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KEYWORDS	ABSTRACT
TPACK, technological knowledge, secondary school teachers, technology and education	The aim of the study was to explore Technological Pedagogical and Content Knowledge and its domains among secondary school teachers based on demographics. This quantitative study was based on a descriptive survey and causal comparative in method. Through convenient sampling technique, 51 teachers were selected as research subjects from public sector secondary school of district Lahore. The participants were divided into three levels low, medium, and high based on their TPACK. TPACK survey scale was used, containing seven sub-domains and 47 items measuring TPACK. The study showed significant differences among TPACK domains in TK, CK, PCK, TPK, TCK and TPACK. The study also showed differences in TPACK based on demographics like age, subject taught by teacher, qualification, and experience.
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Introduction

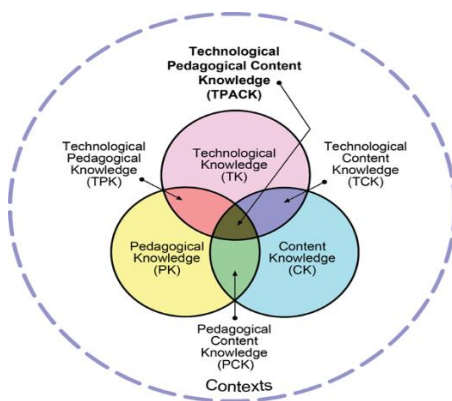
Technology and education are not strangers, the assimilation of technology in education is deemed as major part of academic institutions. The addition of technology in teaching is increasing as per society's mandate. Prensky (2001) has named today's generation the Digital Native because today's generation have exposure of technology from really young age and technology integration is more constant than predecessor's pedagogy and theories which are presenting argument for bringing new and innovative classroom practices. Society's demands are changing which serve as a major input in school organization, the process of school organization should also be changed hence indicating impact of technology on educational organizations.

Sultan (2017). Technological Pedagogical Content knowledge also known as TPACK is an outline for teachers to integrate technology in their teaching for better experience and innovation. Technological pedagogical content knowledge is a current teacher education framework and there has been a growing interest since 2010. TPACK is an intermingled model; an inadequacy in any one domain can trigger an ultimate letdown in the utilization of the intended technology (Pamuk, 2012).

Technological pedagogical content knowledge is a contemporary structural model in educational field which focuses upon of technology inclusion by planning a fusing of pedagogical content knowledge (PCK) and technology knowledge (TK). PCK was primarily cited by Shulman (1986) who highlighted the integration of subject matter content and pedagogical knowledge in teaching learning process. Each domain serves different purposes and builds upon each other pedagogical content knowledge presented by Shulman means the capability of employing pedagogical and content knowledge as one unit, as a substitute of realizing pedagogical and content of a subject independently. Shulman's framework did not embrace the major aspect of 21st century that is technology, the emergence of technology as vital tool cannot be ignored, technological improvement in the field of education has accelerated after 1980s and blending technology within teaching learning systems had been emerging as core component. This model presents influences three sphere of teachers' knowledge which are technology, pedagogy, and content its outcomes are defined by teachers' understanding of these connections and provides teacher with knowledge of effectively incorporating technology with their pedagogy practices (Harris et.al., 2009).

The model presented by Mishra and Koehler in 2006, comprised of seven subdomains which are technological pedagogical content knowledge (TPACK), technology knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological content knowledge (TCK), Technological Pedagogical Knowledge (TPK). These domains are interlinked with each other and covers emergence of technology and provided Mishra and Koehler to make different dimensions by linking them to pedagogy and content.

Figure 11: *Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006)*



Statement of the Problem

Technology is need of time and it is essential for today's teacher to integrate technology in their teaching practices. Just having expertise in single domain like Content Knowledge is not sufficient for coping in this digitalized world. Technological Pedagogical Content Knowledge is a teaching structure which incorporates all domains and gives a better outline for teachers to teach effectively. Information and communication technologies (ICT) have core status in all practical aspects that we have. Utilization of ICT has profoundly altered the practices and skills regarding practical functions in all field of life. Today's educators must be outfitted with these skills. According to National Education Policy 2017-2025 teachers should strive to make sure the mange to adopt the technological proposals made by the policy and other international organizations (Govt. of Pakistan, 2017). But still teachers are not inclined to integrate it in their classrooms. This study focuses on TPACK, its domains and contributing demographics.

