EXPLORING THE RELATIONSHIP BETWEEN PROFESSIONAL DEVELOPMENT PROGRAMS AND TEACHER PERFORMANCE IN KENDRIYA VIDYALAYAS

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Abstract

This study investigates the impact of professional development programs on teachers' performance in Kendriya Vidyalayas. This paper examines the roles of participation in programs, relevance to teaching needs, delivery methods, and teacher engagement. A quantitative research approach was adopted for the study, with data collected from 384 teachers through a standardized questionnaire. The findings reveal that active participation in professional development programs significantly improves teacher performance ($\beta = 0.676$, $P < 0.05$). What is more, the relevance of programmes to specific needs for teaching was found to influence teacher performance positively, $\beta = 0.676$, $P < 0.05$. A further finding of the study is that delivery methods of the programme had a high impact on teacher performance $\beta = 0.742$, $P < 0.05$. Moreover, teacher engagement was a mediator that links professional development program characteristics with teacher performance. Teacher engagement indirectly affected teacher performance to a great extent (0.409, $P < 0.001$). SEM was utilized to study these relationships and establish that teacher engagement is necessary for improving professional development programs' impact on teacher performance. This leads to the importance of professional development programs being meaningful, relevant, and delivered in ways that make teachers actively engage in them. This result underlines the importance of well-designed and thoughtfully delivered professional development initiatives in improving teacher performance, particularly in the Kendriya Vidyalayas context.

Keywords: Professional Development Programs, Teacher Performance, Kendriya Vidyalayas, Teacher Engagement, Program Participation, Program Relevance, Delivery Methods, Structural Equation Modeling.

1 Introduction

Educational systems worldwide are undergoing significant transformations. The need for academic institutions to cultivate individuals equipped with 21st-century competencies is a challenge for teachers. Consequently, the professional development of teachers, including education and training to improve their performance and skills, has become an important objective. To successfully cultivate student talents, educators must possess a strong command of these skills and be prepared to transfer them to pupils. Consequently, teacher professional development programs must provide teachers with the requisite abilities to meet the demands of contemporary education (AbdulRab, 2023). The quest for knowledge and professional development has grown in significance in today's ever-changing world. Teachers who do not pursue ongoing education and training risk falling behind and losing faith in their capacity to provide high-quality instruction. In these situations, taking teacher training courses for continuous professional development is beneficial because it helps teachers grow and broaden their skill sets, improve their knowledge, performance and remain relevant in their respective fields (Laura Taylor, 2023).

Their teachers significantly impact Students' performance throughout the academic year (Araujo et al., 2016) and into adulthood (Chetty et al., 2014). Teachers' performance in the classroom, their capacity to plan a lesson, and their ability to create questions that would successfully elicit student knowledge were all miserably low on the pedagogical knowledge scale (Bold et al., 2017). Professional development is the leading instrument nations of all financial levels use to enhance their working teachers' knowledge and abilities. Professional development includes anything from formal, lecture-style training to mentoring and coaching. However, very few professional development programs undergo thorough evaluation, and among those that do, their efficacy results are very inconsistent. Specific programs work well, such as instructing teachers to teach literacy in the student's mother language and teaching them to assess student performance more often so that they may modify their instruction in response to findings that significantly affect students' reading proficiency.

In this regard, teachers' professional development leads to evolving their roles, responsibilities, and expertise across many educational domains. Consequently, it is essential for teachers who have attained a particular degree of development to possess a larger perspective on their social and professional lives, thereby enhancing student performance (Tynjälä, 2008). The effectiveness of learning is greatly influenced by teacher performance. One way to evaluate a teacher's performance is to look at how well they carry out their responsibilities when teaching in a classroom (Sumarsono et al., 2019). The effectiveness of teachers' execution of their primary duties, which are to provide instruction and learning, is a measure of teacher performance. Teacher performance must be recognized, supported, developed, and maintained to accomplish school objectives. Teacher effectiveness and student achievement are believed to be positively impacted by teachers who exhibit strong performance or professional skills (Agustine et al., 2019). Principals must thus be aware of the factors influencing teacher performance to

support and maximize their performance (Kusumaningrum et al., 2019). High absenteeism, tardiness, and teachers who show up to class exhausted or underprepared may all contribute to poor teacher performance (Khomariyah et al., 2023). The new normal makes achieving perfect learning difficult for students, teachers, and administrators. Several factors, including (a) not pursuing their profession to the fullest extent possible, (b) low adherence to the standards and ethics of the teaching profession, (c) salary received, (d) needs, (e) qualifications, (f) time spent at work, and (g) principal policy, can contribute to teachers' lack of professionalism (Aydin et al., 2015). Strong and qualified teachers are consequently required in the new standard period to enhance learning. Professional teacher development activities are carried out to improve teachers' abilities while instructing students and to strengthen teacher growth and performance, resulting in student success (Hoque et al., 2020).

