

Assessing teacher training quality and student learning outcomes in North Sindh secondary schools: A case study

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Abstract

North Sindh, Pakistan, is plagued by a number of socio-economic factors that confound the provision of quality education. Some of the most prominent issues include teacher shortages of qualified teachers and school facilities, among others. To offset such challenges, the Sindh Teachers Education and Development Authority (STEDA) and Provincial Institute of Teacher Education (PITE) have designed a series of Teacher Training Programs (TTPs). Their effect on Student Learning Outcomes (SLOs) remains to be adequately studied. The present study evaluates the effectiveness and quality of TTPs for Secondary School Teachers (SSTs) in North Sindh, highlighting important gaps such as the non-existence of assessment frameworks, contextual assessment, and feedback systems. The fact that investments have gone on unabated despite the absence of systematic evaluations has held back progress, resulting in flat outcomes. Using the case study approach, the research situates findings within the socio-cultural and institutional life of the region and offers meaningful information to policymakers and education leaders. It identifies the necessity for swift action to develop comprehensive appraisal and feedback systems to ensure continuous growth in teacher training and student achievement. Without such arrangements, long-term sustainability and effectiveness of TTPs are a matter of doubt, and education outcomes in North Sindh would likely continue to be unsatisfactory.

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Introduction

North Sindh, Pakistan, is an area plagued by long-term socio-economic challenges that have a profound impact on ensuring quality education. Despite efforts to increase access and infrastructure, the area still has much to deal with: poor trained teachers, absence of resources, and lack of professional development. These issues, as mentioned by Singh et al. (2021) and Khan et al. (2020), result in poor student learning levels and exacerbate educational inequalities, as observed by Jabeen and Khalil (2023). The rapid pace of globalisation and technological advancement has transformed the educational needs, necessitating a shift in the pedagogy. This shift emphasizes the growing significance of effective TTPs, with UNESCO (2021), and Ahmad and Ali (2023) noting their existence as pillars in education reforms. Despite considerable investments, the positive impact of such programs in North Sindh has been questionable; with Chachar et al. (2023) mentioning a training-on-ground gap. Research

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by Ghunio and Shaikh (2023) has established that traditional training models are often ineffective in equipping teachers with the skills needed for today's classrooms. Kalim and Bibi (2024) also highlight the lack of contextualisation in training programmes, which also keeps teachers at a distance from the communities they serve. Such separation hinders their ability to effectively address local education needs. To counter these issues, there is a need to critically assess the applicability, calibre, and effectiveness of TTPs in North Sindh.

The agenda must be two-pronged: enhancing students' learning achievements and teachers' meaningful professional development, as emphasized by Hussain and Naveed (2023). There must be a holistic and evidence-driven approach that incorporates local social-cultural realities into training material and practice. Shah et al. (2023) enhance stakeholder collaboration, noting that educational reform with a sustainability approach depends on coordinated effort by the government departments, schools, NGOs, and community in general. Stimulating cooperation and the sharing of expertise among SSTs will help construct solution specific to contexts. An inclusive and cooperative strategy not only supports improvement in the quality of instruction but also facilitates development overall of the students within the area. Finally, building a supportive, cooperative teaching community is essential to transforming the nature of education in North Sindh and eventually observing long-term improvement in learning outcomes.

The capability of TTPs is very important in enabling the process of teaching and learning and has a direct implication on SLOs. North Sindh, Pakistan, needs to have an adequate framework to evaluate whether TTPs are effective, particularly in terms of their implications for SLOs. Although significant investments are being made in teacher training, loopholes in designing and executing the same prevail, and therefore this is a concern if they are adequate enough in addressing modern education demands. This research addresses some of the key issues, such as the lack of formal processes to assess TTPs and limited knowledge about the effect of teacher training on student performance. It also highlights the need for continuous, context-specific professional development for practicing elementary and secondary teachers. Focusing on North Sindh as a case study, the research investigates the socio-cultural and institutional concerns of the area to provide a localised perspective. It aims to provide actionable policy recommendations to improve the quality of TTPs and make them locally relevant. By highlighting strengths, weaknesses, and areas for improvement, this research facilitates further teacher development and educational equity towards improved SLOs and long-term educational progress in North Sindh.

Building upon the identified challenges and gaps in North Sindh's educational landscape, this study pursues three interconnected objectives that address the core issues outlined above. The first objective seeks to explore stakeholders' perceptions about TTPs and their effect on SLOs in North Sindh, recognizing that understanding multiple perspectives is crucial for comprehensive reform. The second objective aims to examine how SSTs apply Continuous Professional Development (CPD) training in practice and evaluate its contribution to attaining SLOs, addressing the training-implementation gap highlighted by previous research. The third objective focuses on investigating the available assessment mechanisms used to measure the efficiency of TTPs in North Sindh, responding to the identified lack of formal evaluation processes. These objectives collectively address the fundamental need for evidence-based understanding of TTP effectiveness while considering local contextual factors that influence

educational outcomes. These research questions form a cohesive framework that moves from understanding perceptions to examining implementation practices and finally to evaluating assessment mechanisms, thereby providing a comprehensive analysis of TTP effectiveness in the North Sindh context. To systematically address these objectives and provide actionable insights for educational stakeholders, the study is guided by three corresponding research questions that directly align with the stated objectives as follows:

1. What are the perceptions of teachers, trainers, and educational officials towards TTPs and their impact on SLOs in North Sindh?
2. How are SSTs utilizing continuous professional development training in their classroom practice, and what is its contribution to achieving SLOs?
3. What evaluation processes are currently utilized to assess the effectiveness of TTPs in North Sindh, and how adequate are these mechanisms?

