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Pakistan Sign Language Capacity Building in Punjab, Pakistan: assessment from a Five-Year Study

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Abstract

Pakistan Sign Language (PSL) is very important for quality education and inclusive communication for children with hearing impaired. Although PSL is vital, historically, there has been a lack of consistency in the level of proficiency in PSL across the Public sector in Punjab, poor pre-service preparation and almost no planned in-service professional development for teachers of hearing impaired students of different degree of loss. Government In-Service Teachers Training College in Lahore, for the Teachers of Disabled Children, launched a province-wide capacity building initiative from 2021 to 2026, to address these systemic deficiencies and to make teachers more proficient in PSL and also ensure standard practices in classrooms. The programme adopted a carefully designed four-phase structure, which included training master trainers, teacher training at the district level, competency assessment on a province-wide basis and intensive follow-up training for identified teacher professional development needs. This qualitative study, framed by an interpretivist research paradigm, grounded in Vygotsky's Zone of Proximal Development (ZPD), explores the implementation process, outcomes, challenges and sustainability for the five-year PSL capacity-building initiative. The study highlights some critical threats to sustainability, such as lack of preparation of the initial master trainers, inconsistent administrative involvement, and failure to involve other staff members of the hearing impaired education system in PSL training, and suggests a comprehensive agenda for institutionalizing PSL professional development throughout the hearing impaired education system in Punjab.

Keywords: Pakistan Sign Language, PSL, Hearing Impairment, Professional Development

Introduction

Communication is the basic prerequisite of learning. The communicative competence of the teacher is not only a pedagogical prerequisite for the hearing impaired child, but a developmental requirement: when a teacher is not proficient in the sign language that is the child's mother tongue or most convenient language for communicating with them, the teacher cannot teach, and the hearing impaired child cannot learn, in any meaningful way. Therefore the quality of Pakistan Sign Language (PSL) instruction and the proficiency in sign language of the teachers of hearing impaired children in the Government special education system in Punjab is a direct and immediate issue that affects the educational rights, linguistic development, and academic performance of hearing impaired learners in the province of Punjab (Marschark & Hauser, 2012).

It is a natural visual-gestural language, which is linguistically autonomous with its own phonological, morphological, syntactic and pragmatic systems and is developed within the Hearing impaired community in Pakistan and documented as a language system with significant differences from spoken Urdu, English and other spoken languages of Pakistan (Rahman & Abbasi, 2016). PSL is the most neurologically appropriate language system for cognitive development, education, and socialization for children who are born hearing impaired or become impaired before they learn to speak. Few studies have been conducted in the United States to date, but the research that has been done has revealed that sign language proficiency of the teacher of a DHH learner is the strongest within-classroom predictor of language development, literacy acquisition, and academic achievement for DHH learners (Luckner et al., 2005).

With this base of evidence, however, the PSL skills of the teachers working with hearing impaired students in the government special education sector in Punjab have been a major and important gap for a long time. PSL instruction in pre-service teacher preparation programs at the Punjab Institute of Special Education and affiliated institutions has been limited, too low intensity, and not sufficiently skilled, the PSL being taught mostly by teachers of varying PSL skill levels, and the modules designed in the course content to be taught in a way that would not result in the communicative fluency classroom instructional practices require. In the post stage of the training, teachers in the hearing impaired classrooms in government special education centres under Punjab have received very little structured in-service PSL professional development, consequently, many teachers in special schools for the hearing impaired in Punjab communicate with their students through gestures, fingerspelling, isolated sign and Urdu which are basically not sufficient to meet the linguistic and educational requirements of the hearing impaired students (Akhtar & Yasmin, 2011).

To address this gap in systemic professional development, the Directorate General of Special Education, Government of Punjab began a thorough PSL training and assessment program to help strengthen the professional skills of teachers with hearing-impaired students throughout the province of Punjab. The project was organised and executed by the Government In-Service Teachers Training College for the Teachers of Disabled Children Lahore, which is the main government body for the ongoing professional development of the special education teachers of Punjab. The program was designed in phases: establish a cadre of master trainers; deliver district training by master trainers; assess competency of trained teachers province wide; provide intensive follow up training for teachers identified for additional professional development.

This article provides a detailed summary of this five-year program, including the theoretical underpinnings, programmatic design, process of implementation, assessment results, lessons learned, and challenges faced in this effort, as well as implications for PSL professional development in the future in the context of Punjab and similar settings.

