

Effect of Principals' Digital Leadership and Teachers' Digital Competence on Secondary School Teachers' Classroom Teaching at District Lahore

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ABSTRACT

Rapid integration of digital technologies in the field of education has changed the dimensions of classroom teaching practices, which demand digital leadership practices and digital competencies of teachers. This study examines the effect of principals' digital leadership and teachers' digital competence on secondary school teachers' classroom teaching in District Lahore. This study is grounded in transformational leadership and e-leadership theory. A casual comparative research design is used to conduct this study. Data were collected from secondary school teachers district Lahore through three structured questionnaires which measured principals' digital leadership, teachers' digital competence, and classroom teaching practices. Descriptive statistics, independent sample t-test, and simple linear regression analysis were used for data analysis. The findings revealed a significant strong effect of teachers' digital competence on classroom teaching. Principals' digital leadership practices showed a significant weak effect on classroom teaching practices. The findings of this study have practical implications for professional teachers' trainers, school administrators, and policy makers. This study also contribute in growing body of research on digital leadership and teachers' digital competence in regard of classroom teaching at the secondary school level.

Keywords: Digital Leadership, Teachers' Digital Competence, TPACK, Classroom Teaching

INTRODUCTION

Emerging technologies in the field of education are reshaping the teaching and learning paradigm. This change has influenced the leadership practices of the institutions as well (Nawaz et al., 2023). Leadership practices are now technology embedded, which is flourishing the concept of e-leadership, digital leadership, and virtual leadership (López-Figueroa et al., 2025). Digital competence for leaders is a compulsory element to practice digital leadership for better collaboration, communication, and creativity (Tuschner et al., 2023). The digital skills of teachers are increasingly recognized worldwide as essential because of the consequences of the pandemic. The strategic use of digital tools and data to enhance organisational performance, while adapting to evolving market trends and fostering innovation, continues to pose challenges (Jameson et al., 2022). Recent changes towards decentralized and cooperative leadership models, facilitated by new communication technologies, have underscored the necessity for school leaders and educators to incorporate digital tools into teaching, learning, and leadership practices (Wang et al., 2023). Technologies are the "best option for adopting the new pedagogy in general" (Amir & Arif, 2022),

but they are especially useful for bringing a change to traditional teaching and learning approaches to guarantee the redevelopment of instruction and learning into inquiry and problem-based methods of instruction (Amir & Arif, 2022). As digital technologies involve learners in a better way and more actively in learning, teachers may emphasize learner-centered models during their instructions and thus use educational technology to promote learning without any barriers or restrictions of time, place, and age (McNeil, 2020). The idea of digital transformation in Pakistani public schools is still relatively new, and most efforts are concentrated in urban regions (Mehmood et al., 2025). Many ICT-based changes, including the implementation of digital classrooms, online teacher training programs, and school management information systems (SMIS), have been tried in the Punjab province. However, the majority of rural state schools lack the necessary digital infrastructure to link instructors and students to laptops, projectors, and the internet. One of the biggest obstacles to the digital transformation of Pakistan's public schools is the country's digital disparity between urban and rural areas (Mehmood et al., 2025). ICT integration is impossible in rural schools since they frequently run without electricity for several hours, even though metropolitan schools usually have no access to computer laboratories and the internet (Mehmood et al., 2025). It is difficult to estimate the significance of SDG-4 in the context of Pakistan's digital transformation. During the protracted school closures, the federal and provincial governments tried a variety of remote learning techniques, including televised classes (Tele School), radio broadcasts, and internet delivery. Digital transformation has started to be included in policy frameworks in recent years due to its strategic importance. Provincial plans and the most recent National Education Policy draft from 2021 have also acknowledged the potential of technology to enhance learning outcomes and accomplish expanded educational opportunities (Mehmood et al., 2025).

There is little systematic evidence from Pakistan, especially from urban districts like Lahore, regarding how principals' digital leadership and teachers' digital proficiency jointly impact classroom teaching practices (Ghayyur, 2021; Saeed, 2024). Previous research shows that teachers who adopt technology are positively impacted by leaders who promote, resources, and prioritize digital integration. Practitioners and policymakers in Lahore encounter the risk of carrying out foreign strategies that don't fit local realities or ignoring levers like principal leadership behaviors or focused teacher training that could result in quantifiable improvements in classroom instruction in the absence of solid, contextually grounded studies (Amin et al., 2024).