Conceptual Framework

The conceptual framework is crucial in research as it provides a foundation for understanding and interpreting data. Creswell (2014) emphasizes that a conceptual framework “provides direction and guidance for the research design” by outlining the theoretical basis and the connections between variables. Maxwell (2013) points out, it “helps us to understand what is going on in the world, to make predictions about future events, and to explain why things happened the way they did.” According Yin (2009), without a conceptual framework guiding and informing the research process, the case study may become a mere description lacking the analytical depth and rigor necessary for scientific inquiry. Conceptual framework (Figure 1) is essential in research because it provides a roadmap for the study, guides the research design, and aids in the interpretation of findings.

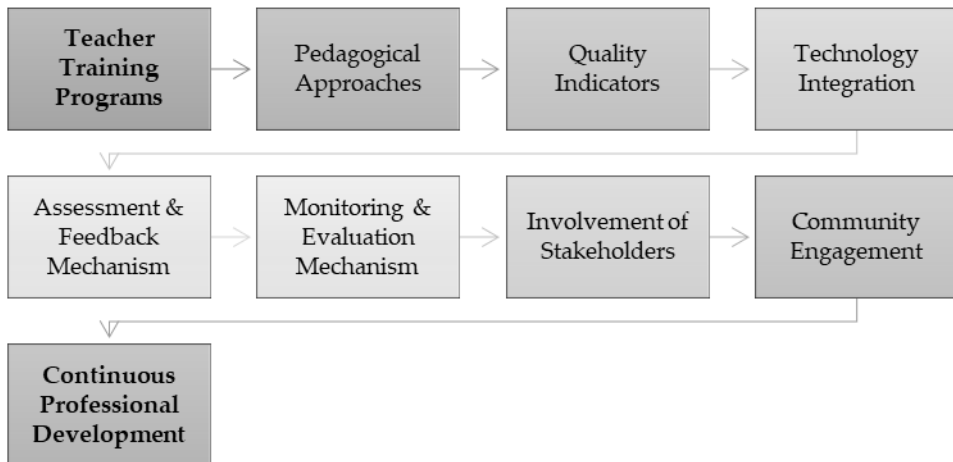


Figure 1. Conceptual framework

Literature Review

As mentioned by Smith (2019), various teacher training programs are developed across the globe to equip teachers with latest and updated teaching techniques, improving curriculum development skills, and providing technical assistance in order to improve the overall standards of teaching and learning process by getting positive outcomes. TTPs play a crucial

role in shaping the quality of education and subsequently influencing student learning outcomes. In the context of North Sindh, where educational challenges persist, understanding the effectiveness of such programs is imperative. This thematic literature review examines key themes and findings in assessing the quality of TTPs and their impact on student learning outcomes in North Sindh.

Quality Standards and Indicators for TTPs

Effective TTPs encompass various dimensions essential for producing competent teachers. Research by Qaisra and Haider (2023) emphasizes the significance of content knowledge, pedagogical skills, and practical classroom experience in teacher preparation initiatives. Furthermore, Khan et al., (2020) highlight the importance of incorporating modern teaching methodologies, technology integration, and culturally relevant content in training curricula to address the diverse needs of learners in the region. Despite the recognized importance of quality standards of TTPs, challenges persist in North Sindh. An investigation by Ahmed et al., (2019) identifies inadequate resources, out-dated curricula, and a lack of qualified trainers as major impediments to the effectiveness of TTPs. Moreover, Hussain and Arain (2021) point out the prevalence of rote learning approaches and a dearth of opportunities for reflective practice among teachers, hindering the translation of training into improved classroom practices. The quality of TTPs directly influences student learning outcomes. A longitudinal study by Jamali and Memon (2022), demonstrates a positive correlation between teachers' participation in comprehensive, well-designed training programs and enhanced student achievement in core subjects. Similarly, research by Baloch and Khoso (2019) underscores the role of on-going professional development and mentorship in sustaining the impact of initial teacher training on student learning over time.

TTPs' effectiveness is often assessed based on several quality indicators. According to Smith and Wilson (2018), these indicators include curriculum relevance, pedagogical strategies, practical training components, and on-going professional development opportunities. Furthermore, Khan et al., (2020) emphasize the importance of aligning training content with the diverse needs of students and communities in North Sindh. The curriculum and pedagogical approaches employed in TTPs significantly impact the effectiveness of teaching practices (Tahira et al., 2020). Programs that align with the socio-cultural context of North Sindh are found to be more relevant and impactful (Ahmed & Malik, 2020).

Pedagogical Approaches, Methodologies, Assessment and Feedback Mechanisms

Effective TTPs incorporate diverse pedagogical approaches and methodologies to cater to different learning styles and contexts. Research by Teo et al., (2021) highlights the significance of promoting interactive teaching methods, such as cooperative learning and inquiry-based instruction, in improving student engagement and achievement. Moreover, Ali and Siddiqui (2021) emphasize the integration of technology-enhanced teaching practices to enhance the effectiveness of TTPs in North Sindh. Practical training components that simulate real classroom scenarios are essential for equipping teachers with necessary skills (Khan & Ali, 2021). Studies highlight the importance of field experiences and practicum in enhancing teaching competencies (Saif et al., 2023). Integration of technology in teacher training enhances digital literacy among teachers and prepares them for technology-enhanced teaching

environments (Memon & Shaikh, 2020). Programs incorporating technology training exhibit higher levels of innovation in teaching methodologies (Rasool et al., 2023).

Assessment and feedback mechanisms within TTPs play a crucial role in monitoring progress and identifying areas for improvement. According to Rahman and Abbas (2018), incorporating formative assessment strategies, such as peer observations and self-reflection, can enhance the effectiveness of teacher training initiatives. Additionally, on-going feedback loops between trainers and trainees facilitate continuous improvement and adaptation of training content to local contexts (Khalid & Hussain, 2022). Robust assessment and feedback mechanisms within TTPs facilitate self-reflection and improvement (Ali et al., 2023). Regular feedback loops between trainers and trainees foster a culture of continuous improvement (Baloch & Khoso, 2023).

