From Workshop to Classroom: Training Transfer in a Cascade Model of Teacher Professional Development amongst Preparatory School Teachers

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ABSTRACT

Teachers are the foundation of education systems. For decades, teacher professional development (TPD) has been delivered using the "Cascade Model", a tiered-delivery mechanism for delivering curriculum, instructional techniques, and resources to teachers in schools with minimal expense and maximum speed. The purpose of this study was to assess how often classroom teachers implement training activities (e.g., pedagogy, materials, assessment) presented during a cascade workshop in their own classrooms. An Exploratory Sequential Mixed-Methods Research Design was employed. Data were collected from 95 teachers of Grades I-V across 11 schools in West Delhi. These teachers completed a 40-question survey instrument; the authors also conducted 190 classroom observations using an adapted version of the Teach Primary Survey Instrument; they conducted 20 semistructured interviews with teachers and 11 master trainers; and conducted a document review. Results from the surveys demonstrated a high rate of application ($M = 4.1$, $SD = .8$) by participants. However, results from the classroom observations revealed significantly lower rates of application than participants' reports ($M = 3.2$, $SD = 1.0$; $p < .001$); therefore, the researchers calculated an Implementation Fidelity of about 78 percent for all of the observations. The Multiple Linear Regression Model explained approximately 62 percent of the variation in application levels among the sample of teachers. In general, the results of this study demonstrate that attendance at a cascade workshop does not result in changes in classroom practice, and offers several suggestions on ways to enhance follow-up and coaching within schools, and offers support to school leaders to develop policies and programs related TPD at the Preparatory Level to promote sustained implementation of training into daily classroom practice.

Keywords: training transfer; cascade model; teacher professional development; preparatory school teachers; classroom practice

INTRODUCTION

A number of research studies across the globe have identified that professional development of teachers is one of the most successful methods of developing student learning, particularly in the early stages (Preparatory Education) of schooling when the fundamental learning experiences are occurring. Despite many systems having resource constraints to deliver large-scale-in-service programs, they have been able to develop an efficient means of delivering new curricula, pedagogy and policy reforms to thousands of teachers with minimal cost, using a cascade model. In this model, a few Master Trainers attend in-service sessions and then go back to their schools and train Secondary Teachers who in turn go back to their schools and train Classroom Teachers. This cascade creates multiple levels of dissemination.

Consequently, there is concern regarding the effectiveness of Cascade Models for TPD due to the lack of training transfer (Darling-Hammond et al., 2017). Studies examining Cascade TPD across several countries have reported that messages and practices originally designed for dissemination weaken as they move down the cascade (Hayes, 2000), and likely only a portion of original message and/or practice will ultimately make its way to classrooms (Bett, 2016). Additionally, while previous research indicates that Training Transfer is

influenced by various factors (e.g. Teacher Motivation, Perceived Relevance, Opportunity to Practice, Organisational Conditions etc.) beyond just the nature of the workshop (Kennedy, 2016), the same cannot be said for recent curriculum/policy changes made for the Preparatory stage in India. Therefore, ensuring that what teachers learn during workshops is applied in actual classrooms is critical to meeting policy objectives concerning foundational literacy/numeracy education, as well as avoiding the "one-off" training approach which can be ineffective in providing students with meaningful educational opportunities.

Statement of The Problem

Although cascade models have become a ubiquitous approach to teacher professional development in all areas of education, including preparatory-level education, there is a growing body of evidence showing that cascades—a form of training where a program is implemented by a group of trainer educators who were themselves educated by trainers at the subsequent layer of the educator hierarchy—frequently do not translate into classroom behaviors. Workshops utilizing cascade models to provide professional learning to large groups of teachers via layers of trainer educators far too frequently result in diluted content, inconsistent implementation, and, eventually, few changes in either the attitudes or practices of participating teachers. As preparatory school teachers work to develop new pedagogies and assessments to meet the requirements of current policy reforms regarding teaching and assessment in schools, many report experiencing barriers to implementing these changes, such as lack of adequate follow-up support, increased workload, insufficient support at the local (school) level, and significant mismatches between training and the realities of daily classroom life.