This study aims to examine the effect of principals' digital leadership and teachers' digital competence on secondary school teachers' classroom teaching in District Lahore. It will assess the effect of principals' digital leadership practices and teachers' digital competence on classroom teaching. The research intends to produce actionable insight for policymakers, school leaders, and teacher educators in Lahore and comparable urban districts. The study is significant, theoretically, empirically, and practically. Theoretically, it contributes to the developing literature on the effect of digital leadership and teachers' digital competence in Pakistani secondary schools. Empirically, it fills a contextual gap by providing rigorously collected evidence from Lahore, which is a big urban hub of education, about the effect of digital leadership and teacher competence on teachers' classroom teaching. Practically, findings can guide district education managers, school principals, and teacher professional development providers about where to prioritize interventions, e.g., leadership coaching, targeted digital pedagogical training, and infrastructure investments, to maximize improvements in classroom teaching. Use of digital tools as a pedagogical technique needs time. School principals are the instructional leaders as well and must integrate the technology in classroom instructions to foster 21st century skills.

Research Objectives

The objectives of the study is to,

1. Assess principals' digital literacy level perceived by secondary school teachers at district Lahore.
2. Investigate the level of secondary school teachers' digital competence.
3. Examine the teachers' digital competence between those who has receive the ICT training and those who did not receive.
4. Determine the effect of principals' digital leadership and teachers' digital competence on teachers' classroom teaching practices at secondary school district Lahore.

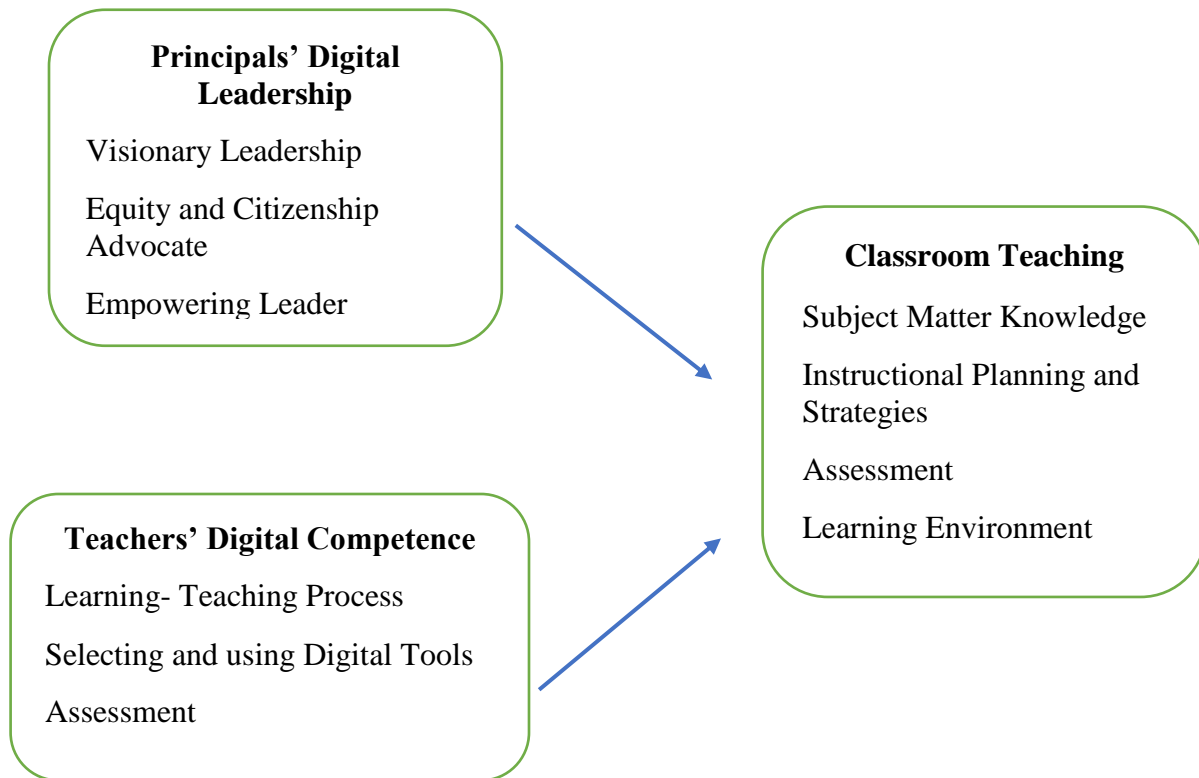
Research Questions

1. What is the level of principals' digital literacy perceived by secondary school teachers in district Lahore?
2. What is the level of secondary school teachers' digital competence?
3. Is there any difference of digital competence of teachers' between ICT trained and untrained teachers?
4. Is there any effect of principals' digital leadership and teachers' digital competence on secondary school teachers' classroom teaching practices at the secondary school district Lahore?

