learning achievement is significantly affected by schooling whether public or private. Private students underachieved markedly compared to students of both public schools and private schools. However, the system of education is much better in private schools compared to public schools as reflected by students' mean scores. This pattern holds even when the analysis is conducted at district or tehsil level. Another important observation is regarding location of the school whereby the difference in performance of public and private school systems is less pronounced in urban areas compared to rural areas.
5. Apparently, there are no material differences in the level of learning achievement for urban and rural students. However, the differences are unmasked when the effect of other factors like gender, language of exam and school type is considered. Indeed, the location of the school matters when its interaction effect with other factors, especially those relating to the socio-economic context of schools is considered.
6. Finally, there is a difference in mean scores achieved by students on different versions of the examination paper. The differences in subject mean scores of different exam versions are attributed to the difference of students' performance in various districts.

Recommendations

The following major recommendations are offered:

1. PEC has been conducting grade 5 examinations in Punjab since 2006. A longitudinal analysis should be undertaken to gain insights into the trends over time and contrasts over grouping factors such as districts, gender and school type. These kinds of analysis are necessary to optimize the efficacy of the investment required to improve primary education in the Punjab.
2. Qualitative survey studies can be used to uncover reasons for the wide diversity of learning outcomes across and within districts. Such analyses should be used as the basis for policy formulation and education planning.

3. This report highlights the schools which have underperformed in a certain subject. The scope of such an analysis can be enhanced to link achievement on student learning outcomes (SLO) with school performance and teacher competence. Such analyses will help to measure teacher competency that covers both pedagogical and subject content knowledge and skills and to provide evidence regarding the effect of teacher competency on student learning achievement. The results of such subsequent analyses involving teacher competence and student learning achievement should inform policy development in respect of teachers' training needs identification, curriculum development and classroom teaching and learning practices.
4. PEC should share the school level analysis with Directorate of Staff Development and other relevant bodies and agencies to explain and interpret findings of the secondary analysis to those schools, union councils and tehsils which are in need of most urgent intervention to improve education quality in primary schools.

APPENDICES

Appendix A: Distribution Curves

Distribution curves of all the students are provided as per their scores for all the subjects. The results of English, Science and Social Studies are symmetrically distributed which suggests that higher proportion of students performed near the average of these subjects. The distribution of Urdu and Islamiat is negatively skewed suggesting that higher proportion of students scored more than the mean score while Mathematics is positively skewed.

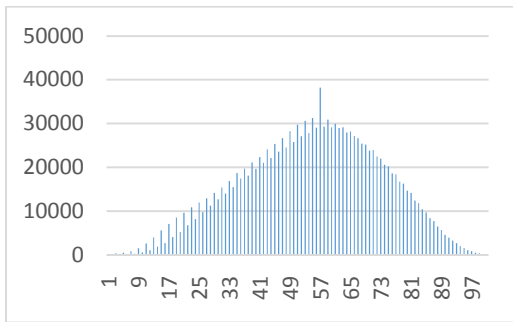


Figure 20: Distribution curve for English

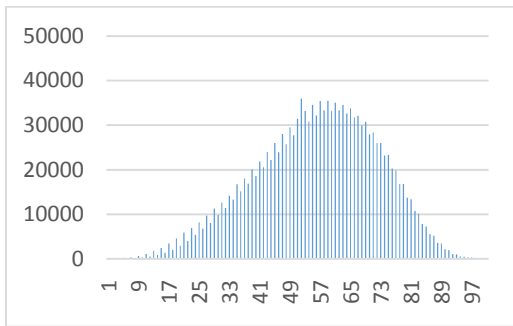


Figure 21: Distribution curve for Urdu

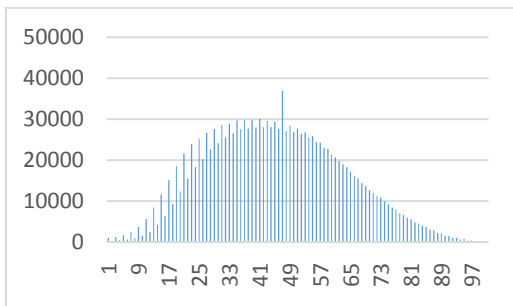


Figure 22: Distribution curve for Maths

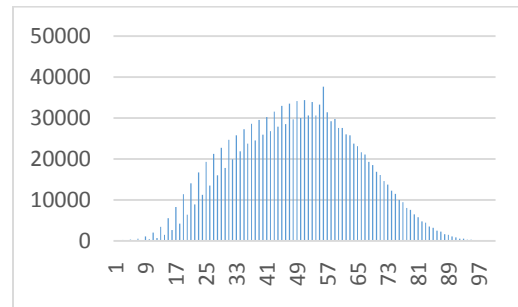


Figure 23: Distribution curve for Science

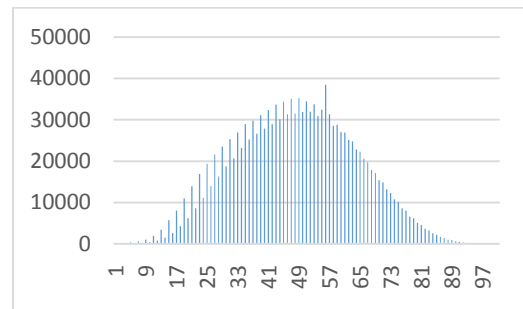


Figure 24: Distribution curve for Social Studies

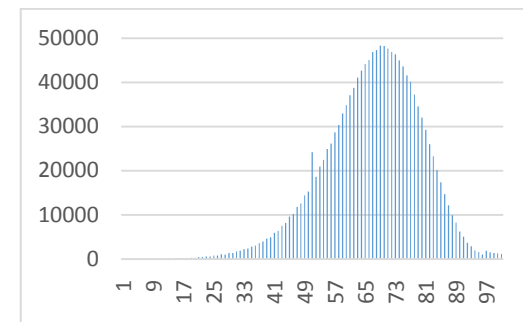


Figure 25: Distribution curve for Islamiat

Appendix B: Tehsils where Public Schools Outperformed Private Schools

In most tehsils the overall mean score of private school students is higher than public school students. The name of tehsils where public school students performed better than private school students are given below:

S.No.	TEHSIL
1	ATTOCK
2	CHINIOT
3	DARYA KHAN
4	FEROZWALA
5	GUJRANWALA
6	HASSANABDAL
7	KABIRWALA
8	KALLAR SYEDAN
9	KAMOKE
10	KOT RADHA KISHAN
11	LAHORE CANTT
12	LAHORE CITY
13	MANKERA
14	MURIDKE
15	MURREE
16	NOSHERA VIRKAN
17	PASRUR
18	RAWALPINDI
19	SAFDARABAD
20	SAMBRIAL
21	SARGODHA
22	SHARAQPUR
23	SHEIKHUPURA
24	SIALKOT
25	TAXILA

Appendix C: Analysis of Student Performance by SLO

Table 14 provides analysis of students' performance in each subject based on content area of student learning outcomes.

Table 14: Analysis of Student Performance by Content

Content	SLO	% of Students Answered Correctly
ENGLISH		
Reading and Thinking Skills	1-12	51.60
Writing Skills	13-29	57.19
Formal and Lexical Aspects of Language	31-37	53.38
Grammar and Structure	38-59	54.59
MATHEMATICS		
Numbers and Arithmetic Operation	1-5	51.99
Decimals and Percentages	6-24	47.91
Unitary Method	25-28	55.90
Average	29-31	47.67
Perimeter and Area	32-51	43.01
Information Handling	52-57	44.86
SCIENCE		
Environmental Pollution	1	63.48
Forces and Motion	2-3	56.03
Electricity and Magnetism	4-9	52.91
Soils	10-13	47.17
Sun and Planets	14-17	57.64
Organization of Plant Body	18-21	47.28
Our Wonderful Body	22-36	48.49
Environment	37-38	47.36
Continuity of Life	39-44	43.91
Matter and its Properties	45-51	50.22
Motion and Force	52-53	41.35
Energy	54-67	42.99
SOCIAL STUDIES		
Islamic Republic of Pakistan	1-6	57.18
Geographical Features of Pakistan	7-14	58.27

Content	SLO	% of Students Answered Correctly
Climate	15-25	56.55
Resources of Pakistan	26-32	54.81
Population	34-38	50.85
Safety	39-42	48.27
Administration	43-47	52.89
Means of Communication and Transportation	48-50	58.18
Problems and their Solutions	54	50.84
Important Personalities	55-58	64.81
URDU		
پڑھنا	1	65.28
لکھنا	2	65.83
زبان کی ساخت اور ذخیرہ الفاظ	3	63.88
گفتگو کرنا	4	52.91
ISLAMIAT		
دنیا آخرت کی یکجہتی	1-3	67.31
اطاعت رسول	4	40.25
سنت نبوی کی اہمیت	5-6	62.92
نماز جو	7-9	60.80
عیدین	10-12	70.69
روزہ	13-14	55.05
انصار مدینہ کا شمار	15-16	63.31
غزوہ بدر	17-18	54.81
غزوہ احد	19-21	54.10
غزوہ اتراب	22-24	51.87
آداب ملاقات	25-26	65.82
حد سے کی پابندی	27-28	58.42
کتابت شہاری	29-31	52.43
بروباری	32-33	50.23
عمود و گزر	36-37	51.93
ردا داری	38-39	53.86
اسلامی اخوت	40-41	48.21
پاکستان ایک اسلامی ریاست	42-44	62.15

The following tables provide analysis of students' performance in each subject based on student learning outcomes. The analysis is based on the percentage of students who correctly answered the questions related to particular SLOs.

Table 15: SLO Wise Student Performance in English

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
1	Reading and Thinking skills		The main idea in a paragraph is carried in a sentence, called a topic sentence.	45.32
2			Other sentences in the paragraph support the topic sentence.	49.65
3			Scan a simple text for specific information.	55.35
4			Apply critical thinking to interact with text using intensive reading strategies (while-reading) to locate specific information to answer short questions.	51.11
6			Use critical thinking to respond to the text (post-reading): Apply world knowledge and own opinion to the text read. Relate what is read to their own feelings and experiences.	48.32
7			Factual	53.52
8			Interpretive	51.16
9			Inferential	48.87
10			Personal response	50.68
11			Tell when and where the story is set.	54.22
12			Describe the characters in a story.	59.36
13			Write multi-syllable words with correct spellings.	57.19
31	Formal and Lexical Aspects of Language		Recognize, find out, create and use more rhyming words.	62.45
32			Locate, provide, connect and use words similar and opposite in meaning.	50.35
33			Use common compound words speech and own writing.	51.69
35			Recognize meaning of common adjectives and verbs in relation to each other.	47.69
37			Apply spelling change in plural form of regular and irregular nouns and regular and irregular verb forms.	54.71
38	Grammar and Structure	Nouns	Recall, and demonstrate use of more common, countable and uncountable, collective nouns from immediate and extended environment.	57.63

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
41		Pronouns	Illustrate use of pronouns learnt earlier. Use the personal pronouns myself, yourself/ves, himself, herself, ourselves, themselves and itself.	51.98
45			Illustrate the use of question words learnt earlier. Identify and use question words: why and how often etc.	65.57
46		Articles	Recall and apply the rules for the use of a and an. Choose between a or an before words that start with mute consonant letters. Identify and use the definite article the. Differentiate between use of definite and indefinite articles.	58.63
47		Verbs	Recognize and use more action verbs from extended environment including other subjects in speech and writing.	53.32
48			Demonstrate the use of be, do and have as main or helping verbs in sentences.	61.22
50			Recognize and use forms of more regular and irregular verbs.	49.57
53		Capitalization	Use capitalization according to rules learnt earlier.	67.15
54		Punctuation	Recall the rules of punctuation learnt earlier.	51.09
55		Sentence Structure	Recognize and use simple SVO pattern sentences with direct and indirect objects.	55.73
56			Demonstrate use of subject-verb agreement according to person and number.	40.43
59			Respond to, and ask why questions.	42.78