Community Engagement and Context in Professional Development

Collaboration between teacher training institutions, schools, and local communities is essential for ensuring the relevance and sustainability of training programs. Studies by Jamali et al., (2020) emphasize the importance of involving community stakeholders in the design and implementation of teacher training initiatives, fostering a sense of ownership and support. Furthermore, Mahmood and Malik (2023), advocate for the establishment of professional learning communities where teachers can share best practices and receive support from peers. Community engagement and collaboration emerge as crucial components for enhancing the effectiveness of TTPs. Qureshi and Memon (2020), advocate for partnerships between schools, universities, and local stakeholders to ensure the relevance and contextualization of training initiatives. Additionally, Mahmood and Shaikh (2023) emphasize the importance of involving parents and community members in teacher training processes to foster a supportive learning environment beyond the classroom.

CPD opportunities provided within TTPs contribute to on-going skill enhancement and knowledge updating (Jatoi & Soomro, 2018). Effective CPD initiatives ensure that teachers remain abreast of latest pedagogical trends and educational reforms (Mirza et al., 2023). Investing in capacity building initiatives for personnel and stakeholders can enhance their skills and knowledge in data collection, analysis, and interpretation (Prasla & Ashiq 2023). Training programs should focus on building expertise in both qualitative and quantitative research methods. Adopting a utilization-focused approach to evaluation can enhance the relevance and usefulness of CPD findings for program decision-making (Raza & Shaikh, 2020). Engaging key stakeholders in the design and implementation of CPD activities can promote greater ownership and uptake of evaluation results. CPD should be viewed as an iterative process aimed at continuous learning and improvement (Aslam & Khoso, 2021). Regular feedback loops and periodic reviews enable program officials to identify strengths, weaknesses, and areas for enhancement and make informed adjustments accordingly.

Monitoring and Evaluation (M&E) including Challenges and Fragmentation

Effective M&E mechanisms are essential to ensure the quality and effectiveness of these programs. In recent years, there has been a growing trend towards integrating technology into M&E processes in TTPs (Smith, 2019). Tools such as mobile applications and online platforms facilitate real-time data collection and analysis, allowing for more efficient monitoring of program activities and outcomes. Scholars have emphasized the importance of adopting participatory approaches to M&E, which involve engaging stakeholders, including teachers,

trainers, and community members, in the evaluation process (Khan et al., 2020). This ensures that M&E efforts are contextually relevant and responsive to the needs of the local community. There is a shift towards outcome-based evaluation frameworks that focus on assessing the impact of TTPs on student learning outcomes (Ahmed & Ali, 2018). This requires aligning M&E indicators with specific learning goals and measuring changes in teacher practices and student performance over time.

One of the primary challenges faced in M&E of TTPs in North Sindh is the limited availability of financial and human resources (Hussain, 2018). Insufficient funding and staffing hinder the implementation of robust M&E systems and limit the capacity for data collection and analysis. Ensuring the quality and reliability of M&E data remains a significant challenge (Kumar & Shaikh, 2021). Issues such as data inaccuracies, incomplete reporting, and bias can compromise the validity of evaluation findings and undermine the effectiveness of M&E efforts. Fragmentation and lack of coordination among stakeholders involved in M&E activities pose challenges to the effective management and utilization of evaluation data (Malik & Aslam, 2019). Strengthening coordination mechanisms and promoting information sharing can enhance the utility of M&E findings for program improvement. TTPs can have a very significant impact on student learning outcomes in North Sindh. By focusing on quality indicators, incorporating diverse pedagogical approaches, implementing effective assessment and feedback mechanisms, and fostering community engagement, these programs can certainly enhance the skills and competencies of teachers including improving educational outcomes for students. However, as per the literature review, it is an established fact that effective TTPs in North Sindh require a multifaceted approach that may address the program quality, pedagogical strategies, CPD, community engagement, and robust monitoring as well as evaluation mechanisms. Therefore, by prioritizing these elements, stakeholders can surely enhance the quality of TTPs and eventually improving SLOs in the region of North Sindh, Pakistan.

Gaps Identified from the Literature Review

Literature review acknowledges challenges such as inadequate resources, out-dated curricula, and lack of qualified trainers; it may lack a deeper exploration of these challenges and their specific impacts on teacher training effectiveness in North Sindh. While some studies mention the importance of culturally relevant content and socio-cultural alignment of training programs, there is a gap in the depth of exploration regarding how cultural factors specifically influence TTPs and SLOs in North Sindh. Although there is mention of the integration of technology-enhanced teaching practices, there is a lack of detailed exploration into the challenges and barriers associated with technology integration in TTPs in North Sindh. There is limited discussion on potential solutions or strategies to overcome these challenges effectively. The literature review focuses primarily on summarizing existing studies and findings without providing comparative analysis or synthesis of contrasting perspectives.

Method

Methodology section for this particular study includes philosophical stance, research method, data collection, sampling strategy, interpretation, and ethical considerations.

Philosophical Stance

This research uses the constructivist perspective, acknowledging that TTP success is framed by institutional, cultural, and social processes (Smith & Sparkes, 2020). Prioritizing individual experiences, this research also investigates the contributions of teachers, mentors, and large-scale systems in influencing TTP attainment in North Sindh. This study gives importance to the voice of actors engaged in an effort to gain a better understanding of teacher development and how it influences learners.

Research Method

This research employs a case study method to investigate the quality of TTPs in North Sindh. A case study permits a thorough examination of a phenomenon in its actual context (Smith & Sparkes, 2020), and therefore it is apt for investigating the region's distinct socio-cultural, economic, and educational environment. North Sindh has unique features that affect the implementation and functioning of TTPs, such as significant education gaps and limited quality education and trained teachers. By targeting this particular context, the study picks up on meaningful regional subtleties that have otherwise gone unnoticed in wider studies. Additionally, lessons from this case have very robust policy implications, as they can inform interventions to enhance teacher development programs in Pakistan. The research design involves triangulation (Jones, 2018), combining semi-structured interviews and document analysis to improve credibility and depth of findings (Creswell, 2014; Smith & Brown, 2019), with a high-quality and contextualised explanation of TTP effectiveness.