Theoretical Framework

The theory for digital leadership is transformational leadership theory. Transformational leadership theory defines that it brings significant changes in individuals and organizations (Burns, 1978; Aziz et al., 2025). Transformational leaders strive to elevate, bring change, set the shared goals for teams, and inspire their followers to achieve those shared goals and challenges. Transformational leadership increases motivation, performance and morale of the followers. A transformational leader gives a sense of identity to their followers, connects them with the organization, and gives a sense to the workers that the organization's success would be their success. Transformational leader present themselves as role model for their followers (Bernard M. Bass (1985). The second under pinning theory is E- Leadership by Avolio and Kahai, 2000. E-leadership was first used by Avolio and Kahai in 2000. Digital leadership means use of technology to guide, inspire and motives. Digital leaders connect with their followers through emails, virtual meeting, and through online platforms. Digital leadership helps collaborative work environment where fast decision making can take place. Digital leaders must understand the use of technology, must communicate through digital platforms, and must build trust worthy virtual environment (Avolio and Kahai, 2000). E- Leadership explains how school leaders can use technology to inspire their teachers, work together to achieve shared goals. It also influences teachers' digital competence and their classroom teaching.

Conceptual Framework:



LITERATURE REVIEW

Due to the significant impact of technological developments on education systems and the growing integration of these technologies in the methods of instruction and learning, school administrators' changing roles, now emphasize technology leadership (Dexter & Anderson, 2005). Digital leadership is appropriate for the digital age. Flexibility, swiftness, and "aggressiveness" are the unique traits of digital leadership, and has the capacity to adjust frequent and unexpected changes (Wang et al., 2018). Dexter et al., (2011) found that particularly in organizational decision-making, policy, and technology implementation, the principal's digital leadership has a strong connection to technology-related tasks. It requires more than just knowing how to use the gadget, it also involves communicating and sharing information in an abstract way. Principals should have a high level of digital proficiency since they are seen as the institution's technology leaders (Yusof et al., 2019). Principals' digital leadership is viewed as an essential part of successful technology integration in the context of education's digital transformation. By consistently promoting change and giving all employees the chance to engage with and utilize digital technologies, principals can attain digital leadership (Ridho et al., 2023).

Principals' Digital Leadership

The term "e-leadership" was first used by Avolio et al. (2000) however, Fisk (2002) claims to be the first author to use the term "digital leadership" in academic writing. Okunlola et al., (2025) states "The digital leaders must possess a visionary mindset and are adept at driving change. They have the ability to integrate

ideas within the organization to execute projects and facilitate partnerships, joint ventures, outsourcing, and other collaborative endeavors.” According to AlAjmi, (2022) critical thinking, creativity, collaboration, and communication are the cornerstones of digital leadership. According to Hamzah et al., (2021) the ISTE-A Standards for Administrators offers strong merits to support and assist principals in their duties as digital leaders. These days, technological leadership is seen as a leadership that seeks to innovatively improve educational processes by integrating technology into classrooms (Jameson, 2013). Baglama et al., (2022) and Digital leadership is the “application of instructional technology such as digital device, service, and resources to inspire and lead school digital transformation, create and sustain digital learning culture, support and enhance technology-based professional development, provide and maintain digital organization management, and facilitate and manage digital citizenship” (Zhong, 2017, p. 28). A digital leader can be called a digital leader, if practices said activities: (i) virtual information sharing (ii) virtual discussions (iii) virtual meetings (iv) teaching and supervision of virtual learning (v) virtual communication (vi) online file sharing (vii) virtual student performance monitoring (viii) virtual teacher professionalism development (ix) promotion of virtual school goals and (x) exposure to digital technology (Wijayati et al., 2023).

