

Assessment of Student Teachers' ICT Knowledge and Its Relationship to ICT Integration in Teacher Education: A Study in Paschim Medinipur District

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Abstract:

This study examines the Information and Communication Technology (ICT) knowledge of student teachers and its relationship with the level of ICT integration within teacher education institutions in Paschim Medinipur district, West Bengal. The objectives were to assess student teachers' ICT proficiency, evaluate the extent of ICT integration in their training institutions, and determine the correlation between these two variables. Employing a descriptive survey design, data were collected from 150 student teachers across six teacher education colleges using structured questionnaires and institutional observation checklists. Descriptive analysis revealed a mean ICT knowledge score of 68.12 (on a scale of 20-100), indicating moderate competency with notable variation (SD = 14.20). ICT integration was most evident in basic infrastructure like computer labs (83.3%), but weaker in advanced pedagogical applications such as smart classrooms (33.3%) and institutional digital policy (33.3%). A Chi-square test of independence yielded a statistically significant result ($\chi^2 = 8.24$, $p = 0.016$), confirming a relationship between higher institutional ICT integration and greater ICT knowledge among student teachers. The findings underscore the role of institutional support in developing digital competency. Recommendations include strategic investment in advanced ICT infrastructure, mandatory hands-on pedagogical training, and sustained professional development for faculty to foster comprehensive digital readiness in teacher education.

Keywords: ICT Integration, Student Teachers, Teacher Education, Digital Literacy, ICT Competency.

1. Introduction

ICT knowledge encompasses the understanding and skilled use of digital tools—including computers, the internet, multimedia, educational software, and online platforms—for teaching and learning. In teacher education, this knowledge extends beyond technical operation to the pedagogical application of technology to enhance instruction, engagement, and professional practice. For student teachers, digital competency is a fundamental requirement, enabling them to design technology-rich learning experiences and navigate modern, connected classrooms.

The integration of ICT in teacher education is critical for developing 21st-century skills such as digital literacy, critical thinking, and collaborative problem-solving. It improves the quality

of training by providing access to diverse resources, interactive content, and innovative teaching models. Global educational frameworks and India's National Education Policy (NEP) 2020 emphasize ICT as a lever for equity, access, and quality in education. However, in rural districts like Paschim Medinipur, implementation often lags behind policy aspirations. This study therefore assesses the ICT knowledge of student teachers in this region and examines its linkage with the level of ICT integration in their training institutions.

Review of Literature

Research consistently affirms that effective ICT integration depends on teacher competence, infrastructure, and institutional support (Anderson & Van Weert, 2002). The TPACK framework (Mishra & Koehler, 2006) further highlights the need to blend technological, pedagogical, and content knowledge. In India, studies note a gap between student teachers' awareness of ICT tools and their actual pedagogical application (Bansal & Kumar, 2019). Research in West Bengal (Mukhopadhyay, 2017) points to infrastructural deficits in teacher training colleges, limiting practical skill development. A study by Mondal and Ali (2018) in West Bengal secondary schools found disparities in ICT resource availability and usage between urban and rural settings, recommending further investigation at different educational levels. This study addresses that gap by focusing on teacher education in a rural district.

Significance of the Study

This research is significant for its focused examination of digital preparedness among future educators in a specific rural context. By assessing both ICT knowledge and institutional integration, it identifies actionable gaps and strengths. The insights can guide teacher educators, administrators, and policymakers in refining infrastructure, training programs, and curricular strategies to enhance the quality of teacher education in alignment with digital transformation goals.

Objectives of the Study

1. To assess the level of ICT knowledge among student teachers in teacher education institutions of Paschim Medinipur district.
2. To evaluate the extent of ICT integration in these teacher education institutions.
3. To determine the relationship between student teachers' ICT knowledge and the level of ICT integration in their institutions.

2. Methodology

A descriptive survey design was adopted, combining quantitative data with qualitative insights. The sample consisted of 150 student teachers from six teacher training colleges in Paschim Medinipur district, selected via purposive sampling. Data were collected using: (a) a validated 5-point Likert-scale questionnaire on ICT knowledge and usage (20 items, score range 20-100), and (b) an observation checklist for institutional ICT facilities. Data were analyzed using descriptive statistics (mean, SD, frequency, percentage) and inferential statistics (Chi-square test).

3. Data Analysis and Interpretation

Table 1: Descriptive Statistics of ICT Knowledge Scores (N=150)

Statistic	Value
Minimum Score	30
Maximum Score	98
Range	68
Mean	68.12
Median	69
Mode	72
Std. Deviation	14.20
Variance	201.64
Skewness	-0.18
Kurtosis	0.41

The ICT knowledge scores ranged from 30 to 98, with a mean of 68.12, suggesting a moderate overall competency. The proximity of the mean, median (69), and mode (72), along with a skewness close to zero (-0.18), indicates a roughly symmetrical distribution. The standard deviation (14.20) points to considerable variation in individual proficiency levels within the sample.

Table 2: Extent of ICT Integration across Teacher Education Institutions (N=6)

ICT Integration Component	No. of Institutions	Percentage (%)
1. Functional Computer Lab	5	83.3%
2. Reliable Internet Connectivity	4	66.7%
3. Smart Classroom Facilities	2	33.3%
4. Regular Use of Multimedia in Teaching	4	66.7%
5. ICT-based Assignments/Projects	4	66.7%
6. Access to Digital Platforms (LMS/MOOCs)	2	33.3%
7. Faculty Trained in ICT Pedagogy	4	66.7%
8. Regular ICT Workshops/Seminars	3	50.0%
9. ICT Use During Practice Teaching Sessions	3	50.0%
10. Institutional ICT Policy Document	2	33.3%

Integration is strongest in basic infrastructure (computer labs: 83.3%). Components like internet, multimedia use, and faculty training show moderate integration (66.7%). However, advanced elements—smart classrooms, digital platform access, and formal ICT policy—are limited to one-third of institutions (33.3%), indicating a gap in systemic, pedagogical adoption.