Teacher competency may be enhanced in five areas: (a) technological awareness, (b) independent study, (c) knowledge and skills, (d) motivation, and (e) interactional competence (Imron et al., 2021). Planning programs, carrying out the learning process, evaluating learning, and analyzing learning outcomes and processes are all steps in the learning process that all teachers must master (Imron et al., 2020). Staff development or "in-service training" was the sole "professional development" option that was accessible to teachers for a long time. These programs typically consisted of workshops or short-term courses that gave teachers fresh knowledge on a specific area of their job. The professional growth of teachers has only recently been seen as a "long-term process that includes regular opportunities and experiences planned systematically to promote growth and development in the profession." Given that teachers acquire information over time, it is a long-term process that produces a valuable sequence of connected experiences that allow teachers to connect previously learned material to new experiences (AbdulRab, 2023). The better the teachers' performance is, the more engaged and committed they are to their work, which results in a more creative and engaging approach for the students to learn the information. This change in how individuals see their professional development aligns with Kendriya Vidyalayas's strategy. In this context, KVs have implemented structured frameworks for professional development to enhance teacher proficiency and guarantee uniformity in instruction.

Part of India's centralized government school system, the Kendriya Vidyalayas were established with support and oversight from the Ministry of Human Resource Development (MHRD). Three schools operate outside, while over a thousand schools operate in India. Initially known as "Central Schools," this system was established in 1963. Later, Kendriya Vidyalaya was adopted as the new name. The Central Board of Secondary Education is the parent organization of each Kendriya Vidyalayas (CBSE). Its goal is to provide Indian Defense Services personnel's children, often stationed in isolated places, a top-notch education. These schools offer a unified syllabus and educational system, and they all adhere to the same curriculum throughout India. Kendriya Vidyalayas ensure that government workers' children do not have educational disadvantages and that their parents get along when they move. Before 2017, Kendriya Vidyalaya Sangathan provided only seven-day induction courses or programs (Alam & Ahmad, 2019). However, in 2017, the organization began offering three levels of induction training:

Stage I: Ten-day induction training program; following the announcement of the recruitment exam results for different cadres, letters of appointment are sent to the chosen candidates (PTRs, TGTs, and PGTs) inviting them to join Kendriya Vidyalaya Sangathan at a designated location on a designated date for a ten-day induction training program. The 10-day introduction training program is typically conducted at the regional level for PRTs and the national level for TGTs and PGTs; however, sometimes it is performed at the regional level as well.
Stage II: One month of on-the-job training; after a ten-day in-person induction training session, the new hires are assigned to a vacant position at a Kendriya Vidyalaya, where the principal of the relevant Vidyalaya will supervise and mentor them.
Stage III: 6-day in-person training; after a month of on-the-job training, the principal in question will report to the Deputy Commissioner of the area and the Course Director who led the 10-day induction training on the performance of the few recruits. Ultimately, a second round of six-day in-person training occurs at the exact location of the first ten-day induction training.

These schools continuously provide high-quality teaching because they focus on holistic education and consistent curriculum. As the country's benchmark for excellent education, Kendriya Vidyalayas place a premium on teacher performance. Professional development programs created especially for KV teachers are essential to continuously improving student outcomes and teaching standards.
While much research emphasizes that teacher professional development is an improvement tool for classroom outcome, limited studies have focused on Kendriya Vidyalaya-it's uniqueness by operating under a central government framework. This research study will fill that gap by investigating whether professional development affects teacher performance in Kendriya Vidyalayas. The novelty of this research is that it seeks to understand not only the general outcomes of professional development but also the specific training frameworks implemented in KVs and their measurable impact on teacher effectiveness and student performance. The study will offer insights into targeted interventions for optimizing teacher training programs in Kendriya Vidyalayas, thus contributing to broader national education policy discussions.

Objectives:
- To examine the impact of professional development program participation on teacher performance in Kendriya Vidyalayas.
- To assess the influence of the relevance of professional development programs to teaching needs on teacher performance in Kendriya Vidyalayas.
- To investigate the effect of different program delivery methods on teacher performance in Kendriya Vidyalayas.

- To explore the mediating role of teacher engagement in the relationship between professional development program factors (participation, relevance to teaching needs, and delivery method) and teacher performance in Kendriya Vidyalaya.

2 Related work and hypothesis development

Professional development programs are known to have the possibility of improving teacher performance, student learning outcomes, and institutional overall performance. Its implementation in school education has caught much attention. The participation, applicability, and delivery methods of professional development programs, as well as their effects on teacher performance, are all examined in this review of the research. The development of the study's hypotheses is based on these observations.

2.1 Impact of Professional Development Program Participation on Teacher Performance

Teacher professional development is a crucial component in enhancing students' performance and practices and educational changes. Numerous studies have looked at various facets of professional development for teachers. (Baabdullah et al., 2024) Found that the professional development program improved teachers' knowledge, skills, and confidence in teaching; it also identified prerequisite challenges that the teachers faced, such as the need to develop research skills and self-directed learning; these findings offer important insights that can help design effective professional development in education and support sustainable education practices. Moreover, (Şahin et al., 2024) discussed the difficulties teachers in rural areas experience in obtaining and using professional development programs. Effectively addressing these specific needs requires specialized solutions. Stakeholders may dramatically benefit regional teachers' professional lives by prioritizing infrastructure, policy support, and community participation.