Teachers’ Digital Competence

The TPACK framework developed by Mishra and Koehler (2006) places teacher digital competency at the nexus of technology knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). The paradigm highlights that integrating various knowledge domains rather than relying solely on technical skills makes use of technology in the classroom effective. The ability to use digitally obtained knowledge and attitudes within a specific educational context is the essence of digital competence (Amir et al., 2025). To guarantee an efficient teaching and learning process, teachers must be proficient with technology and trained in its responsible use. Globally, digitally enabled learning environments are becoming a reality due to the advancement and growth of information and communication technology (ICT) (Ali et al., 2020). In order to begin integrating such developing technologies in education, good behavior towards digital media and administrative assistance are also essential (Ertmer et al., 2012). Teachers’ efficacy can be increased through appropriate training about the use of digital media (Kay, 2006). According to Mehmood, (2023) previous studies have shown that teachers’ opinions of their school principal’s digital leadership style affect how much technology they utilize in the classroom particularly with the reference of recent technology such as artificial intelligence. Teachers now have more demanding duties since they must be engaged to finding different ways to facilitate the use of digital technology in the classroom teaching and learning (Hamzah et al., 2021). Because students want to have access to the internet, students are excited about digital learning and using gadgets like tablets and smartphones. Teaching that incorporates digital technology into student learning is known as “digital teaching”. It can occur in every subject area. According to a study by Hamzah et al., (2021), instructors’ competencies are just as important in predicting the success of digital-based learning as the availability of digital gadgets. Numerous studies highlight obstacles to integrating digital technology into education, such as teacher inability to use it in the classroom due to a lack of training, expertise, and confidence as well as inadequate resources (Hamzah et al., 2021). Before a teacher to be deemed digitally competent, they must meet five requirements, according to Tournon et al. (2023). These five dimensions are information management, collaboration and communication, content creation, security, problem-solving.

Classroom Teaching

The concept of instructional effectiveness is complex, involving a number of dimensions, beliefs, abilities, and characteristics. The course grades and the competencies required for students to demonstrate mastery of the specified learning objectives must be aligned with the teaching strategies, course structure, instructional materials, learning activities, and assignments. One of the most important aspects of a

teacher's job is lesson planning, which has a big impact on the subject matter and teaching style of their students (Peterson & Clark, 2021). It was used by Darling-Hammond et al., (2019) to outline the fundamental teaching strategies and basic knowledge necessary for all teachers, including subject matter knowledge (SMK). Teachers that are well-versed in their subjects encourage students to participate in class. To improve integration of subjects, teachers must be knowledgeable about the material being taught in the classroom (Laghari et al., 2023). Three criteria were identified by Laghari et al., (2023) in an analysis of teaching effectiveness: (a) the competence of instructors to content delivery (b) teaching subject information and (c) teachers' teaching method. Since it is difficult for teachers to study a subject poorly, which leads to a lack of student engagement, disrespect for the teacher, and lack of teacher confidence highlighted the need of instructors having in-depth topic knowledge. The material knowledge that gives ideas or concepts significance for students is the cornerstone of pedagogy for teachers (Laghari et al., 2023). Ahmed et al., (2023) discovered a positive relationship between teachers' qualifications, motivation, content knowledge, teaching experience, and training. According to Clark & Peterson, (2021) California State University (2024), instructional effectiveness includes the wide range of knowledge, readiness, skills, and behaviors that result in effective teaching and learning for students. According to Anthony et al., (2015) there are essentially two main opinions regarding what constitutes teacher expertise. Cognitive capacity, which includes professional knowledge, competence, experience, or intentional practice, is one aspect of it; multiple capacities, which integrate both cognitive and non-cognitive elements of innovation, such as motivation, beliefs, emotional regulation, and affective traits, are another.

RESEARCH METHODOLOGY

It's a positivist research paradigm. Quantitative research approach is employed to answer the research questions. Causal comparative research method is used. The targeted population is all secondary school teachers' of private and public at district Lahore. Sample of 107 teachers were selected through random sampling technique. Random sampling technique was used to ensure that all have equal chances of selection enhance generalizability of the results.

Research Instrument

A quantitative data is collected through three tools. Principals' Digital Literacy Scale is adopted to collect data about principals' digital leadership. Principals' Digital Literacy Scale is developed by (Yuanyuan et al., 2025). It has 25 items under five factors. A 5-point Likert scale agreement is used. Principals' Digital Leadership is based on SITE Standards for Education Leaders which has five components i) Visionary Leadership with 5 statements ii) Equity and Citizenship Advocate with 5 statements iii) Empowering Leader with 4 statements iv) Systems Designer with 6 statements v) Connected Learner with 6 statements. PDL scale alpha reliability >.95.

Teachers' Digital Competence Scale (TDiCoS) developed by Ergül, D. Y., & Taşar, M. F. (2023) is used to collect data about teachers' digital competence. Teachers Digital Competence is guided by European Framework for the Digital Competence of Educators (DigCompEdu) developed by Redecker (2017). This questionnaire has 19 item with five subscales. 5 point frequency Likert scale is used. Factors which reflect teachers' digital competence include i) Learning-teaching process with 6 statements ii) Selecting and using digital resources with 3 statements iii) Assessment with 3 statements iv) Digital technologies with 5 statements v) Ethical use of resources with 2 statements. TDiCoS alpha reliability is >.84.