Theoretical Framework: Vygotsky's Zone of Proximal Development

This study is based on Vygotsky's Zone of Proximal Development (ZPD) which was described by Lev Semenovich Vygotsky in his seminal studies of sociocultural theory of learning and development (Vygotsky, 1978). The ZPD is the zone between what a child can do by him/herself and what he/she can do with the help, support and guidance of a more knowledgeable partner. Vygotsky's key theoretical position was that the best learning takes place within this zone, that is, when a child or an adult professional is learning something that goes beyond what they are able to do on their own, and when they have to learn it from someone who is more capable than

themselves and who provides them with the scaffolding needed to move beyond their current performance levels.

The ZPD framework is an explanatory account of why the program was successful in its design and also a lens for identifying ways in which the program's design did not follow its ZPD principles, which limited impact when applied to the PSL capacity-building initiative reported in this article. The idea of using a master trainer (in which highly competent PSL users are developed as expert practitioners who then scaffold and expertly mediate PSL instruction for less competent teachers) is a direct implementation of the ZPD principle: the more competent PSL users are the more knowledgeable others, whose participation extends the competence of the less proficient PSL users beyond what they could accomplish without their help (John-Steiner & Mahn, 1996).

The ZPD framework also gives a theoretical account of the competency assessment part of the programme. In the ZPD tradition, assessment is not just a summative device to determine what has been accomplished, but a diagnostic indicator of the current independent competence of each learner and thus what point in learning to start at and what level of scaffolding to provide. The province-wide competency assessment reported in this article, which classified teachers into five categories ranging from Excellent to in need of intensive additional training, serves as a ZPD diagnostic to differentiate subsequent professional development provision according to individual teachers' competency profiles (Vygotsky, 1978).

The design principle underlying the intensive follow-up training programs, which made up Phase IV of the initiative, was provided by Vygotsky's theory of scaffolding, which involves providing structured, expert-peoples support that gradually fades away as the learner takes over the new skills he has acquired and performs them independently. The program used a scaffolding logic which focused developmental support from the experts on teachers whose assessment data indicated that they were operating below the PSL competence level thresholds of the assessment, so that support was given to those teachers most in need and at the highest point of need. The use of ZPD principles in all four aspects of the program's architecture: development of the master trainers, competency-differentiated follow-up training, constitutes a theoretically coherent model of professional development as analyzed in this article in relation to the empirical results the program produced (Rogoff, 1990).

Literature Review

The international sign language teacher preparation and professional development literature has built a clear and consequential evidence base of the relationship between teacher sign language proficiency and outcomes of hearing impaired students. Johnson (2006) conducted a thorough review of research literature on sign language and hearing impaired education, and found that all research to date indicated that the level of teacher signing proficiency is the most important in-classroom factor for the language development of hearing impaired students, and that when the level of signing is not as high as it should be, it impacts not only on the linguistic access to the instructional content, but also on the cognitive access to academic material. Swanwick (2016) created a detailed pedagogical model for hearing impaired education that found sign language skills is the prerequisite for the successful implementation of all other aspects of hearing impaired education, including visual pedagogical approaches, literacy and social communication support.

The master trainer model (where highly qualified practitioners are nurtured as trainers with the ability to enhance professional learning capacity for other populations of less skilled practitioners) has received extensive research and documentation in health and education capacity development literature. Community-level master trainer models were shown to be

effective in scaling up health education capacity by Bhutta et al. (2008) and these results are directly applicable to the PSL's adaptation of the community-level master trainer model for special education professional development, and for health education in general, which is often geographically dispersed and lacks capacity in primary healthcare services in Pakistan. In support of the intensive follow-up trainings approach taken in Phase IV of the initiative, Knight (2007) found that coaching-based professional development models produce significantly greater and longer lasting professional practice gains than do passive workshop-based training models, in which expert practitioners deliver one-time, group-based trainings.

There has been a growing emphasis on competency assessment as a catalyst for teacher professional development in special education. McLeskey et al. (2017) developed the High-Leverage Practices framework for special education, which highlights competency-based assessment as the basis for professional development planning, and the plan's use of province-wide assessment to produce disaggregated data on teacher PSL proficiency to inform decisions about training prioritization. The evidence base for the design of Phase IV follow-up training comes from Desimone (2009), who identified alignment between the content of professional learning and evaluated professional needs as a key factor in the effectiveness of professional learning.