Furthermore, (DeMonte, 2013) asserted that professional development for teachers may enhance their subject-matter expertise and enhance classroom practices. The educational system's most potent component is the Teacher. The degree of student achievement increases as teachers gain more excellent professional expertise. Teacher professional development may be seen as a procedure intended to improve the quality of teaching and performance. Implementing teacher professional development, including training, induction, and mentorship programs, is more successful for teachers who have finished it than for those who have not, claimed (Soe, 2018).

Additionally, teachers must continue their professional development to be updated with the needs and quick educational changes. (Chu et al., 2021) claimed that professional development for teachers enables them to meet new standards and support the growth of contemporary abilities in student-centred learning. The researchers provide many methods for teachers to learn 21st-century abilities. (Yue, 2019) concluded that efficient, professional development techniques may address teacher practice and education. These techniques consist of needs assessment, peer mentoring, teamwork, school culture improvement, modern skills development, active learning instructional strategies, integration of core values, ongoing professional development, research-based projects, and integrated information and communication technology instruction. Lastly, (Koh et al., 2015) used a model centred on instructors' capacity to create lessons that help students build contemporary skills to address the problem of teacher professional development. The researchers prove that design-driven development methods may lead to professional learning. When this was taken into consideration, the following hypothesis was formulated.

Hypothesis 1: Professional development program participation has a positive direct effect on teacher performance in Kendriya Vidyalayas

2.2 Influence of Program Relevance to Teaching Needs on Teacher Performance

Recently, interest in the connection between professional development programs and teaching demands and how these programs influence teacher performance has been growing. As a response to this increasing interest, researchers have conducted several studies on instructors' evaluations of the extent to which these programs meet their classroom needs and instructional obstacles. These studies are focused on understanding the effect that the relevance of a program will have on instructors' ability to control classrooms, successfully deliver lessons, and meet the needs of their learners regarding learning. One of the key findings from these studies is that according to (D. C. M. Taylor & Hamdy, 2013), most faculty members believe that professional development programs positively impact teacher performance. These programs are seen as providing teachers with the knowledge, skills, and strategies needed to support their continuous learning and development, as well as the learning and development of their students.

However, despite this general agreement, there is still some debate among faculty members regarding the extent to which professional development programs effectively enhance teacher performance. In fact, (Barbour et al., 2020) claimed that some faculty members believe that the current programs are not adequately preparing teachers for the demands of a rapidly changing society and that they need to be revised to meet the needs of today's teachers better. These faculty members argue that the programs must be designed to provide teachers with a deeper understanding of the key concepts and principles of teacher performance and the practical skills and strategies needed to support their continuous learning and development.

Another factor that affects the effectiveness of professional development programs in enhancing teacher performance is the methods of delivery used by the programs. Faculty members believe that programs need to be delivered in an engaging and

interactive way to promote active participation and learning (Martin et al., 2020). They also believe that programs need to be delivered in a flexible manner to accommodate the diverse needs of teachers and the different contexts in which they work (Rapanta et al., 2021).
The quality of the instructors also plays a critical role in determining the effectiveness of professional development programs in enhancing teacher performance. (Muliyah & Aminatun, 2020) Stated that faculty members believe that programs must be taught by highly qualified and experienced instructors who are knowledgeable about the subject matter and strongly committed to teaching. They also believe that programs need to be taught by instructors who can provide clear and concise explanations and practical and relevant examples to help teachers better understand the concepts and principles of teacher performance. Therefore, the following second hypothesis was formulated:

Hypothesis 2: Program relevance to teaching needs positively affects teacher performance in Kendriya Vidyalayas.

2.3 Effect of Program Delivery Methods on Teacher Performance

There is a wealth of educational research that uses an experimental design and incorporates aspects of professional development (PD) for teachers, even if the characteristics of the PD design were not the main variables studied. The vast majority of this research focuses on interventions that are thought to enhance the quality of education and student outcomes. Researchers usually provide participating teachers PD to help them execute the intervention, which might be a new curriculum, teaching strategies, instructional materials, or a mix of these, to facilitate such a study. Although the researchers in these studies ensure that their PD delivery aligns with the state of the art, their investigations are intended to evaluate the impact of instructional improvement rather than the PD's characteristics. Since PD design requires generating differences between the existing circumstances rather than the subject of inquiry, they do not contain comparisons of various PD characteristics. Therefore, teachers in the treatment group engage in some professional development delivery to learn new teaching techniques or to work with newly developed materials or curricula to improve instruction. In contrast, teachers in the control condition receive neither in most studies, which is the primary research foundation for numerous reviews and meta-analyses (Asterhan & Lefstein, 2024).

Professional development programs, teacher collaboration, university courses, professional conferences, informal communication, and individual learning activities are the six categories of professional learning activities that Akiba and Liang (2016) identified as impacting student achievement in mathematics teaching and learning. Kennedy (2019) uses her theories about what teachers should learn to categorize professional development studies. Material knowledge (focusing on both topic and pedagogical material), specific procedures (teachers are taught in a particular teaching approach), or tactics and ideas (tools are offered for the Teacher to make choices in the classroom) are the most prevalent assumptions.

There are several ways to interpret the word "classroom practices." From this angle, it may concentrate on three: assessment, implementation, and planning. Planning is the choices instructors make about instruction and learning before carrying them out in the classroom. Instructors may either mentally plan or record their plans in a written document. During a lesson, planning compiles and arranges the choices the instructor may make about instruction and learning. According to Schoenfeld (2015), this outline or script is the lesson's visual representation.