REVIEW OF RELATED LITERATURE

Cascade Model of Teacher Professional Development

The cascade model has been used for many years to provide mass teacher professional development (TPD) that can be delivered quickly and cost-effectively in situations where there may be a lack of resources, such as budget, time and expertise. Within a multi-layered system, master trainers have an intensive training experience and then go on to train other layers of educators. These educators will typically apply what they learn in their classrooms. Although the cascading model provides significant benefits including leveraging existing social networks, providing peer support and minimizing logistical costs, its overall efficacy depends greatly on how successful those trained at every layer are in retaining, applying and enacting the knowledge. One of the most significant limitations of the model is "content degradation" and "content distortion"; because information is passed down from one group of educators to another, these intermediate levels of educators will often modify the information based on their experiences and context, which leads to end-users having modified versions of the original curriculum. Therefore, simply attending a workshop does not equate to genuine professional development. The true measure of successful TPD therefore should include not only the educator's ability to comprehend the material but also their application of the material in their classrooms and whether the material is sustainable over time.

Training Transfer in Teacher Professional Development

The term "training transfer" in the context of teacher professional development (PD) is an educator's ability to apply their recently gained knowledge, skills or strategies to their daily classroom instructional activities (Desimone, 2009; Guskey, 2002). The implementation of training will increase dramatically if the educator believes the training is directly related to their instructional needs and there are many opportunities for them to apply the techniques learned through the training while receiving continuous support from both the district and/or school to continue implementing the new instructional techniques. Also, the sustainability of a teacher's instructional change is contingent upon the reinforcement by school-level policies and procedures toward new ways of teaching (Guskey, 2002). Therefore, effective PD programs should include these five main components in its overall design: appropriate instructional content, active learning methodologies, coherent programming, a long-term program schedule, and sufficient time for educators to implement new instructional

methodologies and strategies in their respective classrooms (Darling-Hammond et al., 2017; Desimone, 2009; Kennedy, 2016).

Training Transfer in Cascade-Based Models

At both individual and organizational levels in cascade-based professional development models, successful training is contingent upon a teacher's ability to use their skills from one year to another, at least partially due to their past experiences, beliefs, self-efficacy, and motivation for implementing new teaching strategies (Bandura, 1997) and, at the school or district level, by the extent to which the district supports the staff through leadership and other means (Guskey, 2002; Avalos, 2011; Kennedy, 2016).

From Self-Reported Learning to Observed Classroom Practice

Evaluating Teacher Professional Development (TPD) also includes a critical methodological challenge in that there is a gap between the ways in which teachers believe they are implementing professional development strategies and those actually being implemented in the classroom. Self-reported survey tools for collecting information about teacher beliefs, attitudes, perceptions of professional development, and reported use of professional development can provide rich data regarding teacher beliefs, perceptions, and claims related to professional development; however, they cannot provide direct evidence of the actual realities found in classrooms (Desimone, 2009). Structured classroom observation with systematic assessment of instructional methods, student engagement, lesson planning, and formative assessments using valid observation protocols such as the Teach Primary Observation Tool (Molina et al., 2022) is required for direct validation. Therefore, the most effective way to evaluate training transfer is by utilizing multiple source measures. Surveys measure teacher perceptions, classroom observations provide direct observational measures of teacher practice, interviews reveal additional context-related variables influencing practice, and review of documents provides a historical record of how workshop materials were translated into the design and delivery of lessons. To ensure that this multi-tiered model produces a high-quality evaluation of the effectiveness of TPD program(s), it is essential to utilize multiple sources of data.

Research Gap

The cascade model provides a strong foundation for providing large-scale Teacher Professional Development (TPD). Specifically, there are three significant gaps in the current body of scholarship related to the dissemination of TPD: most of the research relies upon a single source of data (i.e., relying solely on either teacher self-report or classroom observation), the vast majority of the empirical research focuses on secondary education while providing little to no consideration for primary/Indian preparatory levels (Grades I-V) under NEP 2020 and the FLN Mission, and there exists very little statistical modeling of the relative contributions of both organizational and individual variables to implementation fidelity.

This study seeks to address each of these limitations in a comparative manner using Indian preparatory school teachers' self-reported classroom implementation as compared to direct observational evidence of their classroom practices, and also uses multiple linear regression to identify the degree of variation in implementation fidelity that is explained by each of the respective organizational and individual variables.

