

**SECONDARY ANALYSIS OF THE
EXAMINATION RESULTS OF GRADE 5
STUDENTS IN 2012**

Contents

EXECUTIVE SUMMARY	1
SECTION 1: INTRODUCTION	3
Background.....	3
Methodological Issues	4
Examination Statistics.....	5
SECTION 2: ANALYSIS OF STUDENT PERFORMANCE.....	8
Performance by Subject.....	8
Performance by Language of Exam.....	9
Performance by Gender.....	10
Performance by School Type	11
Performance by School Gender	12
Performance by Area	13
Performance by Student Learning Outcome.....	13
SECTION 3: ANALYSIS OF INTERACTION EFFECTS.....	16
Interaction Effect of Gender and Area	16
Interaction Effect of Gender and Language of Exam	17
Interaction Effect of Gender and School Gender.....	18
Interaction Effect of Gender and School Type.....	19
Interaction Effect of Area and Language of Exam	19
Interaction Effect of Area and School Gender	20
Interaction Effect of School Type and Area	21
Interaction Effect of School Type and Language of Exam.....	21
Interaction Effect of School Type and School Gender	22
SECTION 4: DATA MINING & CLUSTERING ANALYSIS	23

Performance by District.....	23
Performance by Tehsil	24
Performance by Schools	25
Performance by Centers	29
SECTION 5: COMPARISON OF EXAM VERSIONS	30
SECTION 6: SUMMARY	32
Findings	32
Recommendations	33
APPENDICES	35
Appendix A: Distribution Curves	35
Appendix B: Tehsils where Public Schools Outperformed Private Schools	36
Appendix C: Analysis of Student Performance by SLO	37
Appendix D: Clustering Analysis.....	49
Appendix E: Analysis of Exam Versions	54

List of Figures

Figure 1: Demographic Breakup of Student Body	6
Figure 2: Mean scores across subjects	8
Figure 3: Mean scores across subjects by language of exam	9
Figure 4: Mean scores across subjects by gender	10
Figure 5: Mean scores across subjects by school type	11
Figure 6: Mean scores across subjects by school gender.....	12
Figure 7: Mean scores across subjects by area	13
Figure 8: Mean % score by question type	14
Figure 9: Mean % score by question type for Islamiat	14
Figure 10: Performance by cognitive domain.....	15
Figure 11: Interaction effect of gender and rural area	16
Figure 12: Interaction effect of gender and urban area	17
Figure 13: Interaction effect of gender and English	17
Figure 14: Interaction effect of gender and Urdu	18
Figure 15: Interaction effect of gender and multi-gender schools	18
Figure 16: Comparison of single gender schools' performance.....	19
Figure 17: Interaction effect of urban area and language of exam	20
Figure 18: Interaction effect of rural area and language of exam	20
Figure 19: Mean scores of exam versions	30
Figure 20: Distribution curve for English.....	35
Figure 21: Distribution curve for Urdu	35
Figure 22: Distribution curve for Maths.....	35
Figure 23: Distribution curve for Science.....	35
Figure 24: Distribution curve for Social Studies	35
Figure 25: Distribution curve for Islamiat.....	35

List of Tables

Table 1: Examination Statistics	6
Table 2: Gender wise pass percentage for each subject.....	7
Table 3: Interaction effect of gender and student type.....	19
Table 4: Interaction effect of area and school gender	21
Table 5: Interaction effect of area and student type	21
Table 6: Interaction effect of student type and language of exam	22
Table 7: Interaction effect of student type and school gender	22
Table 8: District ranks according to mean scores.....	24
Table 9: Tehsil cluster analysis	25
Table 10: School clustering analysis	26
Table 11: Breakup of Public and Private Schools in Poor Category.....	28
Table 12: District wise breakup of poorly performing schools	29
Table 13: List of Districts for Exam Versions	31
Table 14: Analysis of Student Performance by Content	37
Table 15: SLO Wise Student Performance in English	39
Table 16: SLO Wise Student Performance in Mathematics	40
Table 17: SLO Wise Student Performance in Science.....	42
Table 18: SLO Wise Student Performance in Social Studies.....	44
Table 19: SLO Wise Student Performance in Urdu	46
Table 20: SLO Wise Student Performance in Islamiyat.....	47
Table 21: District wise subject mean scores.....	49
Table 22: Tehsil wise subject mean scores	50
Table 23: School cluster analysis based on category	53
Table 24: Version wise exam average	54
Table 25: Correlation between district rank and version average.....	54

EXECUTIVE SUMMARY

This report presents secondary analysis of Grade 5 examinations held in 2012. PEC administered the exam for a candidature of approximately 1.4 million students in 6,955 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 53.97%. 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 23%–30%.
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, D.G.Khan and Lodhran are the best performing districts while Hafizabad, Mandi Baha-ud-Din and Rawalpindi are among the worst performing districts.

10. Muzaffargarh, D.G.Khan and Vehari hosts the largest percentage of best performing schools while Rawalpindi, Kasur, Jhelum and Chakwal hosts the largest percentage of poor performing schools.
11. In some districts, the mean scores of students for whom the examination center was same as their school is much higher when compared to the mean score for the respective district.

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. There appears to be a significant improvement in private school students' scores when their examination center is same as the school. Though it is difficult to establish proofs of malpractice, it would be judicious to provide all students with exam centers different from their schools.
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 2012 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, 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
19.09	31.97	14.41	18.88	21.35	43.83

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 29.76	Between 29.76 – 40.96	Between 40.96 – 63.36	Between 63.36 – 74.56	Above 74.56

Examination Statistics

In 2012, approximately 1.4 million students registered for grade 5 examinations from 36 districts of the Punjab. The candidate body comprised of students from public schools, private schools and private students. A total of 6,955 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/>

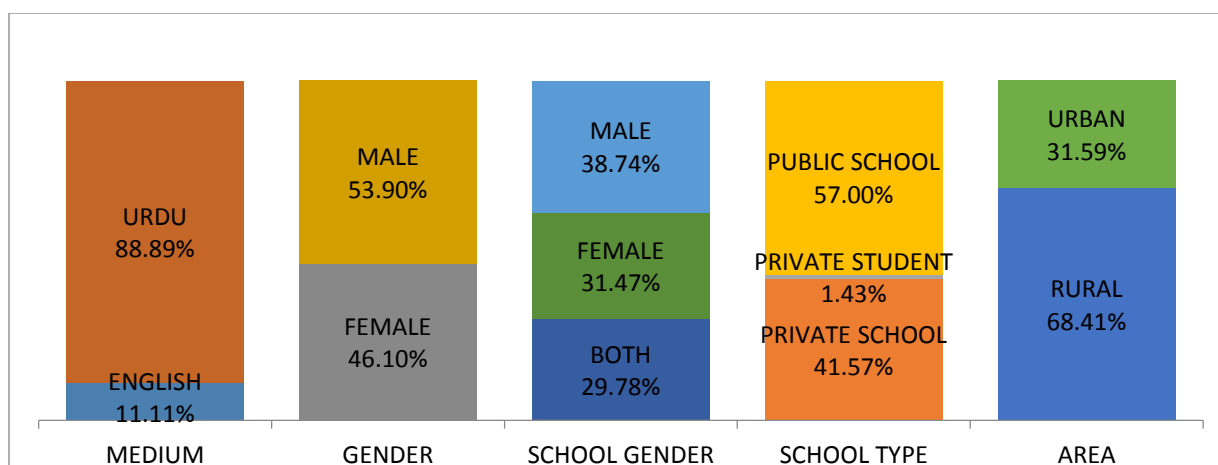


Figure 1: Demographic Breakup of Student Body

Table 1 below provides statistics for student participation and pass rates in 2012 examination across different categories. The data shows that the pass percentages are higher for: female students compared to male students, English medium students compared to Urdu medium students, private school students compared to public school and private students. The most notable observations are very low pass percentage for private students and significantly high pass percentage of students from private schools and schools with both gender students.

		Appeared ⁴	Passed	Pass Rate ⁵
Overall		1,409,526	760,830	53.97
Gender	Female	649,465	361,101	55.59
	Male	759,405	399,394	52.59
Student Type	Private School	585,947	341,357	58.25
	Private Student	20,107	7,778	38.68
	Public School	803,471	411,357	51.19
Area	Rural	962,959	516,971	53.68
	Urban	444,769	242,792	54.58
Language of Exam	English	156,497	90,168	57.61
	Urdu	1,252,372	670,323	53.52
School Gender	Both	413,422	243,022	58.78
	Female	436,882	230,826	52.83
	Male	537,754	278,528	51.79

Table 1: Examination Statistics

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

⁵ Candidates who obtained 33% marks in all subjects were considered pass.

An analysis of sub-groups revealed that the highest pass rate of 65.16% is achieved by female students from English medium female-only schools located in urban areas. 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
76.32	78.09	74.70	73.88	79.89	84.81	91.31	94.82	98.79	99.02	81.69	84.00

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.

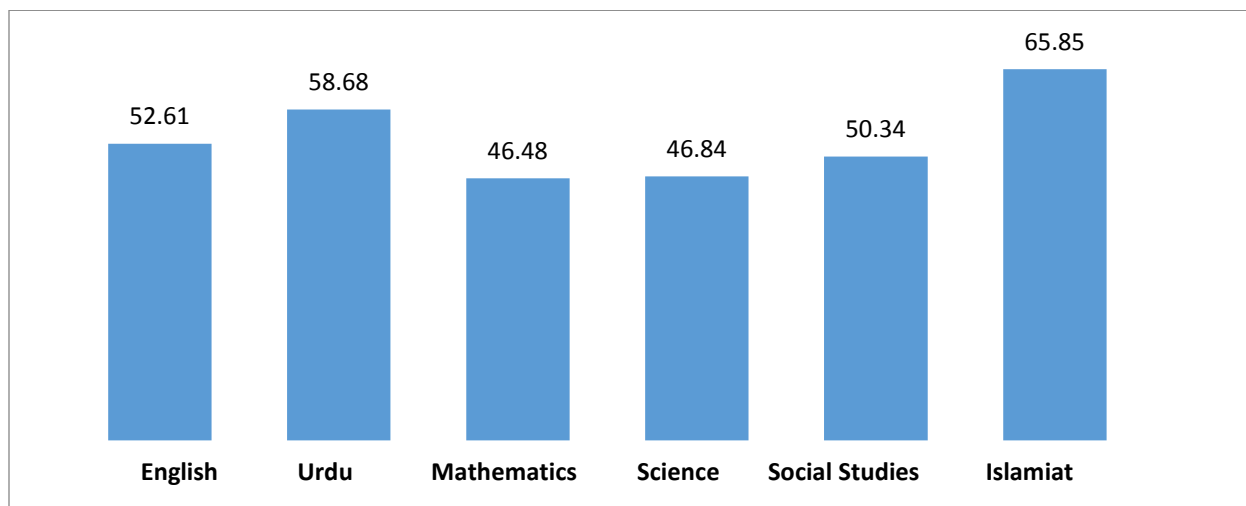


Figure 2: Mean scores across subjects

The same pattern prevails at district level where mean score of students in all districts is highest in Islamiyat followed by Urdu (Table 21). The only exceptions are D. G. Khan and Lodhran where students' mean score in English is higher than Urdu. On the other hand, mean score of Science and Mathematics is lower than Islamiyat, Urdu and English

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

in every district of Punjab. Similarly, subject mean score is highest in Islamiyat in 98.5% tehsils and second highest in Urdu in 90.2% tehsils across all districts (Table 22). On the other hand, in 83.3% tehsils student performance in Science is ranked either at 5 or 6 out of the six subjects examined. Similarly, in 78.8% 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 other subjects. 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 Islamiyat the performance of English medium school is marginally better while Urdu medium schools performed better in Science and Social Studies. 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 ($r = 0.19$) while for all other subjects it is very small ($r \leq 0.04$). There is 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.

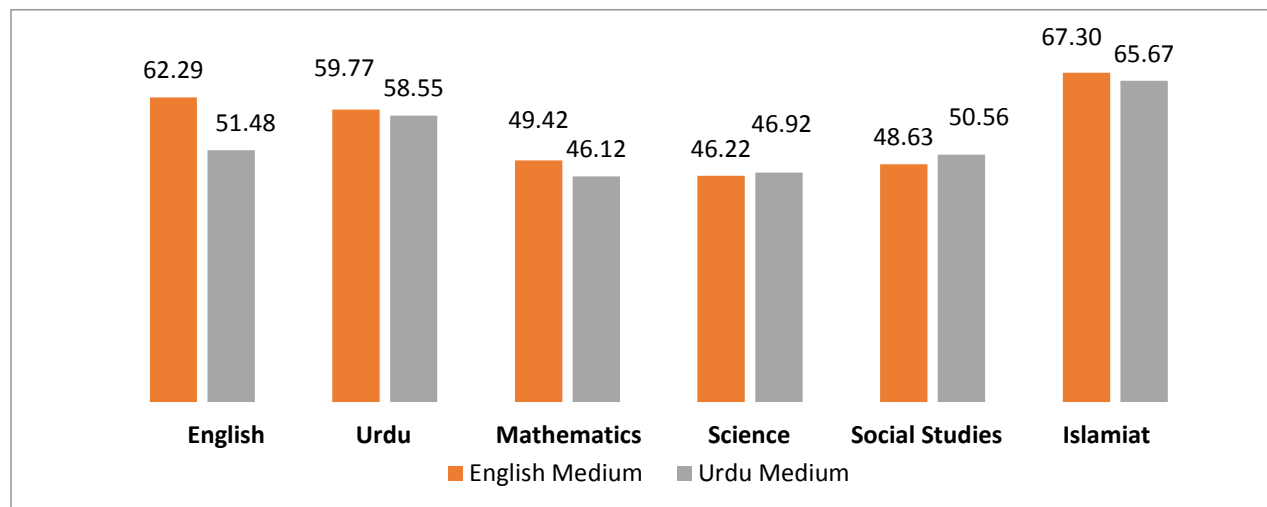


Figure 3: Mean scores across subjects by language of exam

Also, the mean score of English medium schools was higher in English in all 36 districts while it was higher for Mathematics and Islamiyat in 34 districts and for Urdu in 33 districts. Overall, it can be concluded that the English medium schools outperformed, in most subjects, 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 Islamiyat ($P\text{-value} < .001$) while males performed better in Mathematics ($P\text{-value} < .001$). However, the differences in mean scores across gender in the subjects of Science and Social Studies are only marginal and statistically insignificant ($P\text{-value} = 0.647$ and 0.820 respectively). It is pertinent to note that the effect size of gender is small ($r \leq 0.10$) even for the subjects where gender differences are statistically significant.

