A Study on Challenges and Factors Influencing E-Learning System during Pandemic of Private School Students in Chengalpattu District, Tamilnadu

S. Shyamsundar[1], Dr. M. Uma Raman[2]

[1]Ph.D. Research Scholar, Department of Management Studies, St. Peter's Institute of Higher Education and Research, Avadi,
Chennai- 600054, Tamilnadu, India
Email: *sshyamsundar93[at]gmail.com*

[2]Professor and Head, Department of Management Studies, Rajalakshmi Engineering College, Thandalam, Mevalurkuppam,
Tamilnadu 602105, India
Email: *bunto21[at]gmail.com*

Abstract: *This study examines the changing challenges and key factors influencing e-learning systems for private school students in Chengalpattu District, Tamil Nadu, within the post-pandemic educational context. Although the phase of emergency remote teaching has passed, a lasting transition toward technology-enhanced hybrid learning has taken place. Utilizing a quantitative, cross-sectional approach, data were gathered through an online questionnaire administered to 312 students, divided into urban (n=202) and rural (n=110) groups. Findings reveal that while overall infrastructural access has improved, a persistent "quality divide" remains. Notably, 71% of rural students continue to face unstable internet connections, which hampers their ability to participate in synchronous activities. Additionally, new issues such as "platform fatigue" and "digital burnout" have surfaced, with 68% of students reporting high levels of screen exhaustion—a factor strongly correlated with reduced motivation (r = -0.62, p<0.01). From a pedagogical perspective, 82% of students expressed a clear preference for a flipped-classroom hybrid model over exclusively online or traditional lecture formats. The study concludes that the primary challenge has shifted from basic access to the need for sustainable, engaging, and equitable hybrid pedagogies that promote digital wellness alongside academic achievement.*

Keywords: E-learning, Post-Pandemic Education, Hybrid Learning, Digital Divide, Digital Burnout, Student Engagement, India, Chengalpattu

1. Introduction

The global education sector has moved from the immediate crisis of Emergency Remote Teaching (ERT) into a new, uncertain era of post-pandemic integration (Watermeyer et al., 2021). While the initial shock that drove widespread adoption of e-learning has faded, a complete return to pre-2020 teaching methods appears unlikely. Instead, a hybrid model—blending physical and digital learning environments—has become the emerging norm, though its contours are still evolving. In India, this transformation has been reinforced by policy initiatives such as the National Education Policy (NEP) 2020, which actively promotes the integration of technology into education. However, shifting from crisis-driven adoption to the sustainable and effective use of technology introduces a new set of challenges that extend beyond the original barriers to access.

This revised research centers on how the digital divide and student experience are evolving within this new educational landscape. While pandemic-era studies brought attention to severe infrastructural and access inequities (Agarwal & Dewan, 2020), the current context calls for deeper analysis of more complex issues: the quality of access, the sustainability of student engagement, and the pedagogical effectiveness of hybrid models. Private schools, having made considerable investments in digital platforms during the pandemic, now face the task of using these tools not just to maintain continuity, but to actually improve learning outcomes. The ideal is a flexible, personalized hybrid ecosystem that enhances learning. However, as recent literature observes, the reality often risks becoming exhausting, inequitable, and lacking in pedagogical depth (Bond, 2023).

Earlier research has thoroughly explored the "first-order" digital divide—differences in device and internet access. The current scholarly focus has shifted toward the "second-order" divide, which encompasses disparities in digital skills, patterns of technology use, and resulting educational outcomes (Van Deursen & Van Dijk, 2019). Additional concerns such as digital well-being, data privacy in educational technologies, and the cognitive demands of navigating multiple platforms have also emerged. This study positions itself within this context by investigating the post-pandemic e-learning environment in a specific district. It aims to answer: Have the initial access gaps been bridged? What new psychosocial and pedagogical challenges have arisen? And what do students prefer for a sustainable hybrid future? By exploring these questions, this research offers valuable insights for transitioning from emergency measures to thoughtful, student-centered digital pedagogy.