Research Objectives

- To determine how often the skills developed in the Cascade Model Workshops are implemented by Preparatory School Teachers in their classrooms.
- To explore the similarities between what was covered in Classroom Practices prior to the Workshop Sessions and what was presented as examples of Classroom Activities in the Workshop Sessions.
- To study how individual, organizational, and environmental factors influence how well a teacher can implement ideas they learned from the Cascade Model Training into their own classroom practice.

METHODOLOGY

Research Design

This study used an Explanatory Sequential Mixed-Methods Design (Creswell & Creswell, 2018 QUAN → QUAL) to examine the transfer of Pedagogical Practices in the context of cascade-based Teacher Professional Development Workshops into classroom settings. The study is composed of two sequential phases:

Phase 1 (Quantitative): Cross-Sectional Survey Data and Structured Classroom Observation Scores were collected to assess the extent, domains, and fidelity of training transfer as well as organisational and individual predictors of implementation.

Phase 2 (Qualitative): Semi-Structured Interviews and Documentary Analyses were completed to provide explanations for quantitative findings regarding the implementation gap, institutional facilitators, and systemic constraints. During the Interpretation Stage, both phases' data were integrated via side-by-side joint display to compare self-reported implementation with observed classroom fidelity.

Study Setting and Participants

The study was conducted at eleven schools that included both public and privately funded schools within the West Delhi District of Delhi, India. All participating schools had taken part in centralized, cascading model professional development workshops.

Definition of the Participant Group: Teachers that teach Grades I-V were the focus of the study. Although Grade levels I-V traditionally refer to elementary or primary schooling levels, they also refer to a foundational and preparation level continuum within the framework provided by the National Education Policy 2020 (MHRD, 2020). Therefore, the participant group was defined as foundation/primary school teachers.

Sampling Framework: A purposeful sampling method was employed to recruit a sample of 95 preparatory school teachers. The inclusion criteria required participants to have attended a 5-day central cascade workshop approximately 1-3 months before collecting the data. Participants were also required to be currently teaching foundational literacy, foundational numeracy or environmental studies in Grades I-V. The sample recruited teachers based upon their tenure and subjects taught. 40 percent of the sample had been teaching for 5-10 years and 60 percent had been teaching for less than 5 years. Subject areas taught ranged from art to science.

Master Trainers: In addition to the primary teacher cohort, a sample of 11 master trainers who trained the secondary tier cascade training were selected to act as key informants. These key informants were selected to provide qualitative insight regarding issues related to curriculum fidelity, transmission loss and logistical problems.

Data Sources & Research Instruments Teacher Questionnaire

Training Transfer reported by the teachers was assessed via a structured questionnaire consisting of forty items developed from existing evaluation frameworks of Teacher Professional Development (TPD), specifically Guskey's (2000) Five Levels of Professional Development Evaluation Model, Desimone's (2009) Core Features of Effective Professional Development Model, and Holton et al.'s (2000) Learning Transfer System Inventory. The instrument consisted of four dimensions assessing training transfer and organized on a five-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). The dimensions of the instrument include:

- Training Quality & Relevance (eight items)
- Knowledge Acquisition (ten items)
- Organisational Support Following Training (ten items)
- Implementation of Three Pedagogic Domains: Lesson Planning (four items),
- Active Learning (four items) and Formative Assessment (four items)

Validation & Reliability: An expert panel reviewed each item for clarity, representativeness and correspondence to the three cascade-training domains. The panel members included two teacher educators and two institutional academic coordinators. The instrument was piloted with twenty teachers from Grades I-V of a school located in an adjacent district. Internal consistency was determined through Cronbach's Alpha. This resulted in an overall reliability coefficient of $\alpha = .88$, while the subscales yielded coefficients ranging from .81 to .86. Item-total correlation values were greater than .40 for all items maintained in the instrument.

