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Students' Perceptions of Classroom Technology Integration and Its Influence on Academic Achievement: Evidence from Private Primary Schools in Lahore

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Abstract

This study investigates the effect of integrating classroom technology on the academic performance of private primary school students in Lahore, Pakistan. As interactive whiteboards, educational apps, and digital learning platforms gain popularity, many believe they improve classroom engagement and learning outcomes. However, persistent challenges—such as unequal access, digital distractions, and inconsistent teacher preparation—necessitate a closer examination of students' experiences. We gathered data from 155 students using a convenience sampling technique. We analyzed the data using SPSS Version 25, applying descriptive statistics and a chi-square test. The analysis revealed a statistically significant association between students' perceptions and academic achievement, particularly regarding online quizzes (p = 0.000) and educational apps (p = 0.001). These findings suggest that strategic integration of digital tools, when supported by teacher training and equitable access, can enhance student comprehension, engagement, and academic outcomes. To realize the full potential of educational technology, institutions must address implementation challenges and invest in teacher readiness to create inclusive and effective learning environments.

Keywords: Classroom Technology; Student Perceptions; Academic Achievement; Digital Learning; Educational Applications

Introduction

The rapid digitization of society has reshaped traditional teaching methodologies and learning environments. Classrooms that once relied solely on chalkboards and textbooks now embrace a variety of digital tools—interactive whiteboards, educational apps, smart tablets, and platforms such as Google Classroom—creating more dynamic, engaging, and accessible learning spaces (Yilmaz, 2021; Wang & Winstead, 2022). Especially in private primary schools, where resources are comparatively abundant, technological integration has become a central component of instructional strategies (Brown & Green, 2023).

The integration of technology at the primary level has emerged as a transformative force in shaping student engagement and academic achievement. Research indicates that when digital tools are purposefully embedded into instruction, they foster personalized learning experiences that cater to diverse student needs (Li & Ma, 2022). In private primary schools, students perceive technology-enhanced classrooms as more interactive and stimulating, which contributes to improved comprehension and retention (McGrath & Suresh, 2021). ICT-integrated environments have shown a significant increase in academic performance compared to traditional settings, with gains attributed to adaptive learning platforms and multimedia resources (Rosenberg & Thorne, 2023). Moreover, students report heightened motivation and participation when exposed to gamified learning and collaborative digital tasks (Ryan & Deci, 2020). The perceived quality of technology use, rather than its frequency, plays a critical role in shaping learning outcomes (Thomas et al., 2022). In Lahore's private schools, access to well-trained teachers and reliable infrastructure further amplifies the benefits of digital integration (Tavakol & Dennick, 2021). Students also associate technology with real-world relevance, enabling them to connect classroom concepts to broader contexts (Tamim et al., 2020). However, the effectiveness of technology hinges on pedagogical intent and thoughtful implementation strategies (McGrath et al., 2023).

Global educational reforms emphasize technology not just as a supporting tool but as a core component in promoting 21st-century skills such as creativity, collaboration, and critical thinking

(Anderson & Krathwohl, 2022). In Pakistan's urban educational landscape, particularly in cities like Lahore, private schools are increasingly adopting digital tools to enrich students' academic journeys (Hussain, 2022). Smart whiteboards, digital textbooks, and interactive apps have found their way into early education, attempting to bridge pedagogical gaps and provide inclusive, personalized learning experiences (Etikan et al., 2023). Nevertheless, this rapid shift presents challenges (Garrison & Ahern, 2023). Concerns have been raised regarding equitable access, the preparedness of educators, potential for digital distractions, and the real pedagogical value added by these technologies (Ahmed & Farooq, 2021; Raza, 2023).

Despite optimistic projections, limited empirical research in the Pakistani context investigates how students themselves perceive the classroom use of technology and whether it correlates with their performance (Hussain, 2022). Although Nguyen and Hargis (2023) affirm both the potential and pitfalls of digital integration, there is a lack of specific insight into the views of private primary learners. Are these technologies truly enhancing learning, or are systemic gaps—such as inconsistent usage, teacher inexperience, or novelty fatigue—undermining their impact?