Table 16: SLO Wise Student Performance in Mathematics

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
1	Numbers and Arithmetic Operation	Numbers up to One Billion	Read natural numbrers upto 1000000000 (One arab). Write natural numbrers upto 1000000000 (One arab)	60.03
2			Read numbers up to 1,000,000,000 (one billion) in numerals and in words.	53.38
3			Write numbers up to 1,000,000,000 (one billion) in numerals and in words.	62.66
4		Roman Numbers	Roman numerals up to 50	45.60
5			Roman symbols for 100.500 and 1000 (C.D.M)	38.29
6	Decimals and Percentages	Common fractions	Define reducible and irreducible common fractions	50.78
7			Identify reducible and irreducible common fractions	40.15
8			Reducing a common fraction into an irreducible fraction (by H.C.F. Prime factors, Common factors)	42.59
9		Decimal fractions	Describe the concept of continued decimal fraction	43.98
10			Round off decimals up to specified number of decimal places.	46.37

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
11			Convert fractions to decimals and vice versa.	48.29
14		Decimals	Add and subtract decimals.	49.33
15			Multiply a decimal by a decimal (with three decimal places).	51.25
16			Multiply a decimal by a decimal (in the same way as for whole numbers and then put in the decimal	52.34
17			Divide a decimal by a decimal (by converting decimals to fractions).	50.19
20			Simplify decimal expressions involving brackets (applying one or more basic operations)	49.36
21		ORDER of OPERATIONS: BODMAS RULE	Knowing the brackets () , { } , []	55.08
22			Recognize BODMAS rule, involving brackets () , { } , []	51.67
23			Carryout combined operations using BODMAS rule.	47.59
24			Simplify expressions involving fractions using BODMAS rule.	39.73
25	Unitary Method	Unitary Method	Calculate the value of many objects of the same kind when the value of one of these objects is given	57.36
26			Calculate the value of a number of same type of objects when the value of another of the same type is given (unitary method).	56.21
27		Direct and Inverse Proportion	Define and identify direct and inverse proportion.	58.32
28			Solve real life problems involving direct and inverse proportion (by unitary method).	51.72
29	Average	Average	Define an average (arithmetic mean).	49.61
30			Find an average of given numbers.	55.29
31			Solve real life problems involving average.	38.11
32	Perimeter and Area	Concepts and constructions	Define Parallel Lines	52.98
33			Give example of parallel lines from real life	49.38
34			Recognise parallel lines	54.27
35		Angle	Define adjacent, complementary and supplementary angles	50.24

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
36			Give example of adjacent, complementary and supplementary angles	49.36
37			Find adjacent, complementary and supplementary angle of a given angle	42.64
41		Quadrilaterals	Recognize the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium and kite).	52.97
42			Recognize region of a closed figure.	42.36
43		Perimeter and Area	Identify the units for measurement of perimeter and area.	40.13
44			Write the formulas for perimeter and area of a square and rectangle.	35.87
45			Apply formulas to find perimeter and area of a square and rectangular region (Word problem, Complex Diagram, Simple Diagram)	29.26
46		Volume	Define Solids	45.32
47			Recognize solids from daily life	47.51
48			Identify components of solids (Sphere, Cone, Cylinder, Cube, Cuboid)	34.03
50			Know formula of volume of cube and cuboid	26.18
51			Find the Volume of Cube and Cuboids	35.71
52	Information Handling	Block, Column and Bar Graphs	Identify parts of a graph	42.63
53			Know the types of a graph	50.39
54			Draw Bar Graph (Vertical, Horizontal)	32.55
55			Interpret Bar Graph	53.86

Table 17: SLO Wise Student Performance in Science

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
1	ENVIRONMENTAL POLLUTION	Pollution	Define Pollution	63.48
2	FORCES AND MOTION	Gravitational force	Explain the gravitational force using different examples	61.75
3			Explain the natural forces using examples	50.30

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
4	ELECTRICITY AND MAGNETISM	Electric Current	Define Electrical Current	57.17
5			Differentiate between conductors and insulators	60.67
6			Describe flow of electric current in an electrical circuit	40.89
10	Soils	Characteristics of Soil	Identify the soil profile	54.67
11			Describe the general composition of soil	47.59
12			Describe the characteristics of soil	52.26
13		Types of soil	Identify similarities and differences among the different types of soil	34.15
14	SUN AND PLANETS	Star and planets	Differentiate between a star and a planet	58.46
15			Describe the physical characteristics of Sun	68.55
16		Solar system (Sun and planets)	Explain the features of solar system in detail	53.68
17			Differentiate between Natural and artificial satellites	49.87
18	ORGANIZATION OF PLANT BODY	Pollination	Define Pollination	50.34
19			Describe fertilization	44.23
23	Our WONDERFUL BODY		Describe composition of Blood	45.69
24			Describe that circulatory system helps in the transport of gases and food to different parts of the body	37.49
25		Transport of material, through blood	Identify causes of heart diseases	50.19
26		Excretory system	Draw, label and describe the major organs of the excretory system	58.33
27			Identify and describe the relative function of each organ of excretory system	39.70
29			Explain the function of skeletal system	71.42
30			Explain how muscles help in movement	56.68
33			Describe major organs (gonad, ducts) of the reproductive system	29.36
34			Develop an awareness of keeping the body healthy	40.88