In the Pakistani context, Rahman and Abbasi (2016) described the linguistic structure and vocabulary of PSL, finding that it is a natural language in its own right and that advanced proficiency in PSL involves learning a particular set of linguistic skills, such as the use of non-manual markers, classifiers constructions, and spatial grammar. Their work offers the linguistic resource base for teacher competency assessment to be measured against. Prior research, conducted by Akhtar and Yasmin (2011), found that PSL instruction in current special education teacher training programs in Pakistan was lacking, which set the baseline of what needs to be done to build capacity for PSL instruction in teacher education. Padden and Humphries (1988) laid the groundwork for the significance of Hearing impaired community involvement in sign language education programs, and how it is important to develop programs that are grounded in the cultural, pragmatic, and communative aspects of sign language competence that are necessary for culturally responsive hearing impaired education practice.

In their study of the sustainability of teacher professional development in low-resource settings Fixsen et al. (2005) found that the three factors most critical to the success of sustaining PD investments beyond training were institutional infrastructure, continued coaching, and system-level support. The framework is directly applicable to the sustainability challenges faced by the PSL initiative and is included in the recommendations formulated in Section 9 of this article. Easterbrooks and Estes (2007) described the specific professional skills that educators need to have when working with students using hearing assistive technology, such as cochlear implants and hearing aids, which served as the foundation for the subject-specific PSL modules developed for teachers working with students with a variety of audiological profiles in the initiative.

Research Methodology

Research Paradigm

This study is based on an interpretivist research approach that sees understanding being built by the subjective meaning, experiential accounts, and contextually embedded interpretations of the individuals involved in and implementing social programs, including professional development programs (Creswell, 2013). The interpretivist paradigm is suitable for this study because the five-year PSL capacity building program is not a controlled experimental treatment that can be objectively measured but a complex program embedded in an institution and situated in a cultural context, whose process, mechanisms of efficacy and problems of

sustainability can only be understood through an interpretive process involving the subjects who designed it, taught it, engaged in it and were evaluated by it. The epistemological approach taken is constructivist in which the knowledge regarding the effectiveness, difficulties, and lessons of the program is co-constructed during the qualitative inquiry process between researchers and participants (Lincoln & Guba, 1985).

A qualitative case study design was used to analyze the data.

Yin's (2014) framework for case study methodology in the social sciences was used as the primary methodological approach – which is the qualitative case study design. Case study research is a method of investigating a bounded phenomenon with a contemporary context, set in a real-world environment, in this case, the Teachers of Disabled Children, Lahore, PSL capacity building program from 2021 to 2026, which is in-depth and contextually rich. The bounded case for the initiative is explored and the study is conducted using a variety of data sources to come up with a multi-dimensional account of the initiative, its implementation and outcomes, and its implications. The case study design is especially suited for this study, as it is a unique, context-specific, programmatic complex intervention, whose evaluation needs involve program documentation, participant perspectives, assessment data, and institutional observation, which qualitative case study methodology is ideally suited to provide (Stake, 1995).

Study Setting and Context

The study has been carried out within the institutional framework of the Government In-Service Teachers Training College for the Teachers of Disabled Children, Lahore (the lead implementing institution of the study) and in the framework of the five phase implementation network of the districts in Punjab. It is important to note that the following contextual factors have implications for the design and implementation of the initiative: the College's institutional context, faculty expertise, physical infrastructure, and administrative relationships with the Directorate of Special Education. In addition, master trainers delivered Phase II training in several district-level training sites in Punjab, and the diversity of these sites in terms of geographic location, size of the institutions, and local professional development infrastructure has shaped implementation experiences and results, which were captured through the study's multi-method data collection approach.

Participants and Sampling

Purposive sampling was used to choose participants, where the role, experiences, and knowledge of the participant is most relevant to the research questions (Patton, 2002). The four categories of participants were included. The first consisted of program coordinators and designers, three of them being the program coordinator and two senior officials of Directorates of Special Education who are involved in the program design and monitoring, who were selected for the program due to their extensive background knowledge of program rationale, design decisions, problems encountered on implementation and outcomes. The second group consisted of master trainers, who were purposefully selected from the thirty-five master trainers produced in Phase I, to represent diversity in geographic location, institutional affiliation, subject specialization and self-reported level of PSL proficiency. The third category was teacher participants – 25 teachers who had taken part in the Phase II district level training and the Phase III assessment, representing a range of assessment performance levels (Excellent, Very Good, Good, Fair and intensive training required) to ensure a broad spectrum of experience of training effects. The fourth category were institutional administrators, comprising eight principals and deputy principals from institutions where teachers were engaged in the initiative, who were selected based on their knowledge of their experiences implementing the initiative at their

institutions and changes in their teachers' practice when they went back to the classroom. Sampling continued until thematic saturation was reached in all four categories.

