

Exploring the impact of in-service teacher education on the professional development of elementary teachers: a case study of Odisha

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Abstract. The present study explores the professional development of elementary teachers in Odisha, considering the role of in-service teacher education (ISTE) programs. It identifies the challenges and opportunities of teaching in rural and tribal areas where educational disparities exist. Concepts like experiential and transformative learning have been considered the foundation for enhancing teaching practice. The research focuses on national initiatives under Sarva Shiksha Abhiyan and National Education Policy 2020, which have shaped the structure and effectiveness of teacher education programs. Government reports, such as the Odisha School Education Programme Authority's Annual Report and the Economic Survey of Odisha, reveal efforts to improve education in the state, especially for under-served communities. The study uses global perspectives from organisations such as UNESCO to emphasise the need for inclusive education and continuous professional development. Reviewing these sources, the study recommends strengthening ISTE programs in Odisha to enhance teacher efficacy and student learning outcomes.

Keywords: in-service teacher education (ISTE), professional development, teacher training programs, rural and tribal education, National Education Policy 2020

1. Introduction

1.1. Overview of teacher education in India with a focus on Odisha

Teacher education in India is an indispensable component of the nation's education development process; it focuses on providing the appropriate training and skills for producing effective teachers to meet the needs of diverse student populations. The system encompasses pre-service education for prospective teachers and in-service training for currently practising teachers. Pre-service education only forms the ground; in-service teacher education (ISTE) offers continuing education, equipping teachers with changing pedagogical and curriculum change trends and incorporating new technology that affects learning activities [9].

Odisha, a state with more cultural and socio-economic diversity, is a typical representation of the challenges and opportunities in India's teacher education landscape. The state has a large percentage of the population living in rural and tribal areas, and its elementary education sector has unique challenges like infrastructure deficiency, linguistic problems, and varying preparedness levels of teachers [13]. In this regard, ISTE is crucial in addressing these issues by promoting continuous skill development and improving pedagogical practices among elementary teachers.

1.2. The role of ISTE in the context of Odisha's educational challenges

The educational scenario in India has been changing rapidly due to factors such as policy reforms, the integration of technology, and increasing emphasis on inclusive

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Educational
Dimension



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education. ISTE acts as an essential tool for helping teachers adapt to these changes. It focuses on continuous learning, reflective practices, and collaborative problem-solving, ensuring that teachers are always equipped to meet the dynamic needs of their classrooms [8].

In Odisha, ISTE programs aim to develop teachers' capacity to meet the challenges of rural and tribal education, including mother-tongue-based education and ICT-based learning practices. By bridging the gap between policy objectives and classroom realities, these programs contribute to the holistic development of both teachers and students [10].

Though ISTE plays an essential role in enhancing professional development, there is minimal qualitative impact on the elementary teachers in Odisha. The quantitative measurements of ISTE programs, such as the number of students enrolled and completion rates, are usually presented. The more profound dimensions, however, remain unexplored. To what extent do these programs change teachers' teaching practice, confidence level, and overall professional development? What are the obstacles to successful implementation? These questions are especially relevant in Odisha, where socio-economic disparities and infrastructural constraints create a significant barrier to educational initiatives.

1.3. Study objectives

This study seeks to address these gaps by:

1. *Exploring the role of ISTE in enhancing professional development*: by examining existing programs and their implementation, the study aims to understand how ISTE improves teaching competencies, pedagogical innovation, and teacher motivation in Odisha.
2. *Analysing how policy and programmatic initiatives shape teacher practices*: the study seeks to explore how state and national policies influence the design and delivery of ISTE programs in Odisha and their alignment with the unique needs of the region's educators.

1.4. Relevance of Odisha as a case study

The ISTE programmes in Odisha have always responded to the needs of the teachers within the framework of national policies; for example, Odisha organised the following programmes:

- Induction level training of 30 days duration for newly recruited Shikhya Sahayakas under Samagra Shiksha Abhiyan.
- Multi-grade multi-level training of 5 days to address the MGML situation.
- Teacher training programme for the following activity-based education consequent upon activity-based textbooks.
- Teacher training program for teachers serving in tribal areas to implement mother-tongue-based multilingual education.
- Teacher training program for inclusive education.
- Teacher training program for computer-aided learning.
- Gender sensitisation training for the teachers to address gender issues in schools.