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
35			Define balanced diet	51.35
36			Explain the effects of unbalanced diet on health Specify the physical disorder associated with the lack of balance diet	52.29
38	ENVIRONM ENT	Concept of producers, consumers and decomposers and their roles	Differentiate between producers, consumers and decomposers	47.36
39			Define extinct species	34.35
40	CONTINUITY OF LIFE	Endangered species	Describe reason for extinction	46.06
43			Give examples of some endangered animals and plants in Pakistan and at global level	51.33
45	MATTER AND ITS PROPERTIES	Changes are of two types physical and chemical changes	Given various examples, Describe and differentiate between two types of changes	48.21
46		Importance of water	Describe the importance of water	63.47
47		Sources of water	Describe different sources of water	53.38
48		Impurities of water	Classify impurities present in water	45.73
49			Describe various sources of water pollution	49.96
50		Purification of water	Describe different methods used for purification of drinking water	51.27
51			Describe different ways to prevent water pollution	39.49
53	MOTION AND FORCE	Use of action and reaction	Apply the principle to different practical situation	41.35
55			Enlist the different kinds of energy	56.09
56		Kinds of energy	Differentiate between different kinds of energy	47.55
57			Explain different kinds of energies	40.51
58		Energy conversion	Describe conversion of one form of energy into another energy	24.64
59		Transfer of heat	Prove with help of example that heat flow from hot to cold body	33.59
62		Conductors of heat	Differentiate between conductor and non conductor of heat	52.73
63			Explain the phenomena reflection of light from plane shining surface	47.18

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
65		Requirements of sound hearing	Describe the basic requirements for the production, propagation and hearing of sound	37.52
66		Reflection of sound	Explain the law of reflection of sound	59.44
67			Differentiate between phenomena of echo and reverberation	30.71

Table 18: SLO Wise Student Performance in Social Studies

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
1.1	Islamic Republic of Pakistan	Hindu Muslim difference in cultures and need for establishment of independent Muslim state	Identify the events in relation to Hindu-Muslim differences, which laid the foundations for the Pakistan" emergence	63.45
1.3		India's evil designs against Pakistan (the three wars with India)	Evaluate the role of India with reference to wars of 1948, 1965, and 1971.	55.72
1.4		Kashmir Problem	Specify the nature of Kashmir issue and discuss the Solution of this problem.	52.36
2.1	Geographical features of Pakistan	Boundaries	Identify the boundaries of Pakistan on the world map.	57.69
2.2		Location of Pakistan in respect of latitudes and longitudes	Define longitudes and latitudes and identify location of Pakistan in respect of latitudes and longitudes	59.22
2.3		Zones in which Pakistan is situated	Name the geographical zone in which Pakistan is situated.	49.25
2.4		Location of Pakistan in sub continent of Asia	Show location of Pakistan in sub continent of Asia' map	62.51
2.6		Neighboring Countries of Pakistan	List the neighboring countries of Pakistan.	64.83
2.8		Physical features	Locate the important physical features on the map of Pakistan.	56.11
3.1	Climate	Whether and climate	Describe especially the God gifted unique climatic situation in Pakistan	58.38
3.2		Whether Chart	Make the weather charts for a week.	37.09
3.3		Four seasons	Enlist names of four seasons of Pakistan and describe their salient features.	76.93
3.4		Rain fall during winter and summer	Describe how the clouds are made and rain falls.	51.42

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
3.5		Current temperature during summer and winter	Know about extreme winter and summer temperature in Pakistan	54.37
3.11		Environmental problems	Define environmental pollution and discuss the ways through which we may control the environmental pollution in Pakistan.	61.14
4.2	Resources of Pakistan	Agricultural products	Identify the cash crops in Pakistan and describe the important vegetables, fruits and crops which contribute for economic development in Pakistan.	60.85
4.3		Industries	Identify major industries with respect to their contribution for economic development in Pakistan.	51.49
4.4		Minerals	List important minerals found in Pakistan and show their location on the map	49.33
4.5		Power Generation	Identify the energy/power generation resources of Pakistan and describe how we can cope with the scarcity of water resources in Pakistan.	57.56
5.1	Population	Total population and distribution of population on the bases of area, age, gender, literacy and religions in Pakistan	Specify total population and its distribution with respect to area, age, gender, literacy and religions in Pakistan.	57.81
5.2		Cultural similarities and diversities in languages, class and ways of living.	Identify the common and diversified, cultural characteristic of the people in various provinces/areas.	47.35
5.3		Change in population	State meaning of people migration and state causes of people migration from rural to urban areas.	46.92
5.4		Relationship among the people of different provinces	Discuss relationship among people of different provinces in Pakistan.	50.47
5.5		Interdependence of population and environment	Describe how the population growth affects the quality of people's life and promotes unemployment drug usages, environmental pollution and poverty in Pakistan.	51.69
6.1	Safety	Rumors	Describe the effect of rumors on people, causes of foreign invasions and discuss importance of safety at national level	37.16
6.2		Foreign Invasions	Describe the effect of rumors on people, causes of foreign invasions and discuss importance of safety at national level.	43.97
6.3		Armed Forces and police	Describe the role of armed forces for national security.	59.61
6.4		Civil Defense	Explain the agencies' role for safety at national level.	52.37
7.1	Administration	Constitution	Define election, electorate and constitution.	51.81
7.3		President of Pakistan	Describe various constitutional organs in Pakistan	56.75
7.4		Parliament	Describe various constitutional organs in Pakistan	50.93

