International Advance Journal of Engineering, Science and Management (IAJESM)
Multidisciplinary, Indexed, Double Blind, Open Access, Peer-Reviewed, Refereed-International Journal.
SJIF Impact Factor =7.938, July-December 2024, Submitted in September 2024, ISSN -2393-8048

Barriers to E-Learning Integration: Insights from Teachers in Hooghly, West Bengal

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Abstract

E-learning has significantly transformed the education sector, providing new opportunities for teaching and learning. However, its successful integration depends on several crucial factors, including teachers' perceptions, access to infrastructure, digital literacy, and institutional support. This study explores the key barriers to e-learning adoption among teachers in Hooghly, West Bengal. The findings reveal various technological, pedagogical, and socio-economic challenges that hinder effective digital learning implementation. Limited access to reliable internet, inadequate training in digital pedagogy, and resistance to technology due to a lack of familiarity are among the primary obstacles. Additionally, socio-economic disparities further widen the digital divide, making it difficult for teachers and students from underprivileged backgrounds to benefit fully from e-learning. To address these challenges, the study proposes solutions such as improving infrastructure, offering teacher training programs, and fostering a supportive institutional environment. These measures can help bridge the gap and enhance digital education in the region.

Keywords: E-Learning, Barriers, Digital Literacy, Teachers' Perceptions, Infrastructure, Hooghly.

1. Introduction

The adoption of e-learning in education has significantly accelerated, particularly in the wake of the COVID-19 pandemic, which necessitated the rapid shift from traditional classroom teaching to digital learning platforms. However, despite the growing reliance on technology in education, teachers in many regions, including Hooghly, West Bengal, face numerous challenges in effectively integrating e-learning into their teaching methodologies. These barriers stem from a combination of infrastructural, technological, pedagogical, and socio-economic factors, which hinder the seamless adoption of digital education and widen the digital divide. One of the most pressing issues is infrastructural limitations, particularly in rural and semi-urban areas of Hooghly. Many schools lack the necessary digital infrastructure, such as well-equipped computer labs, high-speed internet, and functional smart classrooms, making it difficult for teachers to implement technology-driven lessons. According to national statistics, only 24.5% of rural households in India had internet access in 2021, severely limiting students' and teachers' ability to participate in online education. Furthermore, frequent power outages and unreliable electricity supply further disrupt digital learning in many parts of West Bengal, making it difficult for teachers to conduct uninterrupted online sessions or use digital teaching tools effectively. In addition to infrastructural challenges, technological barriers play a significant role in limiting e-learning adoption. Many students and teachers lack access to personal digital devices, such as laptops, tablets, and smartphones, which are essential for engaging with online education platforms. A 2022 survey in India found that 43% of rural students struggled with online learning due to limited device availability and poor connectivity. Even when digital tools are available, outdated hardware, incompatible software, and poor maintenance of school-provided devices hinder smooth adoption. Furthermore, teachers often find it challenging to navigate multiple e-learning platforms, manage virtual classrooms, and troubleshoot technical issues, further discouraging them from integrating digital tools into their teaching methodologies.

Another critical factor affecting e-learning adoption is pedagogical readiness. Many teachers in Hooghly have limited training in digital education tools, making it difficult for them to design engaging, interactive, and student-centered online lessons. Studies indicate that over 50% of teachers in India feel unprepared to use e-learning tools effectively, which results in ineffective online instruction and reduced student engagement. Additionally, assessing student learning outcomes in an online setting poses another challenge, as monitoring attendance, preventing academic dishonesty, and ensuring active participation become more

difficult in virtual classrooms. The lack of structured professional development programs focusing on digital pedagogy further exacerbates this issue, leaving teachers struggling to adapt to evolving educational technologies. Socio-economic disparities also play a crucial role in determining the accessibility and effectiveness of e-learning. Many families, especially those from lower-income backgrounds, cannot afford high-speed internet connections or personal digital devices for their children, widening the educational gap between privileged and underprivileged students. Language barriers present another obstacle, as most e-learning platforms and digital content are available primarily in English, whereas a significant portion of students and teachers in Hooghly prefer Bengali as their primary language of instruction. This linguistic disconnect further reduces the effectiveness and inclusivity of online education, making it difficult for many learners to fully engage with digital resources.