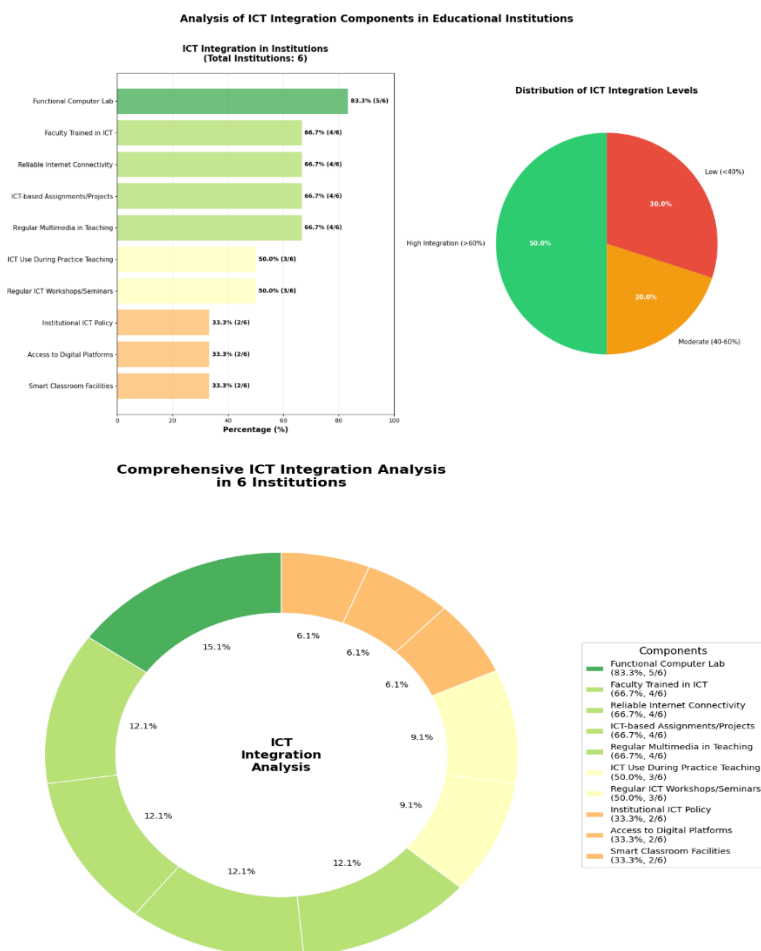


Table 3: Relationship between ICT Knowledge and ICT Integration Levels
Observed Frequencies

ICT Knowledge Level	High Integration	Moderate Integration	Row Total
Low	12	18	30
Moderate	45	25	70
High	33	17	50
Column Total	90	60	150

Chi-Square Test Results

Test Statistic	Value
Chi-square (χ^2)	8.24
Degrees of Freedom	2
p-value	0.016

The cross-tabulation shows a higher proportion of student teachers with moderate and high ICT knowledge in high-integration institutions. The Chi-square test confirms a statistically significant association between the variables ($\chi^2(2)=8.24$, $p=0.016 < 0.05$). This leads to the rejection of the null hypothesis, affirming that student teachers in institutions with greater ICT integration tend to possess higher ICT knowledge.

4. Discussion

The findings reveal a moderate level of ICT knowledge among student teachers (Mean=68.12), with substantial individual variation. ICT integration is foundational but uneven; while basic tools are available, advanced pedagogical integration is lacking. This aligns with studies by Tondeur et al. (2017), which posit that pre-service teachers' digital competence is heavily influenced by the quality of ICT exposure during training. The significant statistical relationship supports the view that institutional ecosystem—infrastructure, training, and policy—directly impacts student teachers' digital proficiency (Kay, Leung, & Tang, 2018). The limited presence of smart classrooms and digital platforms (33.3%) resonates with UNESCO (2019) concerns about the need for moving beyond basic access to meaningful, curriculum-aligned integration.

5. Findings

1. Student teachers demonstrate moderate ICT knowledge on average, with significant dispersion indicating unequal competencies.
2. ICT integration in institutions is strongest in basic infrastructure but weak in advanced pedagogical tools and strategic policy.
3. A statistically significant positive relationship exists between the level of institutional ICT integration and the ICT knowledge of student teachers.

6. Implications

- **For Policy & Administration:** Prioritize funding for advanced ICT infrastructure (smart classrooms, LMS) and develop clear institutional ICT policies.
- **For Curriculum Development:** Integrate mandatory, hands-on ICT pedagogy modules and project-based digital assignments into the teacher education curriculum.
- **For Faculty Development:** Implement ongoing capacity-building programs to equip teacher educators with advanced ICT-integration skills.
- **For Monitoring:** Establish regular audits of ICT integration and student teacher digital competency to inform targeted interventions.

7. Conclusion

This study concludes that student teachers in Paschim Medinipur possess foundational ICT knowledge, but their preparedness for deep pedagogical technology use is constrained by inconsistent institutional integration. The demonstrated link between institutional support and trainee competency underscores the need for a coordinated strategy. Enhancing digital readiness requires simultaneous investment in robust infrastructure, curriculum reform emphasizing applied technology, and continuous professional learning for faculty. Such multi-level efforts are essential to align teacher education in rural India with the demands of a digital age.

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