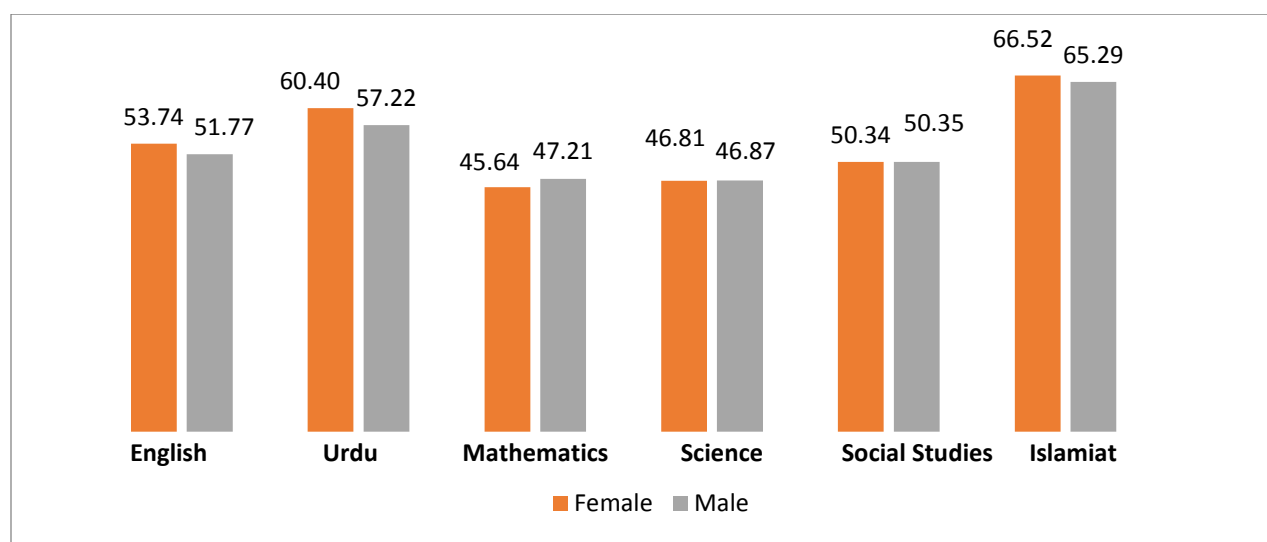


Figure 4: Mean scores across subjects by gender

The number of districts where mean score of females is better in English, Urdu and Islamiyat is 30, 35 and 31 respectively while males performed better in Mathematics in 25 districts out of 36 districts in Punjab. The same pattern is observed in tehsil level analysis where females performed better than males in English, Urdu and Islamiyat in 79%, 94% and 78% of the tehsils while males performed better in Mathematics in 68%

tehsils of Punjab (Table 22). 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. The effect size of school type is very small for all subjects with the highest effect for English ($r=0.124$).

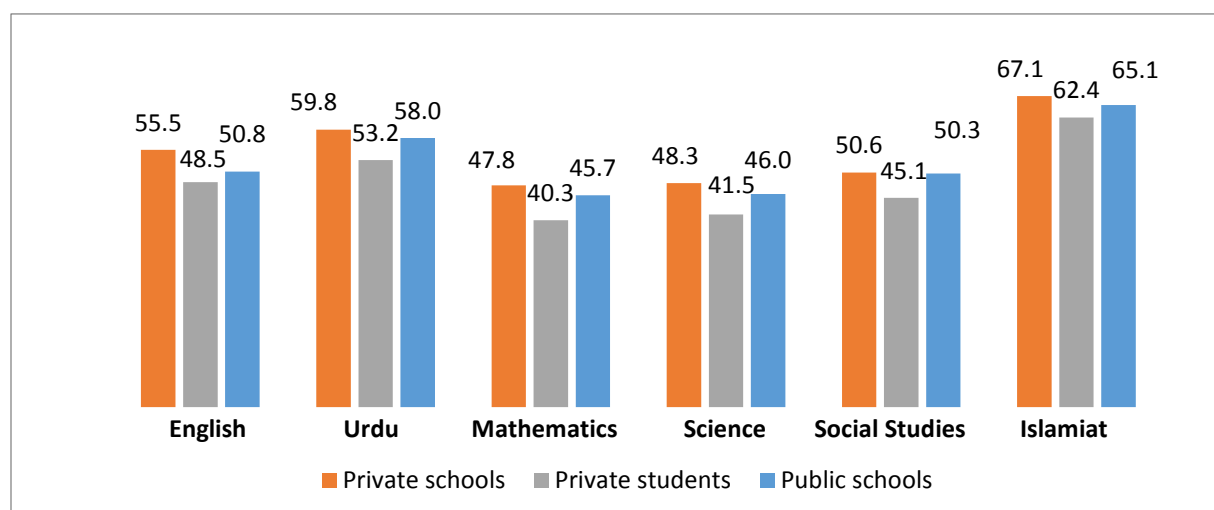


Figure 5: Mean scores across subjects by school type

Overall, the mean score of private school students compared to public school students is higher in 31 districts. Similarly, private school students have outperformed in 80% of the tehsils in Punjab. The five districts where mean score of public school students is higher include: D.G.Khan, Gujranwala, Lahore, Sheikhpura and Sialkot.

Appendix B contains list of tehsils where mean score of public school students is higher. 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 compares performance of students from schools for only males or females and schools for both males and females (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 English and Urdu ($r = 0.10$) while there is no effect for Social Studies ($r = 0.00$).

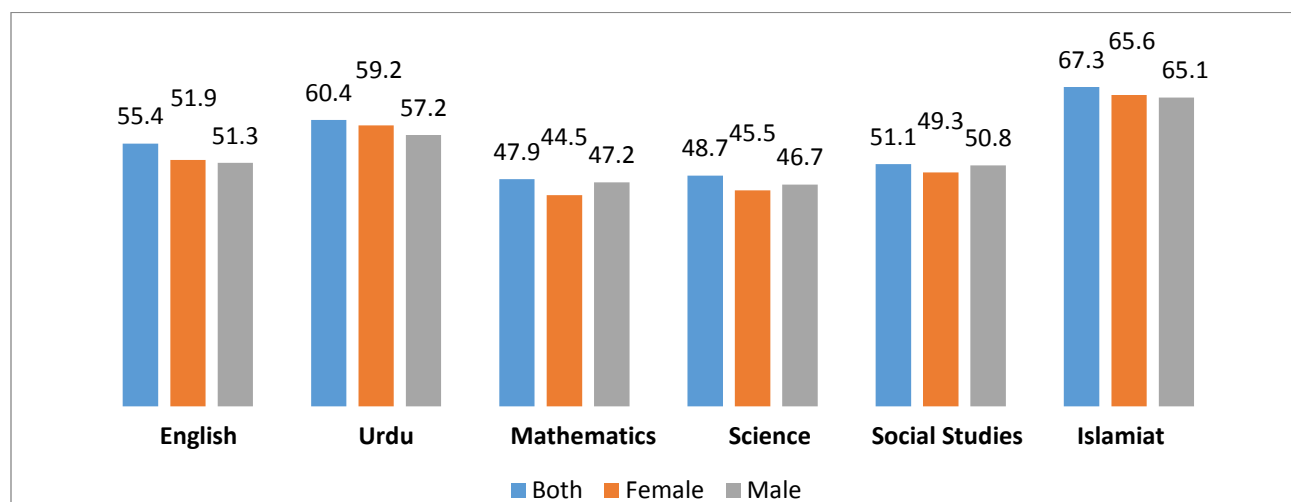


Figure 6: Mean scores across subjects by school gender

The results at district level analysis show that multi-gender schools performed better than male-only schools in 27 districts while they performed better than female-only schools in 30 districts on overall score. Overall, the mean score of students from multi-gender schools was higher compared to female-only schools in 80% of the tehsils. Similarly, the overall mean score of students from multi-gender schools was higher compared to male-only schools in 73% 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 ($P\text{-value} < 0.001$) except for Mathematics where the difference in performance is statistically insignificant. However, the effect size of area is very small for most subjects ($r \leq 0.03$).

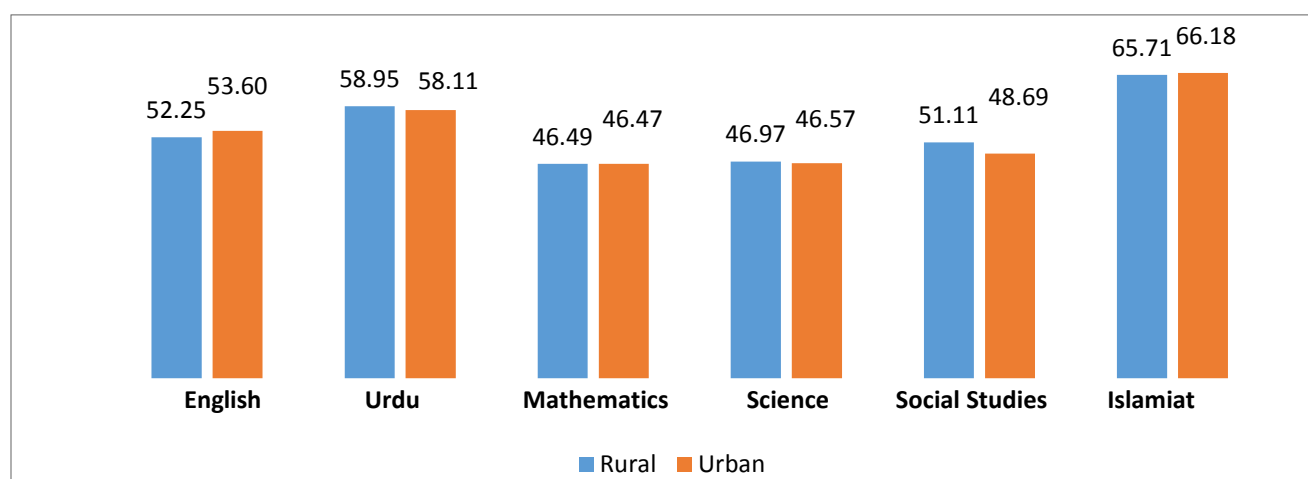


Figure 7: Mean scores across subjects by area

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 (30.79%) and smallest in Mathematics (13.61%). 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.

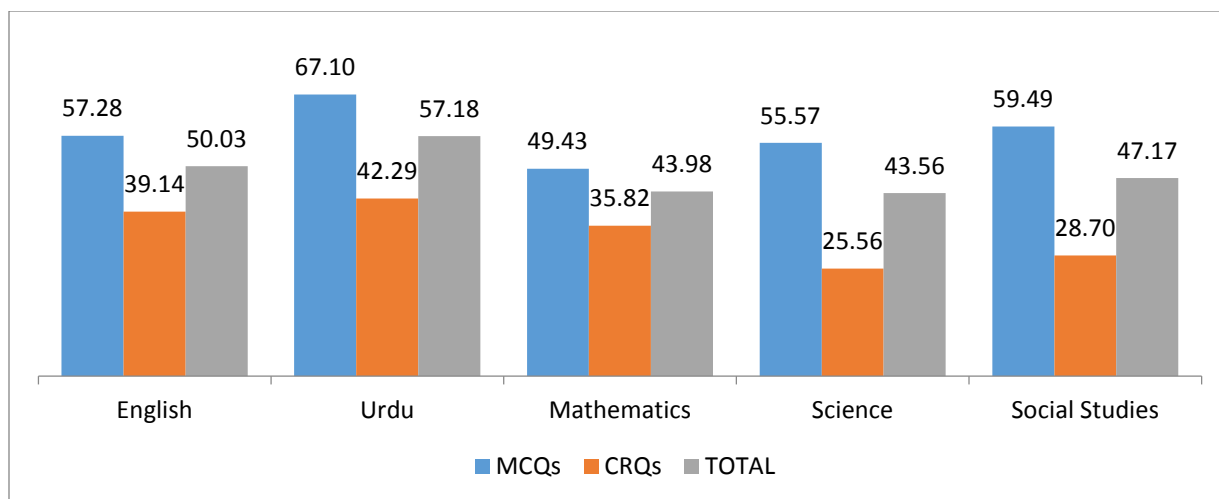


Figure 8: Mean % score by question type

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.

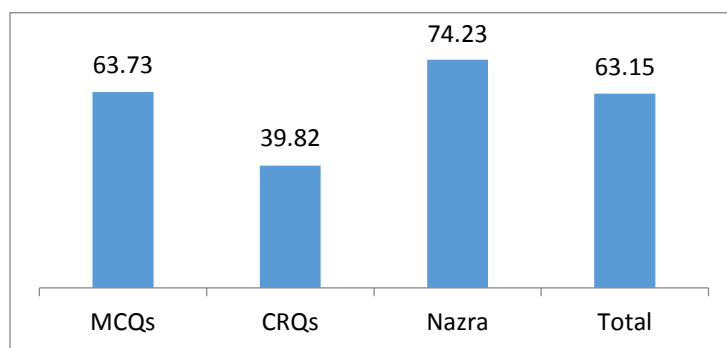


Figure 9: Mean % score by question type for Islamiyat

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.

