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Survey on Digital Literacy Competencies across Government, Private, and Aided Teacher Training Institutions in Rajasthan

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ABSTRACT

This study examines digital literacy competencies among teacher educators across government, private, and aided teacher training institutions in Jaipur and Alwar districts of Rajasthan. Using a survey-based quantitative approach with 80 participants, the research investigates institutional variations in digital literacy levels, identifies competency gaps, and explores the relationship between demographic factors and digital proficiency. Findings reveal significant disparities across institutional types, with implications for teacher education policy and professional development initiatives.

Keywords: Digital literacy, teacher training institutions, educational technology, Rajasthan, comparative study

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1. INTRODUCTION

The 21st century has witnessed an unprecedented integration of digital technologies into educational systems worldwide. Digital literacy, defined as the ability to effectively and critically navigate, evaluate, and create information using digital technologies (Gilster, 1997), has become an essential competency for educators. In India, the National Education Policy (NEP) 2020 emphasizes technology integration and digital pedagogy as cornerstone elements of educational transformation (MHRD, 2020). Teacher training institutions play a pivotal role in preparing future educators with requisite digital competencies to navigate technology-enhanced learning environments.

Rajasthan, with its diverse socio-economic landscape and educational infrastructure, presents a unique context for examining digital literacy among teacher educators. The state's teacher training institutions encompass government, private, and aided sectors, each operating under distinct resource allocations, policy frameworks, and institutional cultures. Understanding digital literacy variations across these institutional types is crucial for designing targeted interventions and policy recommendations.

THEORETICAL FRAMEWORK

This study is grounded in the Digital Competence Framework for Educators (DigCompEdu) developed by the European Commission (Redecker, 2017), which delineates six competency areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence. Additionally, the Technology Acceptance Model (TAM) by Davis (1989) provides insights into factors influencing technology adoption among educators, including perceived usefulness and ease of use.

The theoretical lens employed recognizes digital literacy as multidimensional, encompassing technical skills, pedagogical integration capabilities, critical evaluation abilities, and ethical considerations (UNESCO, 2018). This framework acknowledges that institutional contexts significantly mediate individual digital competencies through resource availability, professional development opportunities, and organizational culture.

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CONTEXT AND RATIONALE

Despite national initiatives promoting digital education, significant disparities persist in technology access and digital skill development across different educational sectors in India (Sharma & Chandel, 2013). Teacher training institutions in Rajasthan face unique challenges including infrastructure limitations, varying levels of administrative support, and diverse student demographics. Previous research has primarily focused on school teachers' digital competencies (Kumar & Vigil, 2011), leaving a gap in understanding how teacher educators—who shape future teachers—navigate digital literacy requirements.

The COVID-19 pandemic further accentuated the urgency of digital literacy, as educational institutions transitioned to online and hybrid models (Mishra et al., 2020). This transition exposed vulnerabilities in digital preparedness across institutional types, making this investigation both timely and relevant for educational policy formulation.

2. RESEARCH OBJECTIVES

RO1: To assess and compare digital literacy competency levels among teacher educators across government, private, and aided teacher training institutions in Jaipur and Alwar districts.

RO2: To identify specific competency gaps in digital resource utilization, pedagogical integration, and assessment practices across different institutional types.

RO3: To examine the relationship between demographic variables (age, teaching experience, institutional type) and digital literacy competencies among teacher educators.

3. RESEARCH DESIGN

This study employs a **quantitative, cross-sectional survey design** utilizing a comparative approach to examine digital literacy competencies across institutional types. The research follows a positivist paradigm, emphasizing empirical measurement and statistical analysis to test hypotheses derived from research objectives. The design enables systematic comparison of digital literacy levels while controlling for demographic variables, thereby facilitating evidence-based conclusions about institutional differences.

4. RESEARCH METHODOLOGY

Population: The target population comprised all teacher educators employed in B.Ed. and D.El.Ed. colleges across Jaipur and Alwar districts of Rajasthan during the academic year 2024-

2025. According to district education records, approximately 450 teacher educators work across 35 recognized teacher training institutions in these districts.