Considering its socio-economic and educational environment, Odisha is an interesting case for studying ISTE's impact. The state has a vast population range, with 22% being Scheduled Tribes (STs) as per the Government of India [1]. This demographic diversity poses challenges in language, culture, and accessibility, making localised and adaptive teacher training programs a matter of urgent necessity.

Furthermore, in Odisha, several exemplary educational initiatives in the recent past include the implementation of the initiative Odisha Shiksha Sanjog by focusing on teaching learning outcomes via teacher training as well as social mobilisation processes [11]. Researchers can then generalise an understanding of the appropriateness and feasibility of this intervention toward ISTE effectiveness in various environments.

2. Review of literature

2.1. Key theories related to professional development and lifelong learning for teachers

Various educational theories ingrained in the professional development of teachers uphold continuous learning and skill improvement. According to Knowles [4] theory of andragogy on adult learning, adults learn best when they perceive the relevance of the content to their personal and professional context. This would apply to ISTE, which aims to capitalise on the prior experiences of educators while filling the gaps in the present.

Another influential model is Kolb's experiential learning theory [5]. The theory underlines the need for reflection in the process of learning. ISTE training programs generally stimulate teachers to reflect on their practices and improve by incorporating fresh classroom strategies.

The transformative learning theory by Mezirow [7] further emphasises the critical role ISTE plays in promoting profound, structural shifts in teachers' perspectives and attitudes. The theory is more relevant in places like Odisha, where teachers constantly face sociocultural and linguistic diversity, and a transformative approach is required to teach.

2.2. ISTE in the Indian context

2.2.1. National policies and frameworks shaping ISTE

Policy initiatives that have profoundly impacted India's teacher education system include enhancing the quality of teaching. The National Education Policy (NEP) 2020 [8] considers continuous professional development, insisting on an annual COP of at least 50 hours to keep the teachers abreast of new methodologies in teaching, assessment techniques, and technologies.

The SSA, initiated in 2001, is also a landmark for ISTE as it initiated regular training workshops and on-site support for teachers. Thereafter, the RMSA and Samagra Shiksha Abhiyan further expanded these programs to include secondary education and foster an integrated approach towards teacher training [14].

The National Initiative for School Heads' and Teachers' Holistic Advancement, launched in 2019, further transformed ISTE by including digital training modules and competency-based education. Therefore, all these policies together have to shape a more dynamic and responsive ISTE ecosystem in India.

2.3. ISTE developments and program landscape in Odisha

Odisha has a rich legacy of education interventions that focus on quality improvement among teachers. Establishing the TEIs, for example, the DIETs, was a marvellous development step towards improving the preparation and in-service training of teachers in the state. These institutions conduct regular workshops and refresher courses for elementary teachers [10].

The SSA framework is a structure, and the early 2000s saw Odisha take up various initiatives under the State-specific programs focused on rural and tribal teaching competencies enhancement. Those programs primarily focus on local culture integration in learning, imparting relevance and importance to the topic for students [13].

Many ISTE programs in Odisha have been instrumental in the professional development of elementary teachers. The Odisha Shiksha Sanjog program, initiated during the COVID-19 pandemic, is a prime example of the state's initiative towards teacher training. This program offered virtual training and support to teachers, which helped them cope with online teaching methods and continue their professional development despite the pandemic [11].

Another very relevant initiative is the establishment of the Teacher Resource Centres (TRCs) throughout the state. TRCs are hubs for collaborative learning, where teachers can get resources, peer mentoring, and hands-on training in innovative pedagogical practices [10].

The state of Odisha has also utilised technology to extend and enhance the effectiveness of ISTE programs. Platforms like DIKSHA and e-Vidyalaya have delivered training modules, thus fostering a blended learning approach combining online and offline methodologies. This action demonstrates the state's commitment to aligning its ISTE initiatives with national priorities while addressing its unique socio-educational context.

The key to ISTE programs in Odisha is that they pursue two distinct but complementary goals: developing pedagogical skills and bridging regional educational disparities. The programs combine theoretical inputs with experience-based learning and draw on adult learning principles like reflection, contextualisation, and peer learning [4, 5]. Their effect on professional growth can be seen in enhanced teacher autonomy, multi-lingual pedagogical approaches, assessment literacy, and universalising measures – particularly in tribal and rural settings [10, 16]. Thus, ISTE does not provide much training but drives professional change in underprivileged environments.