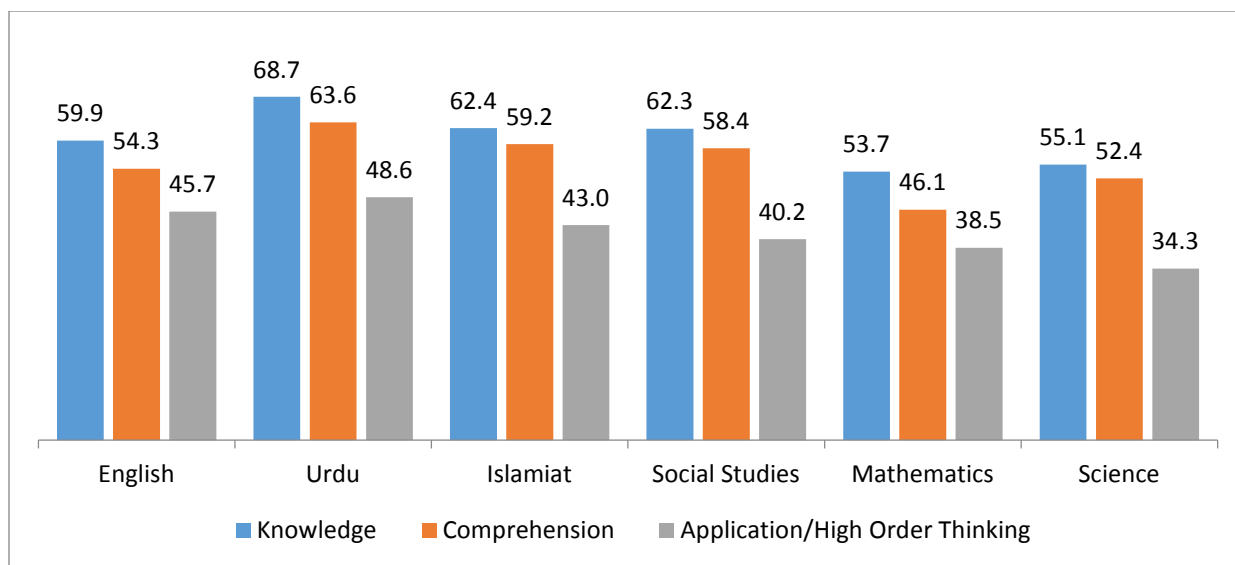


Figure 10: Performance by cognitive domain

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 further augmented in urban areas compared to rural areas. Figure 11 shows that in rural areas, male students performed better in Mathematics, Social studies and Science while female students performed better in English, Urdu and Islamiyat.

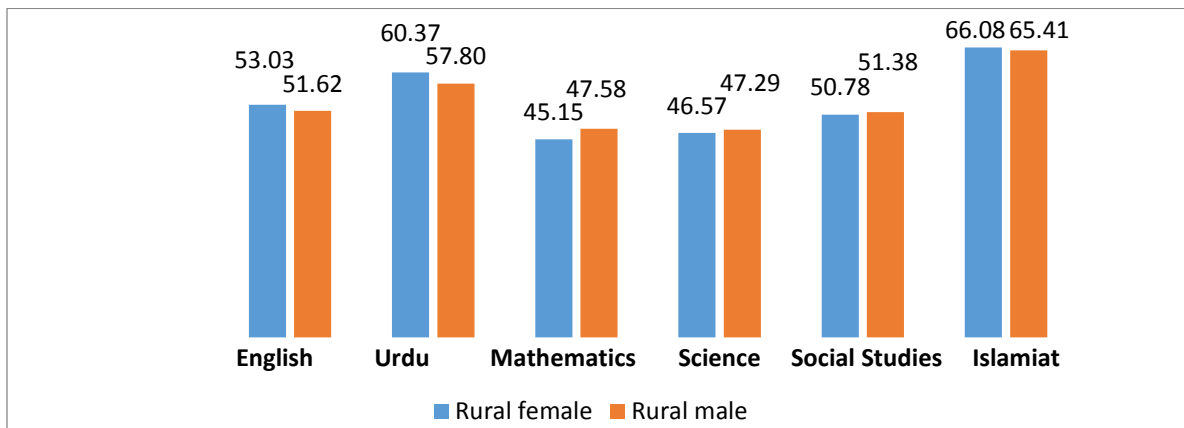


Figure 11: Interaction effect of gender and rural area

Figure 12 shows that female students performed better than male students in all subjects in urban areas. The difference in mean scores is significant for English, Urdu and Islamiyat. Notably, the performance of females in Mathematics is at par with males in urban areas. A comparison of urban and rural female students revealed that urban female students performed better than rural female students.

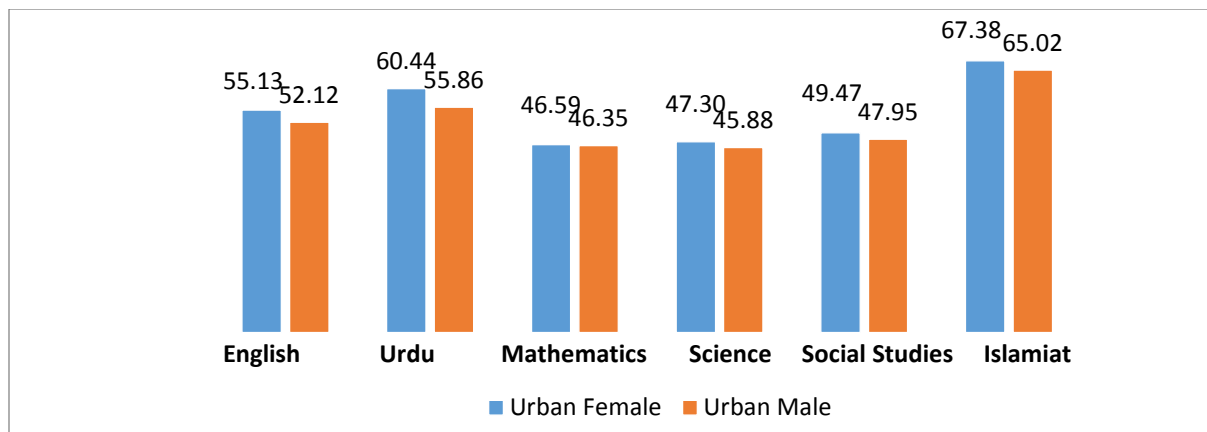


Figure 12: Interaction effect of gender and urban area

Interaction Effect of Gender and Language of Exam

Figure 13 shows that female students of English medium schools performed better in all subjects. Contrary to the general trend in Mathematics and Science, female students of English medium schools performed better even in these two subjects.

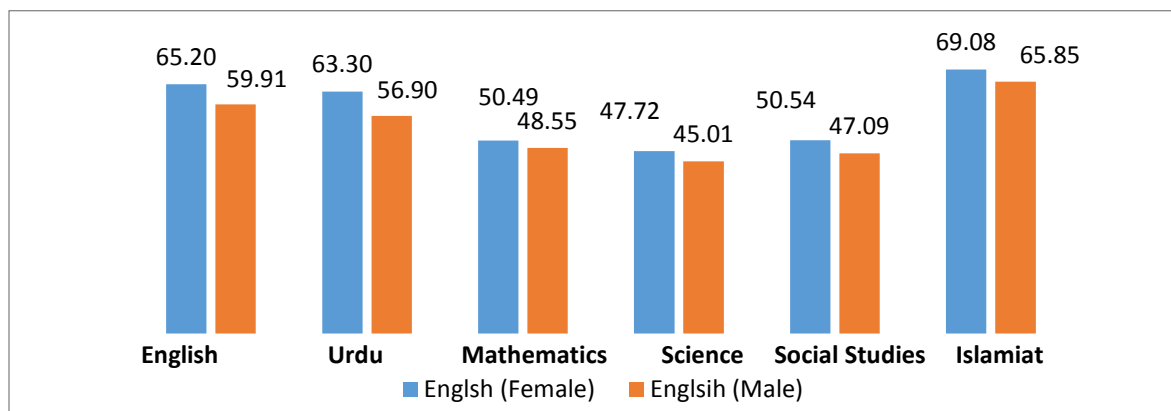


Figure 13: Interaction effect of gender and English

Figure 14 shows comparison of male and female students' performance where language of examinations is Urdu. In case of Urdu medium students, female students scored higher in the subjects of English, Urdu and Islamiat while male students scored higher in Mathematics, Science and Social Studies. Overall, the difference between performance of English and Urdu medium students is significant for Science (p -value=0.054) and highly significant for all other subjects (p -value < 0.001).

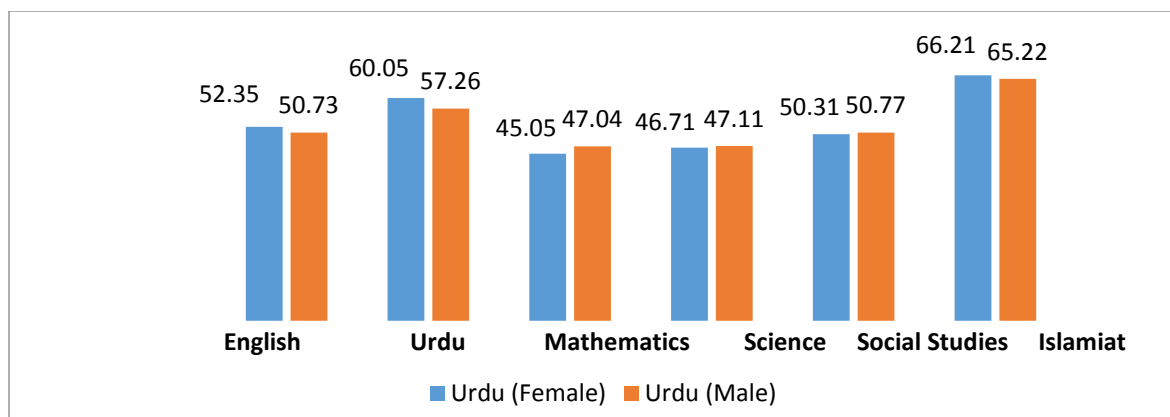


Figure 14: Interaction effect of gender and Urdu

Interaction Effect of Gender and School Gender

Comparison of male and female student performance in multi-gender schools confirm the overall trend in student performance. Female students were better in language, social studies and Islamiat whereas male students were better in Mathematics (Figure 15).

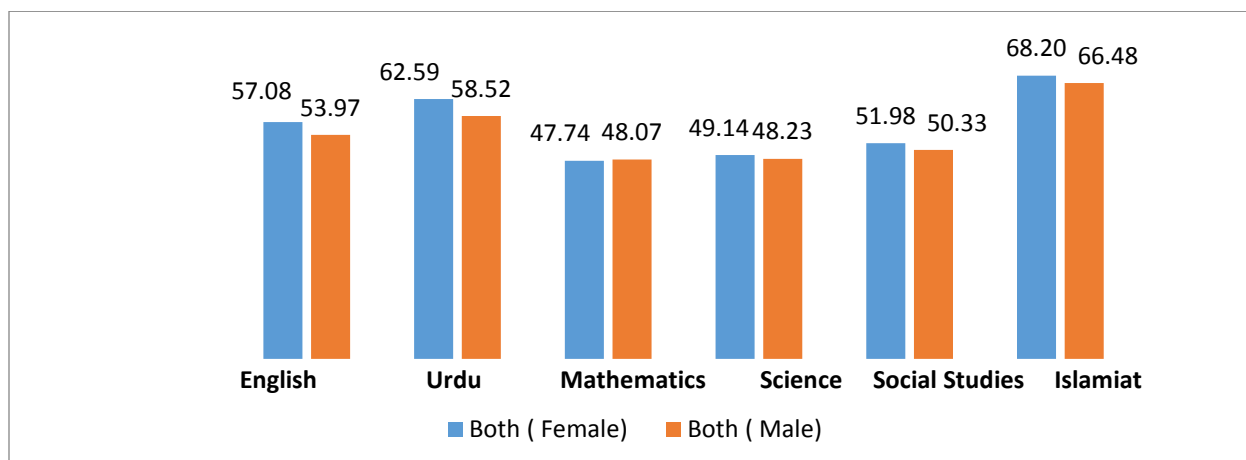


Figure 15: Interaction effect of gender and multi-gender schools

Figure 16 shows the same general trend that female students performed better in language and Islamiat while male students performed better in Mathematics and Science. The mean score of female-only schools (52.82) is not significantly different than the mean score of male-only schools (52.88).

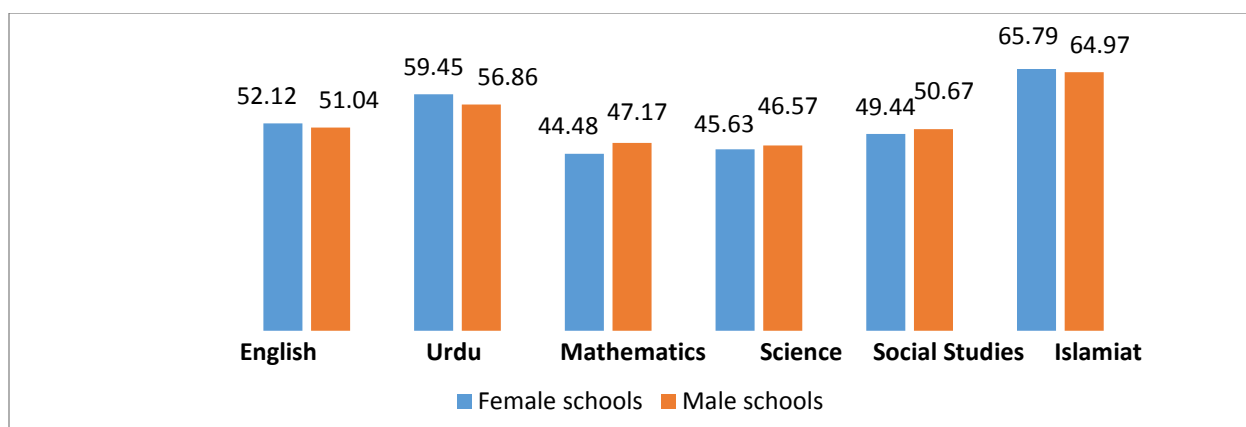


Figure 16: Comparison of single gender schools' performance

Interaction Effect of Gender and School Type

Table 3 shows that female students of private schools performed significantly 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	57.37	62.16	47.82	48.9	51.61	68.15
PRIVATE SCHOOL	MALE	53.82	57.79	47.81	47.69	49.67	66.11
PRIVATE STUDENT	FEMALE	51.33	55.95	41.14	42.3	46.52	64.05
PRIVATE STUDENT	MALE	46.27	51.09	39.64	40.87	43.94	61.07
PUBLIC SCHOOL	FEMALE	51.13	59.2	44.14	45.39	49.5	65.37
PUBLIC SCHOOL	MALE	50.43	56.97	46.98	46.43	51.01	64.81

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 in urban areas have low mean scores in English. The difference in English and Urdu medium students' performance is not significant for the subjects of Social studies and Science (P = 0.64) in urban areas.