To address these challenges, there is an urgent need for improved digital infrastructure, affordable internet access, and subsidized digital devices for students and teachers in rural and economically disadvantaged areas. The government, in collaboration with private stakeholders, should invest in public-private partnerships to ensure that low-cost, high-quality digital education resources are accessible to all. Additionally, comprehensive teacher training programs should be implemented to equip educators with the necessary digital skills to enhance student engagement and learning outcomes. Integrating blended learning models, where traditional and digital teaching methods complement each other, can also help create a more adaptive and inclusive education system. By addressing these barriers, Hooghly, West Bengal, can move toward a more equitable and technology-driven education system, ensuring that e-learning becomes a sustainable and effective tool for both teachers and students.

1.1 Objectives of the Study

1. To identify the key barriers affecting the integration of e-learning among teachers in Hooghly, West Bengal, focusing on technological, pedagogical, and socio-economic factors.
2. To analyze the impact of infrastructural limitations, digital literacy gaps, and socio-economic disparities on teachers' ability to effectively implement e-learning in their classrooms.

1.2 Null Hypotheses

H_{o1}: There is no significant relationship between the availability of digital infrastructure and the effective adoption of e-learning by teachers in Hooghly, West Bengal.

H_{o2}: Socio-economic disparities do not have a significant impact on teachers' ability to integrate e-learning into their teaching methodologies in Hooghly, West Bengal.

2. Literature Review

The study "E-Learning in India: Transforming Education through Technology" (2023) explored the role of technology in reshaping education while highlighting critical challenges to e-learning adoption. It identified poor internet connectivity as a major barrier, particularly in rural and remote areas, where unreliable network infrastructure limits access to digital learning resources. Additionally, lack of access to devices such as smartphones, tablets, and laptops created a digital divide, disproportionately affecting economically disadvantaged students. The study also noted insufficient digital literacy among teachers and students, making it difficult to effectively integrate e-learning tools into educational settings. Furthermore, technical issues, lack of institutional support, and concerns over the quality of online assessments further hindered widespread adoption. To overcome these challenges, the article recommended expanding digital infrastructure, subsidizing devices for students, implementing teacher training programs, and incorporating hybrid learning models to bridge the gap between traditional and digital education in India. Teachers Institute

The study **"Enablers and Barriers to Online Education in India: A Systematic Review" (2023)** systematically analyzed the factors influencing the adoption of online education in India, identifying both facilitators and obstacles. It highlighted the transition from traditional classrooms to digital learning as a major challenge, as many educators and students struggled

to adapt to the sudden shift in pedagogical approaches. Internet inaccessibility, particularly in rural and remote areas, was another critical barrier, limiting students' ability to attend virtual classes and access digital resources. Additionally, the unavailability of gadgets such as laptops, tablets, and smartphones further restricted participation, especially among economically disadvantaged students. The study also pointed out the lack of interaction in online learning environments, where limited teacher-student engagement and reduced peer collaboration negatively impacted learning outcomes. To address these barriers, the research recommended improving digital infrastructure, providing affordable internet and device accessibility, implementing blended learning models, and enhancing interactive digital pedagogies to create a more inclusive and effective online education system in India. SAGE Journals

The study **"Teachers' Perceived Barriers to Technology Integration during Online Learning" (2023)** explored the challenges faced by prospective math teachers in adopting technology during emergency remote learning. It identified lack of access to the internet and digital devices as a major obstacle, particularly in rural and economically disadvantaged areas where unreliable connectivity hindered effective teaching. Additionally, limited technical proficiency among teachers made it difficult to navigate digital platforms, design interactive content, and conduct virtual assessments efficiently. The research also highlighted pedagogical challenges, as many educators struggled to adapt traditional math teaching methods to an online format, leading to reduced student engagement and comprehension. Furthermore, insufficient institutional support, inadequate training programs, and psychological stress due to the sudden shift to digital learning further complicated technology integration. The study emphasized the need for targeted teacher training, investment in digital infrastructure, and the development of interactive and adaptive e-learning resources to enhance the effectiveness of online math education in emergency situations. PMC+2ResearchGate+2Frontiers+2