The term "implementation practices" describes how teachers carry out their classroom plans. Since the Teacher's performance must adjust to the complexity of the events in the classroom throughout a session, this suggests a change in the intended curriculum. The "enacted" curriculum, as defined by Remillard and Heck (2014), is an emerging curriculum that the instructor creates in collaboration with the students. It is shown via the teacher-student interactions centred on each lesson's tasks.

The capacity of the instructor to contrast his or her expected intentions with what was done in the classroom is the last point of evaluation techniques. It enables the instructor to consider what transpired and decide what needs to be changed for subsequent deployments (Pinzón & Gómez, 2019). The student's learning outcomes and the Teacher's performance are evaluated in this evaluation. Taking into account each of these inspections, the following hypothesis was developed:

Hypothesis 3: The program delivery method significantly affects teacher performance in Kendriya Vidyalayas.

2.4 Mediating Role of Teacher Engagement in the Relationship Between Program Factors and Teacher Performance

Professional development programs' impact on teacher performance largely depends on teacher engagement. When actively involved, teachers are more likely to use the abilities and information acquired from these programs in the classroom. The influence of elements, including program participation, relevance to teaching needs, and delivery techniques on teacher effectiveness, may be mitigated by the degree of engagement. Designing professional development programs that improve teacher performance and encourage long-term engagement and growth requires understanding this mediating function. (Li et al., 2022) demonstrated that teachers' job engagement positively predicted self-efficacy, and CPD mediated this relationship. Job years mitigated the impact of CPD. Young teachers benefited more from CPD indirectly than seasoned instructors. Young instructors' self-efficacy increased with their involvement in updated, reflecting, and collaborative activities, but only experienced teachers benefitted. Results suggest increasing participation in CPD activities to boost teacher self-efficacy and highlight the advantages of young teachers' engagement in CPD.

Research by (Wang et al., 2022) indicated that teacher engagement positively impacts children's academic achievement in English. Autonomous motivation and pleasure moderated the link between teacher engagement and English performance, but relief did not significantly affect the relationship. Teacher engagement also impacts students' English success by promoting autonomy and pleasant academic feelings (enjoyment and relaxation). Engagement in active learning, content development and participant analysis, coherence with teacher needs and circumstances, collective participation and duration are the main dimensions of professional development as stated by (De Naeghel et al., 2016)(Ismail et al., 2021).

Furthermore, (Ji, 2021) showed a connection between teachers' engagement in professional development and their teaching practice. Four categories of teacher engagement also developed due to the various PD requirements of specific instructors.(Picard & Kutsyuruba, 2017) Demonstrated that strong leadership, collaborative physical structures, and colleagues all significantly impact teachers' engagement in professional development within a good school culture. They argued that shared leadership, empowerment, continuous improvement techniques, and the physical design of a school site are crucial for ensuring teacher engagement. In summary, teacher engagement is the key mediator between performance and elements of professional development programs. Participating teachers in such programs will likely apply the information and skills learned in their practice, significantly improving performance. These all impact school culture, delivery, and relevance. Enabling school environments can be created through strong leadership, teamwork, and specific professional development experiences. This will likely increase the chances that teacher performance gains will be maintained. For professional development programs to be most effective, there is a critical need to understand and promote teacher involvement. Based on this information, the following hypothesis was formulated.

Hypothesis 4: Teacher engagement mediates the relationship between professional development program factors (participation, relevance to teaching needs, and delivery method) and teacher performance in Kendriya Vidyalayas.

2.5 Research gap

The literature has covered how professional development programs affect the performance of teachers. However, a gap remains in understanding the various factors, including the program's relevance to teaching needs, delivery methods, and teacher engagement, which specifically influence teachers' performance in Kendriya Vidyalayas. Studies on how professional development affects teacher abilities and teaching practices have mostly failed to combine these elements in the framework of Indian schools, especially in Kendriya Vidyalayas, which presents exceptional possibilities and obstacles. More comprehensive research emphasizing both direct and indirect benefits is thus much needed, as few studies look at the mediating influence of teacher engagement in terms of connecting those program characteristics with the instructor's performance. This research provides a comprehensive analysis of the link between teacher performance and professional development programs within the particular environment of Kendriya Vidyalayas, therefore helping to address these gaps.

3 Materials and methods

3.1 Research design

This study uses a quantitative methodology to explore the relationship between Kendriya Vidyalaya teachers' performance and professional development initiatives. A standardized questionnaire will be sent to 384 randomly selected instructors to collect primary data. This sample size ensures that the information is representative and covers various viewpoints from the teaching community. The statistical analysis will be applied to assess the correlation between teacher performance and professional development activities to explore the predicted links. Pre-testing the questionnaire and standardized tools will ensure the validity and reliability of the findings. The researcher will adhere strictly to ethical principles such as informed consent and confidentiality throughout the research process.