Data Collection Methods

Four complementary qualitative data collection methods were used, leading to a triangulated evidence base for the rigorous analysis of the case studies. Semi-structured interviewing was the main approach used. Fifty-one individual interviews were held: three with program coordinators, fifteen with master trainers, twenty-five with teacher participants, and eight with institutional administrators. They were conducted in Urdu and lasted about 45 minutes to one hour and were recorded with informed consent at the participants' institutional workplaces. Interview guides were developed separately for each participant category, covering program design rationale and implementation experience; preparation of master trainers and delivery of training; teacher training participation experience, perceived gains in PSL competency, and changes in classroom practice as a result of participating in teacher training; as well as institutional observation of teacher behavior change following teacher training participation (Kvale & Brinkmann, 2009).

The second approach was the focused group discussion. Three focused group discussions were held with the master trainer participants, based on geographic cluster (Lahore metropolitan, central Punjab, southern Punjab) to facilitate discussion on geographic variations in the experience of delivery of trainings and social dynamics of the master trainer professional community. FGD were carried out in Urdu, each lasting about 90 minutes and were audio-recorded along with some notes which the researcher took while conducting the FGD (Morgan, 1997). Systematic documentary analysis was the third method used. The program documents systematically analyzed consisted of: Phase I master trainer program schedules and content frameworks; Phase II attendance records by district and content guides for the 731 master trainers who were trained at the district level; Phase III assessment protocols, assessment rubrics, and disaggregated assessment outcome data for the 731 assessed teachers; Phase IV attendance records for the 731 master trainers who participated in intensive training programs; and program progress reports submitted to the Directorate of Special Education. The quantitative outcome data – assessment performance distributions and training participation rates – used to validate the empirical findings of the study in this document, were provided through documentary analysis (Bowen, 2009). The fourth approach used was non-participant classroom observation. Twelve classroom observations were carried out in six institutions where the teachers participated in the PSL training, and the direct observation data of the implementation of PSL training in the classroom teaching practice was obtained — such as the signing fluency of teachers, the application of visual teaching methods, the acoustic management of the classroom, and the quality of communicative interaction between teachers and students.

Data Analysis

Thematic analysis was used to analyse the data according to the six-phase approach of Braun and Clarke (2006) and was combined with within-case and cross-case analysis suitable for the qualitative case study design. All the interviews were recorded on video and were later fully transcribed in Urdu by a trained research assistant, and translated back to English for a random 20% sample. Analysis of the documentary data (assessment outcome records) was both quantitative (the descriptive statistics of distributions of assessment performance) and qualitative (thematic analysis of program reports and evaluation documents). The Vygotsky ZPD theoretical framework served as the organizing analytical lens for interpreting the thematic findings, allowing for systematic evaluation of how well each program phase operationalized the concepts of expert-mediated scaffolded learning, developmental zone targeting and progressive competency internalization prescribed by the ZPD (Braun & Clarke, 2006).

The four criteria of Lincoln and Guba (1985) were used for establishing trustworthiness. Methodological triangulation was conducted across interviews, FGDs, documentary analysis, and classroom observation to improve credibility, member checking of analytical summaries with participants from each group was conducted, and peer de-briefing was used with the research team during the analysis of the data. While raising the possibility of insider bias, the program coordinator was a key participant in the study but was reflexively documented and counterbalanced with other perspectives from teachers and administrators, which offered independent evaluations of program effectiveness. Transferability was addressed by thick description of the program context, phases of implementation, and assessment procedures. A comprehensive audit trail maintenance assured dependability. Researcher reflexivity journals (Creswell, 2013) were used for confirmability.

The findings from the implementation of the program are presented.

Master Trainers' capacity building, Phase 1 (2021-2022)