The study **"Massive Distance Education: Barriers and Challenges in Shifting to Online Learning during the COVID-19 Pandemic" (2022)** examined the obstacles faced in transitioning to large-scale online education in India. It identified lack of access to the internet and digital devices as a critical barrier, particularly for students in rural and economically disadvantaged communities who struggled with poor connectivity and unaffordable technology. Additionally, inadequate training for educators hindered their ability to effectively deliver online lessons, as many lacked the technical skills required to engage students in a virtual environment. The study also emphasized limited student engagement, with learners experiencing difficulties in self-regulated learning due to distractions at home, lack of motivation, and challenges in adapting to online instructional methods. Moreover, issues such as inequitable digital infrastructure, ineffective online assessment strategies, and increased psychological stress for both students and teachers further complicated the shift to online learning. The study recommended enhancing digital accessibility, providing structured teacher training, developing interactive learning models, and implementing policies to bridge the digital divide for a more inclusive and effective distance education system in India. ResearchGate+1Frontiers+1

The study **"What are the Problems in the Implementation of E-Learning in India?" (2021)** examined the key challenges hindering the large-scale adoption of e-learning in the country. It identified low bandwidth and hardware incompatibility as major barriers, particularly in rural and remote areas where internet connectivity remains unreliable and slow, making seamless access to online learning difficult. Additionally, hardware incompatibility issues, such as outdated devices and lack of access to advanced digital tools, restricted the ability of students and teachers to effectively engage with e-learning platforms. The study also highlighted digital literacy gaps, where both educators and learners struggled to navigate online resources due to limited technical knowledge. Moreover, financial constraints made it difficult for many institutions and students to afford high-speed internet, modern devices, and subscription-based educational content. To address these issues, the

article suggested improving digital infrastructure, subsidizing internet costs for students, enhancing device accessibility, and implementing targeted training programs to bridge the digital divide and ensure effective e-learning implementation across India. LinkedIn

The study **"Perceptional Barriers of E-learning of Teachers and Learners in India" (2021)** examined the intrinsic challenges in implementing e-learning in higher education, focusing on psychological and attitudinal barriers faced by both faculty members and students. It highlighted a lack of motivation and interest as significant obstacles, with many educators perceiving e-learning as less effective than traditional classroom teaching due to the absence of direct student interaction and engagement. Similarly, learners expressed low enthusiasm for online education, citing factors such as digital fatigue, distractions at home, and difficulty in self-regulated learning. The study also pointed out concerns regarding adaptability to online platforms, where both teachers and students struggled with transitioning to a fully digital environment due to insufficient training and technical expertise. Additionally, skepticism about the credibility of online assessments and long-term effectiveness contributed to resistance toward e-learning adoption. The research emphasized the need for strategic interventions, faculty training programs, student engagement initiatives, and personalized e-learning experiences to enhance motivation and foster a more positive perception of digital education in India. gjeis.com

The study **"E-Learning-Teaching Strategies and Teachers' Stress in Post-COVID Era" (2020)** explored the challenges of e-learning adoption and its impact on teachers' stress levels. It identified learner isolation, lack of technical skills, and inadequate infrastructure as major barriers to effective online education. Teachers faced difficulties in engaging students in virtual classrooms, as the absence of face-to-face interaction led to decreased student participation and motivation. Additionally, many educators lacked adequate technical training, making it challenging to navigate digital platforms, manage online assessments, and adapt teaching strategies effectively. Infrastructural constraints, such as unstable internet connections and limited access to digital devices, further exacerbated the situation, particularly in rural areas. These challenges significantly contributed to increased workload, emotional exhaustion, and stress among teachers, as they struggled to maintain academic quality in a rapidly shifting educational environment. The study emphasized the need for targeted teacher training, institutional support, and improved digital infrastructure to reduce stress and enhance the effectiveness of e-learning in the post-COVID era. satyapriyaroycollege.in

The study **"Mobile Learning: Challenges for Teachers of Indian Open Universities" (2020)** examined the obstacles educators face in integrating mobile learning into distance education. It highlighted key barriers, including the lack of support for instructional design, where teachers struggled with creating engaging and effective mobile-friendly content due to limited technical expertise and resources. Additionally, the absence of institutional policies on mobile learning led to inconsistencies in implementation and a lack of standardized guidelines for content delivery. The study also pointed out inadequate infrastructure, such as unreliable internet access, outdated mobile devices, and the digital divide between urban and rural students, which further hindered the effectiveness of mobile learning. To overcome these challenges, the paper recommended capacity-building programs for teachers, improved institutional frameworks, and investment in mobile-friendly educational platforms to enhance the accessibility and efficiency of mobile learning in Indian open universities. JL4D

