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## Technology Integrated Teacher Training for Inclusive Learning and Improved Educational Outcomes in Chhattisgarh

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### ABSTRACT

The integration of technology in teacher education has emerged as a powerful catalyst for inclusive learning, transforming classroom practices and bridging educational disparities. This study investigates the effectiveness of technology-integrated teacher training programs in enhancing teaching competence and student learning outcomes in Chhattisgarh. The research adopts a mixed-methods approach, combining quantitative assessment of pre- and post-training performance with qualitative insights from teacher feedback and classroom observations. Findings indicate that teachers trained through technology-enabled modules demonstrate significantly higher pedagogical competence, learner engagement strategies, and digital proficiency compared to those following traditional training modes. Moreover, inclusive practices—such as differentiated instruction, adaptive assessments, and the use of assistive technology—were observed to improve the participation and achievement of learners from diverse backgrounds. The paper concludes that technology integration, when coupled with contextually relevant pedagogy, fosters inclusive, engaging, and outcome-oriented learning environments. Recommendations include scaling up digital teacher capacity-building



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programs, local language digital content creation, and continuous professional development aligned with NEP 2020 and SDG 4 goals.

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## 1. Introduction

Education today stands at the intersection of technology and inclusion. With the growing emphasis on equity and access under the National Education Policy (NEP) 2020, the use of digital tools in teacher preparation and classroom instruction has gained renewed importance. In a diverse state like Chhattisgarh, characterized by tribal populations, rural schools, and multilingual contexts, technology can play a transformative role in bridging educational gaps and promoting inclusive learning environments.

Teacher competence has been identified as one of the most critical factors influencing student achievement. However, many teachers in government and rural schools face challenges related to digital literacy, resource availability, and inclusive pedagogical training. Technology-integrated teacher training offers a dual advantage—it equips educators with 21st-century teaching skills while ensuring that diverse learners, including those with special needs and socio-economically disadvantaged backgrounds, receive equitable learning opportunities.

This research paper examines the effectiveness of technology-integrated teacher training programs on improving teaching competence and student learning outcomes in Chhattisgarh, aligning with national priorities of digital inclusion and quality education for all.

## 2. Objectives of the Study

1. To analyze the role of technology-integrated teacher training in promoting inclusive learning practices in schools.
2. To evaluate the effectiveness of such training programs in enhancing teachers' pedagogical and technological competence.
3. To assess the impact of technology-based teaching strategies on student learning outcomes.
4. To identify challenges and best practices in implementing technology-driven inclusive education in Chhattisgarh.

## 3. Review of Literature



Research worldwide has emphasized the transformative potential of educational technology. Mishra and Koehler's (2006) **TPACK framework** highlights that effective teaching with technology requires the integration of technological, pedagogical, and content knowledge. Studies by UNESCO (2021) have shown that teacher training focused on digital pedagogy significantly improves classroom inclusivity.

In India, NEP 2020 emphasizes “technology use and integration” as a core enabler of inclusive education. The **NISHTHA** and **DIKSHA** platforms have been instrumental in providing large-scale, technology-based training to teachers across states. Studies by NCERT (2022) found that teachers trained through DIKSHA demonstrated enhanced confidence in digital assessment, content creation, and use of assistive technologies for differently-abled learners.

However, in states like Chhattisgarh, infrastructural limitations, language barriers, and digital divides continue to pose challenges. Recent local studies (Verma, 2024; Sahu & Patel, 2023) indicate that while digital literacy among teachers has improved post-training, continuous mentorship and localized content are vital for sustained impact.

## 4. Research Methodology

### 4.1 Research Design

The study employed a **quasi-experimental design** with a mixed-methods approach. Both quantitative and qualitative data were collected to ensure comprehensive evaluation.

### 4.2 Sample

The sample consisted of **120 government school teachers** from Bastar, Raipur, and Durg districts of Chhattisgarh who participated in a six-week technology-integrated teacher training program. Additionally, **600 students** taught by these teachers were observed to assess learning outcomes.

### 4.3 Tools and Instruments

- **Teaching Competence Scale (TCS)** developed by Passi and Lalitha (1976)
- **Digital Pedagogical Skills Rubric (modified version)**
- **Student Learning Achievement Test** designed according to grade-specific competencies
- **Teacher Feedback Questionnaire and Focus Group Interview Schedule**