The initial step of the program was to build a pool of trained Master Trainers who can deliver PSL training at district level, spread throughout the geographically varied province of Punjab. In 2021 and 2022 two 5-day intensive training programmes were organized at Government In-Service Teachers Training College, Lahore, with a total of thirty five (35) experienced hearing-impaired teachers, PISE faculty and special education administrators who already have the competencies to deliver PSL. The Master Trainer programmes included advanced PSL grammar, advanced PSL vocabulary, subject-specific PSL (core curriculum areas such as Urdu, English, Science and Mathematics), visual pedagogical skills in hearing impaired classrooms and adult training facilitation skills such as workshop design, demonstration teaching and group management skills. Analysis of the interviews conducted with the master trainer participants showed that the five-day period of the initial preparation program was generally felt to be too short to build the higher level PSL competence and skills needed to effectively deliver training at the district level, across a large number of teachers. Five days we learned vocabulary and basic grammar,' said one of the master trainers, who has 7 years of classroom experience in Faisalabad. Thirty teachers in a district needs more than five days of our training to be able to sign fluently enough to use it in a classroom. We had an idea of how to work on our own signing, but not so much how to work on a person's signing. The finding corroborates the ZPD principle: the competence of the person who performs the scaffolding has to be significantly higher than the learner's current competence, and therefore a five-day preparation program is unlikely to be effective in establishing competence in all thirty-five master trainers.

The development of standardized training materials, instructional guides, and PSL demonstration materials that the master trainers can use in their district-level facilitation work further strengthened the Master Trainer preparation phase, providing some curricular scaffolding to offset limited individual master trainers' preparation for facilitation. Master trainer participants identified coordination and administrative support from the Government In-Service Teachers Training College as a major enabler to the successful completion of Phase I, which includes logistics management, material production and technical supervision.

Phase II: District-Level Teacher Training

After preparation, the 35 Master Trainers delivered PSL trainings in district-wise manner across the 26 districts of Punjab, touching the lives of teachers of hearing impaired students of the province. During Phase II, the Government In-Service Teachers Training College gave all the instructional guidance, training material, monitoring, and administrative support to assure consistency of training content and quality in various district contexts. District-level trainings of 15-25 teachers were arranged, most of which lasted three to five days and focused on key PSL

vocabulary and grammar, effective classroom communication with Hearing impaired children, subject-specific PSL for core curriculum subjects and practical signing tasks with peer feedback. The experience of training students as teacher participants was largely positive, with interview responses indicating that the programs were practical and offered opportunities for peer learning; for most of the teacher participants, the training was the first structured PSL professional development since qualification. One teacher who had nine years of classroom experience in Multan shared a very vivid experience after the training: 'Before the training I knew maybe three hundred signs. I did learn more signs, but more importantly, I learned about PSL grammar for the first time, the spatial and non-manual markers. That was the way I taught, not just what signs I used. This account will highlight the difference between vocabulary learning and competence building of the grammar which is so essential for the use of the instructional PSL, and will indicate that at least a certain portion of the participants in the Phase II training had been successful in making the transition from learning sign vocabulary to a real competence in the PSL.

Planned classroom observations were used to gather triangulating evidence of the effects of the training on instruction. Teachers in seven of the 12 classrooms observed used the PSL spatial grammar more effectively than their teachers' interviews where they self-described baseline use of the grammar. The research team found that in five classrooms, the observed signing was, overall, at the vocabulary level, showing that the Phase II training had begun, but not yet fully succeeded in the communicative level of PSL proficiency for these teachers.

The assessment for Phase III is a province-wide competency assessment.

The province wide competency assessment is the most empirically significant part of the initiative, undertaken by a committee of four sign language experts and it will provide the first systematic and standardized information about the competency of PSL teachers in the government hearing-impaired education system in Punjab. A total of 731 teachers (93.1 percentile of 785 scheduled) took part in the assessment, which had a high degree of institutional compliance with the assessment requirement placed on teachers by the Directorate. Participants were assessed based on their ability in five areas and a structured rubric that covered PSL vocabulary range, grammatical accuracy, communicative fluency, classroom signing intelligibility, and sign language competence in the subject area.

The assessment results showed a good spread in performance, while highlighting the significant effect of the initiative, had also identified the size of the ongoing professional development requirement. Of the 731 assessed teachers, 39 (5.3%) were rated as Excellent—near-native or highly proficient in PSL for Master Trainer roles, 202 (27.6%) were rated as Very Good—strong communicative and instructional PSL competency with minor grammatical limitations, 295 (40.4%) were rated as Good—functional PSL communicative competency with some structural gaps adequate for basic classroom use, 139 (19.0%) were rated as Fair—partial PSL competency, requiring significant further development for effective classroom use, and 56 (7.7%) were identified as requiring intensive additional training—PSL competency is insufficient for adequate hearing impaired classroom communication.

The results of these assessments have significant implications in the light of the ZPD. The 5.3 percent rated Excellent and the 27.6 percent rated Very Good are teachers whose PSL competence is adequate for effective instruction and may be adequate for a role as a peer coach within the school. The 40.4 percent rated Good are those teachers who have a core level of PSL and would benefit from further development through a teacher-led, expert-designed professional development program. The 19.0 percent rated Fair and the 7.7 percent requiring intensive training, suggest that roughly one in four of the teachers assessed with hearing

impairment are currently unable to provide linguistic access to hearing impaired students which is of serious educational consequence.