For classroom teaching Self-assessment Instrument for Teacher Evaluation-II by Mohammad Akram and Zepeda (2015) is used. 5 point Likert frequency scale is used with 28 items. Classroom teaching effectiveness is grounded in teacher evaluation and self-assessment theory, which views reflective practice

as a key mechanism for improving instructional quality. This includes i) Subject Matter Knowledge with 8 statements ii) Instructional Planning and Strategies with 7 statements iii) Assessment with 5 statements iv) Learning Environment with 5 statements v) Effective Communication with 2 statements. SITE II alpha reliability is $>.92$. Data analysis is done by descriptive statistics to find out mean and standard deviation to determine the levels of digital literacy. Inferential statistics by using linear regression to find out the effect of principals' digital literacy and teachers' digital competence on teachers' classroom teaching practices. T-test is used to check the influence of ICT training on their digital competence.

PLS SEM Model

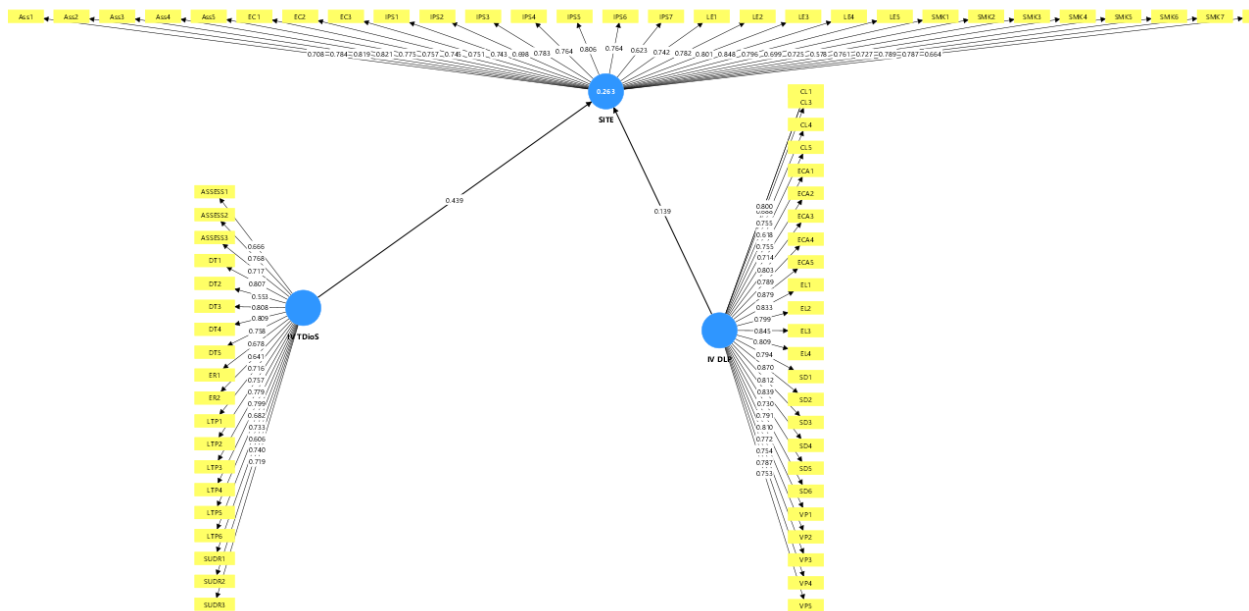


Table 1: Average Variance Extracted (AVE) and Fornell & Larcker Criterion for PDL, TDiCoS and SITE II

	AVE	CR (rho_a)	CR (rho_C)	PDL	TDiCoS	SITE II
PDL	0.613	0.982	0.976	0.788		
TDiCoS	0.527	0.955	0.955	0.416	0.726	
SITE II	0.568	0.974	0.973	0.321	0.497	0.754

Note: AVE= Average Variance Extract; PDL= Principals' Digital Leadership; TDiCoS= Teachers' Digital Competence Scale; SITE= Self-assessment Instrument for Teacher Evaluation-II

Table 1 shows factor loading values of each dimension are greater than 0.05 and significant at p -value <0.001 in all the item loading which is good sign for indicator reliability. Table 1 shows the value of Average Variance Extracted (AVE) which is greater than 0.5 to show existence convergent validity. Square root value of each dimensions is larger than the values in off diagonal which shows discriminant validity.