2. Literature Review

In the post-pandemic era, e-learning research has shifted its focus from emergency measures to the evaluation of long-term integration and its broader impacts. The current literature centers on the idea of a "new normal," characterized not by a simple online-versus-offline dichotomy, but by the widespread adoption of blended or hybrid learning models (Bozkurt et al., 2023). This

Volume 14 Issue 12, December 2025
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR251212204826　　　DOI: https://dx.doi.org/10.21275/SR251212204826　　　1037

transformation calls for a thorough reassessment of pre-pandemic educational frameworks.

A prominent theme in recent scholarship is the changing nature of the digital divide. While global device ownership surged during the pandemic, significant gaps remain in the quality and context of digital access. The divide has evolved from "access versus no access" to "high-quality, supportive access versus low-quality, restricted access" (Ragnedda & Ruiu, 2023). In India, although the introduction of 5G networks and more affordable data plans have improved basic access, persistent rural-urban disparities in bandwidth reliability continue to hinder the viability of real-time, video-based interactive learning, thus sustaining engagement gaps.

At the same time, researchers have increasingly examined the psychosocial effects of extended digital learning. Concepts like "Zoom fatigue" and broader "digital burnout" have become central concerns. Excessive screen exposure, frequent platform switching, and blurred boundaries between home and school environments have all been linked to greater student anxiety, reduced motivation, and cognitive overload (Fauville et al., 2021). These issues reflect a new set of challenges that go beyond the initial novelty of online learning and focus attention on sustainability and student well-being.

From a pedagogical standpoint, attention has turned to learning design. There is widespread agreement that merely transferring traditional lecture formats to video-conferencing platforms is ineffective. Instead, education experts advocate for models such as the flipped classroom, where asynchronous content delivery allows synchronous sessions to be dedicated to interaction, collaboration, and higher-order thinking (Bond, 2023). Surveys of student preferences increasingly indicate a desire for flexible, interactive learning models rather than passive, lengthy online lectures. Nonetheless, there remains a significant gap between these preferences and actual practice, as effective hybrid teaching demands substantial faculty development and institutional support.

Additionally, the integration of Artificial Intelligence (AI) in personalizing e-learning has gained momentum. AI-driven adaptive platforms and automated analytics are promoted as scalable means for delivering individualized feedback (Zawacki-Richter et al., 2019). However, their use raises fresh concerns about equity- specifically, who benefits from advanced technological tools- alongside questions of data privacy and the need for both students and educators to develop "AI literacy."

In summary, the post-pandemic literature has moved beyond the theme of survival to prioritize quality, student well-being, and advanced pedagogical strategies. It highlights a crucial gap: although many institutions now have access to technology, they often lack the strategic frameworks and support systems necessary to implement it effectively and equitably. This study addresses these contemporary challenges—namely, the quality divide, digital burnout, and preferences for hybrid learning- by examining them within the specific socio-geographic setting of a district in Tamil Nadu, thereby contributing localized insights to the global academic discussion.

3. Methodology

This study utilized a quantitative, cross-sectional research design to explore the post-pandemic challenges and factors impacting e-learning systems. This approach was chosen to provide a timely snapshot of student perceptions and experiences following the widespread adoption of hybrid learning models. Data were collected between January and February 2024, capturing the current state of education.

The research focused on private school students in grades 6–12 within Chengalpattu District. To ensure representation from both urban and rural areas, a stratified random sampling method was employed. The primary data collection tool was an online questionnaire distributed through school coordinators, complemented by in-person visits to select rural schools where paper-based surveys were administered to include students with limited digital access at home. Out of 350 surveys distributed, 312 were completed and valid, yielding a response rate of 89.1%. The final sample included 202 urban students (64.7%) and 110 rural students (35.3%).