Objectives of the Study

Following were the objectives for this study:

1. To measure Technological Pedagogical and Content Knowledge of secondary school teachers.
2. To compare secondary school teachers' Technological Pedagogical Content Knowledge levels based on demographics (subject taught by teachers, qualification, age, and teaching experience)

Hypothesis

H01: There is no significant difference between means scores of Technological Pedagogical and Content Knowledge domains of secondary school teachers.

H02: There is no significant difference between teachers' TPACK level based on subject taught by teachers.

H03: There is no significant difference between teachers' TPACK level based on teacher's qualification.

H04: There is no significant difference between teachers' TPACK level based on age of teacher.

H05: There is no significant difference between teachers' TPACK level based on teacher's experience.

Methodology

This study was quantitative by nature and causal comparative by method. It was designed to explore secondary school teachers' TPACK levels and compare them on basis of domains and demographics. The researcher measured secondary school teachers' TPACK and on basis of the TPACK knowledge the researcher made three comparison groups of low, medium, and high TPACK levels.

Population and Sample

Population of the study was all secondary school teachers teaching in public sector in district Lahore. There are total 179 government girls' high schools and 5718 female teachers in Lahore. The researcher used convenient sampling to select five government girls' high schools from district Lahore and 51 teachers were sample from the schools.

Research Instruments

In light of literature review, after studying many questionnaires the researcher opted Technological Pedagogical Content Knowledge survey scale by Sahin. The questionnaire is designed to measure teachers Technological Pedagogical Content Knowledge. The instrument contains seven sub scales technology knowledge 14 items, pedagogy knowledge six items, content knowledge six items, technological content knowledge four items, pedagogical content knowledge six items and technological pedagogical content knowledge five items and have 47 items in total with high reliability of .95. The survey items were answered using Likert scale with five response choices, including "1=not at all," "2=little," "3=moderate," "4=quite," and "5=complete". The highest possible score was 235 and lowest score being 47. The instrument was open access. The instrument was appropriate as it measured all domains required for study. After validation of instrument by experts, pilot was conducted, and overall Cronbach's alpha reliability of instrument was .86.

Administration of Research Instrument

The researcher visited the selected schools in Lahore. Secondary school teachers were invited to fill out TPACK questionnaire. The questionnaire consisted of 47 items measuring seven domains the researcher gave brief description about the TPACK survey scale and its purpose and then asked secondary school teachers to complete TPACK survey accordingly, the response rate was 85 percent as the researcher supervised most of the data collection.

Analysis of Data

For analysis of data the researcher applied statistical test like mean, frequencies, standard deviations to explain descriptive statistics for demographics. For comparing the teachers' TPACK one-way ANOVA was used, the researcher compared teachers TPACK score and seven domains

and chi-square tests were applied to compare categorical groups, subject taught by teachers and teacher qualification of teachers for data analysis in this empirical study.

Results and Interpretations

H₀₁: There is no significant difference between means scores of Technological Pedagogical and Content Knowledge domains of secondary school teachers.

Table 1: Descriptive Statistics for Secondary School Teachers' Technological Pedagogical and Content Knowledge (N= 51)

Domains	Min	Max	Mean	SD
TK	24	74	45.0	15.5
PK	8	29	20.9	5.0
CK	9	30	21.4	5.0
TCK	5	20	12.9	4.1
TPK	6	19	13.3	3.4
PCK	13	35	23.8	6.2
TPACK	6	24	14.6	4.6

Table 2 shows the descriptive statistics of secondary school teachers' Technological Pedagogical and Content Knowledge domains $N= 51$. For technological knowledge the $M=45$, $SD=15.5$ with minimum 24 and maximum 74, for pedagogical knowledge $M=20.9$, $SD=5.0$ the minimum scores were eight and maximum scores were 29, for content knowledge the $M=21.4$, $SD=5.0$ with minimum score of nine and maximum score of 30, for technological content knowledge $M=12.9$, $SD=4.1$, minimum score five and maximum score 20. For the domain technological pedagogical knowledge minimum scores were six and maximum scores reported were 19 with $M=13.3$, $SD=3.4$. For pedagogical content knowledge the minimum scores reported were 13 and maximum 35 with $M=23.3$, $SD=6.2$. For the domain technological pedagogical content knowledge, the $M=14.6$, $SD=4.6$ was reported with minimum scores of 6 and maximum scores 24.

Table 1.1: One-way ANOVA to compare means of the TPACK Domains based on their Technological Pedagogical and Content Knowledge.