Structural Classroom Observation

In order to determine whether the teachers actually implemented what they reported doing in the classroom and therefore validated self-report data collected via the Teacher Questionnaire, structural classroom observations were conducted utilizing an adaptation of Molina et al.'s (2022) Teach Primary classroom observation tool. The original Teach Primary tool assesses classroom behaviors via a three-point qualitative rating system (Low, Medium, High) that is combined into element-level scores on a 1-5 scale. Due to the nature of this research, this 1-5 scale was utilized along with fixed behavioral anchors to define each scale point (i.e., 1 = behavior not present; 2 = behavior attempted but not consistently demonstrated; 3 = behavior partially demonstrated; 4 = behavior demonstrated but with minor breaks; and 5 = behavior completely and consistently demonstrated). The adapted tool rated observed pedagogical behaviors across three transfer domains that corresponded to the workshop content:

- Lesson planning and structuring (workshop lesson plan template alignment)
- Active learning and learner engagement (inquiry-based tasks, peer collaboration, active learning)
- Formative assessment (ongoing assessments for understanding, constructive feedback, adaptive instruction)

Observer Protocol and Consistency

Each of the ninety-five teachers was observed over two full instructional time blocks (total of one hundred ninety observational sessions), spaced between four and twelve weeks post-workshop to measure stabilized instructional practice. Observations were made by a single qualified researcher in order to maintain classroom conditions as naturalistic as possible; thus it was impossible to calculate inter-rater reliability. As a result of conducting observations by a single researcher, steps were taken to minimize observer drift and ensure intra-rater consistency:

- Prior to conducting the observations, the observer underwent rubric calibration using standardized classroom video benchmarks in an initial pilot observation session (n=8 sessions).
- Operationalized behavioral definitions and standardized rubrics for observing classrooms were used throughout all one hundred ninety observational sessions.
- Field notes were documented simultaneously with numerical ratings to substantiate ratings assigned to each domain.

Semi-Structured Interviews

The purpose of this study is to identify potential causes for the variation in classroom fidelity and to understand how system-wide factors can affect that variation. Semi-structured interviews were conducted post-preliminary quantitative analysis:

Teacher interviews (n=20): teachers within a stratified subsample representing high-, moderate-, and low-fidelity groups attended individual interviews lasting approximately 30–45 minutes. Master trainer interviews (n=11): master trainers were also interviewed so that they could provide a context-based perspective of the workshops' design, the cascading delivery tiers, materials being supplied, and the gap in transmitting information. All interviews utilized standardized, open-ended interview guides to address issues related to institutional leadership, peer collaboration, workloads, resources, and cascade content dilution.

Document review

A documentary analysis was used to triangulate the findings from both surveys and observational studies. The following documents were analyzed: Centralized master trainer manuals and modules containing presentations. Workshop handouts and participant activity sheets. Teacher lesson plans, pedagogical logs, student formative evaluation sheets (n=95 sets).

Data collection methodology

Following the sequential explanatory methodology outlined above, the quantitative tools (surveys and classroom observation) were administered to all teachers between 4 and 12 weeks post-cascade workshop (approximately 1–3 months). All 190 scheduled classroom observations were collected over an 8-week period of field work. Prior to conducting semi-structured interviews and document audits, preliminary descriptive and inferential analyses were conducted to determine groupings of implementation and to flag divergent findings (i.e., the significant disparity in formative assessments). Following this, qualitative data from transcripts of the interviews and documentation audits were combined with the quantitative data collected previously to explain differences in perceived and observed implementation.

Data analysis

Quantitative analysis

Quantitative data collected via SPSS (version 26.0) were analyzed and processed. Descriptive statistics: means, standard deviations (sd), percentages, and overall implementation fidelity scores (%) were determined for each pedagogical domain.

Inferential statistics: paired-samples t-tests were conducted to compare self-reported mean implementation with observed classroom mean implementation. Effect size estimates are provided as Cohen's dz ($t / \sqrt{n}$). Linear regression: multiple linear regression model: a multiple linear regression model was developed to predict overall classroom implementation fidelity. Dependent variable: overall observed classroom implementation score (continuous composite scale). Independent variables: school leadership support, training relevance, follow-up coaching, years teaching experience.

Diagnostic tests: assumptions of statistical methods were assessed prior to model development (Field, 2018). It was established that multicollinearity did not exist among variables (all VIF < 1.5). Residuals were found to be normally distributed based upon Shapiro-Wilk test. Homoscedasticity was confirmed through scatterplots of standardized residual values. Results include standardized betas (β), r-squared (r^2), and p-values.