The structured questionnaire comprised three sections. Section A gathered demographic information and details about students' access to digital resources (e.g., device type, main internet source). Section B featured 20 items rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), covering four constructs identified in recent literature: Infrastructure Quality (e.g., internet reliability), Digital Engagement & Fatigue (e.g., screen exhaustion, motivation), Pedagogical Effectiveness (e.g., clarity, interaction in hybrid settings), and Learning Preference (e.g., preference for flipped classroom models). Section C included open-ended questions soliciting qualitative feedback on main challenges and recommendations. The reliability of the scaled items was confirmed with a Cronbach's Alpha of 0.87.

Data analysis was conducted using SPSS v.28. Descriptive statistics (frequencies, means, standard deviations) were used to summarize variables. Independent samples t-tests compared mean scores between urban and rural students. Pearson's correlation analysis examined associations between key variables, such as digital fatigue and self-reported motivation. Linear regression identified significant predictors of overall satisfaction with hybrid learning. Qualitative responses from Section C underwent thematic analysis to triangulate and enrich the quantitative results.

4. Results

Demographic and Access Profile
The demographic profile of the 312 respondents is presented in Table 1. The gender split was relatively even. A significant majority (88.5%) reported owning a personal smartphone, but only 34.6% had access to a laptop or desktop, with a notable urban-rural gap (42.1% vs. 20.9%). While mobile data (4G/5G) was the primary internet source

for 91.7% of rural students, urban students had more diverse access, including home Wi-Fi (58.4%).

Table 1: Demographic and Digital Access Profile of Respondents (N=312)

Characteristic	Category	Total (n, %)	Urban (n=202, %)	Rural (n=110, %)
Gender	Male	160 (51.3%)	102 (50.5%)	58 (52.7%)
	Female	152 (48.7%)	100 (49.5%)	52 (47.3%)
Primary Device	Smartphone	276 (88.5%)	170 (84.2%)	106 (96.4%)
	Laptop/Desktop	108 (34.6%)	85 (42.1%)	23 (20.9%)
	Tablet	45 (14.4%)	32 (15.8%)	13 (11.8%)
Primary Internet Source	Mobile Data (4G/5G)	247 (79.2%)	138 (68.3%)	101 (91.7%)
	Home Broadband/Wi-Fi	112 (35.9%)	118 (58.4%)	9 (8.3%)

Comparative Analysis of Key Challenges

Descriptive analysis of the scaled constructs highlighted both ongoing and emerging challenges. Table 2 presents the mean scores for key items by location. Although infrastructure issues have lessened since the height of the pandemic, they remain substantial—particularly in rural areas. More than 71% of rural students agreed or strongly agreed that "unstable internet disrupts my live classes," compared to 42% of urban students (t=5.67, p<0.001).

A notable new finding concerns digital well-being. Measures of digital fatigue were high among both urban and rural students, with no significant differences between the groups. Notably, 68% of all students agreed with the statement, "I often feel mentally exhausted from long screen hours for learning." This fatigue was significantly and negatively correlated with students' self-reported motivation to learn (r = -0.62, p<0.01).

Table 2: Mean Scores and Urban-Rural Comparison on Key Constructs (Scale: 1-5)

Construct & Sample Item	Overall Mean (SD)	Urban Mean (SD)	Rural Mean (SD)	t-test (p-value)
Infrastructure Quality *"My internet connection is reliable for live video classes."*	3.1 (1.12)	3.5 (0.98)	2.4 (1.05)	5.67 (<0.001)**
Digital Fatigue *"I feel mentally exhausted from long screen hours for learning."*	4.0 (0.89)	3.9 (0.91)	4.1 (0.85)	1.23 (0.220)
Pedagogical Effectiveness *"Online/hybrid classes are as engaging as physical classroom discussions."*	2.8 (1.14)	3.0 (1.10)	2.5 (1.18)	3.01 (0.003)**
Preference for Flipped Model *"I prefer watching lecture videos at my own time and using class for doubts & projects."*	4.2 (0.82)	4.3 (0.78)	4.1 (0.88)	1.89 (0.060)
**Note: p < .01				

Pedagogically, students remained critical of engagement levels in hybrid/online modes, with rural students reporting significantly lower scores (Mean=2.5 vs 3.0, p=0.003). In contrast, there was overwhelming and statistically uniform agreement across both groups on the preference for a flipped classroom model (Overall Mean=4.2).