Digital transformation in education has transitioned technology from a supplementary aid to an integral part of the teaching process. Once limited to computer labs or projectors, educational technology now encompasses cloud-based platforms, augmented reality applications, and interactive simulations (Turkle, 2019). Accelerated by the COVID-19 pandemic, schools globally began to embrace digital continuity tools, shifting the educational paradigm from passive reception to active participation (Yilmaz, 2021).

Students' perceptions are pivotal in evaluating the effectiveness of technology. Chen et al. (2021) emphasize that while many students appreciate the interactivity, personalization, and instant feedback afforded by digital platforms, others cite concerns about overexposure, distractions, and inconsistent teacher use (Jones & Smith, 2022). The varied responses indicate that successful integration hinges not only on the caliber of digital tools but also on the pedagogical strategies in place. Academic achievement is shaped less by mere access to technology and more by its thoughtful and purposeful application (Lai et al., 2021). Patel and Singh (2023) emphasize that the impact of technology on academic performance becomes most significant when clear pedagogical objectives drive its application. It is not the presence of technology alone, but its alignment with instructional purpose that fosters meaningful learning outcomes. Similarly, Shah et al. (2022) highlight that platforms like Google Classroom and Kahoot enhance concept comprehension when paired with timely feedback and interactive strategies.

Chang et al. (2021) found that students who perceive technology as enhancing their learning tend to perform better. This cognitive-emotional link underscores the importance of student-centered integration. When students feel ownership over their learning via digital platforms, they are more likely to invest effort and demonstrate higher achievement levels. Teachers' digital fluency is a determining factor in how technology is perceived and utilized. Connor et al. (2022) argue that educators who are adept at integrating technology foster immersive, student-centered learning experiences. In contrast, those lacking proper training may inadvertently treat technological tools as mere supplementary features, limiting their pedagogical potential. Ahmad et al. (2021) further demonstrate in the context of Pakistan that teachers equipped with robust training not only boost student engagement but also contribute meaningfully to improved academic performance.

While the benefits are evident, several barriers persist, including a lack of technical infrastructure, insufficient training, digital inequity, and resistance to pedagogical change (Ahmed & Farooq, 2021; Alharbi, 2022). Even when digital tools are available, their potential is often undermined by inadequate support or superficial application. Farooqi et al. (2024) emphasize that educational apps tailored for early learners—such as Duolingo for language learning or GeoGebra for mathematics—can significantly enhance learning if aligned with curricular goals and supported by teacher guidance. However, implementation quality varies depending on school readiness and teacher familiarity with these tools.

Research Methodology

Research Design and Sampling Technique

We adopted a quantitative research approach, focusing on a cross-sectional correlation design. We collected data from a total sample of 150 private primary students. We used a convenience sampling method based on accessibility and participants' willingness to respond.

Research Instrument

To gather data, we employed a structured questionnaire comprising two sections. The first section comprised demographic information, including the participants' gender, age, grade level, and details related to their technology use. The second section consists of 15 Likert-scale statements designed to assess students' perceptions of their teachers' integration of technology within classroom instruction. Prior to full-scale data collection, the instrument's reliability was evaluated using Cronbach's Alpha. The coefficient of 0.875 (see Table 1) indicated a high level of internal consistency, affirming the questionnaire's suitability for measuring the intended constructs with confidence.

Table 1:

Cronbach's Alpha analysis of study variables

Variables	Cronbach's Alpha	Items	Sample Size
Statements related to Students' Perceptions of Technology Use	0.875	15	15

Data Collection Procedure

We obtained formal permission from the study participants to collect the data. Data were collected from December 21, 2024, to February 17, 2025. We explained the purpose of the study to the students. We ensured strict adherence to ethical standards. Participation was voluntary, and students were informed that their responses would remain anonymous. Consent forms were distributed, and participants completed the questionnaires independently. The response rate of the data collection was 100%.

Data Analysis Technique

We used SPSS Version 25 for data entry and analysis. Responses on the 5-point Likert scale were analyzed using descriptive statistics, including frequencies and percentages. To examine the association between students' perceptions of technology integration and academic achievement, we used the Chi-square goodness-of-fit test.