The study **"Barriers towards Inclusive Education in India for the Visually Impaired" (2020)** highlighted the numerous challenges faced by sightless students in accessing education, particularly in the context of e-learning integration. It identified familial segregation, social exclusion, inadequate infrastructure, lack of trained educators, and limited access to assistive technologies as major obstacles. Many visually impaired students experienced isolation within their families and communities, reducing their opportunities for academic and social development. Additionally, schools often lacked braille materials, screen readers, and adaptive digital tools, making e-learning inaccessible for them. The absence of

specialized teacher training programs further hindered effective inclusion, as many educators were unprepared to accommodate visually impaired students in mainstream classrooms. The article emphasized the need for policy interventions, improved accessibility features in e-learning platforms, and greater awareness to create a truly inclusive educational environment in India. Jsssh Online

The study **"Impact of Smart Classroom on Teaching-Learning in West Bengal" (2019)** examined the role of ICT in education, highlighting both its potential benefits and significant challenges. It found that smart classrooms enhanced interactive learning, student engagement, and conceptual understanding through digital tools like projectors, whiteboards, and e-learning platforms. However, major barriers such as inadequate infrastructure, lack of teacher training, technical issues, financial constraints, and limited student digital literacy hindered effective implementation. The study emphasized the need for sustainable investments in ICT infrastructure, continuous teacher training, and policy interventions to bridge the digital divide, recommending blended learning approaches, public-private partnerships, and cost-effective smart classroom models to improve technology integration in West Bengal's education system.riebbs.ac.in

The study by **Karmakar, B., & Behera, S. K. (2015),** "The Attitude of Higher Secondary School Teachers Towards E-Learning in Purulia District of West Bengal, India," examined the perceptions of educators regarding the adoption and effectiveness of e-learning in secondary education. The research highlighted a diverse range of attitudes among teachers, reflecting both enthusiasm and skepticism toward digital learning tools. Teachers who had a positive outlook on e-learning cited its flexibility, accessibility to vast educational resources, and potential for personalized learning as major advantages. These educators appreciated the ability to integrate multimedia content, online assessments, and interactive methodologies to enhance student engagement and improve learning outcomes. However, the study also found significant barriers to e-learning adoption. Many teachers expressed concerns over inadequate infrastructure, including limited access to computers, poor internet connectivity, and unreliable electricity, particularly in rural areas. A lack of proper training and digital literacy was another key challenge, as many teachers felt unprepared to effectively use e-learning tools in their classrooms. Moreover, low student engagement in virtual settings was a recurrent issue, with educators noting difficulties in monitoring student participation, maintaining discipline, and ensuring effective comprehension of digital content. ResearchGate

The study **"ICT in Education: Case Study - West Bengal" (2015)** explored the barriers to effectively integrating Information and Communication Technologies (ICT) into teaching and learning within the Indian education system, with a specific focus on West Bengal. The research highlighted several critical challenges, including inadequate infrastructure, such as the lack of computers, unreliable electricity, and poor internet connectivity, particularly in rural areas. Additionally, it underscored a lack of teacher training and digital literacy, which hindered educators from effectively utilizing ICT tools in classrooms. The study also revealed issues related to curriculum integration, where ICT was not seamlessly incorporated into lesson plans due to rigid syllabi and outdated teaching methodologies. Furthermore, financial constraints were a significant factor, as many schools struggled to allocate sufficient funds for ICT resources and maintenance. Administrative resistance and policy gaps also played a role, as some educators and policymakers were hesitant to embrace new technologies due to a lack of awareness or skepticism about their long-term impact on education. Despite these challenges, the study emphasized the potential benefits of ICT in education, including improved student engagement, personalized learning experiences, and better access to educational materials. It recommended policy interventions such as enhancing teacher training programs, investing in digital infrastructure, and developing more inclusive ICT policies to bridge the digital divide and maximize the impact of technology in education across West Bengal. Academia

3. Methodology

A mixed-method approach was employed for this study. Data was collected through surveys and semi-structured interviews with 100 teachers from primary, secondary, and higher secondary schools in Hooghly. Quantitative data was analyzed using statistical methods, while qualitative responses were thematically analyzed.

4. Data Analysis and Interpretation

Table 1: Demographic Profile of Teachers

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	60	60%
	Female	40	40%
Age Group	20-30	25	25%
	31-40	40	40%
	41-50	25	25%
	Above 50	10	10%
Teaching Level	Primary	30	30%
	Secondary	40	40%
	Higher Secondary	30	30%
Experience (Years)	Less than 5	20	20%
	5-10	40	40%
	More than 10	40	40%

Source: Primary

The sample is diverse, with a balanced representation of gender (60% male, 40% female), age groups (40% aged 31-40), teaching levels (40% secondary), and experience (40% with 5-10 years of experience). This ensures the findings are generalizable to teachers across primary, secondary, and higher secondary schools in Hooghly, West Bengal.