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
7.8		Islam and Administration	Describe the Islamic concept of administration	52.07
8.1	Means of communication and transportation	Means of Transportation	Specify the role of various means of transport and communication for national development.	67.14
8.8		Means of communication	Describe uses and benefits of postal service, radio, television and computer.	49.22
10.1	Problems and their solutions	Water logging and salinity	Explain major problems in Pakistan and describe their nature, causes and remedies.	36.31
10.2		Poverty	Explain major problems in Pakistan and describe their nature, causes and remedies.	56.16
10.3		Illiteracy	Explain major problems in Pakistan and describe their nature, causes and remedies.	48.64
10.4		Unemployment	Explain major problems in Pakistan and describe their nature, causes and remedies.	49.76
10.5		Environmental Pollution	Explain major problems in Pakistan and describe their nature, causes and remedies.	63.35
11.2	Important Personalities	Muhammad Bin Qasim	Describe services of	58.33
11.4		Shah Wali Ullah	Describe services of	53.71
11.5		Sir Sayed Ahmad Khan	Describe services of	64.14
11.6		Quaid-e-Azam Muhammad Ali Jinnah	Describe services of	76.28
11.7		Allama Muhammad Iqbal	Describe services of	71.59

Table 19: SLO Wise Student Performance in Urdu

SLO No.	Content	SLO Description	% of Students Answered Correctly
1.3	Reading	سبق، کہانی سے متعلق سوالات کا درست طور پر جواب دے	67.47
1.4		نظم پڑھ کر مفہوم اخذ کر سکے اور سوالوں کا جواب دے سکے	63.09
2.1	Writing	تحریر میں املا کی غلطیوں سے بچے	79.26
2.7		ندائیاں اور علامتیں استعمال کر کے اور وادین کا استعمال سے واقف ہو	52.39
3.1	Grammar & Vocabulary	سادہ مرکبات کا استعمال کرے اور صحیح جملہ بنائے	61.35

SLO No.	Content	SLO Description	% of Students Answered Correctly
3.2		عائب، حاضر اور منکلم کی ضمیروں سے واقف ہو اور ان کا درست استعمال کرے	70.06
3.3		اسم، فعل، حرف اور ضمیر کا صحیح استعمال کرے اور ان اصطلاحات کی تشریح کرے	64.68
3.4		اسم معرف، اسم نکرہ کو پہچانے اور تعریف سے واقف ہو	72.32
3.5		متضاد، مترادف اور ہم قافیہ الفاظ کا معقول ذخیرہ رکھے	59.27
3.6		واحد جمع اور مذکر مؤنث کی رعایت کیجے	71.58
3.7		محاورات اور ضرب الامثال کا استعمال کرے	63.62
3.8		جملے میں قواعد اور زبان کی غلطیوں کی اصلاح کرے	48.17
4.2	Conversation	موقع کی مناسبت سے موزوں الفاظ کا انتخاب کرے مثلاً عزائم چری، بیمار پرسی، اجازت لینا، اور تعزیت کرنا	52.91

Table 20: SLO Wise Student Performance in Islamiyat

SLO No.	Content	% of Students Answered Correctly
2	دنیا آخرت کی تکمیل	67.31
4	اطاعت رسول	40.25
5	سنت نبوی کی اہمیت	69.36
6	سنت نبوی کی اہمیت	56.49
7	نماز چھو	54.72
8	نماز چھو	59.14
9	نماز چھو	68.53
10	عیدین	73.41
11	عیدین	67.98
13	روزہ	55.34
14	روزہ	54.77
15	انصاف دینے کا اثر	61.29
16	انصاف دینے کا اثر	65.33

SLO No.	Content	% of Students Answered Correctly
17	غزوہ ہند	54.81
19	غزوہ واحد	53.67
21	غزوہ واحد	54.54
23	غزوہ اتراب	51.87
25	آداب ملاقات	64.25
26	آداب ملاقات	67.39
28	ہد سے کی پابندی	58.42
29	کفایت شعاری	54.39
30	کفایت شعاری	50.47
32	برجاری	52.15
33	برجاری	48.31
36	عنود و گزر	51.93
39	رداءاری	53.86
40	اسلامی اخوت	54.41
41	اسلامی اخوت	42.02
43	پاکستان ایک اسلامی ریاست	62.15

Appendix D: Clustering Analysis

Table 21: District wise subject mean scores

DISTRICT	Overall	English	Urdu	Math	Science	Social Studies	Islamiat
MUZAFFARGARH	61.71	59.99	64.77	55.02	60.12	57.87	72.52
SARGODHA	58.30	59.83	63.65	47.85	55.53	52.40	70.54
MULTAN	58.00	56.57	61.59	49.64	52.63	56.87	70.71
BHAKKAR	57.88	57.73	60.37	49.68	56.58	54.77	68.16
T.T.SINGH	56.95	60.40	58.02	49.06	51.26	50.32	72.65
LAYYAH	56.14	57.00	60.08	47.08	54.35	49.55	68.77
JHANG	55.70	62.13	57.48	51.37	49.63	49.26	64.30
CHINIOT	55.63	56.22	57.10	48.56	49.44	54.44	68.00
SHEIKHUPURA	55.09	56.42	59.29	46.52	50.82	52.64	64.84
D.G. KHAN	54.56	52.52	56.86	48.67	49.01	50.25	70.05
LODHRAN	54.53	57.00	53.31	51.00	51.02	47.45	67.39
KHANEWAL	54.12	53.33	56.29	47.14	49.51	51.65	66.77
VEHARI	53.94	52.83	57.72	46.81	50.13	45.10	71.07
CHAKWAL	53.87	53.93	57.47	46.25	50.34	51.14	64.08
GUJRANWALA	53.81	56.80	58.99	43.26	49.79	48.55	65.49
BAHAWALPUR	53.68	56.32	57.75	44.66	49.88	43.99	69.51
BAHAWALNAGAR	53.50	50.36	56.36	47.17	48.22	51.58	67.33
NAROWAL	53.47	59.50	53.81	44.43	48.40	50.66	64.03
SAHIWAL	52.80	53.41	55.69	43.43	48.89	45.74	69.65
MIANWALI	52.74	54.93	55.06	43.66	48.90	46.96	66.91
RAJANPUR	52.55	54.81	51.27	45.59	48.44	48.62	66.61
RAHIMYAR KHAN	51.40	49.37	54.21	42.67	46.30	49.02	66.84
KHUSHAB	51.31	49.14	54.75	42.26	49.09	46.64	65.97
OKARA	50.57	48.88	52.56	42.48	45.37	47.41	66.71
PAKPATTAN	50.44	51.26	50.38	42.79	45.38	46.24	66.58
KASUR	50.32	49.43	53.59	41.15	47.73	44.19	65.83
SIALKOT	49.83	50.99	51.77	41.10	45.25	45.90	63.96
LAHORE	49.03	54.70	52.61	39.98	43.93	40.29	62.70
FAISALABAD	48.86	49.92	50.52	39.89	44.92	42.58	65.35
MANDI BAHA UD DIN	48.50	47.35	50.62	41.88	42.31	46.00	62.82
HAFIZABAD	48.11	47.82	51.30	39.51	44.31	41.55	64.18
GUJRAT	47.92	52.51	49.80	39.55	42.32	40.02	63.33
RAWALPINDI	47.57	54.43	49.83	40.70	41.13	42.59	56.73
ATTOCK	47.27	47.90	53.31	39.39	42.04	41.73	59.21
NANKANA SAHIB	46.65	47.00	50.80	38.93	41.18	39.39	62.59
JEHLUM	44.52	45.05	46.54	36.98	41.61	39.38	57.54