Table 2:

Demographic information of the participating students.

Demographic information	Frequency	Percentage
Age		
5 years	13	8.7%
6-7 years	12	8.0%
8-9 years	36	26.0%
More than 9 years	89	57.3%
Gender		
Male	49	32.7%
Female	101	67.3%
Class Level		
Grade 1	10	7.2%
Grade 2	18	13.0%
Grade 3	28	17.4%
Grade 4	28	17.4%
Grade 5	66	44.0%
Access to technology at school		
Yes	123	82.0%
No	27	18.0%
Access to the Internet at school		
Yes	110	73.3%
No	40	26.7%
The device you prefer for learning		
Computer	55	36.7%
Tablets	45	30.0%
Smartphones	38	25.3%
None	12	8.0%
Technology use in the classroom		
Always	41	27.5%
Often	33	22.2%
Sometimes	50	33.5%
Rarely	20	13.0%

Never	6	3.0%
Grade in the last class		
A	79	52.6%
B	46	30.7%
C or lower	25	16.7%

Table 2 revealed that 57.3% of the participants were in the age group of 9 years and above. There were 67.3% female participants, whereas 32.7% were male. 44.0% of participants were from grade 5, whereas the rest, 55.0%, were from grades 1-4. 82.0% of the participants have access to technology at school, whereas 73.3% have access to the internet at school. 36.7% of the students prefer computers as a learning device, 30.0% prefer tablets, 25.3% prefer smartphones, and 8.0% do not prefer any of the devices. Thirty-three and a half percent of teachers use technology sometimes, 22.2% of teachers use technology often, whereas 27.5% of teachers use it always. The 52.6% have a grade A in the last class, 30.7% have a grade B, and 16.7% have a grade C or lower in their last class.

Table 3:

Students' Grades in the Recently Completed School Year by Experiences of Technology Integration in the Classroom

	Overall grades			
Statements related to Technology Integration	**C or lower**	**B**	**A**	**P**
I understand lessons better when my teachers use projectors.				0.060
Strongly agree	24.3%	28.4%	47.3%	
Agree	1.9%	40.4%	57.7%	
Neutral	22.7%	31.8%	45.5%	
Disagree	20.0%	0.0%	80.0%	
Strongly Disagree	25.0%	25.0%	50.0%	
My grades improve when teachers use apps and computer programs in class.				0.001
Strongly agree	13.6%	27.3%	59.1%	
Agree	3.6%	36.4%	60.0%	
Neutral	25.8%	41.9%	32.3%	
Disagree	39.3%	21.4%	39.3%	
Strongly disagree	0.0%	0.0%	100%	
I feel more interested in lessons when teachers show videos and multimedia.				0.208
Strongly agree	12.1%	28.8%	59.1%	
Agree	22.4%	27.6%	50.0%	
Neutral	16.7%	55.6%	27.8%	
Disagree	27.3%	27.3%	45.5%	
Strongly disagree	0.0%	37.5%	62.5%	
Online quizzes help me remember what I have learned.				0.000
Strongly agree	5.2%	20.7%	74.1%	
Agree	11.6%	39.5%	48.8%	
Neutral	53.8%	34.6%	11.5%	
Disagree	50.0%	35.0%	15.0%	
Strongly disagree	42.9%	42.9%	14.3%	
I find it easier to learn when teachers use technology tools to explain topics.				0.025
Strongly agree	25.9%	20.7%	53.4%	
Agree	15.5%	27.6%	56.9%	
Neutral	3.4%	48.3%	48.3%	
Disagree	11.1%	44.4%	44.4%	
Strongly disagree	14.3%	71.4%	14.3%	
I enjoy lessons more when teachers use simulations and virtual tools.				0.030
Strongly agree	11.6%	27.5%	60.9%	
Agree	15.4%	34.6%	50.0%	
Neutral	13.6%	40.9%	45.5%	
Disagree	33.3%	44.4%	22.2%	
Strongly disagree	55.6%	11.1%	33.3%	