2.3.1. Core objectives and thematic content of ISTE programs in Odisha

The Odisha ISTE programs are nationally aligned but locally contextualised to address priorities. These programs are designed to:

- Improve subject matter knowledge and pedagogical content knowledge.
- Promote inclusivity and cultural responsiveness in tribal and rural schools.
- Prepare teachers to use technology for blended and remote instruction.
- Build professional ethics, leadership skills, and reflective teaching habits.

Common tasks and elements in these programs are:

- Multilingual education strategy workshops, such as implementing mother tongue teaching.
- Child-centric and competency-based learning modules, according to NEP 2020.
- Hands-on training with school-based activities and demonstration classes.
- Utilisation of online tools such as DIKSHA and e-Vidyalaya for digital content and performance monitoring.
- Monitoring and supervision of training programmes.

This content structure mirrors both standardised models (NCF-2005, NCFTE-2009) and regional requirements, e.g., encouraging tribal knowledge systems and responding to infrastructural limitations.

3. Methodology

3.1. Case Study approach

This study explored the effects of ISTE on professional development in elementary teachers in Odisha. A qualitative case study methodology is adopted to analyse

the complex interplay between educational policies, training programs, and teacher practices within a specific sociocultural context. As Sharan Merriam points out, case studies are best suited for examining real-world educational issues, providing rich, contextual insights into phenomena that cannot be captured through quantitative methods alone [6]. Yin's framework further underlines the utility of case studies in addressing "how" and "why" questions, particularly when the researcher has limited control over events and focuses on contemporary occurrences within a real-life context [3].

By focusing on Odisha, the study focuses on a bounded system that reflects unique educational challenges and opportunities within that region. It was thus chosen to use a qualitative lens since this will allow for the finding of subtle and detailed understandings of ISTE's qualitative effect on teacher development from policy documents, program reports, and other previous research studies.

3.2. Data sources

The study is based on secondary data from various sources, comprehensively viewing ISTE in Odisha. Some of the key data sources include:

1. *Government reports and policies*: secondary documents are the National Curriculum Framework for Teacher Education (NCFTE-2009), the Sarva Shiksha Abhiyan (SSA) implementation reports, and Odisha-specific teacher education initiatives that reflect what is going on in policy space regarding ISTE programs.
2. *Research studies*: the availability of peer-reviewed articles and reports on ISTE practices in India and Odisha provides academic insight into the effectiveness of such programs.
3. *Program documents*: documentations from various ISTE programs, such as syllabi, training modules and materials, and evaluation reports, are the primary source of references regarding programmatic structure and objectives.
4. *Public databases*: Examples include the database of DISE, UNESCO's reports on education, Education Watch Odisha-2006, performance of children as per ASER-2009, performance of Odisha based on Educational Development Index (EDI), performance of Odisha as per the study conducted by NCERT-2008 that provide some statistics and related information about Odisha.

3.3. Analytical framework

A content and thematic analysis methodology was used to interpret the data collected. The method enables the identification of recurring themes, patterns, and insights across various data sources. The steps in the analysis include:

1. *Data organisation* : the articles and reports assembled were grouped into thematic folders named policy frameworks, program content, and teacher outcomes.
2. *Thematic coding*: applying deductive and inductive coding, data was coded into predetermined categories, such as professional development, pedagogical practices, and systemic challenges, but with the openness of emergent themes.
3. *Interpretation*: evidence from the results was synthesised to reveal how ISTE policies are interconnected with program execution and teacher experience in Odisha.

Because the investigation was based on secondary data, primary longitudinal monitoring or controlled assessment measures did not measure professional development modifications. Instead, surrogate indicators – referred to here as reported variations in teaching approaches, training volume levels, and competency feedback appearing in program reporting – were examined thematically. Although this qualitatively views

ISTE's impact, the results are interpretive. Subsequent research with pre-post rating tools and teacher self-efficacy scales (e.g., TSES) might empirically confirm these improvements [12].

3.4. Ethical considerations

Because this is a secondary data source, ethical concerns over this study called for proper documentation to avoid misrepresenting any sources and proper referencing of intellectual property rights. Since most of the materials involved are public documents, issues concerning privacy and consent were minimal in this study.

This methodological framework provides a firm ground to explore the qualitative impact of ISTE on elementary teacher development in Odisha so that factoring in the policy, practice, and contextual realities would lead to actionable insights.