* The districts names are sorted on their ranking based on overall mean score.

Table 22: Tehsil wise subject mean scores

TEHSIL	English	Urdu	Math	Science	Social Studies	Islamiat
AHMAD PUR SIAL	61.93	58.26	53.52	52.48	48.33	64.47
AHMADPUR EAST	58.43	54.50	41.72	49.61	42.87	67.27
ALIPUR	65.98	68.47	58.66	61.33	62.97	73.86
ARIFWALA	49.29	47.44	41.32	42.12	43.18	65.60
ATTOCK	48.28	53.30	38.71	41.08	42.27	60.13
BAHAWALNAGAR	51.69	59.63	48.70	52.44	55.33	69.34
BAHAWALPUR	54.07	55.48	42.30	46.76	41.10	68.50
BHAKKAR	55.13	59.11	46.46	54.06	52.05	68.72
BHALWAL	57.92	62.92	46.45	53.99	50.24	68.63
BHOWANA	56.58	57.93	50.80	51.11	53.61	69.26
BUREWALA	53.79	57.46	47.17	50.41	45.37	71.16
CHAK JHUMARA	52.49	51.56	38.55	42.78	40.68	64.22
CHAKWAL	54.91	56.83	46.34	50.43	50.93	64.59
CHAUBARA	55.95	56.96	46.93	53.87	49.04	65.25
CHICHAWATNI	35.42	49.10	37.82	45.74	35.80	60.07
CHINIOT	59.72	59.44	50.71	49.81	57.52	68.66
CHISHTIAN	49.34	57.96	48.05	47.10	49.88	66.99
CHOA SAIDAN SHAH	49.57	53.57	42.23	48.90	47.40	61.86
CHUNIAN	49.00	55.62	39.14	49.92	44.09	66.72
D.G.KHAN	51.45	55.33	47.86	46.30	47.86	69.39
DARYA KHAN	59.72	61.34	49.96	57.14	57.77	67.04
DASKA	51.67	52.09	41.64	48.03	48.67	64.65
DEPALPUR	47.21	51.55	42.10	43.18	47.63	66.61
DINA	41.18	44.29	34.83	38.15	37.78	56.97
DUNYAPUR	51.27	48.25	46.86	48.15	44.54	68.17
FAISALABAD CITY	50.49	49.42	39.56	43.06	40.89	65.08
FAISALABAD SADDAR	50.58	51.46	40.82	47.32	43.93	64.64
FATEH JANG	53.32	58.88	42.69	50.07	48.06	62.63
FEROZWALA	52.97	59.00	39.34	47.49	50.14	62.08
FORT ABBAS	48.48	52.99	45.49	41.91	49.32	67.71
GOJRA	60.55	57.60	48.36	50.73	48.58	73.05
GUJAR KHAN	52.89	48.44	39.65	39.11	42.15	57.03
GUJRANWALA	60.69	60.52	45.52	50.45	50.07	66.29
GUJRAT	51.40	49.00	40.83	42.30	41.54	64.29
HAFIZABAD	49.07	51.36	41.09	44.98	42.42	64.83
HAROONABAD	50.22	52.74	47.24	47.85	50.28	69.58
HASILPUR	60.77	65.64	51.21	55.59	48.52	73.71
HASSANABDAL	43.96	50.78	35.66	39.44	37.64	54.53
HAZRO	42.62	48.19	35.09	35.07	35.26	55.44
ISA KHEL	54.38	52.89	42.02	48.58	45.50	64.53
JAHANIAN	44.41	48.78	40.83	43.77	47.28	67.42
JALALPUR PIRWALA	61.23	67.15	53.86	57.59	60.33	73.88
JAMPUR	56.52	54.33	48.45	50.81	50.39	70.15
JAND	48.79	54.96	42.10	45.06	43.02	60.14
JARANWALA	50.71	50.63	40.22	46.94	44.92	66.32
JATOI	60.58	65.86	58.18	58.39	59.34	72.37