Sampling

This study employs a purposive sampling technique to select participants and sites in North Sindh that are both varied and meaningful. The sample includes twelve significant stakeholders of TTPs: eight secondary school teachers, two master trainers, and two education officials. This combination of participants guarantees a range of perspectives and roles within the education system and allows for a thorough examination of TTPs. Participants were selected based on specific inclusion criteria, namely their experience, engagement, and commitment to teacher training programs (Allan, 2020). This targeted recruitment ensures that the participants possess the necessary insights to be capable of making worthwhile contributions towards the research objectives.

Data Collection

Informed consent was taken from all participants before initiating data collection. Data collection was done in two rounds to get a comprehensive idea regarding TTPs in North Sindh. In the first round, semi-structured interviews were conducted with education officials, master trainers, and teachers. These interviews enabled extensive exploration of experiences, views, and knowledge on the efficacy of TTPs by participants and revealed central areas of strength, difficulty, and potential improvement. In Phase Two, document analysis was completed with a pre-formed checklist. This involved investigation into training guides, curriculum material, and pertinent policy directives in an effort to comprehensively realise what goals, matter, and methodologies were integrated within the training programmes. The analysis helped in determining the degree to which TTPs are aligned with national education standards and best practice. Individually, each of these approaches provided a robust and triangulated dataset that enabled an objective balance of evaluating the design, delivery, and effects of TTPs across the region.

Data Analysis

The process of data analysis for the case study at hand examining the quality of TTPs in North Sindh is a systematic, step-by-step procedure meant to yield useful information from qualitative data (See Fig. 2). All the interviews and observations were first transcribed verbatim to ensure accuracy and completeness. Relevant training documents, curriculum reports, and policy documents were then organised and digitised for analysis. The analysis of data began with open coding, establishing key concepts and themes to investigate diverse perspectives (Mohajan & Mohajan, 2022). Axial coding came next, where relationships between codes were established and a preliminary coding guide was formulated to guide further analysis (Mohajan & Mohajan, 2022). Next, thematic analysis was used to discover high-level themes regarding TTP quality, with an initial development of themes by single researchers that were then developed further collaboratively (Creswell, 2014).

Data segmentation was used to systematically review and analyse relevant data segments for comprehensive coverage (Smith & Sparkes, 2020). Lastly, findings from interviews, observations, and documents were synthesized to form a general picture of TTP quality and its impact on SLOs. Comparative analysis was used to determine similarities, differences, and contradictions among perspectives, providing richness to the analysis and pointing to areas that require further exploration. Member checking was used to validate initial findings by asking participants to provide comments, making findings credible and trustworthy (Hennink et al., 2020). Triangulation was used to verify findings between different sources of data, giving the study reliability and validity (Allan, 2020). Results are presented in a narrative form, including a clear overview of the key themes and evidence (Allan, 2020). Finally, the findings are situated within the socio-cultural, economic, as well as the educational context of North Sindh to ensure that results are actionable, meaningful to stakeholders and policymakers.

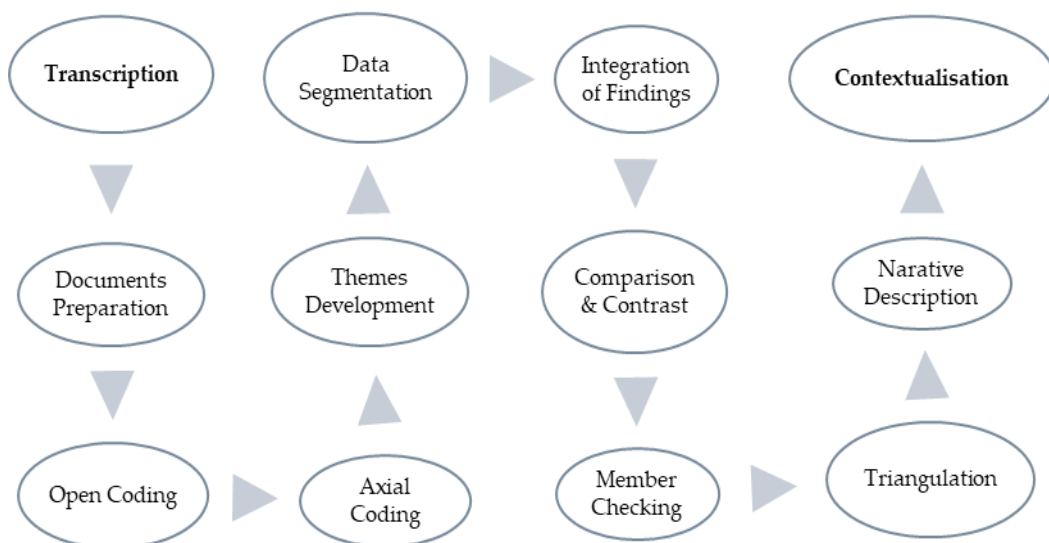


Figure 2. Key steps about data organisation and analysis

Ethical Considerations

In the research assessing TTPs quality in North Sindh, Pakistan, ethical principles were paramount. Key considerations included obtaining informed consent from all participants, ensuring confidentiality through pseudonyms and secure data storage, respecting privacy and cultural sensitivities, and maximizing benefits while minimizing harm. Fair treatment was ensured regardless of background, and transparency and integrity were maintained throughout the data analysis process, documenting procedures and upholding academic honesty (Hennink et al., 2020).