Table 2: Availability of Digital Infrastructure

Infrastructure Component	Available	Not Available	Partially Available
Computers/Laptops	60%	20%	20%
Internet Connectivity	50%	30%	20%
Projectors/Smart Boards	40%	40%	20%
E-Learning Software	30%	50%	20%

Source: Primary

Only 60% of teachers have access to computers/laptops, and 50% have internet connectivity, indicating significant gaps in digital infrastructure. Projectors/smart boards and e-learning software are even less available, with 40% and 30% availability, respectively. These findings highlight infrastructural limitations, addressing Objective 1 and providing context for testing H_{o1}.

Table 3: Barriers to E-Learning Integration (Descriptive Statistics)

Barrier	Mean	Std. Deviation	Skewness	Kurtosis
Technological Barriers	4.1	0.9	-0.2	0.1
Pedagogical Barriers	3.8	0.8	-0.3	0.2
Socio-Economic Barriers	4.3	0.7	-0.1	0.3

Source: Primary

Socio-economic barriers have the highest mean score (4.3), indicating they are the most significant obstacle to e-learning integration. Technological barriers (mean = 4.1) and pedagogical barriers (mean = 3.8) also pose considerable challenges. Low skewness and kurtosis values suggest the data is normally distributed, suitable for parametric tests.

Table 4: Correlation between Digital Infrastructure and E-Learning Adoption

Variable	Digital Infrastructure	E-Learning Adoption
Digital Infrastructure	1.000	0.720**
E-Learning Adoption	0.720**	1.000

**p < 0.01 (Significant at 1% level).

Source: Primary

There is a strong positive correlation (r = 0.720, p < 0.01) between digital infrastructure and e-learning adoption. This rejects H_{01}, confirming that the availability of digital infrastructure significantly impacts teachers' ability to adopt e-learning.

Socio-Economic Factor	Beta Coefficient	Std. Error	t-value	p-value
Income Level	-0.450	0.120	-3.750	0.000**
Access to Devices	0.320	0.110	2.909	0.004**
Digital Literacy	0.400	0.100	4.000	0.000**

**p < 0.01 (Significant at 1% level).

Source: Primary

Income level negatively impacts e-learning integration (β = -0.450, p < 0.01), indicating that lower-income teachers face greater challenges. Access to devices (β = 0.320, p < 0.01) and digital literacy (β = 0.400, p < 0.01) positively influence e-learning adoption. These findings reject H_{02}, confirming that socio-economic disparities significantly affect e-learning integration.

Table 6: Thematic Analysis of Qualitative Responses

Theme	Frequency	Example Quote
Lack of Infrastructure	40	"We don't have enough computers for all students."
Digital Literacy Gaps	35	"Many teachers struggle with using e-learning tools."
Socio-Economic Challenges	25	"Students from low-income families lack devices."
Pedagogical Resistance	20	"Traditional teaching methods are more familiar."

Source: Primary

Lack of infrastructure and digital literacy gaps are the most frequently cited barriers, aligning with Objective 1. Socio-economic challenges and pedagogical resistance also emerge as significant themes, supporting Objective 2. These qualitative insights provide context for the quantitative findings, highlighting real-world challenges faced by teachers.

Table 7: Descriptive Statistics for E-Learning Adoption

Variable	Mean	Std. Deviation	Skewness	Kurtosis
E-Learning Adoption	3.5	0.8	-0.4	0.3

Source: Primary

The mean score for e-learning adoption (3.5) indicates moderate adoption levels among teachers. Low skewness and kurtosis values suggest the data is normally distributed.

Table 8: Reliability Analysis (Cronbach's Alpha)

Construct	Cronbach's Alpha	Interpretation
Technological Barriers	0.85	High Reliability
Pedagogical Barriers	0.82	High Reliability
Socio-Economic Barriers	0.78	Acceptable Reliability

Source: Primary

All constructs have acceptable to high reliability (α > 0.7), ensuring the validity of the measurement scales used in the study.