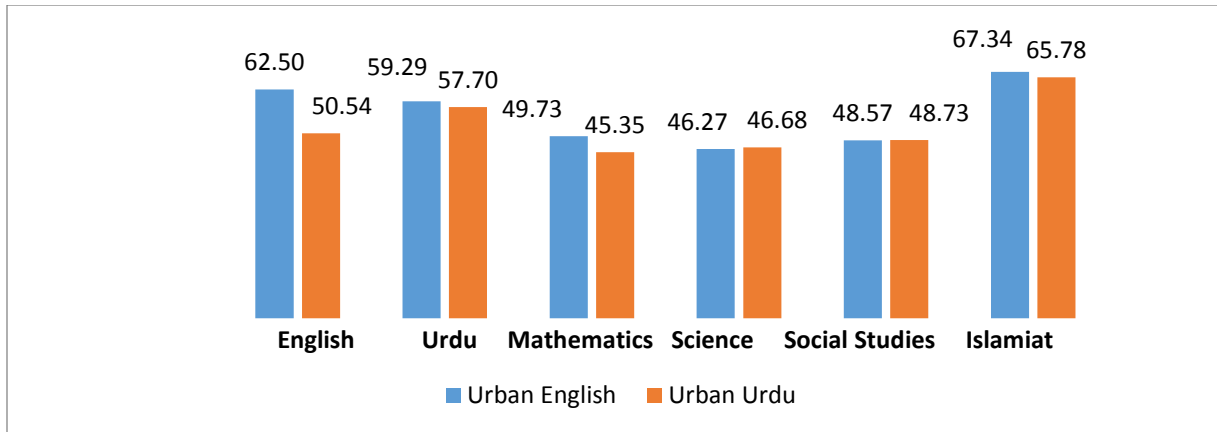


Figure 17: Interaction effect of urban area and language of exam

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. The difference in performance of Urdu and English medium students in Science is not significant ($P = 0.88$).

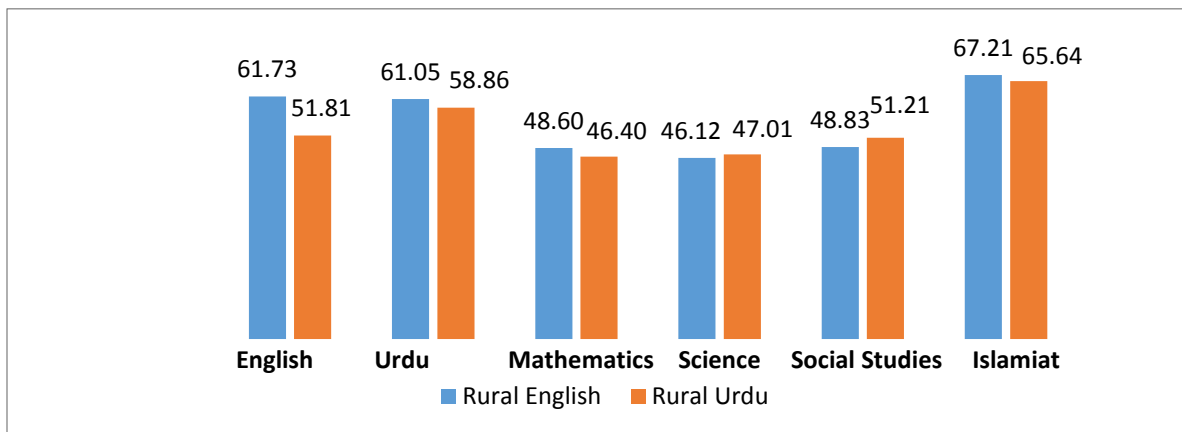


Figure 18: Interaction effect of rural area and language of exam

Interaction Effect of Area and School Gender

Overall, the schools with both male and female students performed better than male-only and female-only schools. Schools with both genders in rural areas performed better than urban schools with both genders in Urdu, Math, Science and Social Studies. Urban schools with both genders were only marginally better than rural schools with both genders in English and Islamiat.

SCHOOL GENDER	AREA	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T	OVERAL L
BOTH	RURAL	55.10	60.88	48.16	49.13	52.11	67.07	55.41
BOTH	URBAN	55.82	59.74	47.59	48.02	49.74	67.55	54.74
FEMALE	RURAL	51.51	59.34	43.95	45.30	49.77	65.31	52.53
FEMALE	URBAN	52.90	58.84	45.75	46.02	48.33	66.34	53.03
MALE	RURAL	51.27	57.66	47.56	47.07	51.63	65.30	53.41
MALE	URBAN	51.58	55.56	46.17	45.61	48.03	64.40	51.89

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 scores and that trend is shown in Table 5 also. Private schools in rural areas performed exceptionally well in all subjects except English. The difference in performance of rural private schools and urban private schools in the subject of English is statistically insignificant. The mean scores of private students are significantly less than school-going students in all subjects.

AREA	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIA T	OVERALL
RURAL	PRIVATE SCHOOL	55.00	60.67	48.08	48.95	51.87	67.17	55.29
RURAL	PRIVATE STUDENT	48.37	54.82	41.06	42.75	46.92	62.83	49.46
RURAL	PUBLIC SCHOOL	50.99	58.20	45.82	46.09	50.81	65.05	52.83
URBAN	PRIVATE SCHOOL	55.99	58.87	47.53	47.48	49.12	66.94	54.32
URBAN	PRIVATE STUDENT	48.57	51.35	39.39	40.03	42.92	61.83	47.35
URBAN	PUBLIC SCHOOL	49.76	57.18	45.05	45.39	48.29	65.12	51.80

Table 5: Interaction effect of area and student type

Interaction Effect of School Type and Language of Exam

Students of private schools in English medium performed better in English, Urdu, Mathematics, and Islamiyat while private school students in Urdu medium performed better in Sciences and Social Studies. According to ANOVA results the differences in performance between different student types are statistically significant ($p\text{-value} < 0.05$).

MEDIUM	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIAT	OVERALL
ENGLISH	PRIVATE SCHOOL	62.76	60.15	49.84	46.73	48.93	67.62	56.00
ENGLISH	PRIVATE STUDENT	56.97	52.94	42.94	39.41	42.60	62.46	49.56
ENGLISH	PUBLIC SCHOOL	54.42	54.87	43.41	38.55	45.00	62.72	49.83
URDU	PRIVATE SCHOOL	53.03	59.71	47.14	48.76	51.11	66.87	54.44
URDU	PRIVATE STUDENT	46.79	53.27	39.77	41.91	45.55	62.35	48.27
URDU	PUBLIC SCHOOL	50.72	58.02	45.70	46.01	50.36	65.09	52.65

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

Interaction Effect of School Type and School Gender

Overall, male-only and female-only public school students have lowest mean scores. Female students from private schools have highest mean scores in this analysis. The differences in performance between different student types are statistically significant (p-value = 0.003).

SCHOOL GENDER	SCHOOL TYPE	ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIAT
BOTH	PRIVATE SCHOOL	55.41	60.40	47.91	48.65	51.09	67.28
BOTH	PUBLIC SCHOOL	57.35	57.48	48.88	50.78	56.33	66.39
FEMALE	PRIVATE SCHOOL	57.21	60.31	47.80	47.45	50.21	67.53
FEMALE	PUBLIC SCHOOL	50.78	58.95	43.78	45.10	49.14	65.20
MALE	PRIVATE SCHOOL	54.29	56.86	47.43	47.18	48.58	65.71
MALE	PUBLIC SCHOOL	50.73	57.24	47.20	46.64	51.26	64.96

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 across all 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	1	1	1	1	1	1
D.G. KHAN	2	2	4	2	5	2	2
LODHRAN	3	3	8	3	2	4	3
JHANG	4	5	7	5	3	7	16
RAJANPUR	5	4	9	7	4	9	4
BHAKKAR	6	12	2	9	6	3	11
MULTAN	7	7	11	6	9	14	12
BAHAWALNAGAR	8	9	19	4	7	15	9
SARGODHA	9	8	12	19	8	6	13
CHINIOT	10	13	5	12	13	5	14
BAHAWALPUR	11	6	6	25	10	12	17
SAHIWAL	12	19	10	15	14	16	15
NAROWAL	13	17	13	16	15	11	21
LAYYAH	14	15	21	26	11	10	10
KHANEWAL	15	36	3	17	21	8	5
SHEIKHUPURA	16	11	20	10	17	18	20
GUJRANWALA	17	10	16	28	12	13	18
T.T.SINGH	18	14	25	8	20	19	6
VEHARI	19	20	24	11	16	21	7
RAHIMYAR KHAN	20	16	23	14	25	20	8
MIANWALI	21	26	14	24	19	17	24

DISTRICT	Overall	English	Urdu	Math	Science	Social Studies	Islamiat
KHUSHAB	22	21	31	13	22	23	19
FAISALABAD	23	28	17	22	24	24	22
SIALKOT	24	24	18	29	27	22	23
LAHORE	25	18	30	23	33	30	28
GUJRAT	26	31	15	34	34	26	26
PAKPATTAN	27	33	27	27	18	31	27
OKARA	28	30	35	18	31	32	25
NANKANA SAHIB	29	25	28	36	28	25	30
ATTOCK	30	22	26	35	23	27	34
KASUR	31	35	22	30	35	29	31
CHAKWAL	32	27	34	21	32	33	32
JEHLUM	33	32	29	31	29	28	35
HAFIZABAD	34	29	33	32	26	35	29
MANDI BAHA UD DIN	35	34	36	20	36	34	33
RAWALPINDI	36	23	32	33	30	36	36

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 tehsils 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
DINA	MANDI BAHUDDIN	SAMUNDARI	MULTAN	SAHIWAL
SARAI ALAM GIR	ATTOCK	KHUSHAB	BHAKKAR	DARYA KHAN
TAXILA	KAHUTA	PIND DADAN KHAN	SHAHPUR	D.G.KHAN
CHOA SAIDAN SHAH	ARIFWALA	PINDI GHEB	YAZMAN	KHAIRPUR TAMEWALI
HASSANABDAL	RENALA KHURD	ISA KHEL	BHOWANA	AHMAD PUR SIAL
PINDI BHATTIAN	SIALKOT	KOT RADHA KISHAN	SHAKARGARH	MINCHINABAD
HAZRO	TALAGANG	DASKA	KABIRWALA	LODHRAN
MALIKWAL	KASUR	SOHAWA	SHORKOT	JALALPUR PIRWALA
JHELMUM	PHALIA	MIANWALI	LIAQATPUR	MANKERA
KOTLI SATTIAN	CHAKWAL	VEHARI	CHINIOT	KAROR PACCA
RAWALPINDI	MULTAN SADAR	SHAHKOT	CHISHTIAN	KOT ADU
MURREE	JAND	TOBA TEK SINGH	KALLUR KOT	TAUNSA
CHUNIAN	PATTOKI	LALIAN	JAMPUR	JATOI
SANGLA HILL	SADIQABAD	FAISALABAD SADDAR	ROJHAN	MUZAFFARGARH
GUJAR KHAN	HAFIZABAD	SAMBRIAL	JHANG	ALIPUR
DEPALPUR	SAFDARABAD	TANDLIAN WALA	BAHAWALNAGAR	
NANKANA SAHIB	JAHANIAN	FATEH JANG	RAJANPUR	
KALLAR SYEDAN	LAHORE CITY	HAROONABAD	HASILPUR	
	KALLAR KAHAR	PASRUR	SHUJA ABAD	
	LAHORE CANTT	KHANPUR		
	QUAIDABAD	KHANEWAL		
	GUJRAT	PIPLAN		
	CHAK JHUMARA	BAHAWALPUR		

	JARANWALA	RAHIMYAR KHAN		
	OKARA	NOSHERA VIRKAN		
	FEROZWALA	SAHIWAL		
	PAKPATTAN	KAROR LALISAN		
	FAISALABAD CITY	BUREWALA		
	NAROWAL	KAMOKE		
	KHARIAN	WAZIRABAD		
	CHAUBARA	MIAN CHANNU		
		GUJRANWALA		
		KAMALIA		
		MAILSI		
		SHEIKHUPURA		
		SHARAQPUR		
		CHICHAWATNI		
		LAYYAH		
		ZAFARWAL		
		DUNYAPUR		
		FORT ABBAS		
		SARGODHA		
		MURIDKE		
		NOORPUR THAL		
		GOJRA		
		AHMADPUR EAST		
		SILLANWALI		
		BHALWAL		