4. Findings and discussion

4.1. Overview of ISTE programs in Odisha

The heart of state transformation in education has been ISTE programs in Odisha, which focus on building the capacity of teachers to cater to the demands of universal elementary education. Significant initiatives include the SSA, the RTE Act-2009, and the E-Shishu Project, which touch on various dimensions of teacher training and quality education. These programs stress equitable access to education and the professional development of teachers, particularly in deprived areas. For example, the RTE Act guarantees quality education that dictates several teacher qualifications, pupil-teacher ratios, and conditions for infrastructure [2, 17].

The E-Shishu Project focused on identifying out-of-school children, mainstreaming these children, and monitoring in-school students for retention. Concurrently, the school development plans have emphasised improving curriculum delivery and teacher training in rural and tribal areas [17].

4.2. Enhancing professional competencies through ISTE

ISTE programs in Odisha have greatly enhanced pedagogical practices and classroom management skills. For instance, the Collectives for Integrated Livelihood Initiatives (CInI) initiative of Tata Trusts recorded a 30% improvement in foundational literacy and numeracy through practical training sessions and library interventions. These programs enhance the capacity of teachers to deal with diverse classroom challenges while promoting inclusive education practices [16, 17].

Programs under Odisha Teacher Education and Research (OTER) stress competency-based training, further boosting teachers' confidence in delivering the curriculum. Teachers have stated that they feel more competent and confident in delivering interactive approaches and catering to the needs of tribal and depressed communities. It shows that the ISTE goals align with the state's socio-economic and cultural requirements [2, 16].

4.2.1. Evidences of positive dynamics in teacher competency development

Evidence from program documents, qualitative observations, and policy analysis suggests a positive trend in the growth of professional competencies among Odisha's elementary teachers, which the Joint Review Mission (JRM) has reported through different field visits. Teachers have started using mobile apps, creating alternative content to cater to the needs of deprived students.

For example, assessments from the Odisha Shiksha Sanjog program enhanced teacher readiness to apply blended learning approaches and create low-cost teaching and learning resources for multilingual classrooms. Teachers who participated in these trainings reported greater classroom flexibility and better instructional design abilities [11, 16].

Additionally, repeated exposure to competency-based systems, like those advocated by the Odisha Teacher Education and Research (OTER) program, has fostered a culture of ongoing improvement. This has resulted in increased utilisation of formative assessments, differentiated instruction, and reflective lesson planning [15].

Although not measured in longitudinal data sets, these qualitative measures, supported by institutional reports, indicate a rising competency-building trend. Further studies would be aided by including pre-and post-training measures to confirm these dynamics empirically.

In addition, incorporating Mezirow's transformative learning theory [7] offers a conceptual framework to make sense of these changes. As educators experience new training materials and reflect on past practices, many experience a perspective transformation from classroom innovation, critical thinking, and collaborative pedagogical practices.

The teachers have started following an activity-based approach, and there is evidence of activity banks and suggestion banks.

4.3. Challenges in implementation

4.3.1. Infrastructure gaps

Infrastructure inadequacies remain the most significant bottlenecks, especially in rural areas. Schools do not have enough libraries and digital tools to use their ISTE programs fruitfully. This weakens their chances of achieving uniform educational results in each district [2, 17].

4.3.2. Resource allocation

Unfair distribution of resources further widens regional gaps. In such places as Nawarangpur and Malkanagiri, literacy levels are still around 21% and thus hardly provide positive impacts from ISTE initiatives. Targeted resource deployment can fill those gaps and render benefits more balanced [17].

4.3.3. Sustainability issues

The frequent change in policy and lack of follow-up mechanisms have weakened the long-term impact of ISTE programs. Many initiatives lack the continuity needed to ensure sustained teacher development. Experts recommend modular, ongoing professional development strategies to address this gap [2, 16].

5. Implications of the study

5.1. Policy recommendations

5.1.1. Strengthening program delivery through regional customisation

The study's findings have pointed out the need for regional adaptation in ISTE delivery in Odisha. Policies must focus on the specific needs of tribal, rural, and marginalised communities, as the training content must be prepared with multilingual and culturally responsive pedagogies. Localised interventions, such as the Odisha School Transformation Program and the RTE Act-2009 initiatives, have proved worthwhile. Such models can be extended with targeted customisation, bridging the gap between standardised training modules and localised teaching challenges [16, 18].