The staffing resources available to the schools were evaluated and intensive follow-up training programs were planned between 2022 and 2026, based on the competency gaps identified in Phase III. The programs were differentiated, based upon several specific training streams: subject-specific PSL courses for Urdu, English, Science and Mathematics, where teachers received training in the specialised signing vocabulary and discourse structures necessary for the academic curriculum; general teacher capacity building for teachers rated Fair or needing intensive training in the Phase III assessment programmes; orientation programmes for newly recruited teachers entering the hearing impaired education workforce who do not have prior PSL training.

In each of the Phase IV programs, 220 teachers were nominated to participate and 169 of them successfully participated in the assessments (a participation rate of 76.8 percent), a lower participation rate than the Phase III assessment participation rate, due to practicalities of travel costs, release time and geographic distance to in-service training venues that limit access to in-service training for teachers in non-metropolitan districts. Participants highlighted that the subject-specific PSL modules were one of the most practically useful professional learning experiences of the five-year project as they identified as a gap in PSL professional development when there is generic communication-level training, but not accurate, precise, and subject-specific sign of the academic content: "The ability to sign academic content accurately, precisely, and in a way that hearing impaired learners can understand the concepts in the subject".

The 5-year PSL capacity building initiative achieved significant and measurable gains in teacher PSL proficiency throughout the province of Punjab, but presented a series of structural, institutional, and programmatic challenges that constrained the reach and depth of its impact and that have implications for the sustainability of the teacher PSL capacity built.

The shortest programmatic restriction found from the study was the lack of enough program time for the master trainers during the Phase I preparation. The five-day intensive program, although a good start with PSL advanced structures and training facilitation principles, was not sufficient to equip individuals with the near-native PSL proficiency and expert level training facilitation skills needed for effective district-level training delivery. This preparation gap was repeatedly described by master trainers as the most significant limitation in the quality of Phase II training: the capacity of master trainers to deliver PSL training was found to vary, which led to similar variations in the quality of training that was administered to teachers in the districts of Punjab, and therefore district-wise inequities in the impact of the training were observed to some extent in the assessment data.

A second significant limitation was the low level of engagement of administrative heads (principals and deputy principals of school for the hearing impaired) in the training. Participants from those institutions whose principals were not trained in PSL reported a lack of awareness about the professional significance of enhancing PSL skills by the administration, no specific expectations for using PSL in hearing-impaired classrooms, and no supervisory system for monitoring and reinforcing the teaching of PSL skills in the classroom. One teacher from a district-level institution noted, 'I returned from training with improved signing. But my principal doesn't know PSL so he can't see if I am signing correctly or not. "No one's there to ensure I'm utilizing knowledge I gained." This institutional PSL illiteracy among heads of institutions eliminated the institutional reinforcement and accountability mechanisms that help to sustain practice change for some participants, counteracting the professional development effects of the training.

A third structural constraint was the exclusion of non-teaching school workers such as sport teachers, computer teachers, psychologists, vocational teachers, speech therapists, transport staff and support workers. These individuals interact with the Hearing impaired student(s) on a daily basis at school and during their school experience, but they are unable to communicate with the Hearing impaired student(s) in PSL, resulting in communicative exclusion in the key areas of the school day and school experience where informal, naturalistic language use is most developmentally relevant: physical education, vocational workshops, transport, counselling, etc. The institutional communicative environment of a hearing-impaired school is only as PSL-accessible as the least proficient PSL user; a training program designed to make only the classroom teacher competent in signing and leave all other school personnel without PSL skills creates an artificial and developmentally limiting communicative boundary between instruction and non-instruction.

The participation deficit in Phase IV (169/220 teachers nominated) was indicative of a wider structural problem regarding the participation in in-service training among teachers in the geographically spread-out special education system in Punjab. Although teachers were nominated, they did not participate because of the burden of travel, lack of institutional release time, inadequate compensation for institutional participation costs, and competing institutional demands, especially for teachers from non-metropolitan regions, who face the challenge of participation when the training program is located in Lahore. This geographic access inequity in participation in professional development adds to the geographic inequities in quality of PSL training identified in Phase II.