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 2012 examination represents about 90,000 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	50	2.48%	449	22.25%	1381	68.43%	126	6.24%	12	0.59%	2018
BAHAWALNAGAR	17	0.58%	231	7.83%	1936	65.63%	687	23.29%	79	2.68%	2950
BAHAWALPUR	37	1.35%	368	13.39%	1947	70.85%	373	13.57%	23	0.84%	2748
BHAKKAR	9	0.45%	108	5.43%	1317	66.25%	510	25.65%	44	2.21%	1988
CHAKWAL	86	4.60%	477	25.52%	1223	65.44%	80	4.28%	3	0.16%	1869
CHINIOT	12	1.13%	113	10.63%	712	66.98%	207	19.47%	19	1.79%	1063
D.G. KHAN	3	0.14%	81	3.80%	858	40.30%	836	39.27%	351	16.49%	2129
FAISALABAD	28	0.51%	917	16.58%	4097	74.06%	461	8.33%	29	0.52%	5532
GUJRANWALA	40	1.19%	426	12.69%	2298	68.45%	552	16.44%	41	1.22%	3357
GUJRAT	31	1.18%	545	20.68%	1903	72.22%	144	5.46%	12	0.46%	2635
HAFIZABAD	33	2.59%	470	36.83%	708	55.49%	61	4.78%	4	0.31%	1276
JEHLUM	73	4.74%	380	24.68%	962	62.47%	114	7.40%	11	0.71%	1540
JHANG	17	0.63%	220	8.21%	1643	61.31%	693	25.86%	107	3.99%	2680
KASUR	111	4.13%	702	26.14%	1699	63.25%	161	5.99%	13	0.48%	2686
KHANEWAL	7	0.33%	125	5.96%	1641	78.22%	299	14.25%	26	1.24%	2098
KHUSHAB	12	0.89%	247	18.23%	960	70.85%	131	9.67%	5	0.37%	1355
LAHORE	61	1.23%	974	19.57%	3544	71.21%	376	7.55%	22	0.44%	4977
LAYYAH	38	1.54%	382	15.53%	1651	67.11%	350	14.23%	39	1.59%	2460
LODHRAN	7	0.54%	95	7.30%	755	58.03%	363	27.90%	81	6.23%	1301
MANDI BAHADIN	21	1.28%	463	28.28%	1069	65.30%	79	4.83%	5	0.31%	1637
MIANWALI	9	0.51%	232	13.26%	1308	74.74%	190	10.86%	11	0.63%	1750
MULTAN	37	1.02%	370	10.19%	2332	64.24%	750	20.66%	141	3.88%	3630
MUZAFFARGARH	2	0.07%	38	1.36%	750	26.85%	1235	44.22%	768	27.50%	2793
NANKANA SAHIB	32	2.00%	403	25.22%	1041	65.14%	75	4.69%	47	2.94%	1598
NAROWAL	27	1.22%	296	13.39%	1508	68.20%	374	16.92%	6	0.27%	2211
OKARA	51	2.07%	645	26.20%	1640	66.61%	119	4.83%	7	0.28%	2462
PAKPATTAN	33	2.04%	443	27.35%	1007	62.16%	92	5.68%	45	2.78%	1620
RAHIMYAR KHAN	35	0.99%	505	14.35%	2383	67.74%	568	16.15%	27	0.77%	3518
RAJANPUR	8	0.60%	80	6.01%	907	68.09%	335	25.15%	2	0.15%	1332
RAWALPINDI	107	3.33%	954	29.70%	1980	61.64%	126	3.92%	45	1.40%	3212
SAHIWAL	18	0.69%	265	10.16%	1830	70.14%	426	16.33%	70	2.68%	2609
SARGODHA	16	0.47%	285	8.29%	2371	68.94%	745	21.66%	22	0.64%	3439
SHEIKHUPURA	19	0.89%	251	11.78%	1428	67.04%	419	19.67%	13	0.61%	2130
SIALKOT	64	1.53%	652	15.55%	3104	74.05%	331	7.90%	41	0.98%	4192
T.T.SINGH	17	0.76%	246	11.00%	1616	72.24%	317	14.17%	41	1.83%	2237
VEHARI	13	0.46%	354	12.44%	1858	65.31%	310	10.90%	310	10.90%	2845

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 58% of the schools in this category are public schools while 42% are private schools. At district level, the number of public schools in poor performing category is more than private schools in 23 out of total 36 districts.

DISTRICT	No. of Schools in Poor Category	Public Schools	%	Private Schools	%
ATTOCK	50	39	78.00	11	22.00
BAHAWALNAGAR	17	9	52.94	8	47.06
BAHAWALPUR	37	30	81.08	7	18.92
BHAKKAR	9	4	44.44	5	55.56
CHAKWAL	86	62	72.09	24	27.91
CHINIOT	12	9	75.00	3	25.00
D.G. KHAN	3	3	100.00	0	0.00
FAISALABAD	28	9	32.14	19	67.86
GUJRANWALA	40	8	20.00	32	80.00
GUJRAT	31	27	87.10	4	12.90
HAFIZABAD	33	22	66.67	11	33.33
JEHLUM	73	55	75.34	18	24.66
JHANG	17	12	70.59	5	29.41
KASUR	111	88	79.28	23	20.72
KHANEWAL	7	4	57.14	3	42.86
KHUSHAB	12	8	66.67	4	33.33
LAHORE	61	5	8.20	56	91.80
LAYYAH	38	7	18.42	31	81.58
LODHRAN	7	2	28.57	5	71.43
MANDI BAHU UD DIN	21	16	76.19	5	23.81
MIANWALI	9	8	88.89	1	11.11
MULTAN	37	11	29.73	26	70.27
MUZAFFARGARH	2	2	100.00	0	0.00
NANKANA SAHIB	32	21	65.63	11	34.38
NAROWAL	27	7	25.93	20	74.07
OKARA	51	19	37.25	32	62.75
PAKPATTAN	33	18	54.55	15	45.45
RAHIMYAR KHAN	35	19	54.29	16	45.71
RAJANPUR	8	7	87.50	1	12.50
RAWALAPINDI	107	80	74.77	27	25.23
SAHIWAL	18	9	50.00	9	50.00
SARGODHA	16	7	43.75	9	56.25
SHEIKHUPURA	19	13	68.42	6	31.58

DISTRICT	No. of Schools in Poor Category	Public Schools	%	Private Schools	%
SIALKOT	64	41	64.06	23	35.94
T.T.SINGH	17	3	17.65	14	82.35
VEHARI	13	0	0.00	13	100.00
	1181	684	57.92	497	42.08

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	17	1.76%	102	4.00%	10	1.68%	11	1.44%	23	2.71%	172	6.99%
BAHAWALNAGAR	21	2.18%	72	2.82%	7	1.18%	12	1.57%	11	1.30%	41	1.67%
BAHAWALPUR	27	2.80%	53	2.08%	44	7.39%	33	4.31%	69	8.13%	116	4.72%
BHAKKAR	19	1.97%	13	0.51%	14	2.35%	12	1.57%	0	0.00%	19	0.77%
CHAKWAL	38	3.94%	160	6.27%	16	2.69%	28	3.66%	52	6.12%	110	4.47%
CHINIOT	16	1.66%	21	0.82%	13	2.18%	15	1.96%	3	0.35%	24	0.98%
D.G. KHAN	10	1.04%	45	1.76%	1	0.17%	4	0.52%	18	2.12%	7	0.28%
FAISALABAD	30	3.11%	43	1.69%	11	1.85%	12	1.57%	12	1.41%	82	3.33%
GUJRANWALA	27	2.80%	78	3.06%	28	4.71%	29	3.79%	26	3.06%	109	4.43%
GUJRAT	34	3.53%	34	1.33%	14	2.35%	21	2.74%	14	1.65%	64	2.60%
HAFIZABAD	20	2.07%	94	3.68%	19	3.19%	16	2.09%	41	4.83%	33	1.34%
JEHLUM	41	4.25%	110	4.31%	26	4.37%	43	5.61%	24	2.83%	163	6.63%
JHANG	22	2.28%	55	2.16%	20	3.36%	12	1.57%	16	1.88%	43	1.75%
KASUR	112	11.62%	116	4.55%	25	4.20%	63	8.22%	52	6.12%	190	7.73%
KHANEWAL	20	2.07%	11	0.43%	10	1.68%	30	3.92%	4	0.47%	6	0.24%
KHUSHAB	16	1.66%	74	2.90%	10	1.68%	7	0.91%	8	0.94%	36	1.46%
LAHORE	18	1.87%	154	6.04%	25	4.20%	35	4.57%	41	4.83%	112	4.55%
LAYYAH	23	2.39%	110	4.31%	36	6.05%	21	2.74%	26	3.06%	26	1.06%
LODHRAN	11	1.14%	21	0.82%	9	1.51%	10	1.31%	11	1.30%	10	0.41%
MANDI BAHAUDDIN	13	1.35%	67	2.63%	4	0.67%	6	0.78%	9	1.06%	48	1.95%
MIANWALI	12	1.24%	27	1.06%	9	1.51%	14	1.83%	4	0.47%	44	1.79%
MULTAN	27	2.80%	71	2.78%	26	4.37%	41	5.35%	48	5.65%	69	2.81%
MUZAFFARGARH	15	1.56%	7	0.27%	7	1.18%	8	1.04%	0	0.00%	22	0.89%
NANKANA SAHIB	17	1.76%	66	2.59%	47	7.90%	12	1.57%	9	1.06%	81	3.29%
NAROWAL	31	3.22%	88	3.45%	14	2.35%	21	2.74%	20	2.36%	75	3.05%
OKARA	40	4.15%	112	4.39%	16	2.69%	21	2.74%	19	2.24%	44	1.79%
PAKPATTAN	33	3.42%	82	3.21%	9	1.51%	11	1.44%	38	4.48%	47	1.91%
RAHIMYAR KHAN	45	4.67%	131	5.14%	23	3.87%	49	6.40%	53	6.24%	17	0.69%
RAJANPUR	5	0.52%	14	0.55%	4	0.67%	13	1.70%	14	1.65%	11	0.45%

DISTRICT	ENG	%	URDU	%	MATH	%	SCI	%	SOC	%	ISL	%
RAWALAPINDI	36	3.73%	171	6.70%	30	5.04%	44	5.74%	81	9.54%	347	14.11%
SAHIWAL	18	1.87%	36	1.41%	10	1.68%	12	1.57%	9	1.06%	40	1.63%
SARGODHA	17	1.76%	50	1.96%	16	2.69%	9	1.17%	11	1.30%	44	1.79%
SHEIKHUPURA	6	0.62%	44	1.72%	6	1.01%	17	2.22%	9	1.06%	58	2.36%
SIALKOT	95	9.85%	79	3.10%	28	4.71%	55	7.18%	50	5.89%	126	5.12%
T.T.SINGH	10	1.04%	66	2.59%	1	0.17%	9	1.17%	7	0.82%	2	0.08%
VEHARI	22	2.28%	74	2.90%	7	1.18%	10	1.31%	17	2.00%	21	0.85%
	964		2,551		595		766		849		2459	

Table 12: District wise breakup of poorly performing schools

Table 12 provides the number of schools in each district that performed poorly in a subject. The list of names of public schools that have performed poorly 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. However, the only notable pattern observed is regarding difference in students' performance where examination center is same as student's school.

In order to investigate this pattern, the overall mean score at district level is computed for students with different school and examination center and for students with same school and examination center. The results show significant increase in overall mean score when computed for students with same school as examination center. The highest increase is observed for the following districts:

DISTRICT	AVERGAE (School = Center)	AVERGAE (Overall)	INCREASE
MUZAFFARGARH	90.35	70.24	20.11
MULTAN	75.07	58.01	17.06
LAHORE	61.86	49.92	11.95

Overall for 88% districts the district average is higher when computed for only those students whose school is same as center. While for only 12% districts this average drops under same circumstances.

⁷ For details, refer to the "Auxiliary Report for Secondary Analysis of Grade 5 Examination in 2012".

SECTION 5: COMPARISON OF EXAM VERSIONS

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

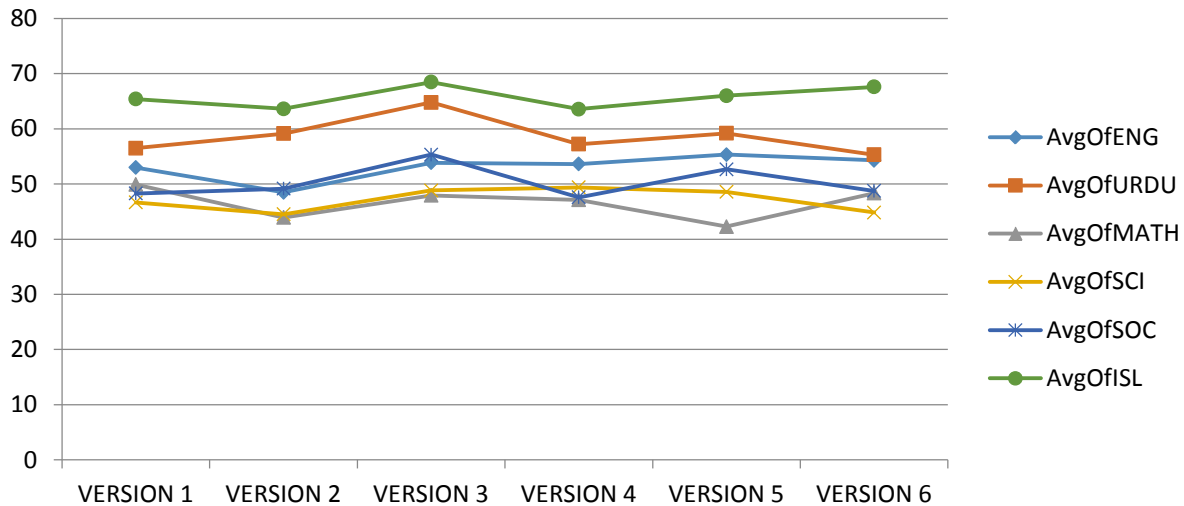


Figure 19: Mean scores of exam versions

The analysis shows that version 3 was the highest scoring version among the six versions used for assessment of Islamiyat, Urdu and Social Studies. The highest mean score for Science, English and Mathematics is in version 4, 5 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 2012 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 7	BAHAWALNAGAR 8	SHEIKHUPURA 16	OKARA 28	CHAKWAL 32	MANDI BAHAUDDIN 35
2	SAHIWAL 12	NAROWAL 13	MIANWALI 21	FAISALABAD 23	KASUR 31	JEHLUM 33
3	MUZAFFARGARH 1	BHAKKAR 6	CHINIOT 10	KHANEWAL 15	SIALKOT 24	GUJRAT 26
4	LODHRAN 3	JHANG 4	RAJANPUR 5	PAKPATTAN 27	HAFIZABAD 34	RAWALPINDI 36
5	SARGODHA 9	BAHAWALPUR 11	LAYYAH 14	GUJRANWALA 17	NANKANA SAHIB 29	ATTOCK 30
6	D G KHAN 2	TOBA TEK SINGH 18	VEHARI 19	RAHIM YAR KHAN 20	KHUSHAB 22	LAHORE 25

* 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 2012 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 2012 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 23%–30%. 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 Mathematics and Sciences. 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. An interesting observation is regarding performance of students for whom the examination center was same as their school. The mean scores for such students were higher when compared to the mean score for the respective district. It is difficult to establish the possible cause behind this phenomenon but a case can be made to undertake further investigation regarding possible use of unfair practices.
7. 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, Mathematics, 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.