Qualitative analysis

Reflexive thematic analysis utilizing Braun & Clarke's (2006) six-phase framework were applied to analyze interview transcripts and documentations:

- Phase 1–familiarization with interview transcripts and document notes.
- Phase 2– generation of initial codes (e.g., time-poverty, instructional-monitoring, material-gap, tier-dilation).
- Phase 3– grouping initial codes into candidate themes.
- Phase 4– reviewing themes against raw textual extracts.
- Phase 5– defining facilitators and barriers (time constraints, resource shortages, cascade dilution, peer collaboration, principal reinforcement).
- Phase 6– developing contextualized interpretive narratives supported by participant quotes.

RESULTS

A total of N=95 elementary school teachers who taught students in grades I–V from eleven schools in the area of West Delhi participated in this research project. In total, sixty percent of all participants were female; forty percent had five or ten years of classroom experience. All teachers received a standardized five-day cascade model workshop focusing on basic pedagogical strategies approximately one to three months before data collection began.

Perceived Versus Actual Implementation of Workshop Training Data for perceived implementation was obtained by recording participant responses to the question on a 5-point Likert scale, with the average level of perceived implementation being 4.1 (SD = .80). The most confident respondents reported the greatest levels of confidence when it came to planning lessons (82%) while the least confident reported the greatest lack of confidence related to formative assessment (61%).

In order to determine if the perceived competency measures corresponded to their actual behavior in class, two trained observers each used the adapted Teach Primary instrument to conduct 190 structured classroom observation sessions (one for each teacher). Overall, observed implementation of training for all evaluated pedagogy areas was less than what was reported in terms of perceived competency.

Table 1. Comparison of Self-Reported and Observed Implementation across Pedagogical Domains (N = 95)

Pedagogical Domain	Self-reported M (SD)	Observed M (SD)	Fidelity Score (%)	t(94)	p	Cohen's dz
Lesson Planning	4.3 (0.7)	3.5 (0.9)	81	8.24	< .001	0.85
Active Learning	4.2 (0.8)	3.4 (1.0)	81	7.91	< .001	0.81
Formative Assessment	3.9 (0.9)	2.9 (1.1)	74	9.15	< .001	0.94
Overall Transfer	**4.1 (0.8)**	**3.2 (1.0)**	**78**	**9.68**	**< .001**	**0.99**

Note. Implementation fidelity refers to how well teachers implemented the practices they reported using. The implementation fidelity scores for each item are based on the ratio of teachers' observed means to their self-reported means. For example, if teachers reported an average of 4.5 out of five (mean = 3.9, SD = .9) on formative assessments but actually averaged 2.9 out of 5 (mean = 2.9, SD = 1.1) on these assessments, then their formative assessment implementation fidelity would be calculated as follows: (2.9 / 3.9) x 100 = 74%. Teachers who overestimated what students did in class may have been less likely to support student learning than those who underestimated.

Determinants of Classroom Training Implementation

An exploratory Multiple Linear Regression Analysis was conducted to determine which variables affect the extent of classroom implementation of the observed classroom training. In addition to being statistically significant at the level of $p < .001$, $F(4, 90) = 36.71$, the model also explained 62% of the total variability in classroom implementation (adjusted $R^2 = .60$).

Table 2. Multiple Linear Regression Model Predicting Observed Training Implementation

Predictor	B	SE	B	t(90)	p	VIF
(Constant)	1.12	0.28	—	4.00	< .001	—
School Leadership Support	0.41	0.09	.45	4.56	< .001	1.34
Training Relevance	0.35	0.09	.38	3.89	< .001	1.42
Follow-up Coaching	0.29	0.11	.32	2.64	.010	1.28
Teaching Experience	−0.16	0.07	−.18	−2.29	.024	1.15

Note. The dependent variable is the classroom implementation score. $R^2 = .62$, adjusted $R^2 = .60$, $F(4, 90) = 36.71$, $p < .001$. No VIF values > 1.5. For all reported t-tests, exact p-values are provided based on a df = 90. For all reported t-tests, approximate squared semi-partial correlation coefficients:

School Leadership Support $sr^2 \approx .14$; Training Relevance $sr^2 \approx .10$; Follow-up Coaching $sr^2 \approx .07$; Teaching Experience $sr^2 \approx .03$. School leadership support was most strongly associated with classroom implementation ($\beta = .45$, $p < .001$), followed by perceived training relevance ($\beta = .38$, $p < .001$) and post-workshop follow-up coaching ($\beta = .32$, $p = .010$). On the contrary, an inverse relationship existed between teaching experience and the degree of implementation ($\beta = -.18$, $p = .024$) and therefore less experienced teachers in this sample had higher levels of adherence to new cascade practices than their more experienced peers.