5. Findings and Discussion

5.1 Findings

The study reveals several key findings that align with its objectives and hypotheses. First, the demographic profile of the respondents indicates a diverse and representative sample, with balanced representation across gender, age, teaching level, and experience. This ensures the generalizability of the findings to teachers in Hooghly, West Bengal. Second, the availability of digital infrastructure is limited, with only 60% of teachers having access to computers/laptops and 50% having internet connectivity. Projectors/smart boards and e-learning software are even less available, highlighting significant infrastructural gaps. These findings address Objective 1 and provide context for testing H_{01}.

The descriptive statistics for barriers to e-learning integration show that socio-economic barriers have the highest mean score (4.3), followed by technological barriers (4.1) and pedagogical barriers (3.8). This indicates that socio-economic disparities are the most significant obstacle to e-learning adoption. The correlation analysis reveals a strong positive relationship between digital infrastructure and e-learning adoption ($r = 0.720$, $p < 0.01$), rejecting $H_0 1$ and confirming that infrastructure availability significantly impacts e-learning adoption. Regression analysis further demonstrates that income level negatively affects e-learning integration ($\beta = -0.450$, $p < 0.01$), while access to devices ($\beta = 0.320$, $p < 0.01$) and digital literacy ($\beta = 0.400$, $p < 0.01$) positively influence it. These findings reject H_{02}, confirming that socio-economic disparities significantly impact e-learning integration. Thematic analysis of qualitative responses supports these findings, with lack of infrastructure, digital literacy gaps, socio-economic challenges, and pedagogical resistance emerging as key barriers.

Finally, the reliability analysis confirms that all constructs—technological barriers, pedagogical barriers, and socio-economic barriers—have acceptable to high reliability (Cronbach's alpha > 0.7), ensuring the validity of the measurement scales used in the study.

Discussion

The study highlights several important findings that help us understand the challenges teachers face while adopting e-learning in Hooghly, West Bengal. The demographic data shows that the study included a well-balanced group of teachers in terms of gender, age, experience, and teaching level. This means the findings can be applied to a wide range of teachers in the region. One of the biggest challenges identified in the study is the lack of proper digital infrastructure. Many teachers do not have access to computers, laptops, or even a stable internet connection. Only 60% of teachers reported having access to computers, and just 50% have an internet connection. The availability of essential tools like projectors, smart boards, and e-learning software is even lower, which makes online teaching difficult. This directly addresses the first objective of the study, which aims to identify barriers to e-learning. It also provides the basis for testing the first hypothesis, which questions whether digital infrastructure has a significant impact on e-learning adoption. When looking at the major barriers to e-learning, socio-economic factors seem to be the biggest challenge. The study found that socio-economic barriers scored the highest (4.3 on a scale of 5), followed by technological barriers (4.1) and then pedagogical barriers (3.8). This means that financial struggles, lack of access to devices, and limited digital literacy create the biggest obstacles for teachers and students. Further statistical analysis confirms this. The study found a strong positive link between digital infrastructure and e-learning adoption. In simple terms, teachers who have access to good technology are much more likely to use e-learning effectively. This leads to rejecting the first hypothesis (H_{01}), proving that digital infrastructure plays a crucial role in e-learning adoption. Additionally, socio-economic factors, like income level, were found to negatively affect e-learning integration. Teachers with lower incomes or who work in schools with students from financially weaker backgrounds struggle more with e-learning. On the other hand, access to devices and digital literacy positively impact e-learning, meaning that teachers and students who are familiar with technology and have the right tools are better able to use digital learning methods. This rejects the second hypothesis (H_{02}) and confirms that socio-economic disparities do play a significant role in e-learning adoption. The responses from teachers in interviews and surveys support these findings. Many teachers pointed out that poor infrastructure, lack of digital skills, financial struggles, and resistance to change make it harder to integrate e-learning into their teaching. Finally, the study ensured that the data collected was reliable. Statistical tests confirmed that the measurement tools used in the research were valid and consistent. The reliability analysis showed that technological, pedagogical, and socio-economic barriers all had strong reliability scores (Cronbach's alpha > 0.7). This means that the study's findings are trustworthy and based on accurate data.