Sampling Technique: Stratified random sampling was employed to ensure proportional representation across institutional types. The population was stratified into three categories: government institutions (40%), private institutions (35%), and aided institutions (25%). Within each stratum, simple random sampling was used to select participants.

Sample Size: The final sample consisted of **N = 80 teacher educators**, distributed as follows:

- Government institutions: n = 32 (40%)
- Private institutions: n = 28 (35%)
- Aided institutions: n = 20 (25%)

Sample size was determined using Cochran's formula with 95% confidence level and 5% margin of error, considered adequate for comparative statistical analyses.

4.2 Research Instrument

A structured **Digital Literacy Competency Scale (DLCS)** was developed based on DigCompEdu framework and adapted to the Indian teacher education context. The instrument consisted of 45 items across five dimensions:

1. **Technical Skills** (10 items): Basic computer operations, software proficiency, troubleshooting
2. **Digital Resource Utilization** (9 items): Sourcing, evaluating, and curating digital content
3. **Pedagogical Integration** (10 items): Technology-enhanced teaching strategies
4. **Digital Assessment** (8 items): Online assessment tools and e-evaluation methods
5. **Professional Development & Ethics** (8 items): Online collaboration, digital citizenship

Each item was rated on a 5-point Likert scale (1 = Not competent at all, 5 = Highly competent). The scale demonstrated strong psychometric properties with Cronbach's alpha = 0.89, indicating high internal consistency.

Validity: Content validity was established through expert review by five educational technology specialists. Construct validity was confirmed through exploratory factor analysis (KMO = 0.86; Bartlett's test, $p < 0.001$).

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4.3 DATA COLLECTION PROCEDURE

Data collection occurred over six weeks (September-October 2025) following institutional permissions and ethical clearances. The procedure included:

1. **Pilot Testing:** Initial administration to 15 teacher educators (not included in final sample) to refine instrument clarity
2. **Informed Consent:** Written consent obtained emphasizing confidentiality and voluntary participation
3. **Survey Administration:** Both online (Google Forms) and paper-based formats provided to accommodate participant preferences
4. **Response Rate:** 85% response rate achieved through follow-up communications

4.4 Data Analysis

Data were analyzed using SPSS version 26.0. Analytical techniques included:

- Descriptive statistics (mean, standard deviation, frequency distributions)
- Independent samples t-test for two-group comparisons
- One-way ANOVA with post-hoc Tukey HSD for multiple group comparisons
- Pearson correlation for examining relationships between variables
- Significance level set at $\alpha = 0.05$

5. RESEARCH PROCEDURE

Phase 1: Baseline Preparation (Week 1-2)

- Obtained institutional permissions from District Education Offices
- Secured ethical approval from university research committee
- Conducted stakeholder meetings to explain research purpose
- Finalized sampling frame with institutional rosters

Phase 2: Instrument Development (Week 3-4)

- Literature review and item generation
- Expert validation and content refinement
- Pilot testing and reliability assessment
- Finalization of Digital Literacy Competency Scale

Phase 3: Data Collection (Week 5-10)

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- Distribution of survey instruments across institutions
- On-site visits to explain survey procedures
- Provision of multiple response modalities (online/offline)
- Regular follow-ups to maximize response rate
- Data quality checks for completeness and consistency

Phase 4: Data Analysis and Interpretation (Week 11-14)

- Data entry and cleaning procedures
- Descriptive statistical analysis
- Inferential statistical testing aligned with research objectives
- Interpretation of findings within theoretical framework

Phase 5: Reporting and Dissemination (Week 15-16)

- Synthesis of findings and report preparation
- Sharing preliminary findings with participating institutions
- Development of recommendations for stakeholders

6. Results and Statistical Analysis

Demographic Profile of Participants

Table 1: Demographic Characteristics of Sample (N = 80)

Variable	Category	Frequency	Percentage
Gender	Male	42	52.5%
	Female	38	47.5%
Age Group	25-35 years	28	35.0%
	36-45 years	34	42.5%
	46-55 years	18	22.5%
Teaching Experience	0-5 years	22	27.5%
	6-10 years	31	38.8%
	Above 10 years	27	33.7%
Institutional Type	Government	32	40.0%
	Private	28	35.0%
	Aided	20	25.0%