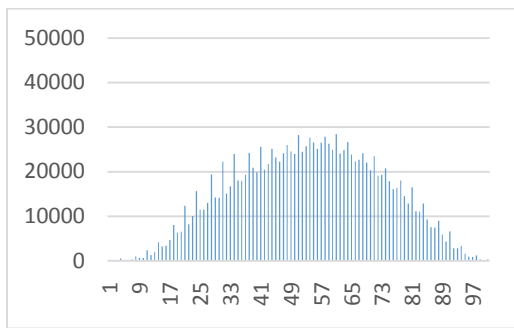


Figure 20: Distribution curve for English

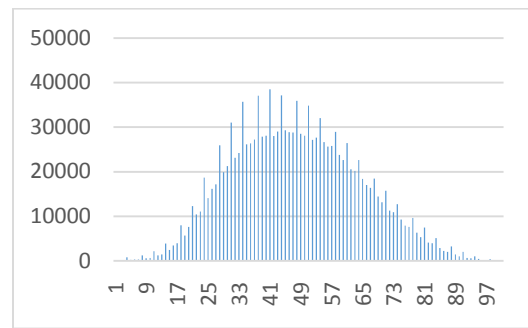


Figure 23: Distribution curve for Science

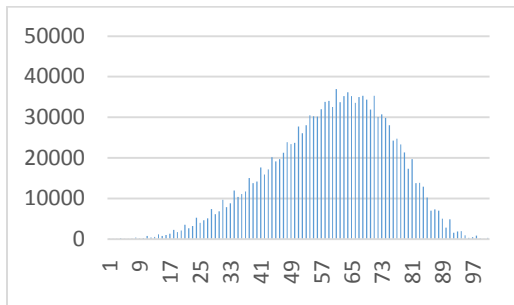


Figure 21: Distribution curve for Urdu

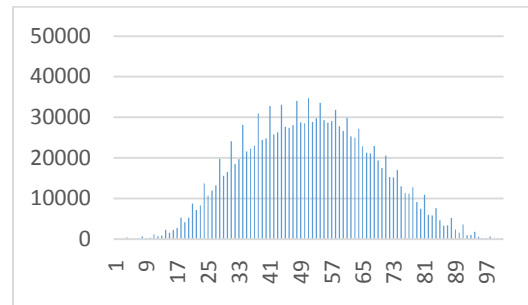


Figure 24: Distribution curve for Social Studies

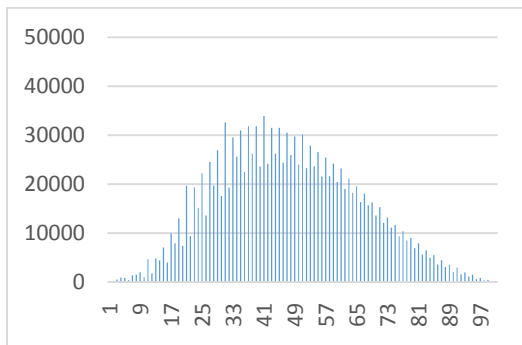


Figure 22: Distribution curve for Maths

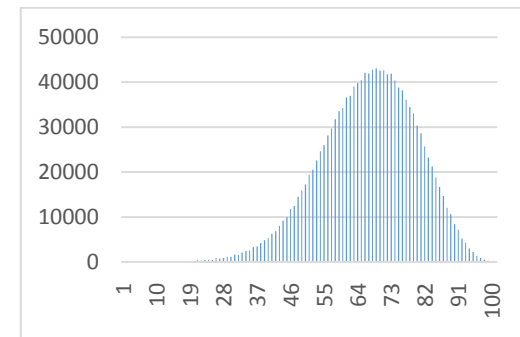


Figure 25: Distribution curve for Islamiat

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	CHAUBARA
3	CHISHTIAN
4	DASKA
5	FEROZWALA
6	GUJRANWALA
7	HAFIZABAD
8	JATOI
9	KALLAR SYEDAN
10	KAMOKE
11	LAHORE CANTT
12	MURIDKE
13	MURREE
14	NOSHERA VIRKAN
15	RAHIMYAR KHAN
16	RAWALPINDI
17	ROJHAN
18	SHAKARGARH
19	SHARAQPUR
20	SHEIKHUPURA
21	SIALKOT
22	SOHAWA
23	TAUNSA
24	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		
Oral Communication	30	78.03
Formal and Lexical Aspects of Language	31-37	58.21
Grammar and Structure	38-59	56.95
MATHEMATICS		
Numbers and Arithmetic Operation	1-5	53.48
Decimals and Percentages	6-24	46.74
Unitary Method	25-28	53.90
Average	29-31	46.22
Perimeter and Area	32-51	43.92
Information Handling	52-57	49.63
SCIENCE		
Environmental Pollution	1	76.49
Forces and Motion	2-3	53.60
Electricity and Magnetism	4-9	47.01
Soils	10-13	47.93
Sun and Planets	14-17	58.28
Organization of Plant Body	18-21	48.11
Our Wonderful Body	22-36	57.86
Environment	37-38	43.41
Continuity of Life	39-44	42.66
Matter and its Properties	45-51	48.41
Motion and Force	52-53	46.06
Energy	54-67	49.66
SOCIAL STUDIES		
Islamic Republic of Pakistan	1-6	63.32
Geographical Features of Pakistan	7-14	54.12
Climate	15-25	57.41

Content	SLO	% of Students Answered Correctly
Resources of Pakistan	26-32	57.58
Population	34-38	54.81
Safety	39-42	60.36
Administration	43-47	46.45
Means of Communication and Transportation	48-50	55.94
Services	51-53	55.87
Problems and their Solutions	54	51.94
URDU		
پڑھنا	1	69.61
لکھنا	2	66.78
زبان کی ساخت اور ذخیرہ الفاظ	3	64.31
گفتگو کرنا	4	50.26
ISLAMIAT		
دنیا آخرت کی سمجھ	1-3	76.05
اطاعت رسول	4	20.02
سنت نبوی کی اہمیت	5-6	68.32
نماز جو	7-9	63.34
عیدین	10-12	69.36
روزہ	13-14	49.90
انصار مدینہ کا اثر	15-16	67.53
غزوہ بدر	17-18	55.11
غزوہ احد	19-21	45.01
غزوہ اتراب	22-24	74.77
آداب ملاقات	25-26	59.34
حد سے کی پابندی	27-28	49.30
اسلامی اخوت	40-41	48.99
پاکستان ایک اسلامی ریاست	42-44	60.07

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
30	Oral Communication		Identify and use previously learnt and more formulaic expressions for greetings and routine social courtesies according to the age, gender and status of addressee.	78.03
31	Formal & Lexical Aspects of Language		Recognize, find out, create and use more rhyming words.	64.66
32			Locate, provide, connect and use words similar and opposite in meaning.	51.88
34			Join some words to make common compound words and use them in speech and writing.	50.36
36			Spell words studied in class in writing.	67.45
37			Apply spelling change in plural form of regular and irregular nouns and regular and irregular verb forms.	56.72
38	Grammar and Structure	Nouns	Recall, and demonstrate use of more common, countable and uncountable, collective nouns from immediate and extended environment.	50.27
39			Change the number of more regular and irregular nouns, and nouns with no change in number.	68.58
40			Classify more nouns as common and proper nouns (names of people, pets, places, mountains, lakes, rivers, etc.).	69.36
41		Pro-nouns	Illustrate use of pronouns learnt earlier. Use the personal pronouns myself, yourself/ves, himself, herself, ourselves, themselves and itself.	49.63
43			Recognize that pronouns agree with their nouns in gender and number.	54.96
44			Identify and illustrate extended use of words that point to something.	50.43
45			Illustrate the use of question words learnt earlier. Identify and use question words: why and how often etc.	67.40
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.	54.40
47		Verbs	Recognize and use more action verbs from extended environment including other subjects in speech and writing.	51.68
48			Demonstrate the use of be, do and have as main or helping verbs in sentences.	65.01
51		Tenses	Illustrate the use of tenses (Simple present and continuous, simple past and continuous, and simple future tense) previously learnt in their speech and writing.	56.17
52		Prepositions	Demonstrate use of words showing position, time and movement and direction.	74.02

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
53		Capitalization	Use capitalization according to rules learnt earlier.	63.99
54		Punctuation	Recall the rules of punctuation learnt earlier.	54.46
55		Sentence Structure	Recognize and use simple SVO pattern sentences with direct and indirect objects.	68.33
56			Demonstrate use of subject-verb agreement according to person and number.	35.97
57		Types of Sentences	Identify and write sentences that state/ negate something, or ask a question.	58.20
58			Recognize function of wh forms used in questions.	47.83
59			Respond to, and ask wh questions.	41.45

Table 16: SLO Wise Student Performance in Mathematics

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
1	Numbers & Arithmetic Operation	Numbers up to One Billion	Read natural numbers upto 1000000000 (One arab). Write natural numbers upto 1000000000 (One arab)	54.86
2			Read numbers up to 1,000,000,000 (one billion) in numerals and in words.	63.65
3			Write numbers up to 1,000,000,000 (one billion) in numerals and in words.	61.03
4		Roman Numbers	Roman numerals up to 50	47.07
5			Roman symbols for 100, 500 and 1000 (C, D, M)	40.79
6	Decimals & Percentages	Common fractions	Define reducible and irreducible common fractions	53.54
7			Identify reducible and irreducible common fractions	43.46
8			Reducing a common fraction into an irreducible fraction (by H.C.F. Prime factors, Common factors)	32.76
10		Decimal fractions	Round off decimals up to specified number of decimal places.	38.15
11			Convert fractions to decimals and vice versa.	44.71
12			Solve real life problems involving decimals.	24.75
13			Solve real life problems involving mixed operations of addition, subtraction, multiplication and division.	62.46
14		Decimals	Add and subtract decimals.	47.93

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
15			Multiply a decimal by a decimal (with three decimal places).	53.33
16			Multiply a decimal by a decimal (in the same way as for whole numbers and then put in the decimal	55.73
17			Divide a decimal by a decimal (by converting decimals to fractions).	57.35
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	58.31
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).	53.76
28		Direct & Inverse Proportion	Solve real life problems involving direct and inverse proportion (by unitary method).	49.64
29	Average	Average	Define an average (arithmetic mean).	43.64
30			Find an average of given numbers.	53.98
31			Solve real life problems involving average.	41.03
32	Perimeter and Area	Concepts & constructions	Define Parallel Lines	55.79
35		Angle	Define adjacent, complementary and supplementary angles	43.53
36			Give example of adjacent, complementary and supplementary angles	61.38
37			Find adjacent, complementary and supplementary angle of a given angle	40.50
38			Identify adjacent, complementary and supplementary angles from given diagram	48.09
41		Quadrilaterals	Recognize the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium and kite).	51.68
43		Perimeter and Area	Identify the units for measurement of perimeter and area.	35.15
44			Write the formulas for perimeter and area of a square and rectangle.	42.44
45			Apply formulas to find perimeter and area of a square and rectangular region (Word problem, Complex Diagram, Simple Diagram)	31.49
46		Volume	Define Solids	43.31
48			Identify components of solids (Sphere, Cone, Cylinder, Cube, Cuboid)	21.13
50			Know formula of volume of cube and cuboid	50.25
51			Find the Volume of Cube and Cuboids	46.19
52	Information Handling	Block, Column and Bar Graphs	Identify parts of a graph	36.71
53			Know the types of a graph	54.07

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
55			Interpret Bar Graph	54.38
57			Interpret a line graph	53.35

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	76.49
2	Forces & Motion	Gravitational force	Explain the gravitational force using different examples	65.71
3			Explain the natural forces using examples	41.48
5	Electricity & Magnetism	Electric Current	Differentiate between conductors and insulators	58.26
6			Describe flow of electric current in an electrical circuit	35.75
10	Soils	Characteristics of Soil	Identify the soil profile	51.30
11			Describe the general composition of soil	48.17
12			Describe the characteristics of soil	54.36
13		Types of soil	Identify similarities and differences among the different types of soil	37.89
14	Sun & Planets	Star and planets	Differentiate between a star and a planet	54.67
15			Describe the physical characteristics of Sun	76.26
16		Solar system	Explain the features of solar system in detail	47.59
17			Differentiate between Natural and artificial satellites	54.60
18	Organization of Plant Body	Pollination	Define Pollination	47.54
20		Dispersal of fruit and seeds	Describe means of dispersal of fruit and seeds	59.48
21		Asexual reproduction in plants	Describe various types of asexual reproduction in plants	37.31
22	Our Wonderful Body	Circulatory System	Draw label and describe major organ of circulatory system such as heart, arteries, veins & capillaries	35.58
23			Describe composition of Blood	46.70
25		Transport of material,	Identify causes of heart diseases	56.95

