



Digital Transformation of Teacher Education in Kerala: Assessing the Synergy between Institutional Readiness and Pedagogical Innovation

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Manuscript ID:
BIJ-SPL1-MAR26-EDU-040

Subject: Education

Received : 23.01.2026
Accepted : 04.02.2026
Published : 14.03.2026

DOI: 10.64938/bijrsi.v10si1.26.Mar040

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Abstract

The prevailing situation in the world of teacher education is experiencing a paradigm shift owing to the demands of digital transformation. The opportunities and challenges that emerge with the integration of digital technology within the teacher education paradigm of Kerala, India, are examined in this study. With the onset of the new landscape of education undergoing a shift from traditional to hybrid and AI-integrated learning spaces, the role of District Institutes of Education and Training (DIETs) in filling the gap between traditional teaching and digital literacy is examined. Through the use of a descriptive survey approach, the self-assessment of digital literacy and the systemic barriers that were encountered were investigated. The study is placed within the policy context of the National Education Policy 2020 and the Kerala Curriculum Framework 2023, which stress technology-enabled, inclusive, and reflective teacher education. Strategic perspectives are provided to policymakers and international policy makers to form a sustainable digital culture in teacher education with a balance between technological optimization and local teaching needs.

Keywords: digital transformation, teacher education, pedagogical integration, professional development, DIET.

Introduction

The rate of development in digital technology has resulted in a paradigm shift in the role of teaching, learning, and teacher education. The role of institutions of teacher education is no longer limited to the transfer of knowledge in teaching but to the preparation of teachers who are able to function effectively in a digitally enabled, data-driven, and increasingly artificial intelligence-supported learning environment. In this context, the digital transformation of teacher education has come to be recognized not as an add-on but as a necessity for ensuring relevance, equity, and quality in education.

The readiness of institutions to meet this transformation is largely dependent on their preparedness.

The digital transformation of teacher education in India is a legal requirement under the National Education Policy (NEP) 2020, (Ministry of Education, 2020) which focuses on the use of technology in all levels of education. In Kerala, the digital transformation is implemented at the local level through the Kerala Curriculum Framework (KCF) 2023, which focuses on a learner-centric and technology-enabled environment. The District Institutes of Education and Training (DIETs) are the



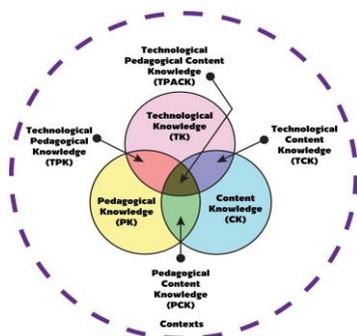
nerve centers that implement the macro policies at the grass roots level. This paper explores the complementarity between the institutional readiness and the pedagogical innovation developed by the teachers.

In the Indian scenario, Kerala offers a unique socio-educational setting characterized by a high literacy rate, early adoption of information and communication technology, and heavy government outlay on education. At the same time, disparities exist in the effective adoption of digital technology in teacher education courses. The District Institutes of Education and Training (DIETs), being major actors in pre-service and in-service teacher education, are ready to respond to the policy requirements at the classroom level. It is, therefore, imperative to assess the institutional readiness of the actors and their innovations in pedagogy in the context of the effectiveness of digital transformation strategies. This study is situated in this context, examining the relationship between institutional readiness and innovations in pedagogy in facilitating or hindering the digital transformation of teacher education in Kerala.

Review of Related Literature

Theoretical background of this study is based on the TPACK (Technological Pedagogical Content Knowledge) framework proposed by Mishra and Koehler in 2006. As per this paradigm, the optimal integration of technology is the intersection of content, pedagogy, and technology.

Technological Pedagogical Content Knowledge (TPACK)



Studies on digital inequality have pointed out that despite improvements in hardware and internet

connectivity, inequalities still exist in terms of effective and pedagogically appropriate use of technology. Hargittai (2002) has clarified this scenario as the “second-order digital divide,” where inequalities exist in terms of skills, confidence, and application, as opposed to access.

The SAMR model (UNESCO, 2023) (Substitution, Augmentation, Modification, Redefinition) is a tool used to assess the level of technology integration, where the focus is on the notion that “transformational learning occurs when technology makes possible tasks that were unimaginable before”.

Research studies conducted in the Indian scenario have shown that teachers are increasingly aware of more advanced digital and AI-based technologies, but their use in the classroom is still limited due to a lack of professional training and ethical support (Haleem et al., 2022). In the Kerala scenario, the policy focus of NEP 2020 and Kerala Curriculum Framework 2023 (SCERT Kerala, 2023) emphasizes the significance of critical, inclusive, and ethical use of technology in teacher education, where the focus is on institutional readiness and pedagogical innovation as significant concerns of the current study.

Objectives

The proposed study intends to:

1. Investigate the level of institutional preparedness for digital transformation in District Institutes of Education and Training (DIETs) in Kerala;
2. Evaluate the extent of pedagogical innovation and digital literacy among teacher educators;
3. Explore the systemic factors that impede the smooth integration of digital technology in teacher education; and
4. Analyse the congruence between digital practices in DIETs and the overall agenda of national and state-level policy documents like NEP 2020 and KCF 2023.