Findings

Upon conducting a thorough thematic analysis of the collected data from twelve research participants, it is apparent that continuous TTPs yield significant positive effects on students' learning outcomes. These programs serve as vital platforms through which SSTs not only refine their instructional techniques but also stay abreast of cutting-edge pedagogical approaches on a global scale. However, the examination of semi-structured interviews, observational data, and document analyses unveiled numerous shortcomings and discrepancies within the implementation of TTPs. These deficiencies include substandard quality control measures, limited opportunities for teachers' professional development, and inadequate access to relevant TTP resources. Delving deeper into the comprehensive thematic analysis of the gathered findings, a nuanced understanding of the challenges and opportunities associated with TTPs emerged.

Significance of TTPs for CPDs of SSTs

In contemporary education, from the perspective of research participants, the imperative for secondary level teachers to undergo continuous CPD cannot be overstated. Research participants underscored the significance of CPD, affirming its vital role in supporting teachers throughout their careers (Refer Table 1). RP3 emphasized *"the importance of on-going CPDs to enhance teaching effectiveness and yield positive SLOs"*. RP3 mentioned the significance of continuous professional development for teachers to improve their teaching effectiveness, which ultimately leads to positive student learning outcomes. CPDs help teachers stay updated with the latest teaching methodologies, technologies, and pedagogical strategies, which in turn enhance their ability to effectively facilitate student learning.

Moreover, RP5 focused the role of TTPs, such as *"CPD schemes, in bolstering teachers' content knowledge and pedagogical skills, thereby enabling them to better engage students"*. In essence, RP5 emphasized the importance of CPD for teachers to enhance their abilities and ultimately benefit student learning. Whereas, RP2 emphasized that; *"TTPs play a pivotal role in preparing teachers for the classroom, providing them with essential practical teaching experiences"*. RP2 highlighted the crucial role of TTPs in equipping teachers with the necessary skills and practical experiences to excel in the classroom. These programs serve as a foundational platform for teachers, offering them invaluable opportunities to develop effective teaching techniques and strategies through hands-on experiences and mentorship.

Additionally, as stated by RP4; *"TTPs foster awareness among teachers regarding the integration of modern teaching methodologies, including technology, into their instructional practices"*. RP4 indicated the importance of TTPs in raising awareness among teachers about integrating modern teaching methodologies, such as incorporating technology, into their teaching

practices. This suggests a focus on empowering teachers with the skills and knowledge needed to effectively utilize technology in the classroom to enhance learning outcomes.

This sentiment is echoed in document analysis as well, which reveals the widespread implementation of various TTPs across public and private sector organizations at local, district, regional, and provincial levels. These initiatives encompass pre-induction training programs, CPDs tailored for both general and science teachers, mandatory teaching training, and the promotion of quality teaching methodologies. Overall, TTPs serve as essential mechanisms for equipping secondary level teachers with the tools and knowledge necessary to excel in their profession and meet the evolving demands of education in the 21st century.

SSTs' Perceptions about TTPs

Upon detailed analysis of the gathered data, it became evident that SSTs harbour negative perceptions stemming from various factors. One of the respondents, RP7, expressed dissatisfaction, stating, *"TTPs are of no use as we do not learn something effective, motivating, and enthusiastic. It is just a waste of time as trainers teach us in a traditional way and there is no any change or updated syllabus."* Here, RP7 has emphasized a point, possibly related to training or learning methods, while RP7 expressed dissatisfaction with the current training program, highlighting that it lacks effectiveness, motivation, and enthusiasm. They feel it's a waste of time because trainers stick to traditional methods without updating the syllabus.

Similarly, RP6 lamented the lack of facilities during TTPs, highlighting the absence of access to technology and a supportive learning environment: *"There are no any facilities while attending TTPs including access to technology. There is no any supporting environment for teachers where we can learn something new and interesting."* RP6 expressed disappointment or frustration about the lack of facilities during TTPs, underscoring the absence of access to technology including, conducive learning environment for teachers. This suggests a significant gap in the infrastructure and resources necessary for effective teacher training and professional development.

Establishing a positive and conducive learning atmosphere is crucial for effective TTP implementation, as noted by RP9: *"Training sessions lack practical training components and curriculum relevance. Trainers do not engage us practically rather they rely on a theoretical approach by reading training manuals only."* RP9 specifically highlighted the concern that trainers primarily rely on theoretical approaches, such as reading training manuals, rather than engaging participants in practical learning experiences. This lack of practical engagement can hinder the effectiveness of training and limit participants' ability to apply what they have learned in real-life situations.

Analysis of different training manuals including training manuals of 2018 to 2022 reflected the absence of updated curriculum, relevant pedagogical strategies, and practical training components were evident upon assessment of various training manuals. Furthermore, the alignment of training content was found to be lacking, as observed during visits to training centres. The researcher noted a dearth of proper mechanisms for technology integration, including the availability of IT-based teaching tools such as computers, projectors, smart screens, and laboratory equipment. This deficit underscores the need for comprehensive improvements in TTPs to meet the evolving needs of SSTs effectively. It is the main section in which the collected data and results are presented.

