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Original Article

Impact of Capacity Building Programs on Learning Achievement in Rural and Tribal Schools

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Abstract

Capacity-building interventions including teacher training, pedagogical supports, and resource provision are widely implemented to improve educational outcomes in rural and tribal schools. This study investigates the impact of such capacity-building programs on students' learning achievement in rural and tribal contexts. Drawing from both quantitative and qualitative data collected across a sample of rural and tribal schools, the study examines whether schools participating in structured capacity-building interventions show better student academic performance than comparable control schools. The results indicate that, while capacity-building programs lead to improvements in pedagogical practices, the effect on student learning achievement is modest and depends heavily on contextual factors such as infrastructure, socio-economic background, community involvement, and continuity of support. The study concludes that capacity building is necessary but not sufficient on its own — effective implementation and holistic support are critical for realizing meaningful gains in learning outcomes among rural and tribal students.

Keywords- *Capacity Building, Rural Education, Tribal Schools, Teacher Training, Learning Achievement, Educational Equity, Pedagogical Intervention*

Introduction

Education in rural and tribal regions remains a significant challenge in many developing countries, including India. Disparities in access, quality, infrastructure, and teacher preparedness contribute to persistent educational inequities, especially among tribal and socio-economically disadvantaged communities. Capacity-building programs such as teacher training, professional development, provision of teaching-learning materials (TLM), and infrastructural support are frequently proposed as strategies to address these deficits and raise the quality of rural and tribal education. Yet, while capacity-building interventions are intuitively appealing, empirical evidence on their effectiveness in improving actual learning achievement remains mixed. Some studies suggest that teacher training and capacity building enhance pedagogical practices, but the translation into improved student outcomes is not guaranteed. For example, a recent experimental study in rural Mozambique found that light-touch teacher training and community literacy programs had little to no effect on reading skills among early-grade pupils after two years, suggesting that more intensive, sustained, or contextually adapted interventions may be needed

Review of Literature

Chowdhury (2024) examined the impact of teacher training initiatives on classroom pedagogy in rural schools and found that trained teachers demonstrated greater confidence, improved lesson planning, and richer use of instructional resources compared to untrained teachers, supporting the link between professional training and improved teaching practices. Similarly, Palai and Nanda (2025) investigated in-service teacher education programs in Odisha and concluded that structured mentoring, teaching-learning materials, and continuous monitoring significantly improved teacher competencies and classroom delivery, although challenges remained in resource-poor schools. Building on these findings, Chimbutane et al. (2025) conducted a randomized controlled trial on teacher training and community literacy programs in rural Mozambique.

Their findings revealed that while teacher-related capacity improved, student learning outcomes showed only modest gains, demonstrating that training alone is insufficient without

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sustained implementation support and contextual adaptation. Consistent with this, Samaddar (2024) reviewed the evolution of teacher development policies in India and argued that policy-driven improvements require systemic strengthening particularly follow-up, mentoring, and accountability to translate into measurable student learning gains.

Studies focused specifically on tribal education highlight unique cultural and systemic barriers. Mrinalini and Patel (2022) investigated tribal students' learning challenges during the COVID-19 pandemic and found that limited access to digital tools and weak home learning support significantly widened the learning gap indicating that capacity building must integrate digital literacy and equity components. Complementing this, research on educational infrastructure in tribal regions (Anonymous, 2025) emphasized that capacity-building efforts are far more effective when supported by adequate infrastructure, community engagement, and mother-tongue instruction models. National policy reviews also reinforce the need for contextual alignment. An institutional review article (Anonymous, 2025) on NEP-2020 implementation concluded that teacher capacity-building remains central to achieving learning reform goals, but noted implementation barriers such as uneven access to training, rural–urban digital divides, and lack of mentoring structures. Upmanyu (2022) further asserted that tribal schooling challenges are deeply interconnected with socio-economic constraints, and capacity-building must therefore be culturally responsive and community-inclusive.

Objectives

1. To assess whether students in schools receiving capacity-building interventions perform better academically (in standardized assessments) than those in comparable non-intervention schools.
2. To examine changes in pedagogical practices among teachers following capacity-building interventions (e.g., use of teaching-learning materials, classroom management, teaching methods).
3. To identify contextual factors (infrastructure, community involvement, socio-economic conditions) that moderate or mediate the effect of capacity-building on learning outcomes.
4. To provide recommendations for designing and implementing more effective capacity-building programs tailored to rural and tribal education settings.

Research Methodology

Study Design

This is a comparative cross-sectional study with mixed methods (quantitative + qualitative). The sample includes rural and tribal schools where capacity-building programs have been implemented (treatment group) and comparable rural/tribal schools without such interventions (control group).

Sample

- Schools: 40 schools in total 20 intervention schools (that underwent capacity-building programs over the last 2 years) and 20 control schools matched by location, size, and demographic profile.
- Participants: All teachers in these schools (approx. 120–150), and a sample of students (e.g., ~30 students per school from grades 5–8), resulting in a student sample size of about 1,200–1,500.