The variables that have been chosen to serve as the basis of this study are presented in Table 1. These are all taken from the previous literature about professional development and Teacher performance. The professional development program participation variable has been borrowed from factors about active engagement in professional development activities (Lee, 2005). This program relevance to teaching needs variable evaluates the extent to which the programs support the specific needs of the teachers for teaching purposes and was adapted from (Beitlers & Noguera, 2015). The delivery method variable concerning the mode and effectiveness of delivery was adopted from (Mahmud et al., 2022). Teacher engagement variable regarding the Teacher's level of involvement and motivation in professional development programs was adopted (Klassen et al., 2013). Based on frameworks like (E. S. Taylor & Tyler, 2012) that assess the efficacy and classroom performance of the Teacher, a measure of teacher performance variable, reflecting the general performance and effectiveness in the school, was derived. Variables were chosen judiciously to holistically examine professional development's impact on teacher performance with support from appropriate studies in the domain.

Table 1 Adopted variables

Variable	Number of Items	Source of Adoption
Professional development program	6	Lee, 2005
Program relevance to teaching needs	4	Beitlers & Noguera, 2015
Program delivery method	4	Mahmud et al., 2022
Teacher engagement	6	Klassen et al., 2013

Teacher performance	6	(E. S. Taylor & Tyler, 2012

3.2 Description of the Study Area

The research will focus on Kendriya Vidyalayas, a network of schools managed by the Indian Ministry of Education that offers high-class education to the children of transferable government servants. The schools are spread throughout India and vary in student and faculty composition. A group of Kendriya Vidyalayas selected from diverse geographic locations would represent a sample so that findings can be generalized well across regional contexts. In particular, this study would target teachers working within such schools and determine the implications of participating in professional development on their teaching performances.

3.3 Data collection

Questionnaires will be administered to these participants to garner quantitative data from them. More or fewer questions will be centred on participants' feelings when they participate in professional development programmes, how these teachers perform on the job, and how relevant their participation is to teachers' needs during teaching. In addition to addressing the level of teacher involvement in these programs and the success of the different modalities, the questionnaire will also examine how these influence teachers' teaching performance. The questions will be specifically crafted to determine the major determinants of teacher success at Kendriya Vidyalayas, such as the relationship between program participation, its applicability to teaching needs, delivery strategies, and general teacher engagement. The measuring instrument used was a five-point Likert scale, with one denoting "strongly disagree" and five denoting "strongly agree." Likert scale questions have the benefit of being easily standardized, which makes the data they provide excellent for statistical analysis.

3.4 Tools for data collection

Data collection tool will be a structured questionnaire. Every question item will be meant to catch capture factors pertinent to the goals of study. The questionnaire's online distribution and the accessibility and effectiveness of data collection.

- **Quest Structure**

The questionnaire has two sections: In the first section, respondents were asked questions on their demographics, including details such as age, gender, years of teaching experience, educational qualifications, and teaching subject. The second section will involve the perceptions of professional development programs and teacher performance. The respondents will be rated on statements related to participation in professional development programs, the relevance of these programs to their teaching needs, the effectiveness of different delivery methods, and their overall teacher performance. The survey will also measure the respondents' involvement in such programs and their impact on teaching performance. The assertions are rated on a Likert scale from 1 to 5, where one indicates Strong disagreement and five indicates Strong agreement.

3.5 Sampling Technique

The research will use a random sampling method to guarantee the inclusion of a wide spectrum of individuals. Overall, the research will use a representative sample of 384 respondents.

- **Random Sampling Technique**

Random sampling is the method of picking samples from a population so that every potential participant has an equal chance of being selected. In many cases, a representative sample of the whole population may be obtained by randomly selecting individuals from a larger pool of possibilities. Random sampling is one of the most straightforward approaches to collecting information from the whole population.

The following is the formula for random sampling when a sample is chosen only once:

$$P = 1 - (N-1/N)(N-2/N).....(N-n/N-(n-1))$$

3.6 Inclusion criteria

The requirements for participants in this study include instructors who have taught for at least one year and are currently working in Kendriya Vidyalayas all over India. This is because the participants must have participated in at least one professional development program in the last 12 months since that falls within the scope of the study. The last requirement is that participants must give informed permission and be willing to volunteer for research.

3.7 Exclusion criteria

Based on the exclusion criteria, teachers outside the Kendriya Vidyalaya system are excluded, as are teachers with years of teaching experience and those who are part of the non-teaching staff. All those teachers opt-out or don't give informed consent will be excluded from this study. All these crThesesure an informed and pertinent sample for this research.

3.8 Tools for Data Analysis

In this study, SPSS (Statistical Package for the Social Sciences) and AMOS (Analysis of Moment Structures) tools will be utilized for Data Analysis.

3.9 Techniques for Data Analysis

The data will be analyzed using SPSS 23 to investigate the relationships between teacher engagement, performance, delivery methods, professional development program relevance to teaching needs, and participation in professional development programs. These complex relationships will be investigated using structural equation modelling, or SEM. SEM will be implemented using the Analysis of Moment Structures (AMOS) program, which provides a tool to probe the interactions of these variables. Each component will be measured through standardized questionnaires prepared to measure aspects like teacher involvement, program appropriateness, participation in the Program, delivery mechanisms, and teacher effectiveness. To establish the degree and significance of these relationships, the study will calculate regression weights and model fit indices, including CMIN/DF, RMR, GF

I, CFI, and RMSEA. This will ensure that the ways through which these variables affect teacher performance in Kendriya Vidyalayas are well assessed.