Table 1. Triangulation of results and findings on TTPs for CPDs of SSTs

Theme / Focus Area	Research Insights	Participant	Document Analysis	Researcher Observation / Interpretation	Triangulated Interpretation
1. Importance of CPD for Teaching Effectiveness	RP3: CPD enhances teaching effectiveness and student learning outcomes. RP5: CPDs strengthen pedagogical skills and content knowledge.		Document analysis confirms widespread implementation of CPDs at various administrative levels.	CPDs are recognized as essential mechanisms in teacher development, widely adopted in both public and private sectors.	Strong convergence: All data sources affirm the critical role of CPDs in improving teaching quality and student outcomes.
2. Role of TTPs in Professional Preparedness	RP2: TTPs provide essential practical experience and classroom readiness. RP5: Emphasized on pedagogical enhancement through CPDs.		Manuals and frameworks indicate a formal structure of pre-induction and in-service programs for secondary teachers.	TTPs lack sufficient practical engagement, but are established components of teacher development systems.	Partial convergence: While the design of TTPs aims to build readiness, implementation issues affect their effectiveness.
3. Integration of Modern Pedagogies and Technology	RP4: TTPs foster awareness about integrating technology and innovative methods.		Manuals from 2018–2022 show lack of updated content and insufficient inclusion of tech-based teaching strategies.	Visits reveal absence of basic tech tools like projectors, smart boards, or functioning IT labs.	Strong divergence: Intent of modernization exists, but practical execution and content update lag significantly behind.
4. Practicality and Relevance of Training	RP9: Training lacks practical engagement; trainers rely on reading manuals. RP7: Training is ineffective and not motivating; outdated methods used.		Training content analysis confirms theoretical bias and outdated materials.	Observations reveal minimal hands-on learning and outdated instructional approaches.	Strong convergence: All sources indicate that training lacks practical relevance, with limited hands-on experiences.
5. Training Environment and Infrastructure	RP6: No access to tech, facilities, or a conducive learning environment.		No indication in documents of dedicated infrastructure support for teachers during TTPs.	Physical visits confirm poor training conditions and absence of digital integration tools.	Strong convergence: Environmental constraints, including lack of infrastructure, are a major barrier to effective CPD.
6. Teacher Motivation and Perception of Usefulness	RP7: TTPs seen as demotivating and a waste of time. RP9: Lack of enthusiasm from trainers affects engagement.		Documents do not address motivational aspects or feedback mechanisms.	Trainers rely heavily on theoretical delivery with little engagement or innovation.	

Implementation and Effectiveness of TTPs

The successful implementation and effectiveness of TTPs are deeply intertwined with various factors such as consistency, transparency, quality assurance, and the provision of adequate equipment (Refer Table 2). RP1 highlighted concerns regarding hindrances to successful implementation, notably *“limited budget allocation leading to only a select few teachers receiving training opportunities. As a result, many teachers are unable to attend TTPs”*. RP1’s emphasis likely revolves around addressing the issues. By placing importance on the concerns raised, RP1 wanted to focus on finding solutions to overcome obstacles such as the limited budget allocation, thereby ensuring that more teachers have access to training opportunities, which could ultimately lead to more successful implementation of whatever program or initiative is being discussed.

However, to develop effective training manuals for diverse TTPs, it’s crucial to gather input from all stakeholders. RP5 mentioned *“the lack of input from teachers, school leaders, and other stakeholders in the development process of training manuals and setting aims and objectives. Moreover, TTPs must be contextualized, relevant, and tailored to meet the specific needs of trainees.”* In his statement, RP5 emphasized the importance of involving teachers, school leaders, and other stakeholders in the development process of training manuals and in setting aims and objectives for educational initiatives. This involvement ensures that the perspectives, needs, and expertise of those directly involved in the educational system are considered, leading to more effective and relevant training materials and goals. It underscores the value of collaborative and participatory approaches in educational development. RP8 recommended *“conducting comprehensive surveys of schools to identify available resources and highlight any deficiencies before finalizing TTP syllabi and training manuals”*. RP8 seems to suggest a process for developing syllabi and training manuals for a program or initiative related to schools or education. RP8’s recommendation suggests conducting comprehensive surveys of schools to gather information about the resources available to them and to identify any areas where resources may be lacking or deficient.

Conducting schools survey approach ensures that TTPs align with the realities and requirements of the educational context, maximizing their impact on teacher development and SLOs. Upon reviewing the documents, it became evident that there were significant shortcomings in the implementation and effectiveness of Tactics, Techniques, and Procedures. Notably, there was a glaring lack of proper financial expense tracking and budget allocation records, leading to potential mismanagement of resources. Furthermore, field observations revealed a concerning trend: training manuals were found discarded in storage areas, rendering them useless and highlighting a clear waste of valuable materials. These findings underscore the need for a comprehensive overhaul of operational procedures to ensure efficiency and accountability across all levels of the organization.

Impact of TTPs on SLOs

As per the views of the research participants, importance and impact of TTPs on SLOs cannot be ignored. As observed in RP10, *“students demonstrated a significant improvement in critical thinking skills after implementing the new teaching methodology.”* This statement (given by RP10) suggests that students experienced notable enhancements in their critical thinking abilities following the implementation of a new teaching approach. This implies that the methodology

employed was effective in fostering critical thinking skills among the students involved. RP3 highlights that *“there was a notable increase in academic achievement among students, particularly in subjects where hands-on learning was emphasized.”* RP3 indicates a significant improvement in academic performance among students, especially in subjects that emphasize hands-on learning. This suggests that when students engage in practical, experiential learning activities, they tend to excel academically. This finding underscores the importance of incorporating hands-on learning approaches into educational curricula.

Additionally, RP8 indicates that *“student engagement and motivation noticeably improved, leading to higher retention rates and active participation in class discussions.”* RP8 suggested that whatever intervention or method was implemented led to an increase in student engagement and motivation. This improvement resulted in higher retention rates, meaning more students stayed in the course, and there was increased participation in class discussions, indicating a more interactive and engaging learning environment. This could have significant positive effects on overall learning outcomes and student success. Furthermore, RP12 underscores that *“the implementation of personalized learning strategies resulted in more individualized support for students, leading to a positive impact on their overall learning outcomes.”* RP12 highlighted the effectiveness of personalized learning strategies by emphasizing how they provide tailored support to students, ultimately enhancing their learning outcomes. This suggests that when educational approaches are customized to individual needs, students experience more positive academic results.

These findings were further corroborated through documents analysis, which consistently highlighted the need of positive changes in behaviour, participation, and academic performance. However, best practices and focus on hands-on learning strategies was missing.