In order to compare the standardized regression coefficients to the overall proportion of variance explained in classroom implementation ($R^2 = .62$), we calculated squared semi-partial correlations (sr^2) to quantify how much each predictor contributed uniquely to explaining classroom implementation beyond what is explained by the other predictors. Thus, school leadership support uniquely explains about 14% of the variance ($sr^2 \approx .14$); perceived training relevance accounts for about 10% of the variance ($sr^2 \approx .10$); follow-up coaching accounts for about 7% of the variance ($sr^2 \approx .07$); and teaching experience accounts for about 3% of the variance ($sr^2 \approx .03$). Together these individualized contributions amount to approximately 34%, while the additional 28% within the total R^2 represents shared variance among the correlated predictors found in school-level TPD contexts (i.e., typical moderate collinearity between organizational characteristics like school leadership support, coaching, and training relevance), since all VIFs < 1.5. See Figure 1 for standardized beta coefficients.

Figure 1. Predictors of Classroom Training Implementation (Standardised Beta Coefficients):

Qualitative Results — Institutional Support and Systemic Challenges Data from a thematic analysis of semi-structured interview responses from 20 teachers and 11 Master Trainers (total N=31) provided context for the quantitative results presented above and identified the institutional mechanisms that govern the degree of transfer fidelity. Supportive Mechanisms at an Institutional Level Collegiality (i.e., peer cooperation) (15/31 participants; 48%): The majority of respondents indicated that their ability to translate workshop-based

pedagogy into practical application was supported through informal collaborative relationships with peers, common planning times, and joint design of instructional materials.

Administrative Reinforcement (e.g. principal or department head) (11/31 participants; 35%): Respondents reported active administrative reinforcement of their use of new teaching practices included, but were not limited to: supportive classroom walkthroughs; resources available for supporting students with disabilities; and other forms of administration-led support that increased teacher motivation to maintain these new routines.

Challenges to Systematic Implementation Lack of Time and Curriculum Pacing (16/31 participants; 52%): The need to complete the curriculum within a predetermined timeframe created pressure on teachers to utilize traditional lecture methods to maximize their instructional time.

Resource Shortages (14/31 participants; 45%): Teachers lacked access to low-cost materials and technology necessary to implement activities modeled in the workshop environment such as printing equipment and student-centred, task-based activities.

Content Dilution During Cascade Process (9/31 participants; 29%): All types of educators reported that there was significant dilution of nuanced aspects of pedagogy as they cascaded through each tier of the process. For example, many teachers had an abstract sense of what Informal Formative Assessment looked like in theory, but were unable to apply it practically due to the absence of adequate training in this area.

Combining Quantitative and Qualitative Data When combining the two sets of data, we see that although preparation teachers felt very capable after participating in the workshop (M = 4.1), actual classroom transfer was much lower (M = 3.2; Fidelity = 78%). The qualitative findings indicate why the largest decline in fidelity occurred in Formative Assessment (Fidelity = 74%): In order to engage in ongoing, continuous formative tracking of all students' progress, a large amount of instructional time must be dedicated to providing one-on-one attention to each student, both of which are often severely impacted by time constraints and curriculum pacing (52%) and content dilution during cascade dissemination (29%); conversely, the importance of school leaders ($\beta = .45$) and coaches ($\beta = .32$) can be explained by teacher-reported administrative support (35%) and collegial support (48%), respectively.

DISCUSSION

While cascade-based Teacher Professional Development (TPD) may provide the opportunity for pedagogical transfer, there is considerable evidence that there are significant discrepancies between teachers' reported implementation of new strategies and their actual use in the classroom. Utilizing independent observation methods as outlined by the Teach Primary Framework, the observed use of the new approaches was substantially less than what was reported through surveys. Additionally, while some competences exhibited little loss during the process of cascading, such as procedures (lesson planning), others lost considerable amounts of fidelity including formative assessments. The ability to maintain fidelity in these types of interactive instructional processes proved particularly difficult because of the nature of the cascading process; specifically, the constant need to be able to give feedback in real-time as students complete activities.