I perform better when teachers share online resources, such as Google Classroom.				0.240
Strongly agree	13.3%	23.3%	63.3%	
Agree	17.1%	26.8%	56.1%	
Neutral	17.4%	43.5%	39.1%	
Disagree	18.2%	40.9%	40.9%	
Strongly disagree	26.7%	46.7%	26.7%	
Technology helps me work better with my classmates.				0.023
Strongly agree	13.0%	22.2%	64.8%	
Agree	8.5%	42.4%	49.2%	
Neutral	33.3%	19.0%	47.6%	
Disagree	29.4%	35.3%	35.3%	
Strongly disagree	30.0%	40.0%	30.0%	
Educational games and apps make learning more fun for me.				0.000
Strongly agree	14.3%	27.0%	58.7%	
Agree	10.7%	30.4%	58.9%	
Neutral	0.0%	64.3%	35.7	
Disagree	35.0%	25.0%	40.0%	
Strongly disagree	62.5%	37.5%	0.0%	
My grades improve when teachers use technology to assign and provide feedback.				0.047
Strongly agree	19.7%	23.0%	57.4%	
Agree	5.5%	38.2%	56.4%	
Neutral	20.0%	40.0%	40.0%	
Disagree	33.3%	41.7%	25.0%	
Strongly disagree	37.5%	12.5%	50.0%	
Watching recorded lessons shared by teachers helps me understand the subject.				0.394
Strongly agree	20.0%	25.0%	55.0%	
Agree	11.3%	34.0%	54.7%	
Neutral	9.1%	31.8%	59.1%	
Disagree	27.8%	44.4%	27.8%	
Strongly disagree	25.0%	37.5%	37.5%	
I stay focused better when teachers use Smart Boards.				0.061
Strongly agree	9.1%	29.1%	61.8%	
Agree	11.1%	37.0%	51.9%	
Neutral	22.7%	31.8%	45.5%	
Disagree	41.2%	29.4%	29.4%	
Strongly disagree	30.8%	23.1%	46.2%	
I understand complex topics better when teachers use real-life examples through technology.				0.014
Strongly agree	11.9%	23.9%	64.2%	
Agree	22.4%	36.2%	41.4%	
Neutral	4.8%	47.6%	47.6%	
Disagree	37.5%	0.0%	62.5%	
Strongly disagree	28.6%	57.1%	14.3%	
I can study more effectively at home when the teacher provides us with digital resources.				0.000
Strongly agree	13.6%	25.4%	61.0%	
Agree	7.8%	31.4%	60.8%	
Neutral	9.1%	36.4%	54.4%	
Disagree	35.0%	45.0%	20.0%	
Strongly disagree	66.7%	33.3%	0.0%	
I participate more in class discussions when we use technology, such as online discussion boards.				0.399
Strongly agree	22.0%	28.8%	49.2%	
Agree	12.2%	24.5%	63.3%	
Neutral	13.3%	46.7%	40.0%	

Disagree	10.0%	30.0%	60.0%
Strongly disagree	23.1%	38.5%	38.5%

Table 3 illustrates that students who strongly agreed that apps and computer programs improved their grades demonstrated a higher proportion of 'A' grades (59.1%) compared to peers who disagreed or remained neutral ($p = .001$). Similarly, those who strongly agreed that online quizzes enhanced recall exhibited the most notable grade distribution, with 74.1% securing 'A' grades, showcasing a highly significant association ($p = .000$). In contrast, a majority of students who disagreed or remained neutral fell into lower grade categories.

Students who found it easier to learn through technology tools ($p = .025$) or who enjoyed simulations and virtual tools ($p = .030$) also demonstrated stronger academic performance, underscoring the positive influence of interactive learning resources. Interestingly, those affirming that technology improved collaboration with classmates were more likely to achieve higher grades as well ($p = .023$), suggesting that peer-based digital interaction may reinforce comprehension and engagement. The statement, *"I can study better at home when teachers give us digital resources,"* presented one of the strongest associations with academic success ($p = .000$). Notably, over 60% of students who strongly agreed or agreed with this statement secured 'A' grades. In contrast, a sharp reversal appeared among those who disagreed or strongly disagreed, none of whom reported an 'A' grade. This finding reinforces the significance of home-based digital support in reinforcing classroom learning.