Evaluation & Feedback Mechanism of TTPs

Proper evaluation and feedback mechanism are one of the important quality indicators as far as effective TTPs are concerned. However, results revealed an absolutely different story. In this regard, RP11 stated that; *“the evaluation of TTPs lacks a structured approach, hindering the identification of effective strategies. I would rather say that there isn't any mechanism regarding evaluation and feedback after conducting TTPs”*. RP11 highlighted a couple of critical points. Firstly, there's a lack of a structured approach in evaluating Tactics, Techniques, and Procedures. This absence makes it challenging to identify which strategies are truly effective. Secondly, there is a gap in mechanisms for evaluating and providing feedback after TTPs are conducted. This lack of post-evaluation feedback can hinder the improvement and refinement of TTPs over time. Both issues underscore the need for a more systematic and comprehensive approach to TTP evaluation and feedback.

RP13 also highlighted the lack of feedback and evaluation procedures. He mentioned that; *“feedback mechanisms for TTPs are inadequate, impeding the refinement of tactics based on real-world outcomes. There is no any system of post TTPs visit, communication, and collaboration so that evaluation of TTPs can be done and feedback be shared”*. RP13, in his statement, emphasized the deficiency in feedback and evaluation processes regarding Tactics, Techniques, and Procedures. He pointed out that there is a lack of adequate mechanisms for gathering feedback on TTPs, hindering the refinement of tactics based on real-world outcomes. Additionally, he highlighted the absence of a system for post-TTPs visitation, communication, and collaboration, which would enable the evaluation of TTPs and the sharing of feedback.

Pertaining to RP1 who expressed his views that; “*evaluation criteria for TTPs need refinement to ensure alignment with operational objectives. However, in our context neither trainers nor PITE and STEDA bother to evaluate teachers’ performance and share feedback with them*”. RP1 seems to be highlighting a concern about the evaluation criteria for TTPs not being aligned with operational objectives. Additionally, he points out that there’s a lack of evaluation and feedback for teachers’ performance from trainers, PITE, and STEDA in their context. Concerning RP6 who claimed that; “*The absence of robust feedback loops undermines the adaptation and optimization of TTPs over time. Mostly TTPs are funded programs funded by different donor agencies including US-Aid, UK-Aid, ADB, and so on which run only a short period of time*”. RP6 highlighted a very critical issue regarding the lack of effective feedback loops in the adaptation and optimization of Tactics, Techniques, and Procedures over time.

Documents analysis also suggested a same story that there are no apparent evaluation and feedback mechanisms in place for TTPs, as evidenced by the lack of data-driven insights into their efficacy. Similarly, higher authorities who control funding, and approving TTPs do not bother to devise any evaluation and feedback mechanism. Their role is just to grab the funded money and when the project time duration is over, everything is over.

Table 2. Findings on implementation, effectiveness, and evaluation of TTPs

Focus Area	Research Participant Insights	Document Analysis	Researcher Observations	Triangulated Interpretation
1. Budget Constraints in TTP Implementation	RP1: Limited budget restricts teacher participation in TTPs.	No formal budget transparency or tracking in documents.	Mismanagement evident; manuals found unused in storage.	Strong convergence: Financial limitations and misallocation of resources hinder TTP implementation. A more equitable and monitored budget system is necessary.
2. Stakeholder Involvement in TTP Design	RP5: Lack of teacher and school leader input in manual and syllabus development.	No evidence of participatory design processes in documentation.	Training content often out-dated and disconnected from classroom realities.	Strong convergence: Lack of stakeholder collaboration leads to irrelevant, non-contextualized TTPs. A participatory approach is urgently needed.
3. Contextual Relevance of Training Content	RP8: Recommended conducting school resource surveys before designing manuals.	No contextual surveys or school-needs analyses found.	Training content misaligned with school-level resources and realities.	Strong convergence: Training content is generic and non-specific. Contextual mapping of resources is essential for relevance.
4. Effect on Student Learning Outcomes (SLOs)	RP3, RP8, RP10, RP12: TTPs positively impacted critical thinking, hands-on learning, engagement, and personalized learning outcomes.	Reports indirectly note improved student behaviour and participation.	Hands-on approaches not widely observed; TTPs rarely translated to practice.	Partial convergence: TTPs have the <i>potential</i> to improve SLOs, but poor implementation prevents consistent outcomes.

5. Quality of Training Materials	RP5, RP9: Training manuals out-dated and lacking practical strategies.	Manuals from 2018–2022 missing updated pedagogies and tech integration.	Materials not used; theoretical focus observed in sessions.	Strong convergence: Quality of manuals and resources is inadequate and non-practical, calling for urgent revision.
6. Infrastructure and Resources	RP6: Lack of facilities, technology, and learning environments.	No indication of infrastructure planning or resource provision.	Training centres lacked basic tools (e.g., projectors, smart screens).	Strong convergence: Infrastructural deficits significantly weaken training delivery and uptake.
7. Perception and Engagement of Trainees	RP7, RP9: TTPs seen as demotivating, boring, and irrelevant.	No tracking of teacher satisfaction or trainee feedback found.	Low engagement observed; sessions lacked interactivity.	Strong convergence: Teachers' low motivation results from passive, irrelevant delivery. Major redesign needed in pedagogy.
8. Evaluation Mechanisms	RP11, RP13: No structured evaluation of TTPs; no follow-ups or post-training assessments.	No framework for impact assessment, feedback collection, or performance review.	Absence of data-driven feedback systems and monitoring mechanisms.	Strong convergence: Lack of evaluation frameworks impedes data-driven decision-making and continuous improvement.
9. Feedback Loops for Program Improvement	RP1, RP6, RP13: No feedback to teachers, trainers, or institutions post-TTP.	Documents reflect no policy on feedback or knowledge loop systems.	No evidence of feedback sharing or performance evaluation in any observed TTP.	Strong convergence: The absence of systematic feedback mechanisms limits learning, refinement, and adaptation of TTPs.
10. Sustainability of Donor-Funded TTPs	RP6: Donor-funded programs are short-lived, with no long-term sustainability plans.	Projects end with funding; no continuity plans found in policy documents.		