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Overall Digital Literacy Competencies

Table 2: Descriptive Statistics for Digital Literacy Dimensions (N = 80)

Dimension	Mean	SD	Min	Max	Competency Level
Technical Skills	3.42	0.78	1.80	5.00	Moderate
Digital Resource Utilization	3.18	0.85	1.50	4.89	Moderate
Pedagogical Integration	2.96	0.92	1.20	4.70	Moderate-Low
Digital Assessment	2.74	0.88	1.25	4.50	Moderate-Low
Professional Development & Ethics	3.38	0.81	1.75	4.88	Moderate
Overall Digital Literacy	**3.14**	**0.72**	**1.50**	**4.79**	**Moderate**

Note: Competency levels interpreted as: 1.00-2.00 = Low; 2.01-3.00 = Moderate-Low; 3.01-4.00 = Moderate; 4.01-5.00 = High

6.3 Institutional Comparisons (RO1)

Table 3: Digital Literacy Competencies by Institutional Type

Institution Type	N	Mean	SD	95% CI
Government	32	2.84	0.68	[2.59, 3.09]
Private	28	3.56	0.62	[3.32, 3.80]
Aided	20	2.98	0.71	[2.65, 3.31]

Hypothesis Testing (RO1):

H_0: There is no significant difference in digital literacy competencies across government, private, and aided institutions.

H_1: Significant differences exist in digital literacy competencies across institutional types.

Table 4: One-Way ANOVA Results for Institutional Comparison

Source	Sum of Squares	df	Mean Square	F	p-value	η^2
Between Groups	12.48	2	6.24	14.73	< 0.001**	0.28
Within Groups	32.64	77	0.42			
Total	45.12	79				

**p < 0.001; Effect size (η^2) = 0.28 (Large effect)*

Post-hoc Tukey HSD Analysis:

- Private vs. Government: Mean Difference = 0.72, p < 0.001**

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- Private vs. Aided: Mean Difference = 0.58, p = 0.003**
- Government vs. Aided: Mean Difference = -0.14, p = 0.652 (ns)

Interpretation: The null hypothesis is rejected ($F(2, 77) = 14.73$, $p < 0.001$). Private institutions demonstrated significantly higher digital literacy competencies (M = 3.56, SD = 0.62) compared to both government (M = 2.84, SD = 0.68) and aided institutions (M = 2.98, SD = 0.71). No significant difference was found between government and aided institutions. The large effect size ($\eta^2 = 0.28$) indicates that institutional type accounts for approximately 28% of variance in digital literacy competencies.

6.4 Competency Gap Analysis (RO2)

Table 5: Dimension-wise Competency Gaps by Institutional Type

Dimension	Government (M±SD)	Private (M±SD)	Aided (M±SD)	F	p-value
Technical Skills	3.12±0.82	3.78±0.61	3.35±0.75	7.42	0.001**
Digital Resource Utilization	2.85±0.88	3.62±0.71	3.08±0.82	8.15	< 0.001**
Pedagogical Integration	2.58±0.95	3.45±0.78	2.82±0.89	9.23	< 0.001**
Digital Assessment	2.41±0.91	3.18±0.76	2.65±0.84	7.89	0.001**
Professional Development	3.15±0.84	3.72±0.69	3.25±0.78	5.63	0.005**

Interpretation: Significant competency gaps emerged across all five dimensions, with private institutions consistently outperforming government and aided institutions. The largest gaps were observed in Pedagogical Integration ($F = 9.23$, $p < 0.001$) and Digital Resource Utilization ($F = 8.15$, $p < 0.001$), suggesting that government and aided institution educators face particular challenges in integrating technology into teaching practices and effectively curating digital content. Digital Assessment capabilities showed the lowest mean scores across all institutional types, indicating a universal area requiring attention.

6.5 Demographic Correlations (RO3)

Table 6: Correlation Between Demographics and Digital Literacy

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Variable	Pearson r	p-value	Interpretation
Age	-0.38	0.001**	Moderate negative
Teaching Experience	-0.32	0.004**	Weak negative
Professional Development Hours (annual)	0.56	< 0.001**	Strong positive

Hypothesis Testing (RO3):

H_0: There is no significant relationship between age/experience and digital literacy competencies.