Domains	Teachers	Sum of Squares	df	Mean Square	F	P
TK	Between Groups	9473.765	2	4736.882	86.907	.000
	Within Groups	2616.235	48	54.505		
	Total	12090.000	50			
PK	Between Groups	626.980	2	313.490	22.885	.000
	Within Groups	657.529	48	13.699		
	Total	1284.510	50			

CK	Between Groups	506.392	2	253.196	16.333	.000
	Within Groups	744.118	48	15.502		
	Total	1250.510	50			
TCK	Between Groups	568.353	2	284.176	48.984	.000
	Within Groups	278.471	48	5.801		
	Total	846.824	50			
TPK	Between Groups	449.098	2	224.549	71.352	.000
	Within Groups	151.059	48	3.147		
	Total	600.157	50			
PCK	Between Groups	1519.882	2	759.941	85.722	.000
	Within Groups	425.529	48	8.865		
	Total	1945.412	50			
TPACK	Between Groups	474.627	2	237.314	19.454	.000
	Within Groups	585.529	48	12.199		
	Total	1060.157	50			

Note. *The mean difference is significant at the .05 level

One-way ANOVA was to explore difference between TPACK domains and secondary school teachers technological pedagogical content knowledge scores. As the table showed all domains were significantly different i.e. content knowledge $F(2,48) = 86.9$, $p = .000$, pedagogical knowledge $F(2,48) = 22.885$, $p = .000$, content knowledge $F(2,48) = 16.333$, $p = .000$, Technological Content Knowledge $F(2,48) = 48.984$, $p = .000$, technological pedagogical knowledge $F(2,48) = 71.352$, $p = .000$, pedagogical content knowledge $F(2,48) = 85.722$, $p = .000$ and technological pedagogical and content knowledge $F(2,48) = 19.454$, $p = .000$. The most substantial difference was between Technological knowledge (TK) with eta squared value of .78 and lowest variation among groups was in Content Knowledge (CK). Hence rejecting null hypothesis.

H₀₂: There is no significant difference between teachers' TPACK level based on subject taught by teachers.

Table 3: Results of Cross Tabulation for Subject Taught by Teachers and TPACK Levels

		Subject taught			
		science	computers	Arts	others
TPACK	Low	4	0	7	6
	Medium	3	2	4	8
	High	8	4	1	4
	Total	15	6	12	18

Table 3 shows cross tabulation among subject taught by teachers and TPACK levels to compare frequencies counts of the subject taught by teachers ($N = 51$) which indicate teachers with low TPACK had most frequency count for arts, teachers with medium TPACK had most frequency

count for other category i.e. compulsory subjects. Teachers with high TPACK had most frequency count for science subject.

Table 3.1: Result of Chi-Square Test Indicating Differences Among the Subject Taught by Teachers based on TPACK Levels

	<i>N</i>	χ^2	<i>p</i>	<i>Cramer's V</i>
Chi-square	51	14.636	.023	.352

Table 4.11.1 displays cross tabulation between TPACK levels and subject taught by teachers using chi-square test. The table depicts that teachers with low level of TPACK were teaching arts subjects and teacher with high TPACK were teaching science subjects and teachers with medium level of TPACK varied among the categories. There was a statistically significant difference at the $p < .05$ level among subjects taught for the three TPACK levels ($\chi^2 = 14.6$, $p = .023$), whereas the effect size is small *Cramer's V* = .35. the null hypothesis stated that there is no significant difference between teachers TPACK level based on subject taught by teachers was rejected.

H03: There is no significant difference between teachers TPACK level based on teacher's qualification.

Table 4: Results of Cross Tabulation for Teachers Qualification based on TPACK Levels (N=51)

		Qualification			
TPACK		FA/BA	Bachelors	masters	MPhil
	Low	8	4	5	0
	Medium	0	8	7	2
	High	0	1	7	9
Total		8	13	19	11

Table 4 show teacher that have low level of TPACK had qualification of F.A. or B.A. ($f=8$) and teachers with bachelor's degree had $f=4$ for low TPACK, $f=8$ for medium TPACK and $f=1$ for high TPACK. five Teachers with master's degree had low TPACK levels seven had medium and high TPACK levels. 9 teachers with MPhil degree had high TPACK level and 2 with medium level and no teachers with low TPACK.