4 Results:

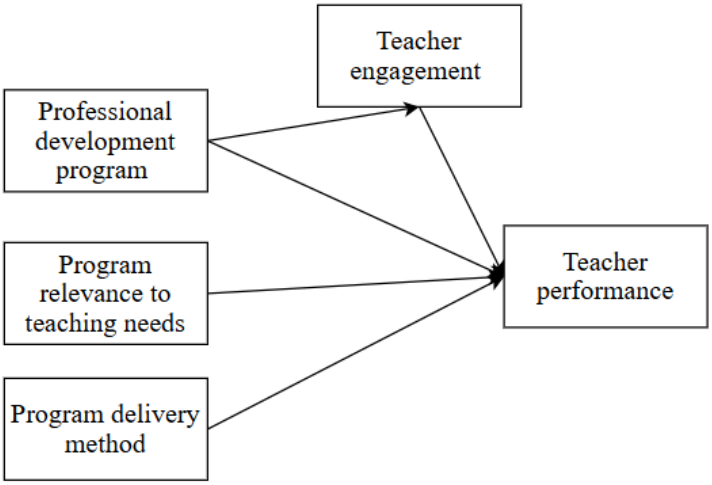

Figure 1 Conceptual Framework

Table 2 Demographic variables

		Frequency	Per cent
Age	25- 30 years	172	44.8
	31-35 years	90	23.4
	36-40 years	62	16.1
	41-45 years	53	13.8
	Above 46 years	7	1.8
	Total	384	100.0
Gender	Male	211	54.9
	Female	173	45.1
	Total	384	100.0
Teaching Experience	0-5 years	144	37.5
	6-10 years	25	6.5
	11-15 years	38	9.9
	16-25 years	98	25.5
	Above 26 years	79	20.6
	Total	384	100.0
Educational Qualification	Below Bachelor's Degree	80	20.8
	Bachelor's Degree	147	38.3
	Bachelor of Education	113	29.4
	Master's Degree	23	6.0

	Master of Education	21	5.5
	Total	384	100.0
Teaching Subject	Science	116	30.2
	Mathematics	80	20.8
	Social Studies	96	25.0
	English	60	15.6
	Hindi	32	8.3
	Total	384	100.0

According to the sample's demographic analysis, which included 384 secondary school teachers from Kendriya Vidyalayas, the bulk of participants (44.8%) are between the ages of 25 and 30, with those between the ages of 31 and 35 coming in second (23.4%). Of the instructors in the sample, 45.1% are female, and the majority are male (54.9%). Teachers with 0–5 years of experience make up the most significant category (37.5%), followed by those with 16–25 years (25.5%) and those with more than 26 years (20.6%). The majority of teachers (38.3%) have a bachelor's degree, followed by those with less than a bachelor's degree (20.8%), those with a bachelor's degree (29.4%), and those with a master's degree (6.0%) or master of education (5.5%). Regarding the subject matter, the majority of teachers (30.2%) teach science, followed by social studies (25.0%), math (20.8%), English (15.6%), and Hindi (8.3%).

4.1 Proposed hypothesis:

H_1: Professional development program participation has a positive direct effect on teacher performance.

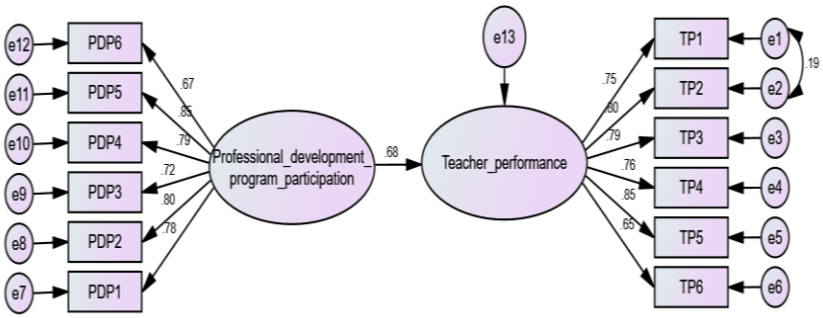

Table 3 Regression Weights: (Group number 1 - Default model)

Path	Estimate	S.E.	C.R.	P
Teacher performance <--- Professional development program participation	.676	.058	11.075	***

The table depicts a hypothetical structural equation model that shows cases of the interdependence between Two variables, namely the Professional development program and Teacher performance. In the present model, the independent variable is the Professional Development program, whereas the dependent variable is the Teacher performance. The investigation findings indicate a positive and statistically significant relationship between Professional development programs and Teacher performance (β=.676, P<0.05).

The standardized coefficient of 0.676 indicates a positive association between professional development programs and teacher performance, as shown in the route connecting these two variables. The correlation coefficient values (C.R. values) show large magnitudes, suggesting that the observed associations are statistically significant. The fit indices indicate that the model fits nicely since the factors exhibit statistical significance with p-values over 0.05 (Table 9). Therefore, the total model fit was evaluated using seven distinct fit indices, demonstrating a statistically significant positive association between Professional development programs and Teacher performance.