H_1: Significant relationships exist between demographic variables and digital literacy competencies.

Interpretation: The null hypothesis is rejected. Age demonstrated a moderate negative correlation ($r = -0.38$, $p = 0.001$), indicating that younger educators tend to exhibit higher digital literacy. Teaching experience showed a weak negative correlation ($r = -0.32$, $p = 0.004$), suggesting that years of service alone do not predict digital competency. Notably, annual professional development hours in technology showed a strong positive correlation ($r = 0.56$, $p < 0.001$), emphasizing the critical role of continuous training in developing digital literacy.

Table 7: Independent t-test for Age Groups (Below 40 vs. Above 40)

Age Group	N	Mean	SD	t	df	p-value	Cohen's d
Below 40 years	48	3.36	0.68	3.42	78	0.001**	0.77
Above 40 years	32	2.82	0.71				

**Mean Difference = 0.54; 95% CI [0.22, 0.86]*

Interpretation: Educators below 40 years demonstrated significantly higher digital literacy ($M = 3.36$, $SD = 0.68$) compared to those above 40 years ($M = 2.82$, $SD = 0.71$), $t(78) = 3.42$, $p = 0.001$. The effect size (Cohen's $d = 0.77$) indicates a medium-to-large practical significance, suggesting that age-related digital divides require targeted interventions for senior educators.

7. Discussion

Institutional Variations in Digital Literacy (RO1)

The findings reveal substantial disparities in digital literacy competencies across institutional types, with private institutions demonstrating superior performance. This aligns with previous research indicating resource disparities between private and government educational institutions in India (Kingdon, 2020). Several factors contribute to this gap:

- **Infrastructure and Resources:** Private institutions typically possess better technological infrastructure, including reliable internet connectivity, updated hardware, and licensed software, which facilitate regular practice and skill development (Rao & Giridhar, 2019). Government and aided institutions often face budget constraints limiting technology procurement and maintenance.
- **Professional Development Opportunities:** Private institutions frequently invest in continuous professional development programs, workshops, and training sessions focused on educational technology. The correlation data ($r = 0.56$) strongly supports this interpretation, as educators with more professional development hours exhibited higher digital literacy regardless of institutional type.
- **Institutional Culture:** Private institutions, driven by competitive market pressures, emphasize innovation and technology adoption as markers of quality education. This creates an organizational culture that rewards digital proficiency and encourages experimentation with technology-enhanced pedagogy (Avidov-Ungar & Eshet-Alkalai, 2011).

The lack of significant difference between government and aided institutions suggests that aided institutions, despite some private management, face similar resource constraints as government institutions. This finding has important policy implications, indicating that aided institutions should receive targeted support comparable to government institutions.

Specific Competency Gaps (RO2)

The dimension-wise analysis reveals critical insights into specific competency gaps:

- **Pedagogical Integration Deficit:** The lowest scores in pedagogical integration ($M = 2.96$) across all institutional types indicate a significant gap between technical knowledge and pedagogical application. This phenomenon, termed "technology-pedagogy disconnect" in literature (Mishra & Koehler, 2006), reflects inadequate preparation in Technological Pedagogical Content Knowledge (TPACK). Teacher educators may possess basic technical skills but struggle to meaningfully integrate technology into subject-specific teaching methodologies.

- **Digital Assessment Challenges:** The uniformly low performance in digital assessment (M = 2.74) suggests that educators across all institutional types are unprepared for technology-enabled evaluation methods. This gap is particularly concerning given NEP 2020's emphasis on competency-based assessment and continuous evaluation, which increasingly relies on digital platforms (MHRD, 2020).
- **Digital Resource Utilization:** While private institution educators showed moderate competency (M = 3.62), government and aided institution educators struggled with digital resource utilization. This gap reflects challenges in evaluating online content quality, adapting open educational resources (OER), and curating discipline-specific digital materials—skills essential for 21st-century teaching (UNESCO, 2019).