Table 4.1: Chi-Square Test Indicating Differences Among Secondary School Teachers Qualification based on TPACK Levels

	<i>N</i>	χ^2	<i>df</i>	<i>P</i>	<i>Cramer's V</i>
Chi-square	51	37.991	6	.000	.58

Chi-square Test was applied to find difference between the TPACK levels of teachers and their qualification. There was a statistically significant difference at the $p < .05$ level among categories of qualification for the three TPACK levels $\chi^2 = 37.9$, $p = .000$, the effect size indicated high magnitude Cramer's $V = .58$ suggesting difference between teachers TPACK level based on teacher's qualification

H04: There is no significant difference between teachers TPACK levels based on age of teacher.

Table 4: Descriptive Statistics for Demographic Age of Teachers

TPACK	Mean	SD
Low	43.35	8.299
Medium	41.76	9.141
High	35.47	5.907
Total	40.20	8.471

Teachers with low TPACK level ($M = 43.35$, $SD = 8.2$) had highest mean score age as compared to teachers with medium TPACK ($M = 41.7$, $SD = 9.1$) and high TPACK level ($M = 35.4$, $SD = 8.4$).

Table 4.1 Result of ANOVA Indicating Mean Differences Among Demographics (Age) Based on TPACK Levels

Source of variation	Sum of Squares	df	Mean Square	F	p
Between Groups	292.800	2	295.431	4.731	.013
Within Groups	520.800	48	62.441		
Total	813.600	50			

Note. * = significant value at 0.05 level

Table 4.2: Result of Post Hoc Multiple Comparisons of TPACK Level for the Demographic Age

Teachers	teachers	Mean difference	P
Low	medium	1.588	.828
	High	7.882*	.012

Note. * = significant value at 0.05 level

The table shows results of one-way ANOVA among age of teachers based on TPACK levels, which indicate there is significant difference in the groups $F(2,48) = 4.731$, $p = .013$). Hence null hypothesis is rejected. Post hoc test describe there was significant difference between low TPACK level ($M = 43.35$, $SD = 8.299$) and high TPACK level ($M = 35.47$, $SD = 5.907$). despite reaching statistical significance, the effect size was small 0.35.

H05: There is no significant difference between teachers TPACK level based on teacher's experience.

Table 5: *Descriptive Statistics for Demographic (Teacher's Experience)*

TPACK level	Mean	SD
Low	18.88	8.477
Medium	15.71	8.887
High	10.35	4.716
Total	14.98	8.247

Table 5 depicts the descriptive statistic for the demographic variable teachers' experience ($N = 51$) the highest mean score is for low TPACK level ($M = 18.8$, $SD = 8.4$) as compared to medium TPACK level ($M = 15.7$, $SD = 8.8$) and high TPACK level ($M = 10.3$, $SD = 4.7$)

Table 5.1 One-way ANOVA Indicating Mean Difference Among Teaching Experience and TPACK Levels

Source of variation	Sum of squares	df	Mean square	F	
Between groups	631.804	2	315.902	5.476	.007
Within groups	2769.176	48	57.691		
Total	3400.980	50			

Table 5.2 Result of Post Hoc Multiple Comparisons of TPACK Level for Experience

Teachers	teachers	Mean difference	p
Low	medium	3.176	.448
	High	8.529*	.005

Note. * = significant value at 0.05 level

A one-way between-groups analysis of variance was conducted to measure significant difference between experience of teachers based on TPACK levels. Participants were divided into three groups according to their TPACK levels low, medium, and high. There was a statistically significant difference at the $p < .05$ level for teaching experience and the three TPACK levels: $F(2, 48) = 5.4$, $p = .007$. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for low TPACK level ($M = 18.8$, $SD = 8.47$) was significantly different from high TPACK ($M = 10.35$, $SD = 4.71$). The null hypothesis stated that there is no significant difference between teachers TPACK level based on teacher's experience was rejected.

Discussion

TPACK is framework for teachers to integrate technology in their pedagogy and content knowledge (Mishra and Koehler, 2006). Each domain is interlinked with other which presents combinations and provides seven domains which are serving different kinds of knowledge. TPACK shows positive relation among educators and learning skills (Zahid & Khosos, 2026). The

researcher concluded there was difference between secondary school teacher's TPACK and their domains the most substantial difference was between technological knowledge and lowest variation among groups was in content knowledge. Technology is vital aspect of education and the previous studies shows that teachers possess low technological knowledge (Irum et.al., 2018; Safdar et al., 2012; Memon, 2015). The study showed there was significant differences among TPACK levels of teacher based on their age, teaching subject, qualification, and teaching experiences. Teachers taking science subjects scored higher on TPACK and teacher which scored low in TPACK were teaching arts subjects. Teachers with MPhil and master's degree scored higher in TPACK and undergraduates scored low in TPACK. Previous studies also show that there is difference between teachers teaching styles and strategies in classroom and their TPACK and there was less cohesiveness in all the TPACK sub-domains in teachers and studies also support that teachers score high in pedagogical knowledge (Gero, 2025) and educators battle to use the new technologies in an innovative way that it is practically benefited to real classroom and have low TPACK (Srisawasdi, 2012; Tanak, 2018; Eilti & Çoklar, 2013).