Table 4 Model fit summary

Variable	Chi-square value(χ^2)	Degrees of freedom (df)	CMIN/DF	P value	GFI	RFI	NFI	IF	CFI	RMR	RMSEA
Value	97.021	52	1.866	0	0.962	0.955	0.965	0.983	0.983	0.034	0.048

The quality of fit was an acceptable representation of the sample data (χ^2 = 97.021), NFI (Normed Fit Index) =0.965; IFI (Incremental fit index) = 0.983, GFI (Goodness of Fit) = 0.962, RFI (Relative Fit Index) = 0.955 and CFI (Comparative Fit Index) =0.983 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.034 and RMSEA (Root mean square error of approximation) = 0.048 values are lower than the 0.080 critical value**.** Results indicated a good fit for the model presented, including RMSEA of 0.048, RMR of 0.034, GFI of 0.962, and CFI of .983.

H2. Program relevance to teaching needs has a positive direct effect on teacher performance in Kendriya Vidyalayas.

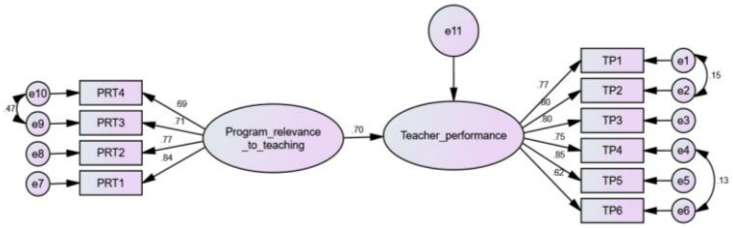

Table 5 Regression Weights: (Group number 1 - Default model)

Path	Estimate	S.E.	C.R.	P
Teacher performance <--- Program relevance to teaching	.703	.057	11.484	***

The table depicts a hypothetical structural equation model that shows cases of dependence between two variables: the relevance to teaching and Teacher performance. In the present model, the independent variable is the Program's relevance to teaching, whereas the dependent variable is the Teacher's performance. The investigation findings indicate a positive and statistically significant relationship between Program relevance to teaching and Teacher performance (β=.676, P<0.05).
The standardized coefficient of 0.757 is a positive association between program relevance to teaching and teacher performance, as shown in the route connecting these two variables. The correlation coefficient values (C.R. values) show large magnitudes, suggesting that the observed associations are statistically significant. The fit indices indicate that the model fits nicely since the factors exhibit statistical significance with p-values over 0.05 (Table 9). Therefore, the total model fit was evaluated using seven distinct fit indices, demonstrating a statistically significant positive association between Professional development programs and Teacher performance.

Table 6 Model fit summary

Variable	Chi-square value(χ^2)	Degrees of freedom (df)	CMIN/DF	P value	GFI	RFI	NFI	IF	CFI	RMR	RMSEA
Value	59.524	31	1.920	0.002	0.971	0.961	0.973	0.987	0.987	0.024	0.049

The quality of fit was an acceptable representation of the sample data (χ^2 = 59.524), NFI (Normed Fit Index) =0.973; IFI (Incremental fit index) = 0.987, GFI (Goodness of Fit) = 0.971, RFI (Relative Fit Index) = 0.961 and CFI (Comparative Fit Index) =0.987 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.024 and RMSEA (Root mean square error of approximation) = 0.049 values are lower than the 0.080 critical value**.** Results indicated a good fit for the model presented, including RMSEA of 0.049, RMR of 0.024, GFI of 0.971, and CFI of .987.

H3. Program delivery method has a significant effect on teacher performance in Kendriya Vidyalayas.

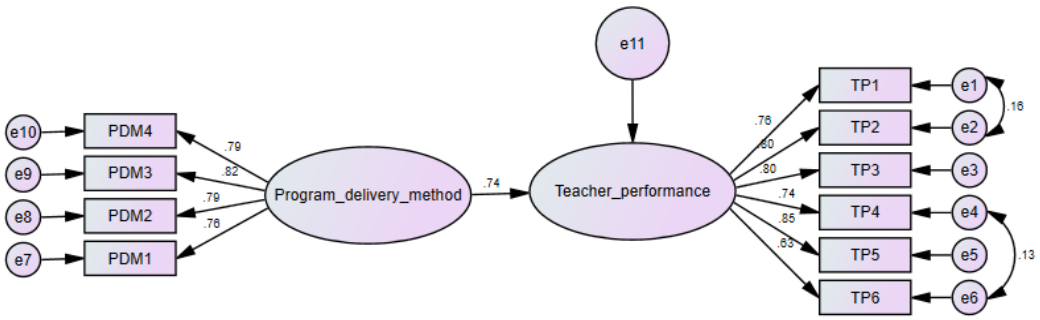

Table 7 Regression Weights: (Group number 1 - Default model)

Path	Estimate	S.E.	C.R.	P
Teacher performance <--- Program delivery method	.742	.069	11.719	***

The table depicts a hypothetical structural equation model that shows the interdependence between two variables: the Program delivery method and Teacher performance. In the present model, the independent variable is the Program delivery method, whereas the dependent variable is the Teacher performance. The investigation findings indicate a positive and statistically significant relationship between the Program delivery method and Teacher performance (β=.742, P<0.05).