Materials and Methods

The research design was descriptive survey. The sample included 75 teacher educators from various



DIETs of Kerala (93.8% Lecturers; 6.2% Senior Lectures, 56.3% aged 41-50 years). A Likert Scale which contains 15-item questionnaire was used to gather data on Institutional Readiness, Pedagogical Innovation, and Systemic Barriers. The data was analysed through weighted mean scores.

Findings and Results

The analysis indicates a pedagogically strong faculty operating within institutional and policy-related constraints.

Table 1 Perceptions of Digital Transformation (n=75)

Dimension	Item	Indicator	Mean Score
Institutional Readiness	1	Hardware & High-speed Internet Availability	3.67
	2	Clear Institutional Roadmap for AI Integration	3.07
	5	Sufficiency of infrastructure for "High-Tech" standards	3.07
Pedagogical Innovation	6	Confidence in using LMS (Moodle/Google Classroom)	3.53
	8	Encouragement of digital portfolios among trainees	3.73
	10	Blending traditional values with digital assessment	4.00
Barriers & Challenges	11	Syllabus pressure as an innovation constraint	3.40
	12	Difficulty keeping up with rapid tech change	2.73
	15	Concern regarding AI ethics and data privacy	3.73

Interpretation and Discussion

The results of the study reveal the real situation of digital transformation in the teacher education system in Kerala, where there is a coexistence of teaching intentions and system-level challenges. The mean score of 4.00 on the item of aligning traditional teaching values with digital assessment practices reveals the fact that the teacher educators in DIETs are not resistant to change but are actually trying to align the use of technology with the traditional teaching values of Kerala, which are inclusive, learner-friendly, and reflective. This is in line with the Kerala Curriculum Framework (KCF) 2023, which gives paramount importance to the use of technology for deeper learning.

However, the slightly lower mean score on the item concerning the availability of a clear institutional roadmap for advanced technology and AI integration (3.07) indicates an important institutional weakness. Although the individual teacher educators are confident about the use of learning management systems and digital portfolios, the absence of institutional guidelines and long-term digital planning indicates that digital practices are

still individually initiated and not institutionally embedded. This result is consistent with the concerns expressed in the NEP 2020, which claims that technology integration in education needs to be holistic, strategic, and institutionally developed, and not individually initiated.

The results also confirm the idea of the “second-order digital divide” as described by Hargittai (2002). In the Kerala context, it appears that the fundamental digital infrastructure, such as hardware and internet connectivity, is quite satisfactory, as indicated by the mean score on the provision of infrastructure (3.67). But there are apprehensions regarding appropriate pedagogical use, upgradation, and confidence levels in handling the ever-unfolding digital tools. The mean score on keeping abreast of the latest technological advancements (2.73) reveals that the teacher educators are in a state of dilemma and suffer from cognitive overload, especially in the absence of upgradation opportunities.

Concerning the integration of pedagogy, the results indicate that most of the digital practices in the DIETs are still at the substitution and augmentation stages of SAMR, where technology is



used to support and enhance existing practices but does not change them. Although the use of LMS software and digital portfolios is a step in the right direction, the lack of evidence on the modification and redefinition stages indicates that technology has not yet been fully leveraged to support new learning practices that are collaborative, data-driven, or reflective.

The issue of AI ethics and data privacy, which had a mean of 3.73, is very relevant in the light of the new digital paradigm for education. This reflects an increasing awareness among teacher educators of the ethical dimensions of data use, bias, and student privacy in AI-enhanced learning environments. This reflects UNESCO's (2023) vision for human-centered and ethically governed educational technology.

Generally, the findings indicate that the nature of the synergy between the institutional readiness and the pedagogical innovation in the Kerala DIETs is partial and not complete. While the teacher educators have a strong foundation in pedagogy and are ready to innovate, the institutional framework and learning environment are not yet developed to the extent that they are fully ready to support the paradigm shift in digital practices. There is a need to shift the focus from the current digital training programs to a more reflective and data-informed approach to professional development, as per the NEP 2020 and KCF 2023.

Conclusion

The present study underlines that the digital transformation of teacher education in Kerala is at a critical transitional phase, where the pedagogical readiness of teacher educators is already visible, but institutional systems are yet to support the transformative use of digital technologies. The results of the study indicate that the DIETs in Kerala have a strong human resource base that is prepared to adapt to digital technology in a way that is compatible with the educational ethos, and at the same time, meets the current technological challenges, as outlined in the vision of NEP 2020 and the Kerala Curriculum Framework 2023.

However, the fact that the second-order digital divide exists in reality indicates that the digital transformation cannot be achieved only by developing infrastructure. The absence of roadmaps, guidelines on the integration of AI, and digital evaluation frameworks makes it difficult to ensure sustainable and systemic change. Without these frameworks, digital initiatives are likely to be piecemeal and depend mostly on individual initiatives rather than institutional support.

The paper also emphasizes the growing significance of ethical considerations in digital teacher education. Concerns about data protection, AI ethics, and responsible use of technology suggest a growing recognition among teacher educators that technological development should be aligned with human values and ethical considerations. These considerations can be addressed only by adopting a systemic approach to continuous professional development, developing ethical policies at the institutional level, and encouraging digital citizenship.

From the above discussion, it is evident that to ensure successful digital transformation in the teacher education system in Kerala, there is a need for a balanced approach that integrates institutional readiness with pedagogical innovation. This will help to strengthen the significance of DIETs as key change agents in the education sector and offers important lessons to other regions that are confronted with the challenges of digital transformation in teacher education.

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