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
		through blood		
26		Excretory system	Draw ,label and describe the major organs of the excretory system	67.05
27			Identify and describe the relative function of each organ of excretory system	67.98
28		Skeletal and muscular system	Label the major bones of the skeletal system	89.96
31		Nervous system	Describe that nervous system consists of brain, spinal cord and nerves	54.86
32			State that nervous system helps in co-ordination of body parts	45.26
36			Explain the effects of unbalanced diet on health Specify the physical disorder associated with the lack of balance diet	56.36
37	Environment	Production of food by green plants utilizing sunlight	Describe Photosynthesis	36.47
38		Producers, consumers & decomposers	Differentiate between producers, consumers and decomposers	50.35
40	Continuity Of Life	Endangered species	Describe reason for extinction	47.29
42			Describe features of endangered species	45.36
43			Give examples of some endangered animals and plants in Pakistan and at global level	35.34
45	Matter & Its Properties	Physical & Chemical Changes	Given various examples, Describe and differentiate between two types of changes	51.06
46		Importance of water	Describe the importance of water	49.49
47		Sources of water	Describe different sources of water	51.50
48		Impurities of water	Classify impurities present in water	47.26
49			Describe various sources of water pollution	58.34
50		Purification of water	Describe different methods used for purification of drinking water	58.31
51			Describe different ways to prevent water pollution	22.88
53	Motion and Force	Use of action and reaction	Apply the principle to different practical situation	46.06
54	Energy	Energy	Define Energy	44.73

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
56		Kinds of energy	Differentiate between different kinds of energy	43.19
57			Explain different kinds of energies	41.44
58		Energy conversion	Describe conversion of one form of energy into another energy	38.28
59		Transfer of heat	Prove with help of example that heat flow from hot to cold body	60.76
62		Conductors of heat	Differentiate between conductor and non conductor of heat	58.61
64		Law of reflection	Prove the law of reflection	55.98
65		Requirements of sound hearing	Describe the basic requirements for the production, propagation and hearing of sound	39.36
66		Reflection of sound	Explain the law of reflection of sound	64.61

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	72.03
1.2		Ideology of Pakistan	Describe the meanings of Ideology and identify the behaviour patterns for a Pakistani, which may preserve the ideology and improve the situation with reference to national cohesion and state integrity.	83.24
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.	53.40
1.4		Kashmir Problem	Specify the nature of Kashmir issue and discuss the Solution of this problem.	50.97
1.5		Need for security of Pakistan and Islam	Explain the need for security of Pakistan and Islam	61.04
1.6		Sustainable development of Pakistan on the basis of self reliance	Describe need for self reliance of Pakistan and exemplify the elements that show self reliance	59.22
2.1	Geographical features of Pakistan	Boundaries	Identify the boundaries of Pakistan on the world map.	52.15
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	62.80
2.3		Zones in which Pakistan is situated	Name the geographical zone in which Pakistan is situated.	42.29
2.6		Neighboring Countries of Pakistan	List the neighboring countries of Pakistan.	60.32

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
2.7		Place of Pakistan in world affairs	Specify the place of Pakistan in world affairs.	53.04
3.11	Climate	Environmental problems	Define environmental pollution and discuss the ways through which we may control the environmental pollution in Pakistan.	70.22
3.3		Four seasons	Enlist names of four seasons of Pakistan and describe their salient features.	72.51
3.4		Rain fall during winter and summer	Describe how the clouds are made and rain falls.	47.78
3.5		Current temperature during summer and winter	Know about extreme winter and summer temperature in Pakistan	52.13
3.6		Cyclones	Describe the nature of cyclones in Pakistan.	44.40
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.	56.67
4.3		Industries	Identify major industries with respect to their contribution for economic development in Pakistan.	55.28
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.	60.78
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.	53.29
5.3		Change in population	State meaning of people migration and state causes of people migration from rural to urban areas.	54.59
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.	56.53
6.2	Safety	Foreign Invasions	Describe the effect of rumors on people, causes of foreign invasions and discuss importance of safety at national level.	62.11
6.3		Armed Forces and police	Describe the role of armed forces for national security.	62.78
6.4		Civil Defense	Explain the agencies' role for safety at national level.	56.19
7.1	Administration	Constitution	Define election, electorate and constitution.	48.92
7.2		Islamic republic of Pakistan and its meaning	Discuss the importance of constitution for Pakistan's progress in Islamic perspective.	26.84
7.8		Islam and Administration	Describe the Islamic concept of administration	63.58
8.1	Means of communication & transport	Means of Transportation	Specify the role of various means of transport and communication for national development.	65.72
8.2		roads	Discuss the maximum benefits from means of communication and transportation out in Pakistan.	49.06
8.8		Means of communication	Describe uses and benefits of postal service, radio, television and computer.	53.04
9.1	Services	Social service Centers	Discuss the demands of a welfare society with respect to various social institutions.	50.50

SLO No.	Content	Sub Content	SLO Description	% of Students Answered Correctly
9.3		Special Education Institutions	List the major welfare Institutions in Pakistan.	67.49
9.8		Auqaf	List the major welfare Institutions in Pakistan.	49.60
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
10.5		Environmental Pollution	Explain major problems in Pakistan and describe their nature, causes and remedies.	63.35

Table 19: SLO Wise Student Performance in Urdu

SLO No.	Content	SLO Description	% of Students Answered Correctly
1.1	Reading	عام تحریریں، قلمی مسودے، اخبارات و رسائل روانی سے پڑھ کر مفہوم اخذ کرے، مصنف کا انداز نظر اور نتیجہ استنباط کر سکے	70.58
1.3		سبق، کہانی سے متعلق سوالات کا درست طور پر جواب دے	71.08
1.4		قلم پڑھ کر مفہوم اخذ کر سکے اور سوالوں کا جواب دے سکے	67.17
2.1	Writing	تحریر میں املا کی غلطیوں سے بچے	83.47
2.7		ندائیہ اور علامت استعمال کرے اور وادین کا استعمال سے واقف ہو	50.09
3.1	Grammar & Vocabulary	سادہ مرکبات کا استعمال کرے اور صحیح جملہ بنائے	68.26
3.2		عائب، حاضر اور متکلم کی ضمیروں سے واقف ہو اور ان کا درست استعمال کرے	59.96
3.3		اسم، فعل، حرف اور ضمیر کا صحیح استعمال کرے اور ان اصطلاحات کی تشریح کرے	68.50
3.4		اسم معرف اسم نکرہ کو پہچانے اور تعریف سے واقف ہو	69.39
3.5		متضاد ہترادف اور ہم قافیہ الفاظ کا معقول ذخیرہ رکھے	61.35
3.6		واحد جمع اور مذکر مؤنث کی شکلیں دیکھے	75.06
3.7		مخاورات اور ضرب الامثال کا استعمال کرے	66.69
3.8		جملے میں قواعد اور زبان کی غلطیوں کی اصلاح کرے	45.31

SLO No.	Content	SLO Description	% of Students Answered Correctly
4.2	Conversation	موقع کی مناسبت سے موزوں الفاظ کا انتخاب کرے مثلاً مزاج پر سی، بیمار پر سی، اجازت لیتا، اور تعزیت کرنا	50.26

Table 20: SLO Wise Student Performance in Islamiyat

SLO No.	Content	% of Students Answered Correctly
1	دنیا آخرت کی کھتی	89.71
2	دنیا آخرت کی کھتی	80.19
3	دنیا آخرت کی کھتی	58.26
4	اطاعت رسول	20.02
5	سنت نبوی کی اہمیت	76.85
6	سنت نبوی کی اہمیت	59.79
7	نماز چھو	50.32
9	نماز چھو	76.36
10	عیدین	69.10
11	عیدین	69.62
13	روزہ	52.10
14	روزہ	47.69
15	انصار مدینہ کا امیار	67.85
16	انصار مدینہ کا امیار	67.20
17	غزوہ بدر	52.01
18	غزوہ بدر	58.20
19	غزوہ واحد	39.39
20	غزوہ واحد	50.63
22	غزوہ ازاب	75.64
23	غزوہ ازاب	73.89
25	آداب ملاقات	59.34
28	صد سکی پابندی	49.30

SLO No.	Content	% of Students Answered Correctly
40	اسلامی اخوت	59.69
41	اسلامی اخوت	38.29
43	پاکستان ایک اسلامی ریاست	60.07

Appendix D: Clustering Analysis

Table 21: District wise subject mean scores

DISTRICT	Overall	English	Urdu	Math	Science	Social Studies	Islamiat
MUZAFFARGARH	70.24	67.85	76.23	64.64	63.86	70.99	77.89
D.G. KHAN	63.85	66.39	64.44	60.97	54.04	60.84	76.42
LODHRAN	61.70	62.76	62.44	56.62	59.28	57.25	71.88
JHANG	59.46	59.62	63.08	54.96	55.97	55.56	67.59
RAJANPUR	59.38	60.59	62.33	52.60	54.45	54.52	71.78
BHAKKAR	59.33	55.05	67.49	50.28	54.02	59.96	69.15
MULTAN	58.01	58.82	61.65	53.92	51.41	53.12	69.12
BAHAWALNAGAR	57.85	57.45	58.94	56.40	52.19	52.52	69.59
SARGODHA	56.90	57.93	61.16	45.40	52.15	55.70	69.05
CHINIOT	56.52	54.53	63.95	48.78	48.00	56.14	67.71
BAHAWALPUR	56.33	59.04	63.88	43.30	50.99	53.92	66.88
SAHIWAL	54.83	52.12	61.84	47.36	47.79	52.23	67.66
NAROWAL	54.72	53.72	61.11	46.66	47.67	53.98	65.16
LAYYAH	54.66	54.10	58.46	43.26	48.76	54.13	69.27
KHANEWAL	54.65	44.59	64.86	46.11	45.69	55.43	71.25
SHEIKHUPURA	54.61	55.99	58.69	50.20	46.86	50.53	65.38
GUJRANWALA	54.52	56.41	59.19	42.99	48.28	53.48	66.76
T.T.SINGH	54.51	54.13	55.39	51.16	45.94	49.34	71.12
VEHARI	53.87	51.59	55.44	50.19	46.94	48.71	70.33
RAHIMYAR KHAN	53.47	53.88	55.78	48.19	43.93	49.00	70.06
MIANWALI	52.28	48.38	60.81	43.31	46.17	51.45	63.53
KHUSHAB	51.92	51.37	53.05	48.59	44.21	48.38	65.89
FAISALABAD	51.20	47.94	59.17	43.74	44.01	48.15	64.21
SIALKOT	51.00	48.87	59.06	42.15	43.63	48.43	63.87
LAHORE	49.92	52.69	53.11	43.67	41.89	45.41	62.72
GUJRAT	49.59	46.23	60.13	39.58	41.52	46.89	63.19
PAKPATTAN	49.41	45.80	54.60	43.02	46.75	43.34	62.93
OKARA	48.80	46.59	51.66	45.61	42.26	43.28	63.41
NANKANA SAHIB	48.74	48.76	54.43	36.85	43.41	47.54	61.48
ATTOCK	48.71	50.46	54.81	37.52	44.05	46.76	58.66
KASUR	48.54	44.72	57.17	41.63	41.23	45.95	60.54
CHAKWAL	48.19	48.21	51.98	43.83	42.03	42.75	60.37
JEHLUM	47.97	45.84	53.89	40.71	42.48	46.71	58.19
HAFIZABAD	47.79	47.38	52.13	40.59	43.88	40.63	62.11
MANDI BAHA UD DIN	47.47	45.13	51.36	45.02	40.59	42.49	60.26
RAWALPINDI	46.73	49.53	52.36	40.28	42.33	40.29	55.59

* 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	63.16	64.43	58.90	56.26	57.38	67.89
AHMADPUR EAST	61.00	64.98	43.13	51.42	53.13	66.53
ALIPUR	74.49	76.72	71.04	65.00	74.56	82.93
ARIFWALA	46.30	53.90	40.76	44.38	41.30	61.75
ATTOCK	49.95	54.50	37.34	43.09	44.77	58.53
BAHAWALNAGAR	58.70	61.55	56.55	53.23	54.64	71.93
BAHAWALPUR	56.29	60.24	40.06	48.38	50.98	64.85
BHAKKAR	50.37	66.55	47.52	51.75	57.97	68.39
BHALWAL	56.49	61.58	45.87	51.59	56.19	69.42
BHOWANA	55.71	64.72	51.23	49.68	54.62	68.99
BUREWALA	53.43	55.09	50.61	46.77	49.78	69.99
CHAK JHUMARA	50.03	59.54	41.29	42.67	46.72	62.55
CHAKWAL	48.28	53.05	43.86	42.36	42.70	61.09
CHAUBARA	50.46	52.91	41.32	44.85	51.01	63.66
CHICHAWATNI	53.26	62.26	48.01	48.48	53.15	69.02
CHINIOT	57.45	65.43	50.15	49.89	60.73	69.02
CHISHTIAN	59.66	61.43	58.07	52.21	51.77	69.86
CHOA SAIDAN SHAH	45.92	44.44	39.52	39.23	39.80	55.99
CHUNIAN	42.60	55.17	41.07	39.93	44.68	58.91
D.G.KHAN	63.99	60.68	59.51	50.64	56.90	74.37
DARYA KHAN	59.55	68.24	50.88	54.02	61.12	69.03
DASKA	48.36	58.75	43.82	45.98	49.17	65.53
DEPALPUR	43.26	50.41	45.34	41.86	41.37	62.68
DINA	39.24	47.92	37.26	39.41	39.77	54.94
DUNYAPUR	53.32	59.55	49.84	51.75	51.54	69.02
FAISALABAD CITY	48.55	57.95	43.69	43.17	47.20	63.23
FAISALABAD SADDAR	49.13	61.48	44.22	46.00	50.60	65.79
FATEH JANG	57.85	59.17	40.67	47.97	51.51	62.01
FEROZWALA	52.06	55.32	45.29	42.64	45.43	62.28
FORT ABBAS	55.82	55.47	55.26	51.73	50.03	67.57
GOJRA	56.15	58.08	52.72	47.12	51.01	73.46
GUJAR KHAN	49.91	52.86	41.03	42.74	41.00	56.55
GUJRANWALA	57.70	59.43	43.25	48.70	52.91	66.65
GUJRAT	47.25	60.17	40.70	42.98	46.95	63.88
HAFIZABAD	50.27	53.80	41.72	45.04	42.35	63.84
HAROONABAD	50.67	54.24	51.43	47.91	48.65	66.37
HASILPUR	60.37	66.05	47.14	53.41	59.09	72.13
HASSANABDAL	43.86	51.33	35.08	41.98	41.84	54.51
HAZRO	46.01	51.30	35.12	40.08	44.21	55.28
ISA KHEL	48.68	60.79	40.19	44.04	52.32	63.88
JAHANIAN	37.50	61.32	40.51	44.71	48.52	65.63
JALALPUR PIRWALA	65.12	68.00	62.72	57.31	60.47	72.62
JAMPUR	58.76	61.13	55.19	55.50	51.81	72.64
JAND	50.51	55.18	35.83	44.14	48.40	58.10
JARANWALA	45.72	58.75	43.68	43.62	47.12	64.07
JATOI	69.30	75.91	67.95	64.50	71.68	74.66