However, not all statements yielded statistically significant associations. For example, students' perceptions regarding videos and multimedia, Smart board usage, and online discussions did not show strong correlations with overall grades, as indicated by their non-significant p-values ($p > .05$). These responses, while positive in sentiment, suggest that certain technologies may enhance engagement without necessarily translating into measurable academic improvement.

Discussion

The present study examined students' perceptions of classroom technology integration in private primary schools and its influence on academic performance. The findings indicate that students primarily associate instructional technologies—such as educational apps, online quizzes, digital simulations, and smart boards—with enhanced comprehension, engagement, and academic success. The strongest associations were observed with digital assessment tools and home learning resources. Students who agreed that online quizzes helped them remember material were significantly more likely to achieve higher grades. This finding aligns with those of Farooqi et al. (2024), who observed that formative digital assessments effectively foster metacognitive awareness and retention in young learners when purposefully embedded within instruction.

Similarly, students who affirmed that digital resources supported home study also showed higher academic outcomes. These insights align with Raja et al. (2023), who argue that autonomy-supportive platforms enable students to review material at their own pace, particularly in environments where individualized support may be limited during school hours. Not all technological tools, however, showed consistent relationships with achievement. Perceptions of multimedia use and smartboard engagement were largely positive, yet not statistically significant in influencing grades. This supports Chen et al. (2021), who highlight that while such tools enhance engagement, their academic utility depends on the depth of instructional design and integration. The Puentedura (2021) emphasizes that unless technology moves beyond substitution to modification or redefinition of tasks, its transformative impact may be limited.

One compelling thread throughout the analysis is the influence of teacher proficiency. Students expressed greater benefits from technology when tools were used consistently, clearly, and interactively. This finding aligns with Hernandez et al. (2023), who identified teacher digital fluency as a determining factor in whether classroom technologies enhance or dilute pedagogical value. Likewise, O'Connor et al. (2022) noted that in South Asian private schools, professional development has a direct influence on both teacher confidence and student perceptions of digital learning effectiveness. An important nuance emerged around collaborative technologies. While some students associated online tools, such as discussion boards, with improved connectivity, their academic benefits were not consistently realized. This aligns with Nguyen et al. (2023), who argue that collaboration tools require scaffolding, moderation, and clarity of intent to yield measurable outcomes. Moreover, students' access to devices and their level of digital literacy may mediate the effectiveness of such tools (Fisher & Peterson, 2023), underscoring the need for inclusive design.

Conclusion

This study adds to the growing discourse on educational technology by centering students' voices, an often-overlooked perspective in instructional planning. The results indicate that students in private primary schools generally view classroom technology positively, particularly when it enhances interactivity, personalization, and access to learning opportunities outside the school. Key tools, including educational apps, online quizzes, and home learning resources, were positively associated with academic achievement. These tools empower students, reinforce content retention, and encourage independent study. However, mixed perceptions surrounding discussion platforms, multimedia tools, and shared digital resources reflect the need for alignment between technological affordances and instructional purpose.

Most critically, the study emphasizes the importance of teacher readiness in facilitating successful integration. Without structured training and ongoing support, even the most advanced tools may underdeliver. As such, technology should not be viewed as a shortcut to learning, but as a scaffold, whose impact depends on human intent and pedagogical competence.

Recommendations

To ensure the effective integration of technology in primary education, schools should initiate structured professional development programs that aim to enhance teachers' competencies in digital pedagogy and instructional design. Educational administrators are encouraged to adopt interactive, age-appropriate technological tools that align with curricular standards and facilitate differentiated learning strategies. Bridging the digital divide remains a critical responsibility for policymakers and school leaders, who must provide equitable access to devices, high-speed internet, and technical support across all socioeconomic backgrounds. Periodic evaluations should be conducted to assess the impact of digital resources on students' comprehension, attention, and overall academic performance. Additionally, future research should incorporate mixed-method approaches, with a particular emphasis on public schools and teacher insights, to explore the challenges of technology implementation and its long-term effects on teaching and learning practices.

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