Conclusion and Recommendations

The conclusions drawn from this research are that there is significant difference among secondary school teachers' technological pedagogical and content knowledge the most substantial difference was between technological knowledge and lowest variation among groups was in content knowledge. The study also showed that young teachers with less experience taking science and computer subjects had high TPACK knowledge, holding MPhil and master's degree in comparison of teachers teaching arts subjects with F.A and B.A degrees. Therefore, it is recommended that:

- All teachers should lean towards integration of technology as utilitarian tool.
- Less understanding of technology integration effecting teaching pedagogies might be countered by government by arranging workshops and seminars regarding amalgamation of technology for in-service teachers.
- Teachers should be trained to use technology modules as per the growing demand of society.
- Subject wise training workshops regarding pedagogical, content, and technological integration should be provided to teachers.

References

- Eilti, Erkan & Çoklar, Ahmet. (2016). The analysis of the relationship between epistemological beliefs and TPACK education competence among pre-service teachers. *Journal of Human Sciences*. 13.29-60.10.14687/jhs.v13i2.3593.
- Gero, A. (2025). Characteristics of effective teaching: Two-year technical college students' perspective. *International Journal of Engineering Pedagogy*, 15(6), 139-146. <https://doi.org/10.3991/IJEP.V15I6.56351>

- Government of Pakistan Ministry of Federal Education and Professional Training. (2017). *National Education Policy 2017-2025*. Retrieved from <http://www.moent.gov.pk/userfiles1/file/National%20Educaiton%20Policy%202017.pdf>
- Haris, J., Mishra, P., & Koehler, M. (2009). Teachers' Technological Pedagogical Content Knowledge and learning activity types: curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, 41(4), 393–416. EJ844273
- Irum, S. et.al. (2018). University teacher's knowledge about technological devices and their use: An analytical study. *International Journal of Computer Science and Network Security*, 18(8), 74-80. 201808/20180811.
- Koehler, M., & Mishra, P. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record* (108),6.
- Memon, M. (2015). *An investigation of primary school teachers' 'technological Pedagogical content knowledge' in district Matiari, Sindh* (Unpublished master's dissertation). Aga Khan University, Karachi, Pakistan.
- Pamuk, S. (2012). Understanding preservice teachers' technology use through TPACK framework. *Journal of Computer Assisted Learning*, 28, 425–439.10.1111/j.1365-2729.2011.00447.x
- Safdar, M., Sher, F., Iqbal, S., Shakir, K., Ali, W., Sohail, M. & Saeed, S. (2012). The role of information technology in education sector (a case study of Faisalabad –Pakistan). *International Journal of Asian Social Science*, 2(8) 1294-1299.
- Sahin, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *The Turkish Online Journal of Educational Technology*, 10(1). v10i1/10110
- Srisawasdi, N. (2012). *The role of TPACK in physics classroom: case studies of preservice physics teachers*. *Procedia - Social and Behavioral Sciences* (46),3235-3243. [10.1016/j.sbspro.2012.06.043](https://doi.org/10.1016/j.sbspro.2012.06.043).
- Sultan, F., & Arslan, K. (2017). A comparison of in-service and pre-service teachers' technological pedagogical content knowledge self-confidence. *Cogent Education*, 4 (1). [10.1080/2331186X.2017.1311501](https://doi.org/10.1080/2331186X.2017.1311501)
- Tanak, A. (in press). Designing TPACK-based course for preparing student teachers to teach science with technological pedagogical content knowledge. *Kasetsart Journal of Social Sciences*. 10.1016/j.kjss.2018.07.012.
- Zahid, M. & Khoso, F. (2026). IMPACT OF TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK) ON THE TEACHING SKILLS OF SECONDARY SCHOOL TEACHERS IN KHAIRPUR MIR'S, SINDH, PAKISTAN. (2026). *Journal for Social Science Studies*, 4(6), 335-342. <https://jssstudies.org/site/index.php/jsss/article/view/312>