In addition to understanding how cascading impacts instructional fidelity, it also provides insight into which factors contribute most significantly to this phenomenon. In this case, multiple linear regression identified that institutional conditions accounted for approximately 62% of the variation in how well new instructional approaches were implemented. Specifically, school leadership support was the single best predictor of implementing the new approaches as evidenced by other studies. Other predictors included whether or not the participants believed that the training they received was relevant to their work, whether or not they received additional coaching after receiving the training and whether or not they were able to collaborate with colleagues who also received the training. Conversely, teaching experience demonstrated an inverse relationship with implementation fidelity; this was likely due to the fact that teachers with more experience have developed a number of established routines and would find it increasingly difficult to "unlearn" them. A number of severe systemic constraints also impacted the implementation of activity-based instructional

processes; these constraints include rigid pacing of the curriculum, large classes, limited time and insufficient resources. These systemic constraints made it nearly impossible for many teachers to abandon traditional lecture-based instructional strategies and instead adopt new strategies that emphasize student participation.

The results of this study will have important implications for policy makers at all levels of government and education officials when considering developing programs aimed at increasing teacher capacity building as outlined in India's National Education Policy (NEP) 2020. While the cascade model represents a viable method for disseminating new instructional strategies on a large scale, the expansion of this model to larger scales without supporting institutions will lead to a significant amount of content dilution. Therefore, in order for teachers to actually implement new instructional strategies in their classrooms, teacher development must move from being one-time events (such as workshops) to providing ongoing support through professional learning communities located within schools and supported by on-site coaches and administrative leaders.

LIMITATIONS AND FUTURE DIRECTIONS

The use of a multi-methods study increases the validity of this investigation. However, there are limitations in terms of methodology. Specifically, the 4-12 week observation time frame (which included assessments of short-term and intermediate instructional strategies) did not allow for an assessment of long-term retention. The sample consisted of 95 teachers from eleven different schools in West Delhi. Therefore, it is limited by location and will likely have difficulty being generalized to rural areas. In addition, the fact that all 190 teacher observations were conducted by one observer limits our ability to calculate interrater agreement and thus creates some risk of rater bias. Despite the calibration of rubrics via video examples, questionnaire data collected throughout the study remain susceptible to both memory loss and social desirability bias due to observational validation. As such, we recommend that future researchers conduct longitudinal studies over a period of at least two or three school years. Additionally, we recommend that researchers conduct cross-sectional studies which compare different geographical and socio-economic locations. Finally, we suggest that researchers develop experimental designs that assess whether targeted post-training interventions (i.e., digital micro-coaching, peer lesson studies, formal principal training, etc.) can increase the effectiveness of large-scale professional development efforts to affect the transfer of knowledge and skills.

CONCLUSION

Teachers generally reported a moderate degree of implementation of their cascade-based training; however, classroom observation of implementation was significantly less than what teachers reported (Mean=3.2). The Fidelity Score averaged 78% overall, which indicates there are differences in how participants implement in the classroom based on their own report. Participation in a professional development workshop does not equate to identical levels of implementation in classroom practice.

Training Transfer is directly related to factors at both the individual teacher level and organizational (school) level. For example, School Leadership Support, Training Relevance, and Follow-Up Coaching all had positive relationships to Implementation. Additionally, the qualitative data identified Peer Collaboration and Principal Reinforcement as significant facilitators of Implementation. Conversely, Time Constraints, Resource Shortages, and Dilution of Training Content due to the Cascade Process were identified as substantial barriers. Furthermore, the qualitative results indicated Formative Assessment was the area where Implementation was at its lowest rate, suggesting a clear need for additional support in helping teachers to transfer this more complex assessment practice from the training into the classroom setting. Therefore, the research supports the idea of continuing to move away from the singular one-time workshop delivery model and instead toward a continuous and supported model of teacher professional development. Through regular school-level follow-up, supportive school leadership, peer collaboration, coaching, and adequate resources for teaching will enhance the amount of professional learning that is transferred into classroom practice. Future cascade-based Ultimately, strengthening the relationship between workshop learning and classroom practice will lead to sustained and contextualized professional development for preparatory school teachers. This is aligned with

the practice-oriented and embedded teacher professional development emphasized by the National Education Policy (NEP) 2020.

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