TEHSIL	English	Urdu	Math	Science	Social Studies	Islamiat
JHANG	61.40	56.75	51.60	48.30	49.25	64.07
JHELUM	43.03	43.38	35.29	38.51	36.33	55.87
KABIRWALA	57.75	59.62	52.52	53.31	54.81	67.40
KAHUTA	53.67	48.86	43.26	41.63	42.75	59.26
KALLAR KAHAR	59.34	63.95	50.41	58.05	58.15	67.99
KALLAR SYEDAN	54.82	50.48	41.72	47.45	43.70	59.33
KALLUR KOT	58.04	59.37	52.46	58.43	54.90	67.01
KAMALIA	63.80	59.05	52.25	51.85	54.05	74.15
KAMOKE	54.79	56.96	41.46	49.20	47.28	64.66
KAROR LALISAN	55.44	58.90	46.73	52.50	46.65	67.75
KAROR PACCA	58.97	52.73	53.26	50.12	47.06	67.00
KASUR	50.41	53.08	42.68	46.26	43.27	65.80
KHAIRPUR TAMEWALI	53.46	64.15	44.54	51.27	47.97	68.65
KHANEWAL	52.64	56.97	45.03	47.46	50.30	65.90
KHANPUR	53.43	57.48	43.41	48.80	50.73	67.52
KHARIAN	56.56	51.08	38.95	43.90	39.29	63.03
KHUSHAB	50.25	55.42	42.78	49.21	47.38	67.70
KOT ADU	58.42	63.85	51.13	59.54	57.05	72.43
KOT RADHA KISHAN	50.50	57.76	44.33	51.02	49.06	66.31
KOTLI SATTIAN	50.66	51.79	41.10	43.34	46.65	56.57
LAHORE CANTT	53.96	50.97	39.82	42.17	38.55	61.71
LAHORE CITY	55.53	54.43	40.17	45.89	42.22	63.80
LALIAN	51.69	53.65	44.30	47.76	51.29	66.28
LAYYAH	58.15	61.43	47.33	55.57	51.40	70.11
LIAQATPUR	56.47	58.15	48.17	49.29	55.93	69.68
LODHRAN	60.20	57.61	52.78	53.83	49.96	67.03
MAILSI	52.50	59.06	47.68	49.86	46.69	70.18
MALIKWAL	47.23	49.19	41.02	42.01	44.58	62.54
MANDI BAHUDDIN	47.07	50.47	41.80	42.81	46.45	63.00
MANKERA	61.75	63.83	54.15	60.06	58.10	69.60
MIAN CHANNU	53.66	55.62	46.82	50.47	51.86	66.76
MIANWALI	55.71	55.35	44.14	48.61	48.07	67.33
MINCHINABAD	52.21	57.35	44.50	50.42	52.44	59.69
MULTAN	55.53	60.16	48.73	50.98	55.62	70.16
MULTAN CITY	55.16	57.51	47.26	45.71	53.25	69.46
MULTAN SADAR	51.25	50.42	42.14	50.44	52.06	74.25
MURIDKE	59.32	60.44	50.70	52.51	53.32	64.11
MURREE	56.42	53.44	43.21	45.95	49.59	55.02
MUZAFFARGARH	59.38	64.06	56.17	60.94	56.50	72.26
NANKANA SAHIB	44.73	49.02	36.95	38.60	37.45	61.23
NAROWAL	55.48	49.75	39.28	46.14	46.73	61.81
NOORPUR THAL	51.67	57.77	44.05	52.83	49.26	64.64
NOSHERA VIRKAN	53.32	58.23	39.88	50.35	46.70	62.90
OKARA	50.35	54.05	43.47	46.99	47.54	67.41
PAKPATTAN	52.94	52.86	44.04	48.14	48.82	67.42
PASRUR	55.01	54.67	47.24	48.44	49.57	66.76
PATTOKI	47.94	50.79	39.38	46.53	43.51	64.91

TEHSIL	English	Urdu	Math	Science	Social Studies	Islamiat
PHALIA	47.74	51.70	42.53	41.93	46.41	62.80
PIND DADAN KHAN	49.74	51.26	41.29	47.07	43.88	61.14
PINDI BHATTIAN	45.95	51.19	37.17	43.33	40.26	63.19
PINDI GHEB	50.47	54.08	41.94	42.36	44.38	61.64
PIPLAN	53.79	56.49	44.20	49.79	46.02	68.26
QUAIDABAD	42.29	49.16	38.45	44.94	41.13	60.42
RAHIMYAR KHAN	44.87	48.36	38.81	43.88	46.52	63.69
RAJANPUR	52.30	47.02	42.09	45.12	46.11	64.92
RAWALPINDI	56.13	50.35	40.89	40.30	41.80	55.90
RENALA KHURD	49.80	51.74	41.23	47.22	46.56	65.38
ROJHAN	56.71	53.64	45.69	50.41	50.18	55.25
SADIQABAD	46.03	56.00	42.92	44.88	45.33	68.28
SAFDARABAD	56.26	59.69	45.58	51.98	52.43	65.26
SAHIWAL	52.11	54.23	42.20	47.71	44.95	69.37
SAHIWAL	65.71	68.04	54.52	63.44	59.30	74.29
SAMBRIAL	51.68	52.74	39.49	47.09	44.44	64.03
SAMUNDARI	44.65	49.61	38.05	42.75	40.65	64.54
SANGLA HILL	49.63	53.26	40.05	43.23	41.38	63.85
SARAI ALAM GIR	43.99	49.85	33.94	36.49	33.45	58.52
SARGODHA	59.10	62.54	46.15	53.75	51.13	71.20
SHAHKOT	50.99	53.51	43.60	46.68	43.05	65.30
SHAHPUR	60.53	63.74	49.46	56.39	53.52	69.46
SHAKARGARH	63.30	57.55	49.15	49.73	53.86	65.81
SHARAQPUR	54.67	56.54	47.28	48.18	51.05	64.89
SHEIKHUPURA	56.52	59.18	47.06	51.16	53.29	65.77
SHORKOT	64.75	59.31	48.93	51.82	50.04	64.97
SHUJA ABAD	59.66	66.50	52.26	59.36	62.07	71.84
SIALKOT	47.47	49.20	36.91	40.53	41.91	61.50
SILLANWALI	62.05	65.94	50.75	58.70	56.17	71.21
SOHAWA	45.88	47.65	35.85	42.84	39.91	55.69
TALAGANG	52.45	57.46	46.04	48.55	50.46	63.01
TANDLIAN WALA	48.55	55.03	42.31	48.87	46.80	68.22
TAUNSA	54.85	60.17	50.44	54.87	55.41	71.45
TAXILA	49.84	46.34	36.29	37.54	36.19	57.25
TOBA TEK SINGH	57.72	57.59	47.24	51.24	48.96	71.20
VEHARI	51.93	56.76	45.52	50.03	43.25	71.82
WAZIRABAD	53.02	58.01	42.54	48.52	47.77	66.40
YAZMAN	55.88	57.05	46.72	51.18	45.92	70.40
ZAFARWAL	59.19	53.63	44.24	49.25	51.03	64.25