Table 2: Factor Loading Cross Loading Cronbach Alpha & Composite Reliability of PDL, TDiCoS and SITE II

	PDL	TDiCoS	SITE II
Assess 1	0.344	0.666	0.180
Assess 2	0.255	0.768	0.383
Assess 3	0.113	0.717	0.359
Ass1	0.214	0.287	0.708
Ass2	0.208	0.462	0.784
Ass3	0.236	0.455	0.819
Ass4	0.277	0.325	0.821
Ass5	0.274	0.368	0.775
CL1	0.800	0.462	0.279
CL2	0.857	0.367	0.229
CL3	0.688	0.315	0.127
CL4	0.755	0.394	0.366
CL5	0.618	0.323	0.287
DT1	0.381	0.807	0.375
DT2	0.280	0.553	0.114
DT3	0.434	0.808	0.455
DT4	0.264	0.809	0.415
DT5	0.299	0.758	0.401
EC1	0.219	0.313	0.757
EC2	0.211	0.266	0.745
EC3	0.204	0.249	0.751
ECA1	0.755	0.249	0.256
ECA2	0.714	0.301	0.141
ECA3	0.803	0.261	0.122
ECA4	0.789	0.322	0.246
ECA5	0.879	0.378	0.317
EL1	0.833	0.308	0.326
EL2	0.799	0.255	0.201
EL3	0.845	0.342	0.160
EL4	0.809	0.270	0.292
ER1	0.294	0.678	0.200
ER2	0.334	0.641	0.743
IPS1	0.143	0.349	0.743
IPS2	0.198	0.283	0.698
IPS3	0.179	0.372	0.783
IPS4	0.298	0.528	0.764
IPS5	0.162	0.296	0.806
IPS6	0.227	0.354	0.764
IPS7	0.219	0.465	0.623
LE1	0.312	0.438	0.742
LE2	0.343	0.357	0.782
LE3	0.411	0.360	0.801
LE4	0.246	0.307	0.848

LE5	0.157	0.261	0.796
LTP1	0.236	0.716	0.354
LTP2	0.350	0.757	0.281
LTP3	0.445	0.799	0.378
LTP4	0.412	0.682	0.378
LTP5	0.310	0.682	0.378
SD1	0.794	0.333	0.373
SD2	0.870	0.345	0.275
SD3	0.812	0.262	0.146
SD4	0.839	0.403	0.200
SD5	0.730	0.372	0.241
SD6	0.791	0.433	0.161
SMK1	0.145	0.338	0.699
SMK2	0.202	0.383	0.725
SMK3	0.169	0.402	0.578
SMK4	0.257	0.273	0.761
SMK5	0.172	0.421	0.789
SMK6	0.325	0.448	0.789
SMK7	0.338	0.416	0.787
SMK8	0.237	0.321	0.664
SUDR1	0.217	0.606	0.293
SUDR2	0.337	0.740	0.425
SUDR3	0.177	0.719	0.332
VP1	0.810	0.256	0.281
VP2	0.772	0.293	0.142
VP3	0.754	0.299	0.199
VP4	0.787	0.346	0.163
VP5	0.753	0.205	0.230

Note: PDL (Principals' Digital Leadership), TDiCoS (Teachers' Digital Competence Scale), SITE II (Self-assessment Instrument for Teacher Evaluation-II), Assess (Assessment); Ass (Assessment); CL(Connected Learner); DT (Digital technologies); EC (Effective Communication); ECA (Equity and Citizenship Advocate); EL (Empowering Leader); ER (Ethical use of resources) IPS (Instructional Planning and Strategies); LE (Learning Environment); LTP (Learning-Teaching Process) ; SD (Systems Designer); SMK (Subject Matter Knowledge); SUDR (Selecting and using Digital Resources); VL (Visionary Leadership)

The cross loading results indicate that the majority of the item load highest on their respective construct with sufficient separation from other construct. Discriminant validity for the model is adequate. This shows satisfactory discriminant validity among principals' digital leadership, Teachers' Competence and Instructional Teaching Effectiveness.

RESULTS

RQ 1. What is the level of principals' digital literacy perceived by secondary school teachers in district Lahore?

Table 3: Level of Principals' Digital Leadership

Level	Score Range	<i>f</i>	%
Low	26 – 60	4	3.7
Moderate	61 – 95	20	18.7
High	96 – 130	83	77.6
Total		107	100.0

Results showed that more than half of the principals have high level of digital competence (77.6%, $f=83$), while (18.7%, $f=20$) have moderate level of digital competence. A small proportion of principals (3.7%, $f=4$) have low level of digital competence. Overall principals in the sample possess high level of digital competence.

RQ 2. What is the level of secondary school teachers' digital competence?