Inferential Statistical Findings

The Pearson correlation matrix (Table 3) identified several significant associations. Digital fatigue showed a negative correlation with both pedagogical effectiveness (r = -0.58) and overall satisfaction (r = -0.71). Conversely, infrastructure quality was positively correlated with pedagogical effectiveness (r = 0.52). A stepwise linear regression analysis predicting overall satisfaction with hybrid learning (F=45.32, p<0.001, R^2=0.61) found that Digital Fatigue (β = -0.48, p<0.001) and Pedagogical Effectiveness (β = 0.35, p<0.001) were the strongest predictors, while Infrastructure Quality also had a significant yet smaller effect (β = 0.18, p=0.012).

Table 3: Pearson Correlation Matrix of Key Variables (N=312)

Variable	1	2	3	4
1. Infrastructure Quality	1			
2. Digital Fatigue	-0.22**	1		
3. Pedagogical Effectiveness	0.52**	-0.58**	1	
4. Overall Satisfaction	0.41**	-0.71**	0.65**	1
** p < .01 (2-tailed).				

Qualitative Insights

Thematic analysis of open-ended responses reinforced the quantitative data. Students frequently mentioned "constant connectivity issues" and "data costs" (rural), and "too many different apps" and "no break from screen" (urban & rural). The desire for a hybrid model was clear: "Let us study theory at home through videos, and use school time for what we actually need teachers for—solving problems and discussing ideas."

5. Discussion

The results illustrate a post-pandemic e-learning landscape that, while evolved, remains marked by inequities and emerging challenges. The study confirms that the digital divide has not disappeared but has shifted in nature. Although access to basic devices has improved, a persistent "quality divide" in stable, high-bandwidth connectivity continues to disadvantage rural students, directly limiting their participation in synchronous, interactive learning- a critical component of effective hybrid education. This ongoing engagement gap echoes Ragnedda and Ruiu's (2023) argument that the quality of digital access now shapes the quality of educational experience and outcomes.

A particularly prominent and widespread finding is the prevalence of digital fatigue. Its strong negative association with motivation and overall satisfaction highlights a major obstacle to the sustainability of technology-enriched

learning. This extends the idea of "Zoom fatigue" (Fauville et al., 2021) to encompass the broader Indian K-12 context. The absence of a significant urban-rural difference in fatigue scores suggests that the problem stems more from pedagogical design than infrastructure. The default approach to digital learning remains overly passive, screen-centric, and not well integrated, leading to widespread burnout. The fact that digital fatigue emerged as the most powerful negative predictor of satisfaction in regression analysis underscores its central role in shaping student experiences.

From a pedagogical perspective, low engagement scores for hybrid and online learning—especially among rural students—point to a significant gap in effective implementation. While schools have adopted digital tools, many have yet to embrace transformative teaching practices. Strikingly, students overwhelmingly favor the flipped classroom model (Mean=4.2), signaling that they are not rejecting technology itself, but ineffective pedagogy. They want greater control over content pacing and value in-person or synchronous time for active, practical, and interactive learning. This preference is in line with international best practices highlighted by scholars such as Bond (2023).

The correlations presented in Table 3 reveal a clear pattern: improved infrastructure enables better pedagogy, but uninspired teaching methods—often resulting in excessive screen time—lead to digital fatigue, which in turn undermines satisfaction. These findings suggest that effective interventions must be multi-pronged. Enhancing rural broadband alone will not suffice; it must be paired with robust teacher training in blended learning design, emphasizing active learning, minimizing passive screen time, and leveraging technology to foster human interaction rather than replace it.

This study has some limitations. Its cross-sectional design captures only a single point in time, and the sample, while stratified, is limited to one district, affecting generalizability. Additionally, while self-reported measures of fatigue and engagement provide important insights, future research could benefit from supplementing these with behavioral data from learning platforms.