Areas in need of improvement Future prospects

Despite the problems highlighted in Section 6, the five-year PSL capacity-building programme had a significant impact on the hearing-impaired education system in Punjab. The most significant accomplishment was the development of a province-wide model to build the capacity of practitioners to perform in sign language, the first of its kind in the government special education sector in Pakistan, which represented the institutional viability and feasibility of systematic capacity building in the context of the special education professional development structure in Punjab.

The PSL professional development efforts are indefinite and sustainability of the human resources infrastructure has been achieved by the development of thirty-five master trainers. These people spread across the districts of the province and institutional contexts are a standing capacity for professional development which the Directorate of Special Education can tap for future training cycles, additional courses, and institutional mentoring, without having to construct the entire infrastructure from scratch. The most institutionally valuable legacy of this initiative is this distributed master trainer network, which will require the ongoing professional growth, institutional buy-in, and institutional implementation of the master trainers themselves. In the province wide competency assessment of 731 teachers, the most comprehensive data on teacher proficiency of PSL in the special education system in Pakistan has been created. This dataset, which shows the actual distribution of proficiency levels among the hearing-impaired teachers in the country of Punjab, is the evidence basis that will inform targeted, needs-driven professional development planning that has been lacking in the absence of systematic proficiency data. The assessment framework itself – the validated rubric that includes the range of vocabulary, grammatical accuracy, communicative fluency, intelligibility of classroom discourse and the level of achievement in the content area – forms a re-usable assessment infrastructure for future assessment cycles to measure the growth of PSLs over time at the system level.

The creation and dissemination of the PSL modules for Urdu language, English, Science and Mathematics is an innovation in the PSL PD landscape in Pakistan. These modules fill the gap between general level PSL training and the instructional level of PSL which academic education in core curriculum subjects demands for teaching and learning academic content. The subject-specific module framework offers a repeatable blueprint for future PSL professional development in alignment with the specific linguistic needs of hearing impaired classroom instructional.

Discussion

Analyzed within the framework of Vygotsky's ZPD, this 5-year PSL capacity-building initiative demonstrates a professional development program where the ZPD design principles were implemented with varying degrees of fidelity in each of the four phases, and which produced outcomes commensurate with this fidelity, with the greatest outcomes occurring in the most faithful implementation, and predictable limitations in the least faithful.

The most obvious expression of the ZPD concept of learning with an expert is the master trainer model of the initiative. The program established the expert-novice learning relationship described in the ZPD framework as the most effective approach to professional learning of PSL skills, by developing highly proficient PSL users as PSL training specialists who teach PSL skills to less proficient teachers in a supported, expert manner. This limitation — inadequate preparation of master trainers themselves — is explainable in the ZPD context as the lack of an adequate competence of the mediators before they have the chance to use themselves as expert mediators. If the PSL ability of the master trainer is only significantly higher than the trainee's, then the zone of proximal development will be too narrow and therefore will not afford enough opportunities for substantial learning by the zone to enable the trainee to make significant development.

The most innovative aspect of the competency assessment initiative to PSL professional development methodology in Pakistan is the province-wide competency assessment. The assessment provided the first systematic, standardized, and disaggregated data on the PSL proficiency of the teacher work force in Punjab and thus served as the evidence for competency differentiated professional development aimed at directly operationalizing Desimone's principle (2009): "Professional development should be based on assessed professional needs to elicit meaningful practice change." The results of the assessment — about one fourth of the teachers assessed lack PSL competency to communicate effectively with a hearing impaired student in the classroom — is a sobering accountability data point that the Directorate of Special Education cannot afford to dismiss in planning professional development.

That the administrative heads and other non-teaching staff were not included in the training suggests that the organizational dimension of professional learning environments was not considered. By the time developing practitioners return to their institutional context after the professional development, their influence is mediated by the norms, structure, and practices of the professional community, as well as the norms and practices of their organizational culture. Without PSL competence, an institutional principal is unable to recognize, reinforce and hold accountable the improved PSL practice of a trained teacher, effectively undoing the ZPD-mediated development that has occurred as a result of the removal of the post-training scaffolding and accountability that would sustain it. Future stages of the initiative should include building PSL capacity among institutional administrators and non-teaching staff as a foundation for establishing the professional learning environments that are institutional supportive and required for long-term impacts of PSL.

Recommendations

Following the 5 years experience of the PSL capacity building programme, the following recommendations have been suggested to enhance the sustainability, quality and accessibility of Pakistan Sign Language professional development for the hearing impaired education system in Punjab.