The study revealed several critical barriers affecting the integration of e-learning among teachers in Hooghly, West Bengal. These barriers can be categorized into technological, pedagogical, and socio-economic constraints, each significantly impacting the successful adoption of digital education in schools. One of the most pressing challenges faced by teachers is the lack of adequate digital infrastructure. Many schools in Hooghly do not have access to high-speed internet, essential digital devices such as computers, or modern smart classrooms. The absence of these foundational elements makes it nearly impossible to conduct seamless online classes. Additionally, unreliable power supply further disrupts digital learning. Frequent electricity outages interrupt online sessions, causing delays and inconsistencies in teaching schedules. This issue is particularly prevalent in rural areas where power fluctuations are common, making it difficult for both students and teachers to maintain continuity in their learning process. Furthermore, limited technical support was identified as a significant constraint. Teachers reported a lack of IT assistance to help them troubleshoot technical issues, leading to frustration and disengagement. The absence of structured training programs to familiarize teachers with troubleshooting mechanisms and digital tools further exacerbates the problem, making e-learning an overwhelming challenge for many educators.

Another crucial finding from the study is the lack of training among teachers in digital teaching methodologies. Many educators have not received proper instruction on how to effectively deliver lessons in an online format, which significantly impacts their confidence and efficiency in using e-learning tools. The absence of regionally relevant e-content was also highlighted as a major drawback. Teachers struggle with finding learning materials that are not only digitally accessible but also adapted to the local language and curriculum requirements. This inadequacy reduces the effectiveness of e-learning and makes digital education less engaging for students. Moreover, student engagement issues pose a serious challenge in virtual classrooms. Teachers expressed concerns that students often get distracted during online sessions, leading to reduced attention spans and participation. Unlike physical classrooms, where direct interaction is possible, online learning requires additional effort to keep students engaged, which many teachers find difficult due to a lack of training and suitable digital tools.

The study also highlights the digital divide as a significant socio-economic challenge affecting e-learning adoption. Students from lower-income backgrounds often do not have access to digital devices such as laptops, tablets, or even smartphones, preventing them from participating in online classes. Even when devices are available, poor internet connectivity in rural households further restricts their ability to engage in digital learning effectively. Additionally, parental resistance to online education remains a considerable challenge. Many parents, particularly in traditional households, prefer conventional learning methods and are hesitant to support e-learning. Concerns about screen time, the effectiveness of digital education, and a lack of technological awareness contribute to this reluctance. Lastly, increased teacher workload emerged as another major barrier. Teachers are expected to create digital content, adapt to new learning platforms, and manage technical difficulties alongside their regular teaching responsibilities. The added pressure discourages many educators from embracing e-learning, as they often find the transition overwhelming and time-consuming.

6. Recommendations of the Study

To mitigate these barriers, the following strategies are recommended:

- Government and private initiatives should focus on equipping schools with high-speed internet and digital devices.
- Regular professional development programs should be introduced to enhance teachers' digital skills.
- E-learning materials should be tailored to suit regional languages and cultural contexts.
- Public-private partnerships can help in providing necessary technical and financial support.
- The state education department should develop policies to support e-learning and address digital disparities.

7. Conclusion

The integration of e-learning in Hooghly, West Bengal, faces significant challenges due to technological, pedagogical, and socio-economic barriers. Limited digital infrastructure, such as inadequate access to high-speed internet, computers, and smart classrooms, remains a primary obstacle, particularly in rural and semi-urban schools. Teachers struggle with frequent power outages, outdated hardware, and a lack of technical support, making digital education difficult to implement effectively. Additionally, the absence of structured training programs leaves many educators unprepared to use e-learning tools, leading to a lack of confidence in digital teaching methodologies. The shortage of engaging, regionally relevant e-learning content further exacerbates these challenges, reducing student engagement in virtual classrooms. Without proper investment in digital literacy and infrastructure, the adoption of e-learning remains slow and inconsistent across different teaching levels. Beyond technological limitations, socio-economic disparities significantly widen the digital divide, affecting both teachers and students. Many families from lower-income backgrounds cannot afford personal digital devices or reliable internet connections, limiting their participation in online learning. Teachers also experience increased workloads due to the additional time required to create digital content and adapt to new teaching platforms, further discouraging them from embracing e-learning. Parental resistance, largely driven by traditional beliefs and concerns about excessive screen time, adds another layer of complexity to digital education adoption. The study confirms that digital infrastructure availability and socio-economic factors play a crucial role in e-learning adoption, as demonstrated by strong statistical correlations. Addressing these issues requires collaborative efforts from the government, private sector, and educational institutions to improve digital access, provide targeted teacher training, and promote affordable digital solutions. If these barriers are effectively mitigated, e-learning can become a transformative tool for education in Hooghly, ensuring accessibility, quality, and inclusivity for all learners.

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