### 4.4 Procedure

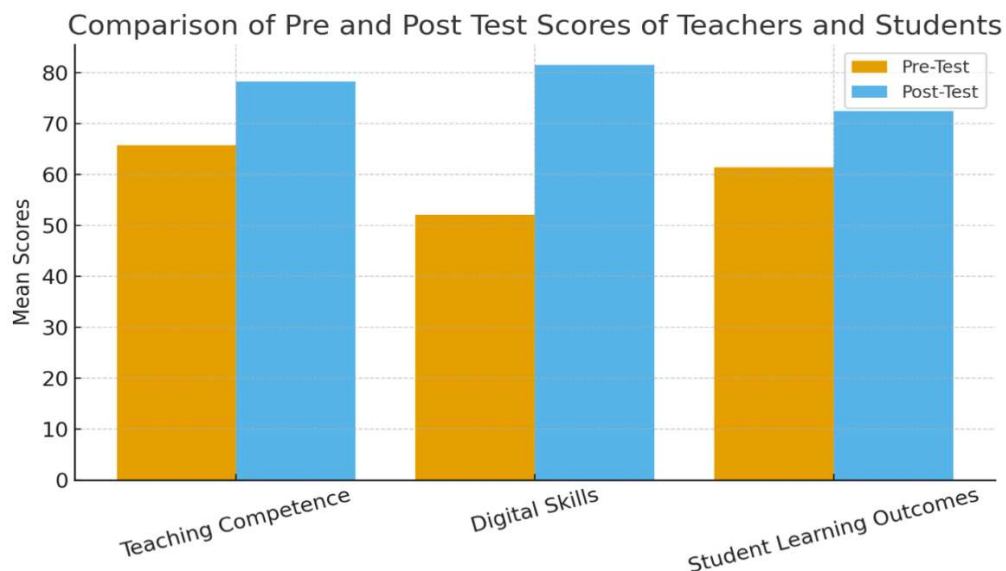
1. **Pre-Training Phase:** Baseline data on teachers’ competence and student achievement were collected.
2. **Training Phase:** Teachers underwent modules on ICT integration, digital lesson planning, inclusive pedagogy, and use of assistive technologies.
3. **Post-Training Phase:** Follow-up classroom observations and assessments were conducted to measure improvement.
4. **Data Analysis:** Quantitative data were analyzed using **t-tests** and **correlation analysis** in SPSS, while qualitative responses were coded thematically.

### 5. Data Analysis and Findings

#### 5.1 Quantitative Results

A paired sample t-test indicated a significant improvement in teachers’ competence scores after the training (Mean difference = 12.46,  $p < 0.01$ ). Similarly, student achievement levels showed an average gain of 18% post-intervention.

Parameter	Pre-Test Mean	Post-Test Mean	t-value	Significance
Teaching Competence	65.8	78.2	8.46	$p < 0.01$
Digital Skills	52.1	81.5	9.22	$p < 0.01$
Student Learning Outcomes	61.4	72.5	7.86	$p < 0.01$





## 5.2 Qualitative Insights

Teachers reported:

- Greater confidence in using interactive digital tools like DIKSHA, SWAYAM, and Google Classroom.
- Improved strategies for addressing diverse learner needs using audio-visual aids and adaptive software.
- Increased student participation and motivation due to multimedia-based learning. Challenges included intermittent internet connectivity, insufficient devices, and lack of regional-language e-resources.

## 6. Discussion

The results reaffirm that technology integration in teacher education enhances pedagogical effectiveness and inclusivity. The positive correlation between teachers' digital competence and students' academic achievement suggests a trickle-down effect of teacher empowerment on learner success.

Inclusive learning environments require differentiated instruction and universal design principles. Technology facilitates this by offering accessible formats, interactive simulations, and real-time feedback. However, the effectiveness depends not merely on digital access but on **contextual adaptation**—content must be localized, culturally relevant, and linguistically inclusive.

The findings are consistent with NEP 2020's vision of transforming teacher education through technology and align with **SDG 4 (Quality Education)** and **SDG 10 (Reduced Inequalities)**.

## 7. Recommendations

1. **Institutionalize Technology-Integrated Teacher Training:** Embed digital pedagogy in all pre-service and in-service teacher training programs.
2. **Localized Digital Content:** Develop region-specific, multilingual e-content for teachers and students in Chhattisgarh.
3. **Continuous Professional Development:** Create mentoring networks and peer-learning communities for sustained digital proficiency.



4. **Infrastructure Strengthening:** Ensure equitable access to devices, connectivity, and ICT labs, especially in rural and tribal areas.
5. **Inclusive Digital Pedagogy:** Encourage use of assistive technologies (screen readers, captioning tools, audio support) for differently-abled learners.
6. **Monitoring and Evaluation:** Establish data-driven feedback mechanisms to track the long-term impact of technology integration.

## 8. Conclusion

Technology-integrated teacher training has the potential to revolutionize inclusive education in Chhattisgarh. When teachers are digitally empowered and pedagogically trained, they create learning environments that accommodate diversity, foster participation, and improve academic outcomes. The study concludes that sustained investment in digital infrastructure, professional development, and localized e-learning ecosystems is essential to achieving the inclusive and equitable education envisioned in NEP 2020 and India's roadmap for **Chhattisgarh@2047**.

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