TEHSIL	English	Urdu	Math	Science	Social Studies	Islamiat
JHANG	59.26	63.20	54.23	56.72	55.00	67.61
JHELMUM	43.43	52.79	37.67	39.77	44.40	56.49
KABIRWALA	50.27	67.94	49.75	48.29	59.77	72.18
KAHUTA	50.05	52.05	40.99	45.12	41.82	58.25
KALLAR KAHAR	51.97	53.55	45.67	43.25	43.33	61.41
KALLAR SYEDAN	50.09	52.20	40.38	43.56	43.86	55.54
KALLUR KOT	54.13	67.30	49.91	55.66	58.27	68.54
KAMALIA	55.14	55.13	51.45	46.50	50.23	70.20
KAMOKE	55.56	59.52	41.99	48.46	54.83	66.50
KAROR LALISAN	52.68	59.32	43.86	47.91	53.05	68.67
KAROR PACCA	69.36	65.28	61.75	63.39	60.36	73.83
KASUR	43.95	56.26	41.25	41.51	45.55	61.18
KHAIRPUR TAMEWALI	64.05	69.41	48.27	57.11	58.74	69.60
KHANEWAL	42.81	64.56	42.55	45.16	55.01	70.25
KHANPUR	55.52	55.02	47.07	44.80	47.41	70.07
KHARIAN	47.30	61.45	40.26	41.53	49.38	64.04
KHUSHAB	50.28	51.82	48.62	43.60	46.96	65.99
KOT ADU	63.68	75.93	59.58	62.64	68.38	77.02
KOT RADHA KISHAN	49.93	60.19	44.74	44.89	48.78	62.12
KOTLI SATTIAN	50.21	49.51	39.65	43.06	40.75	54.57
LAHORE CANTT	53.19	52.89	43.91	42.15	45.53	62.58
LAHORE CITY	51.80	53.55	43.25	41.44	45.24	62.98
LALIAN	49.83	61.43	45.17	44.30	51.26	65.05
LAYYAH	55.72	59.09	43.29	50.09	55.44	70.80
LIAQATPUR	59.91	61.03	53.95	47.85	55.02	74.01
LODHRAN	66.17	62.98	58.83	62.70	59.86	72.94
MAILSI	52.08	57.52	50.71	47.87	49.93	71.21
MALIKWAL	43.79	49.51	43.37	38.89	39.51	58.88
MANDI BAHUDDIN	46.03	52.29	45.45	40.23	42.79	59.64
MANKERA	63.20	69.31	57.67	58.18	66.16	72.25
MIAN CHANNU	43.82	63.65	48.50	44.14	54.47	73.63
MIANWALI	47.79	59.66	44.25	46.60	50.78	63.02
MINCHINABAD	64.05	60.99	62.64	57.86	59.33	72.30
MULTAN	57.69	60.65	52.95	50.42	51.61	68.71
MULTAN SADAR	45.55	55.88	37.32	42.00	44.57	66.56
MURIDKE	57.92	59.08	53.05	48.47	52.75	66.31
MURREE	49.46	53.15	39.15	40.80	43.14	54.20
MUZAFFARGARH	68.98	76.47	65.96	64.37	71.95	78.29
NANKANA SAHIB	48.77	53.19	34.33	42.47	46.06	60.46
NAROWAL	49.41	57.11	40.88	43.68	49.92	62.89
NOORPUR THAL	58.47	57.54	52.16	47.42	53.81	68.59
NOSHERA VIRKAN	55.85	58.09	41.70	46.94	54.67	66.26
OKARA	50.05	53.37	46.64	42.86	44.90	65.14
PAKPATTAN	45.38	55.22	44.98	48.81	45.12	63.95
PASRUR	50.10	60.44	44.35	44.84	52.56	67.51
PATTOKI	45.47	58.98	41.35	40.41	46.44	60.40
PHALIA	44.97	51.47	45.57	42.06	44.03	61.83

TEHSIL	English	Urdu	Math	Science	Social Studies	Islamiat
PIND DADAN KHAN	50.51	56.87	44.04	45.74	50.69	61.36
PINDI BHATTIAN	42.97	49.59	38.87	42.09	38.00	59.47
PINDI GHEB	53.13	56.80	41.17	47.26	48.52	62.94
PIPLAN	49.33	63.25	44.52	47.41	51.95	64.23
QUAIDABAD	48.56	53.47	44.84	43.41	48.64	62.72
RAHIMYAR KHAN	54.30	57.14	49.05	43.48	49.27	69.36
RAJANPUR	62.92	63.99	49.37	53.80	56.78	71.03
RAWALAPINDI	53.05	53.44	40.54	42.74	39.30	54.85
RAWALPINDI	49.36	52.73	40.45	41.76	39.30	55.33
RENALA KHURD	46.47	50.75	44.04	41.84	43.97	61.32
ROJHAN	60.10	61.37	53.04	51.57	59.23	70.45
SADIQABAD	46.60	50.07	43.15	40.45	45.05	67.76
SAFDARABAD	49.43	53.77	38.11	44.37	49.30	62.32
SAHIWAL	53.49	61.68	47.29	49.45	53.47	67.56
SAMBRIAL	52.68	61.60	42.38	44.47	50.32	65.77
SAMUNDARI	45.41	59.31	43.47	43.48	48.48	65.06
SANGLA HILL	45.28	53.59	36.41	41.73	46.50	59.92
SARAI ALAM GIR	39.02	56.48	33.10	35.39	40.01	57.95
SARGODHA	58.56	60.48	44.48	50.56	53.66	68.22
SHAHKOT	51.12	59.20	42.78	46.44	50.66	64.78
SHAHPUR	55.97	60.85	45.31	53.77	57.08	69.82
SHAKARGARH	56.61	63.68	50.51	50.83	57.16	67.09
SHARAQPUR	55.53	59.20	49.48	46.20	49.23	71.97
SHEIKHUPURA	56.35	59.35	50.51	47.44	51.20	65.04
SHORKOT	58.16	61.65	54.44	53.21	56.06	67.26
SHUJA ABAD	61.67	63.38	54.38	53.54	57.22	69.23
SHUJABAD	36.29	44.43	32.29	37.57	40.57	64.86
SIALKOT	47.18	57.53	39.47	40.97	44.51	59.68
SILLANWALI	57.73	61.67	43.85	53.29	55.78	68.54
SOHAWA	50.35	57.90	45.08	45.90	52.51	59.96
TALAGANG	47.62	52.10	44.33	41.98	43.36	60.29
TANDLIAN WALA	49.10	61.07	45.06	46.64	50.78	66.27
TAUNSA	71.60	72.62	64.14	61.42	69.40	80.87
TAXILA	45.98	49.74	37.40	40.45	36.15	53.31
TOBA TEK SINGH	51.63	53.35	49.62	44.52	47.23	69.88
VEHARI	48.84	53.98	49.18	46.31	46.24	69.94
WAZIRABAD	54.89	59.30	44.13	48.29	52.93	67.64
YAZMAN	59.91	66.48	45.13	51.87	54.71	65.98
ZAFARWAL	55.10	62.54	48.57	48.36	54.72	65.37

Table 23: School cluster analysis based on category

DISTRICT	POOR	%	BELOW AVER- AGE	%	AVER- AGE	%	ABOVE AVER- AGE	%	EXCE PTION AL	%
ATTOCK	50	4.23%	449	3.26%	1381	2.33%	126	0.97%	12	0.48%
BAHAWALNAGAR	17	1.44%	231	1.67%	1936	3.26%	687	5.28%	79	3.13%
BAHAWALPUR	37	3.13%	368	2.67%	1947	3.28%	373	2.87%	23	0.91%
BHAKKAR	9	0.76%	108	0.78%	1317	2.22%	510	3.92%	44	1.74%
CHAKWAL	86	7.28%	477	3.46%	1223	2.06%	80	0.61%	3	0.12%
CHINIOT	12	1.02%	113	0.82%	712	1.20%	207	1.59%	19	0.75%
D.G. KHAN	3	0.25%	81	0.59%	858	1.45%	836	6.42%	351	13.92%
FAISALABAD	28	2.37%	917	6.65%	4097	6.90%	461	3.54%	29	1.15%
GUJRANWALA	40	3.39%	426	3.09%	2298	3.87%	552	4.24%	41	1.63%
GUJRAT	31	2.62%	545	3.95%	1903	3.21%	144	1.11%	12	0.48%
HAFIZABAD	33	2.79%	470	3.41%	708	1.19%	61	0.47%	4	0.16%
JEHLUM	73	6.18%	380	2.76%	962	1.62%	114	0.88%	11	0.44%
JHANG	17	1.44%	220	1.60%	1643	2.77%	693	5.32%	107	4.24%
KASUR	111	9.40%	702	5.09%	1699	2.86%	161	1.24%	13	0.52%
KHANEWAL	7	0.59%	125	0.91%	1641	2.76%	299	2.30%	26	1.03%
KHUSHAB	12	1.02%	247	1.79%	960	1.62%	131	1.01%	5	0.20%
LAHORE	61	5.17%	974	7.06%	3544	5.97%	376	2.89%	22	0.87%
LAYYAH	38	3.22%	382	2.77%	1651	2.78%	350	2.69%	39	1.55%
LODHRAN	7	0.59%	95	0.69%	755	1.27%	363	2.79%	81	3.21%
MANDI BAHAUDDIN	21	1.78%	463	3.36%	1069	1.80%	79	0.61%	5	0.20%
MIANWALI	9	0.76%	232	1.68%	1308	2.20%	190	1.46%	11	0.44%
MULTAN	37	3.13%	370	2.68%	2332	3.93%	750	5.76%	141	5.59%
MUZAFFARGARH	2	0.17%	38	0.28%	750	1.26%	1235	9.49%	768	30.45%
NANKANA SAHIB	32	2.71%	403	2.92%	1041	1.75%	75	0.58%	47	1.86%
NAROWAL	27	2.29%	296	2.15%	1508	2.54%	374	2.87%	6	0.24%
OKARA	51	4.32%	645	4.68%	1640	2.76%	119	0.91%	7	0.28%
PAKPATTAN	33	2.79%	443	3.21%	1007	1.70%	92	0.71%	45	1.78%
RAHIMYAR KHAN	35	2.96%	505	3.66%	2383	4.01%	568	4.36%	27	1.07%
RAJANPUR	8	0.68%	80	0.58%	907	1.53%	335	2.57%	2	0.08%
RAWALPINDI	107	9.06%	954	6.92%	1980	3.34%	126	0.97%	45	1.78%
SAHIWAL	18	1.52%	265	1.92%	1830	3.08%	426	3.27%	70	2.78%
SARGODHA	16	1.35%	285	2.07%	2371	3.99%	745	5.72%	22	0.87%
SHEIKHUPURA	19	1.61%	251	1.82%	1428	2.41%	419	3.22%	13	0.52%
SIALKOT	64	5.42%	652	4.73%	3104	5.23%	331	2.54%	41	1.63%
T.T.SINGH	17	1.44%	246	1.78%	1616	2.72%	317	2.44%	41	1.63%
VEHARI	13	1.10%	354	2.57%	1858	3.13%	310	2.38%	310	12.29%
	1,181		13,792		59,367		13,015		2,522	

Appendix E: Analysis of Exam Versions

Table 24: Version wise exam average

	English	Urdu	Maths	Science	Social Studies	Islamiat
VERSION 1	52.96	56.49	49.91	46.65	48.28	65.39
VERSION 2	48.48	59.13	43.92	44.51	49.15	63.60
VERSION 3	53.83	64.77	47.92	48.81	55.31	68.45
VERSION 4	53.62	57.21	47.12	49.38	47.57	63.55
VERSION 5	55.31	59.18	42.27	48.56	52.64	65.99
VERSION 6	54.27	55.30	48.34	44.82	48.73	67.57

Table 25: Correlation between district rank and version average

Spearman's rho		ENGLISH	URDU	MATH	SCIENCE	SOCIAL STUDIES	ISLAMIAT
RANK	Correlation Coefficient	-.158	-.113	-.022	-.163	-.122	-.182
	Sig. (2-tailed)	.357	.513	.899	.343	.478	.289
	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).