Discussion

The findings reveal a critical gap in the evaluation and feedback systems for TTPs in North Sindh, which fundamentally undermines their effectiveness and sustainability. The study demonstrates that there is no established framework for assessing TTP effectiveness, which severely limits the capacity to analyze, improve, and modify these practices in response to changing operational requirements. Khushi (2023) supports this finding by highlighting that the absence of a structured evaluation framework limits identifying and scaling up effective approaches. Similarly, Singh et al. (2021) emphasize the poor feedback mechanisms in place, which thwart the process of improving tactics following their actual performance. The lack of post-implementation review measures, such as post-TTP visitations, constructive communication, and stakeholder collaboration, prevents rigorous testing and development of TTPs. This failure to institutionalize feedback practices creates a vacuum that curbs iterative development and knowledge transfer to subsequent participants. Furthermore, the research reveals that evaluation criteria, where they exist, are mismatched or overly broad and incapable of providing usable insights, as supported by Adom et al. (2020) who advocate for operational objectives to be matched with evaluation criteria.

The study identifies significant deficiencies in TTP implementation, particularly regarding budget allocation, stakeholder involvement, and resource management. Research participants consistently reported limited budget allocation leading to restricted teacher participation, while document analysis revealed no formal budget transparency or tracking mechanisms. Field observations confirmed mismanagement of resources, with training manuals found discarded in storage areas. The lack of stakeholder involvement in TTP design emerged as another critical issue, with participants highlighting the absence of teacher and school leader input in manual and syllabus development. This finding aligns with the literature emphasizing participatory approaches in educational program development. Additionally, the study revealed that training content lacks contextual relevance, as participants recommended conducting comprehensive school resource surveys before designing training materials. The absence of proper infrastructure, including technology integration tools such as computers, projectors, and smart screens, further compounds implementation challenges and limits the effectiveness of training delivery.

Despite the implementation challenges, the research demonstrates that well-designed TTPs have the potential to significantly improve teaching practices and student learning outcomes. Participants reported positive impacts including enhanced critical thinking skills, improved academic achievement in subjects emphasizing hands-on learning, increased student engagement and motivation, and better retention rates. These findings are supported by document analysis, which consistently highlighted positive changes in student behavior, participation, and academic performance. However, the study reveals a significant gap between TTP potential and actual implementation effectiveness. While participants acknowledged the importance of continuous professional development for enhancing teaching effectiveness and staying updated with modern pedagogical approaches, they also expressed frustration with the traditional delivery methods and lack of practical engagement in current programs. The research indicates that when TTPs incorporate practical training components, technology integration, and relevant pedagogical strategies, they can effectively transform teaching practices and improve student outcomes, as evidenced by participants' experiences with hands-on learning approaches and personalized learning strategies.

The findings reveal concerning patterns of institutional disengagement and short-term orientation in TTP management. The study demonstrates that institutions such as PITE and STEDA, though tasked with capacity development and professional growth, underperform when it comes to performance measurement and providing constructive feedback. This institutional apathy prevents accountability and improvement in training delivery. The research also highlights the problematic nature of donor-funded programs, which tend to focus on implementation at the expense of long-term impact assessment. Participants noted that these programs are typically short-lived with no sustainability plans, and funding timelines diverge from meaningful evaluation efforts. Field experiences indicate an alarming trend of disengagement by top-level officials charged with sanctioning and funding TTPs, with focus continuing to be skewed toward obtaining and leveraging funds rather than sustainable, evidence-based enhancements. As observed by Nguyen et al. (2024), this short-term orientation sustains inefficiencies and stifles innovation. The data collectively suggest a compelling necessity to institutionalize systematic, data-based, and goal-oriented TTP feedback and evaluation mechanisms to ensure ongoing improvement and accountability, without which the transformative potential of TTPs cannot be fully realized.

Limitations

The study assessing the quality of TTPs in North Sindh, Pakistan faces several limitations. Firstly, the sample size is constrained due to practical reasons, potentially limiting the generalizability of findings. Data collection encountered challenges such as scheduling conflicts and language barriers, affecting data completeness and reliability (Smith & Sparkes, 2020). The study's focus on North Sindh's unique context may limit its applicability to other regions. Researcher biases could influence data interpretation, while temporal constraints may restrict the depth of analysis (Jackson & Mazzei, 2022). External factors like government policies could also impact the outcomes. Acknowledging these limitations enhances transparency, facilitating critical evaluation of the findings and suggesting avenues for future research in teacher professional development and educational quality improvement (Allan, 2020).

Conclusion

Based on the thematic analysis of the collected data, it is evident that continuous TTPs play a crucial role in improving teaching techniques, providing technical assistance to SSTs, and enhancing SLOs in North Sindh. However, despite their potential benefits, several deficiencies were identified within the implementation of TTPs, including substandard quality control measures, limited opportunities for professional development, and inadequate access to resources. Therefore, key recommendations are suggested to improve the quality of TTPs and meet the requirements of 21st century teaching and learning practices. First, robust quality control measures should be implemented to ensure the effectiveness and relevance of TTPs through regularly reviewing and updating training content, incorporating stakeholder feedback, and aligning programs with evolving educational needs. Second, comprehensive professional development opportunities must be provided by offering practical training components, technology access, and supportive learning environments to enhance teachers' skills and motivation. Third, structured evaluation and feedback mechanisms should be established to assess TTP effectiveness through post-training visitations, stakeholder collaboration, and refined evaluation criteria aligned with operational objectives. Fourth, greater stakeholder involvement is essential, ensuring teachers, school leaders, and other stakeholders participate in TTP development and implementation to maximize impact on teacher development and student outcomes. Finally, sufficient budget allocation and transparent resource management must be ensured through tracking financial expenses, monitoring resource utilization, and holding authorities accountable for funding decisions. By implementing these recommendations, stakeholders can work collaboratively towards overcoming the identified challenges in TTP implementation in North Sindh and maximize their potential to improve teaching practices and SLOs.

Declarations

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