The time and level of preparation required for Master Trainers needs to be greatly lengthened and deepened. The current five-day preparation format should be replaced with at least 20 days of intensive PSL training that includes explicit training facilitation skill development, subject-specific vocabulary acquisition, and development of discourse-level competency skills within a PSL context. Master trainers should have baseline scores in PSL at the Very Good or Excellent level and have a competent level that is significantly higher than that of the trainee teacher to provide for meaningful ZPD mediated professional development. There should be a process of ongoing professional development refreshment for master trainers every year, and a formal recognition and compensation process for master trainers' contributions to the provincial professional development network (Knight, 2007).

It is important that Pakistan Sign Language be continually improved by adding the best practices of sign language education from other countries where contextually appropriate, while keeping in mind the PSL vocabulary and discourse structures needed for new academic and technological areas. Permanent Pakistan Sign Language committee should be established under the Directorate of Special Education which will include representatives of Hearing impaired community, PSL linguists, special education academics and experienced hearing-impaired teachers whose mandate will include PSL vocabulary standardization and development, revising the curriculum, development of a PSL certification framework, and development of indigenous teaching resources such as textbooks, instructional videos, digital applications, and online learning portals (Rahman & Abbasi, 2016).

PSL competency assessment should be formalized as a requirement for all hearing-impaired teachers in government hearing impaired classrooms every two years, and the results should be used to create individual plans for professional development, evaluate hearing impaired teachers for Master Teacher status, and make decisions about who should be deployed in the institution. PSL proficiency should be formally integrated as a requirement into the Special Education Teachers' Service Structure, for teachers who support students with hearing impairments, creating the structural incentives for enduring investments in PSL professional development that are only likely to be created through voluntary participation (McLeskey et al., 2017).

Head of institution (principals and deputy principals), sport teachers, computer teachers, psychologists, vocational teachers, speech therapists, transport workers and other support staff who come into contact with hearing impaired students should be urgently provided with training opportunities. Institutional PD that only involves classroom teachers and does not include all other institutional personnel results in an institutionally fragmented communication environment that cannot fully support the development impact of better teacher signing. Additional PSL modules should be given on a two-year cycle (biannually) where appropriate to teachers' curricular needs and should be packaged into a PSL continuum, where foundation, intermediate and advanced competencies can be built upon (Swanwick, 2016).

Technologies that facilitate PSL professional development should be designed and used to overcome the geographic access barriers that are impeding access to PSL professional development in the spread-out district network of Punjab. A dedicated online PSL professional learning portal to provide video-based PSL instructional content, recorded by Hearing impaired and highly proficient hearing PSL users, PSL module recordings for different subjects, self-assessment tools and virtual practice communities would help teachers in remote locations,

where travelling to Lahore is logistically and financially unattainable. The creation of this digital infrastructure should be funded through a specific provincial budget allocation and should be aligned with the current digital education initiatives in Pakistan so as to make use of the existing technological infrastructure (Edyburn, 2010).

Conclusion

The five years PSL capacity building programme of Government In-Service Teachers training College, Lahore for Teachers of Disabled children (2021-26) is the most comprehensive and most well documented attempt to build the competency of the PSL professionals in the country's hearing impaired teacher corps in Pakistan's special education system. The initiative resulted in measurable gains in PSL proficiency for hundreds of teachers, created a distributed network of master trainers across the districts of Pakistan, created the first systematic data on PSL proficiency in Pakistan and produced subject-specific PSL professional learning resources of replicable value in the four phases of its program architecture, namely master trainer development, district-level training, province-wide competency assessment, and intensive follow-up training.

The outcomes of the initiative are predictable results of the most effective use of ZPD principles, such as the master trainer model (expert mediated professional scaffolding), the competency assessment as a systematic ZPD diagnostic, and the intensive follow up training as competency differentiated scaffolded support, as well as results of the departure from the ZPD principles, most notably inadequately prepared master trainers and the inability to involve institutional administrators and non-teaching staff in the professional development ecosystem.

Hearing impaired children of the government special education system of Punjab are the ones who will benefit or suffer from the success or failure of this initiative because their teachers need to be fluent and competent in the PSL. The recommendations outlined in Section 9 are an all-encompassing, evidence-based, institutionally sustainable roadmap for leveraging the work of the initiative to create a PSL professional development system that is planned, institutionalized, competency evaluated, Hearing impaired community informed, and geographically equitable. The investment that this roadmap calls for is relatively small compared to the developmental gains that would be achieved by the hearing impaired learner population of Pakistan. There is a strong and urgent moral and rights basis for its making.

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