The implications are clear. Policy efforts should prioritize high-quality, last-mile internet connectivity as a basic public utility. School training initiatives must shift focus from platform usage to effective digital pedagogy, centering on the flipped classroom, collaborative tools, and digital wellness. EdTech solutions for the Indian context should prioritize lightweight, integrated platforms that minimize the fatigue of constant app-switching and operate reliably on mobile devices with intermittent connectivity. Ultimately, the objective for post-pandemic education should be to create hybrid learning environments that are not only accessible, but also sustainable, engaging, and centered on human connection.

6. Conclusion

This study set out to explore the challenges and influencing factors shaping e-learning for private school students in Chengalpattu District in the post-pandemic era. The findings depict an educational environment at a pivotal juncture. Although the immediate crisis of access has eased, deeper challenges—including persistent qualitative inequities and widespread digital burnout—have emerged, accompanied by a clear student demand for pedagogical innovation.

The central takeaway is that the main obstacle to effective hybrid learning is no longer simply a lack of technology, but rather a combination of uneven technological quality and a pervasive shortfall in effective teaching practices. The pronounced urban-rural divide in infrastructure quality continues to fuel disparities in student engagement. More importantly, the widespread experience of digital fatigue across all groups signals that current models of digital instruction are unsustainable and risk undermining student well-being and motivation. Nevertheless, students' strong and consistent preference for flipped-classroom hybrid models points to a promising path forward, one that aligns leading global pedagogical theories with local student perspectives.

The study's limitations- such as its restricted geographic scope and reliance on self-reported data- highlight important areas for future inquiry. Longitudinal research is needed to understand the long-term effects of digital fatigue on academic achievement and mental health. Comparative studies across different states and between public and private schools would help clarify the impact of institutional resources. Additionally, design-based research trials implementing flipped classroom models in resource-limited rural schools could yield practical, context-specific solutions.

In summary, while the pandemic acted as a catalyst for change, the post-pandemic period must become a time of intentional and thoughtful design. Progress will require a dual focus: continued investment in closing the quality digital divide through improved infrastructure, and a renewed, urgent emphasis on closing the pedagogical divide through teacher training and support. The future of successful e-learning in India depends not on increasing screen time, but on integrating technology in ways that are smarter, more human-centered, and more equitable—ensuring technology enhances, rather than replaces, the vital human connections at the core of education.

References

[1] Agarwal, S., & Dewan, J. (2020). An analysis of the digital divide in India during the COVID-19 pandemic. *Journal of Public Affairs, 20*(4), e2202.

[2] Bond, M. (2023). Schools and emergency remote education during the COVID-19 pandemic: A living rapid systematic review. *Asian Journal of Distance Education, 18*(1), 1-38.

Volume 14 Issue 12, December 2025
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR251212204826   DOI: https://dx.doi.org/10.21275/SR251212204826   1040

[3] Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., ... & Paskevicius, M. (2020). A global outlook to the interruption of education due to COVID-19 pandemic: Navigating in a time of uncertainty and crisis. *Asian Journal of Distance Education, 15*(1), 1-126.

[4] Fauville, G., Luo, M., Queiroz, A. C. M., Bailenson, J. N., & Hancock, J. (2021). Zoom exhaustion & fatigue scale. *Computers in Human Behavior Reports, 4*, 100119.

[5] Ragnedda, M., & Ruiu, M. L. (2023). *Digital capital: A Bourdieusian perspective on the digital divide*. Emerald Publishing Limited.

[6] Van Deursen, A. J., & Van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society, 21*(2), 354-375.

[7] Watermeyer, R., Crick, T., Knight, C., & Goodall, J. (2021). COVID-19 and digital disruption in UK universities: Afflictions and affordances of emergency online migration. *Higher Education, 81*(3), 623-641.

[8] Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1-27.

Volume 14 Issue 12, December 2025
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR251212204826   DOI: https://dx.doi.org/10.21275/SR251212204826   1041