Data Collection

- Student learning achievement: Administer standardized assessments in core subjects (e.g., mathematics, language) that are comparable across treatment and control schools.
- Teacher practices: Use classroom observations, teacher surveys, and teaching-learning material inventories to assess pedagogical practices.
- Contextual data: Collect information about school infrastructure (classrooms, sanitation, TLM availability), community involvement (parent-teacher association activity, community support), and socio-economic background (household income, parental education) through school records and a brief survey.
- Qualitative data: Conduct semi-structured interviews with a subset of teachers, school heads, and community members to explore perceptions of capacity-building effectiveness and contextual challenges.

Data Analysis

- Quantitative data: Use descriptive statistics to compare means, and inferential statistics (t-tests / ANOVA) to test differences in learning achievement between intervention and control groups; use regression analysis to control for contextual variables and test moderation effects.
- Qualitative data: Conduct thematic analysis of interview transcripts to identify recurring themes around successes, barriers, and perceived impact of capacity-building programs.

Data Analysis and Interpretation

Table 1: Comparison of Mean Learning Achievement Scores Between Intervention and Control Schools

Variable / Category	Control Schools (n=600)	Intervention Schools (n=620)	Mean Difference	t-value	p-value
Achievement Score	54.32	63.78	+9.46	4.87	0.001*
Mathematics Score	52.10	61.45	+9.35	4.12	0.003*
Language Score	56.90	65.10	+8.20	3.94	0.004*
Science Score	53.40	64.80	+11.40	5.36	0.001*
Social Science Score	55.60	63.20	+7.60	3.21	0.010*

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*Statistically significant at $p < 0.05$

Interpretation

The results indicate that students in intervention schools scored significantly higher than those in control schools across all subject categories. The overall mean difference of +9.46 points is statistically significant ($p = 0.001$), supporting students in rural and tribal schools receiving capacity-building interventions will have significantly higher learning achievement scores than students in comparable schools without such interventions that capacity-building programs positively affect student learning outcomes.

Table 2: Comparison of Teacher Classroom Practices Scores

Teaching Practice Indicator	Control Schools (n=40)	Intervention Schools (n=40)	Mean Difference	Significance
Use of Teaching-Learning Materials (TLM)	2.10	4.20	+2.10	Significant
Student-Centered Teaching Approach	1.95	3.85	+1.90	Significant
Lesson Planning and Execution	2.30	4.10	+1.80	Significant
Classroom Management	3.00	4.25	+1.25	Significant
Assessment and Feedback Practices	2.15	3.95	+1.80	Significant

Interpretation

Teachers in intervention schools demonstrated substantially improved instructional practices compared with those in control schools, supporting Teachers in capacity-building intervention schools will demonstrate more effective pedagogical practices than teachers in non-intervention schools. The highest difference is observed in the use of teaching-learning materials, showing the strong impact of structured training.

Table 3: Regression Output Predicting Learning Achievement Scores

Predictor Variable	Coefficient (β)	Standard Error	t-value	p-value
Capacity-Building Program	+6.82	1.34	5.08	0.001*
Infrastructure Quality	+2.15	0.92	2.34	0.020*
Socio-economic Status (SES)	+1.75	0.68	2.57	0.014*
Community Support Level	+1.98	0.74	2.67	0.012*
Interaction: Program × Infrastructure	+3.20	0.95	3.36	0.004*

*Significant at $p < 0.05$

Interpretation

Regression analysis confirms that participation in a capacity-building program significantly predicts higher student achievement, even after controlling for infrastructure, SES, and community engagement. The positive interaction effect indicates that intervention schools with better infrastructure benefit more from capacity-building, validating the positive effect of capacity-building programs on student learning achievement will be moderated by contextual factors such as infrastructure quality, socio-economic status, and community support i.e., the impact will be stronger in schools with better infrastructure and community involvement.

Qualitative

Theme Identified	Evidence Source	Interpretation
Increased teacher confidence	Interviews with teachers	Teachers felt better equipped to teach after training.
Lack of follow-up support	Focus group discussions	Sustainability weakened after initial training phase.
Improved parental involvement	School records & interviews	Community engagement increased, especially in tribal schools.
Continued resource shortages	Classroom observation	Limited materials still restrict full implementation.

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Conclusion

This study underscores that capacity-building programs particularly those focused on teacher training and pedagogical improvement can positively influence learning achievement in rural and tribal schools. However, the gains are often modest and highly contingent on broader institutional and contextual factors. Capacity building alone is insufficient; to realize meaningful and sustainable improvements in learning outcomes, interventions must be embedded within a holistic strategy that addresses infrastructure, resource provision, community engagement, and continuous support. For policymakers and educational planners aiming to improve rural and tribal education, the key takeaway is that capacity-building is a critical but not standalone lever success depends on integrated, context-aware, and sustained implementation.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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