Table 4: Level of Teachers Digital Competence

Level	Score Range	<i>f</i>	%
Low	43 – 63	4	3.7
Moderate	64 – 84	47	43.9
High	85 – 105	56	52.3
Total		107	100.0

Results showed that half of the teachers have high level of digital competence (52.3%, $f=56$), while substantial proportion (43.9%, $f=47$) have moderate level of digital competence. A small proportion of principals (3.7%, $f=4$) have low level of digital competence. Overall results showed that most of the teachers have moderate to high level of digital competence.

RQ 3. Is there any difference of digital competence of teachers' between ICT trained and untrained teachers?

Table 5: Independent sample t-test Comparing Teachers' Digital Competence by ICT Training

	<i>ICT Training No (34)</i>		<i>ICT Training Yes (66)</i>		<i>df</i>	<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
<i>TDiCoS</i>							
Subject Matter Knowledge	34.59	4.72	35.32	4.74	98	-.730	.758
Instructional Planning and Strategies	30.85	3.66	31.15	4.03	98	-.361	.170
Exams	22.74	2.34	22.21	3.05	98	.874	.882
Learning Environment	22.68	2.85	22.38	3.22	98	.454	.285
Effective Communication	13.65	1.90	13.71	1.94	98	-.160	.561

Independent sample t-test was conducted to whether ICT training had a significant effect on teachers' instructional competence. The results indicates that there is no significant difference between the teachers with ICT training ($M=35.32$, $SD = 4.74$) and teachers without ICT training ($M=34.59$, $SD = 4.72$) on subject matter knowledge $t(98) = -0.73$, $p = .758$. There is no significant difference between ICT trained teachers ($M=31.15$, $SD = 4.03$) and untrained teachers ($M=30.85$, $SD = 3.66$) on instructional planning and strategies

$t(98) = -.361, p = .170$. There is no significant difference between ICT trained teachers ($M=22.21, SD = 3.05$) and untrained teachers ($M=22.74, SD = 2.34$) on exams $t(98) = .874, p = .882$. There is no significant difference between ICT trained teachers ($M=22.38, SD = 2.85$) and untrained teachers ($M=22.68, SD = 2.85$) on learning environment $t(98) = .454, p = .285$. There is no significant difference between ICT trained teachers ($M=13.71, SD = 1.94$) and untrained teachers ($M=13.65, SD = 1.90$) on effective communication $t(98) = -.160, p = .561$.

RQ 4. Is there any relationship between principals' digital leadership and teachers' digital competence on secondary school teachers' classroom teaching practices?

Table 6: PDL as predictor of SITE

	<i>B</i>	<i>t</i>	<i>p</i>	<i>r</i>	<i>R</i> ²
PDL	.28	2.94	.004	0.276	.068

PDL (Principals' Digital Leadership), SITE II (Self-assessment Instrument for Teacher Evaluation-II)

Simple linear regression analysis was conducted to determine whether PDL predict SITE. Model was significant with 7% of variance of SITE ($r = 0.276, R^2 = .068$). PDL was a significant positive predictor of SITE ($\beta = .28, t = 2.94, p = .004$). Overall PDL have a positive but weak predicative ($r = .27$) effect on SITE.

Table 7: TDiCoS as predictor of SITE

	<i>B</i>	<i>t</i>	<i>p</i>	<i>r</i>	<i>R</i> ²
TDiCoS	.603	7.75	.000	0.603	0.358

TDiCoS (Teachers' Digital Competence Scale), SITE II (Self-assessment Instrument for Teacher Evaluation-II)

Simple linear regression analysis was conducted to determine whether TDiCoS predict SITE. Model was significant with 36% of variance of SITE ($r = 0.603, R^2 = 0.358$). TDiCoS was a significantly strong positive predictor of SITE ($\beta = .60, t = 7.75, p = .000$). Overall TDiCoS has a strong positive predicative of SITE.

Table 8: PDL and TDiCoS as predictor of SITE

	<i>B</i>	<i>t</i>	<i>p</i>	<i>r</i>	<i>R</i> ²
PDL	-.002	-.018	.985	0.603	0.352
TDiCoS	.604	6.85	.000		

PDL (Principals' Digital Leadership), TDiCoS (Teachers' Digital Competence Scale), SITE II (Self-assessment Instrument for Teacher Evaluation-II)

Simple linear regression analysis was conducted to determine whether PDL and TDiCoS predict SITE II. Model showed 35.2% variance in SITE ($r = 0.603, R^2 = .352$). TDiCoS was a significantly strong positive predictor of SITE ($\beta = 0.604, t = 6.85, p = 0.00$) whereas PDL did not significantly predict SITE II ($\beta = -.002, t = -.018, p = .985$). Overall TDiCoS has a strong positive predicative of SITE. PDL does not significantly contribute in SITE II.