The training module developed at the state level needs to be tried out in rural and tribal settings and finally adopted for capacity building in the state.

5.1.2. Enhancing monitoring and evaluation mechanisms

One of the significant challenges when implementing ISTE is the lack of concrete M&E frameworks. Policymakers need to work on implementing real-time data collection and analytics to attain effectiveness in the program. For example, using digital tools to monitor teacher participation and performance would enhance accountability

and the program's outcomes [2]. States such as Kerala have exhibited the possibility of such systems, and Odisha can adopt them as well [17].

The monitoring network must be strengthened, and teachers' classroom performance must reflect the training inputs.

5.2. Educational practices

5.2.1. Incorporating ISTE outcomes into continuous learning frameworks

It also makes professional development sustainable for the teacher by infusing ISTE outcomes into lifelong learning frameworks. Workshops, peer learning sessions, and online courses aligned with ISTE principles can reinforce training objectives and encourage continued development. Additionally, incentives created for teachers to participate actively in such programs may boost engagement and enhance long-term outcomes [16, 18].

5.2.2. Fostering a collaborative culture among teachers

Building a collaborative culture among teachers is critical to sustaining the effects of ISTE programs. Peer networks and professional learning communities (PLCs) facilitate sharing best practices, discussing problems, and developing solutions. Policy support through institutional backing for such collaborations enhances the effectiveness of ISTE initiatives [2, 17].

5.3. Further research

5.3.1. Need for community-based assessments

Community-based assessments will need to evaluate ISTE programs for the broader social and cultural impact of such programs. Local community, parents, and students would need to be engaged in this study to know the views on such programs of training teachers and whether they have been found applicable and accepted in real-life scenarios. Such a method will also identify grassroots challenges and opportunities for improvement [17, 18].

5.3.2. Exploration of technology integration in ISTE delivery

The potential of technology in revolutionising ISTE delivery remains unexplored. Digital platforms for training dissemination, virtual mentoring, and real-time feedback can improve the reach and quality of programs. Digital initiatives in education, such as ICT in Kerala, have been known to democratise access and improve learning outcomes. Odisha could pilot similar models tailored to its needs [16, 18].

The implications of this study will reflect the significance of tailored, data-driven, and community-oriented approaches to ISTE in Odisha. These together can fortify policy frameworks, foster collaborative practices among teachers, and employ technology to upgrade the quality of education. Moreover, in addition to an impact-oriented teacher education program, engaging the local community in the design and implementation of ISTE ensures that the outcomes are impactful but also inclusive and sustainable.

5.4. International relevance and transferability

Although the research has a regional focus, the problems discussed – teacher capability in under-equipped environments, multilingual schooling, and inclusion – are essential worldwide. All countries in South Asia, Sub-Saharan Africa, and Latin America experience teacher loneliness, poor infrastructure, and ethnically mixed classrooms. Odisha's strategy can be replicated elsewhere, especially in mobile training teams, community-based TRCs, and digital platforms like DIKSHA. This is consistent with UNESCO [18] focus on prioritising context-based teacher professional development worldwide. Therefore, the research provides not only local insight but also a replicable model of ISTE based on cultural responsiveness and adaptability.

6. Conclusions

This study's results indicate that ISTE programs are critical in developing teacher competency, especially in a state like Odisha, which has diverse socio-economic and cultural settings. ISTE programs have positively impacted teaching practices, boosted teachers' confidence, and encouraged inclusive classroom practices. A comparison of Odisha with the likes of Kerala establishes the sharp divergences existing in ISTE implementation. Kerala's approach towards digitisation and a better monitoring system delivers more efficiency. There is still importance attached to tribal educational development and grassroots engagement for states with the aforementioned socio-economic needs. However, issues like infrastructural gaps, uneven distribution of resources, and limited sustainability call for systemic reforms. Adopting regional customisation, technology-driven training and monitoring, and collaboration among educators can strengthen the ISTE framework further in Odisha. Training the trainers at the state and national levels is also necessary to orient them with new pedagogical approaches.

The state's emphasis on tribal education and community engagement is replicable for other similar regions. As Odisha continues to march forward, addressing the systemic gaps with innovative approaches would be crucial in ensuring equitable, high-quality education for all.

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