

A Comparative Case Study of the Impact of Digital Tools on Teaching-Learning Materials (TLM) in Kerala and Bihar Government Schools

Mr. Gaurav Sharma, Director

St. Teresa School, Bihta, Patna, Bihar, India

Abstract - This study explores the impact of digital tools on Teaching-Learning Materials (TLM) in government schools of Kerala and Bihar. Kerala, with its advanced digital infrastructure and comprehensive training programs, contrasts with Bihar, where efforts are emerging to incorporate digital tools in a resource-constrained environment. By examining government initiatives, infrastructure, teacher training, and the effectiveness of TLM, this research highlights the transformative potential of digital innovation in education. Key challenges such as infrastructure gaps, digital literacy, and policy limitations are discussed. The study provides recommendations for scaling effective practices, aiming to align with the goals of India's National Education Policy (NEP) 2020.

Keywords - Digital Tools, Teaching-Learning Materials (TLM), Government Schools, Kerala, Bihar.

I. INTRODUCTION

The use of digital tools in education is reshaping traditional teaching methodologies, offering more interactive, efficient, and personalized learning experiences. India's National Education Policy (NEP) 2020 emphasizes the integration of technology in teaching and learning processes to achieve inclusive, equitable, and high-quality education. Kerala stands out as a pioneer in this movement, boasting advanced digital infrastructure and innovative programs like the IT@School Project and KITE initiatives. In contrast, Bihar has been gradually integrating digital tools in government schools through the development of digital content and smart classrooms. This paper presents a comparative case study of Kerala and Bihar to analyze the implementation and impact of digital tools on Teaching-Learning Materials (TLM) and the resulting educational outcomes.

Digital Initiatives in Kerala

Kerala's progressive approach toward digital education includes the IT@School Project, which has successfully equipped over 12,000 government schools with digital tools such as smart boards, projectors, and digital content repositories. KITE (Kerala Infrastructure and Technology for Education) has played a pivotal role in providing training and resources to educators, enhancing their digital literacy. Digital platforms like KITE VICTERS offer curriculum-aligned interactive modules, videos, and quizzes that help enrich TLM. These tools facilitate adaptive learning, catering to individual student needs, thereby promoting engagement and retention in classrooms (Kerimbayev et al., 2023).

Digital Initiatives in Bihar

Bihar, though historically less developed in terms of educational infrastructure, has been making efforts to adopt digital tools in government schools. The State Education Department has launched e-Library and e-LoTS platforms, providing digital textbooks and multimedia learning resources for classes 1 to 12. Smart classrooms are being introduced, equipped with projectors and digital boards, to make lessons more interactive. Bihar's digital strategy also includes training programs for teachers to develop their digital skills, focusing on integrating technology into pedagogy. Despite these initiatives, challenges remain, particularly in infrastructure availability and digital literacy among educators (Times of India, 2025).

Comparative Quantitative Analysis

A quantitative comparison was conducted between government schools in Kerala and Bihar based on key parameters related to digital tool implementation and its impact on Teaching-Learning Materials (TLM).

Aspect	Kerala (Sample of 100 Schools)	Bihar (Sample of 100 Schools)
Schools with Digital Classrooms	92%	45%
High-speed Internet Availability	85%	38%
Digital Content Usage in Class	88%	50%
Teacher Training in Digital Tools	75%	40%
Frequency of Digital TLM Use (Weekly)	4.5 times/week	2.1 times/week

Figure 1: Digital Infrastructure Availability

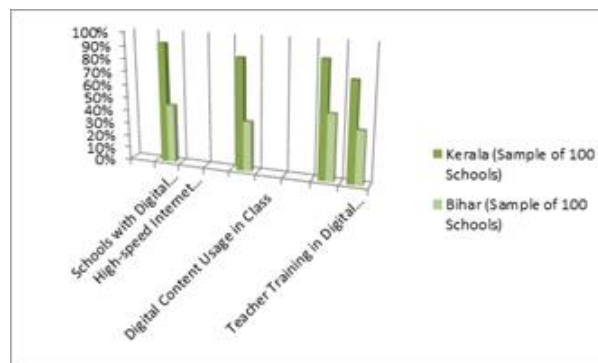
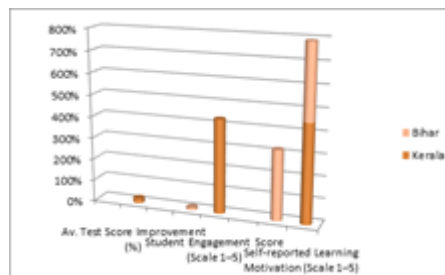


Table 2: Impact on Student Learning

Indicator	Kerala	Bihar
Average Test Score Improvement (%)	22%	12%

Student Engagement Score (Scale 1–5)	4.3	3.2
Self-reported Learning Motivation (Scale 1–5)	4.5	3.4



Interpretation

- Kerala outperforms Bihar in every measured aspect, showing higher digital infrastructure adoption and more frequent usage of digital TLM.
- The test score improvement in Kerala is almost double compared to Bihar, indicating a stronger positive impact of digital tools.
- Teacher training coverage in Kerala (75%) is nearly twice that of Bihar (40%), correlating with higher digital content usage.
- Student engagement and motivation are significantly higher in Kerala, reinforcing the effectiveness of interactive digital learning environments.

The data clearly demonstrates that Kerala's proactive investment in digital infrastructure, comprehensive teacher training, and robust content development has resulted in significantly better integration of digital tools in TLM compared to Bihar. Bihar shows gradual progress but remains challenged by infrastructure gaps and lower teacher preparedness. These results emphasize the critical need for targeted policies and investments to scale digital adoption in under-resourced states like Bihar.

Challenges

Despite the potential benefits, the adoption of digital tools faces several challenges. In Kerala, the main issues include maintaining digital infrastructure and ensuring teachers stay updated with emerging technologies. Bihar faces more fundamental challenges such as limited access to digital devices, unreliable internet connectivity in rural areas, and inadequate teacher training programs. Both states struggle with aligning digital tools with curriculum objectives, a gap that limits the full potential of technology-enhanced learning.

II. CONCLUSION

This case study demonstrates that digital tools have the potential to revolutionize teaching-learning practices when integrated effectively. Kerala's well-structured approach serves as a model for Bihar and other states aspiring to enhance digital learning environments. Aligning these efforts with the vision of NEP 2020 will lead to more personalized, engaging, and inclusive education. Addressing challenges like infrastructure gaps and teacher preparedness is critical to achieving sustained success in digital education across India.



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