FINDINGS

Findings indicate that school principals demonstrate high level of digital leadership practices at secondary school Lahore. This shows that Secondary school principals are engaged in using digital technologies for leadership practices, communication, and instructional practices. They are also encouraging other staff members to integrate technology in daily practices. The results showed that secondary school teachers have moderate level of digital competence. This shows that teachers can use digital tools for instructional practices, planning and communication, they should be provided with high tech professional trainings. They should integrate technology in classroom teaching. Results showed that principals' digital leadership practices have a positive effect on teachers' classroom teaching which indicates that principals' digital practices contribute to improve the instructional practices, increased use of digital tools in teaching. Similarly teachers with high to moderate level digital competence have a strong positive result on their classroom teaching. They integrate the digital tools for student data analysis, for providing personalized learning experience, and for better classroom engagement. Combine effect of PDL and TDiCoS on classroom teaching have positive effect which indicate that school principals and teachers' digital tool usage have effect on administrative, leadership and pedagogical practices.

DISCUSSION

This study has examined the effect of Principals' Digital Leadership (PDL) and Teachers' Digital Competence (TDiCoS) on Secondary School Teachers' Classroom Teaching (SITE) in District Lahore. Findings of the present study provides current status of digital leadership practice of secondary school principals and digital competence of teachers and their effect on classroom teaching. Results showed that school principals demonstrate high level of digital leadership practices. The findings revealed that school principals are fully aware of digital practices and are capable of using digital technologies for their administrative tasks and for instructional practices as well. These findings are aligned with previous studies which highlights that school principals have recognized the importance of use of digital tools for communication, administrative tasks and for instructional supervision (Anderson & Dexter, 2005). On the other hand teachers' have demonstrated high to moderate level of digital competence. Although this shows an encouraging trend in the use of technology in the classroom, the variation implies that not all teachers have the same level of proficiency with digital technologies. Similar results have been shown in previous studies, which emphasize that teachers frequently exhibit basic technological proficiency but have difficulty in integrating digital resources that is pedagogically significant (Koehler & Mishra, 2006). Findings also highlights that there is no significant difference in ICT trained and untrained teachers that shows that teachers are not sufficiently trained on integrating technology into pedagogical aspect. Previous research shows that teachers' efficacy can be enhanced through need based training about use of digital tools (Kay, 2006). Regression analysis shows that principals' have a positive but weak predicative effect on SITE while previous research indicates that digital leadership means innovate improvement of educational process through the integration of technology into classroom teaching (Jameson, 2013). Teachers' digital competence is a strong positive predictor of SITE. This suggests that teachers' classroom teaching methods are significantly impacted by their proficiency with digital tools. The results strongly align with previous researches that teachers' digital competence is very necessary for high quality education, equality and development of 21st century skills (Antonopoulou, 2025). The results support the Transformational Leadership Theory by demonstrating that principals' high levels of digital leadership proficiency have a positive, yet weak, impact on classroom instruction. This suggests an indirect effect rather than direct instructional control through vision building and a supportive school culture (Bass, 1985; Avolio, 2000). Principals' use of digital tools seems to support organizational and technological frameworks that facilitate instruction but do not directly dictate classroom practice, according to an E-Leadership viewpoint. On the other hand, instructors' strong digital competence was found to be a substantial predictor of classroom

teaching effectiveness, suggesting that teachers' ability to implement digital pedagogy is the main factor driving instructional change. These findings collectively imply that transformational and e-leadership are most successful when they concentrate on enabling teachers' digital capacities to convert leadership assistance into effective classroom practice. This study was delimited to the secondary schools at Lahore was a limitation to generalizability of the finding to other levels and regions. Secondly it was a self-reported data which may be subjected to social desirable response biasness. Thirdly data was collected from a very small sample size. This research has significant implications for teacher professional development, leadership, and educational policy.

CONCLUSION AND FUTURE IMPLICATIONS

This study has examined the effect of principals' digital leadership and teachers' digital competence on classroom teaching at secondary schools Lahore. The findings revealed that school principals' have high level of digital competence with relatively positive but weak effect on classroom teaching. Whereas teachers possess moderate to high level of digital competence but have strong positive effect on classroom teaching practices. No significant difference also highlighted the need of context based professional ICT training for effective integration in pedagogical practices. Longitudinal research can be conducted to see the long term effect of PDL on classroom teaching. Overall study concludes that digital leadership practices are important to create digital culture in the school but proper teachers' training regarding use of digital tools for better classroom pedagogical practices are also important.

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