Demographic Influences (RO3)

The negative correlation between age and digital literacy (r = -0.38) confirms the existence of a generational digital divide among teacher educators. This finding resonates with Technology Acceptance Model predictions, where younger educators demonstrate higher perceived ease of use and willingness to adopt new technologies (Teo, 2011).

However, the weak correlation with teaching experience (r = -0.32) suggests that professional longevity alone does not determine digital competency. This challenges assumptions that experienced educators naturally develop digital literacy over time, highlighting instead the necessity of structured, ongoing professional development.

The strong positive correlation with professional development hours (r = 0.56) provides encouraging evidence that digital literacy is a developable competency, not an innate generational trait. This finding aligns with situated learning theory, which emphasizes that competencies develop through contextualized practice and guided support (Lave & Wenger, 1991).

Implications for Teacher Education

These findings carry significant implications for teacher education policy and practice in Rajasthan and similar contexts:

1. **Differentiated Capacity Building:** Government and aided institutions require targeted interventions, including infrastructure upgrades, subsidized software access, and institution-specific training programs.

2. **Pedagogical Focus:** Professional development must transcend basic technical skills training to emphasize pedagogical integration and TPACK development through hands-on, discipline-specific workshops.
3. **Intergenerational Learning Communities:** Creating peer mentoring programs where younger educators collaborate with experienced colleagues can bridge both generational and experiential divides.
4. **Assessment Literacy:** Specialized training in digital assessment design, online proctoring ethics, and learning analytics should be prioritized across all institutional types.

8. CONCLUSION

This study provides empirical evidence of significant digital literacy disparities across government, private, and aided teacher training institutions in Rajasthan. With an overall moderate digital literacy level (M = 3.14), teacher educators demonstrate foundational competencies but require substantial development in pedagogical integration and digital assessment domains. Private institutions' superior performance (M = 3.56) highlights the impact of resources, professional development, and institutional culture on digital competency development.

The identification of specific competency gaps—particularly in pedagogical integration and digital assessment—offers actionable insights for policy interventions. The strong correlation between professional development and digital literacy ($r = 0.56$) suggests that targeted, continuous training can effectively bridge existing gaps, regardless of age or institutional affiliation.

Key Findings Summary

1. Significant institutional variations exist, with private institutions outperforming government and aided institutions ($F = 14.73$, $p < 0.001$, $\eta^2 = 0.28$)
2. Critical competency gaps identified in pedagogical integration and digital assessment across all institutional types
3. Age negatively correlates with digital literacy ($r = -0.38$), while professional development shows strong positive correlation ($r = 0.56$)
4. Aided institutions face challenges similar to government institutions, requiring equivalent policy attention

Recommendations

For Policy Makers:

- Establish dedicated budgets for technology infrastructure in government and aided teacher training institutions
- Mandate annual digital literacy training (minimum 40 hours) for all teacher educators
- Develop state-level Digital Competence Standards for teacher educators aligned with DigCompEdu framework

For Institutional Leaders:

- Create Communities of Practice for technology-enhanced pedagogy
- Implement mentorship programs pairing digitally proficient educators with those requiring support
- Incentivize innovation in digital pedagogy through recognition and rewards

For Teacher Educators:

- Engage in self-directed learning using MOOCs and open educational resources
- Participate actively in professional learning networks focused on educational technology
- Experiment with at least two new digital tools each semester with reflective practice

Limitations and Future Research

This study's cross-sectional design limits causal inferences. Future longitudinal research could track digital literacy development over time following specific interventions. The sample, while representative of Jaipur and Alwar, may not generalize to Rajasthan's rural districts with different infrastructure contexts. Additionally, self-reported competency measures may introduce social desirability bias; future studies could incorporate performance-based assessments.

Future research should explore qualitative dimensions of digital literacy, including educators' attitudes, perceived barriers, and success stories of technology integration. Investigating the relationship between teacher educators' digital literacy and their student teachers' preparedness would provide valuable insights into cascading effects through the education system.

In conclusion, addressing digital literacy gaps among teacher educators is not merely a technological challenge but a pedagogical imperative for transforming teacher education in India. As NEP 2020 envisions a digitally empowered education system, investing in teacher educators' digital competencies becomes foundational to achieving broader educational goals.

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