Table 23: School cluster analysis based on category

DISTRICT	POOR	%	BELOW AVER- AGE	%	AVER- AGE	%	ABOVE AVER- AGE	%	EXCE- PTIO- NAL	%
ATTOCK	67	4.41%	439	3.28%	1326	2.25%	177	1.37%	9	0.46%
BAHAWALNAGAR	43	2.83%	341	2.55%	2039	3.45%	475	3.68%	40	2.04%
BAHAWALPUR	48	3.16%	419	3.13%	1973	3.34%	287	2.22%	24	1.22%
BHAKKAR	18	1.18%	183	1.37%	1134	1.92%	565	4.38%	78	3.98%
CHAKWAL	21	1.38%	191	1.43%	1282	2.17%	288	2.23%	18	0.92%
CHINIOT	3	0.20%	80	0.60%	752	1.27%	218	1.69%	40	2.04%
D.G. KHAN	19	1.25%	183	1.37%	1390	2.35%	487	3.77%	86	4.39%
FAISALABAD	59	3.88%	1044	7.81%	3885	6.58%	393	3.04%	22	1.12%
GUJRANWALA	39	2.57%	418	3.13%	2197	3.72%	548	4.25%	87	4.44%
GUJRAT	62	4.08%	580	4.34%	1850	3.13%	154	1.19%	3	0.15%
HAFIZABAD	41	2.70%	319	2.39%	891	1.51%	64	0.50%	1	0.05%
JEHLUM	97	6.39%	423	3.16%	862	1.46%	52	0.40%	2	0.10%
JHANG	24	1.58%	303	2.27%	1737	2.94%	473	3.66%	76	3.88%
KASUR	33	2.17%	459	3.43%	1855	3.14%	256	1.98%	11	0.56%
KHANEWAL	29	1.91%	218	1.63%	1511	2.56%	431	3.34%	67	3.42%
KHUSHAB	38	2.50%	274	2.05%	1002	1.70%	162	1.25%	13	0.66%
LAHORE	62	4.08%	870	6.51%	3524	5.97%	356	2.76%	19	0.97%
LAYYAH	50	3.29%	311	2.33%	1444	2.45%	501	3.88%	122	6.22%
LODHRAN	36	2.37%	226	1.69%	848	1.44%	189	1.46%	15	0.76%
MANDI BAHAUDDIN	32	2.11%	349	2.61%	1163	1.97%	119	0.92%	7	0.36%
MIANWALI	14	0.92%	170	1.27%	1263	2.14%	286	2.22%	25	1.27%
MULTAN	47	3.09%	284	2.12%	2064	3.50%	640	4.96%	162	8.26%
MUZAFFARGARH	35	2.30%	255	1.91%	1354	2.29%	901	6.98%	332	16.93%
NANKANA SAHIB	52	3.42%	372	2.78%	787	1.33%	42	0.33%	5	0.25%
NAROWAL	28	1.84%	235	1.76%	1532	2.59%	335	2.60%	40	2.04%
OKARA	48	3.16%	473	3.54%	1512	2.56%	263	2.04%	40	2.04%
PAKPATTAN	28	1.84%	276	2.06%	994	1.68%	135	1.05%	12	0.61%
RAHIMYAR KHAN	77	5.07%	552	4.13%	2396	4.06%	457	3.54%	48	2.45%
RAJANPUR	68	4.48%	326	2.44%	881	1.49%	143	1.11%	27	1.38%
RAWALPINDI	77	5.07%	694	5.19%	2111	3.57%	178	1.38%	7	0.36%
SAHIWAL	30	1.97%	316	2.36%	1695	2.87%	384	2.97%	43	2.19%
SARGODHA	9	0.59%	179	1.34%	2040	3.45%	996	7.72%	175	8.92%
SHEIKHUPURA	26	1.71%	292	2.18%	1531	2.59%	572	4.43%	93	4.74%
SIALKOT	122	8.03%	868	6.49%	2881	4.88%	434	3.36%	64	3.26%
T.T.SINGH	6	0.39%	125	0.93%	1477	2.50%	488	3.78%	100	5.10%
VEHARI	31	2.04%	324	2.42%	1866	3.16%	460	3.56%	48	2.45%
	1,519		13,371		59,049		12,909		1,961	

Appendix E: Analysis of Exam Versions

Table 24: Version wise exam average

	English	Urdu	Maths	Science	Social Studies	Islamiat
VERSION 1	52.78	56.92	46.06	48.78	51.57	66.59
VERSION 2	51.42	52.18	41.18	46.41	44.32	65.37
VERSION 3	54.50	55.94	45.93	49.77	49.52	66.71
VERSION 4	55.31	52.35	44.95	45.87	45.63	62.85
VERSION 5	55.42	58.53	44.08	49.88	47.14	66.59
VERSION 6	53.72	54.85	43.57	47.00	45.09	66.76

Table 25: Correlation between district rank and version average

Spearman's rho		ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIAT
RANK	Correlation Coefficient	-.097	-.243	-.224	-.232	-.255	-.265
	Sig. (2-tailed)	.573	.154	.189	.174	.133	.119
	N	36	36	36	36	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).