The standardized coefficient of 0.742 is a positive association between the program delivery method and teacher performance, as shown in the route connecting these two variables. The correlation coefficient values (C.R. values) show large magnitudes, suggesting that the observed associations are statistically significant. The fit indices indicate that the model fits nicely since the factors exhibit statistical significance with p-values over 0.05 (Table 9). Therefore, the total model fit was evaluated using

seven distinct fit indices, demonstrating a statistically significant positive association between the Program delivery method and Teacher performance.

Table 8 Model fit summary

Variable	Chi-square value(χ^2)	Degrees of freedom (df)	CMIN/DF	P value	GFI	RFI	NFI	IF	CFI	RMR	RMSEA
Value	42.653	32	1.333	0.099	0.978	0.973	0.981	0.995	0.995	0.022	0.029

The quality of fit was an acceptable representation of the sample data (χ^2 = 42.653), NFI (Normed Fit Index) =0.981; IFI (Incremental fit index) = 0.995, GFI (Goodness of Fit) = 0.978, RFI (Relative Fit Index) = 0.973 and CFI (Comparative Fit Index) =0.995 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.022 and RMSEA (Root mean square error of approximation) = 0.029 values are lower than the 0.080 critical value**.** Results indicated a good fit for the model presented, including RMSEA of 0.029, RMR of 0.022, GFI of 0.978, and CFI of .995.

H4. Teacher engagement mediates the relationship between the professional development program and teacher performance in Kendriya Vidyalayas.

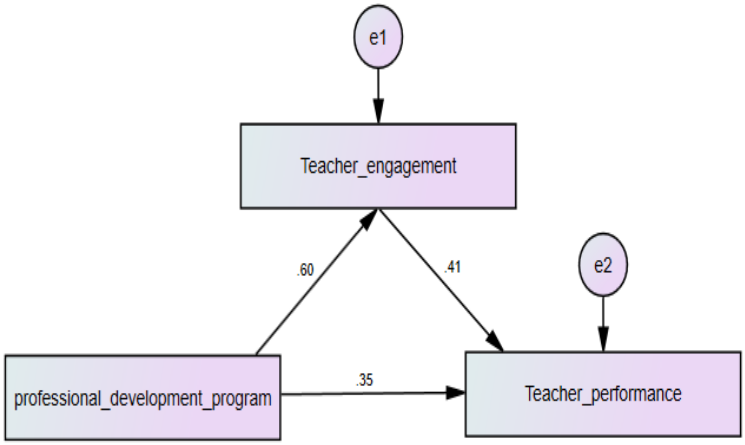

Table 9 Regression Weights: (Group number 1 - Default model)

Path			Estimate	S.E.	C.R.	P
Teacher engagement	<---	Professional development program	.604	.038	14.830	***
Teacher performance	<---	Teacher engagement	.409	.048	8.752	***
Teacher performance	<---	Professional development program	.355	.045	7.590	***

According to the research, professional development programs impact Kendriya Vidyalaya teachers' performance directly and indirectly. Professional development programs have a substantial and favourable impact on teacher performance, demonstrating the direct effect (Estimate = 0.355, $p < 0.001$). Furthermore, professional development programs have an indirect impact by increasing teacher engagement (Estimate = 0.604, $p < 0.001$), which in turn improves teacher performance (Estimate = 0.409, $p < 0.001$). The total impact of professional development programs on teacher performance is strengthened by the mediating function of teacher engagement, highlighting the vital need to implement tactics that increase teacher engagement in these programs to maximize their efficacy.

5 Discussion:

This research shows several important conclusions about how professional development programs affect Kendriya Vidyalaya teachers' performance. First, it was demonstrated that program participation directly improved teacher performance. This finding is consistent with Guskey's (2002) research, which highlights how successful professional development is when teachers actively participate. Likewise, teacher performance was favourably influenced by program relevance to teaching needs, supporting Desimone's (2009) claim that meeting instructors' individual requirements improves results.

Teacher performance was strongly impacted by the program delivery technique, which aligns with (Darling-Hammond, 2017), who emphasized the significance of efficient delivery for optimizing learning. Additionally, the research verified that the association between teacher performance and professional development program characteristics is mediated by teacher involvement. This result is consistent with the study by (Kraft et al., 2018), which showed that motivated instructors are more likely to implement professional development ideas, which enhances instruction.

This research concludes by highlighting the significance of professionally designed, relevant, and engaging programs that not only emphasize teacher involvement but also encourage teacher engagement for improved classroom performance.

6 Conclusion:

The study concluded significant links between professional development and teacher performance at Kendriya Vidyalayas. Professional development program involvement significantly impacts teacher performance, with a β value of 0.676 ($P < 0.05$), showing that more engagement leads to better performance. Program relevance positively impacts teacher performance ($\beta = 0.676$, $P < 0.05$), emphasizing the need to connect material with instructional needs. The program delivery strategy positively impacts teacher performance, with a β value of 0.742 ($P < 0.05$), emphasizing its significance. The research concludes that teacher involvement mediates the association between professional development program participation, relevance, delivery mode and Teacher performance. Teacher engagement has a significant indirect effect on professional development programs, with an estimated 0.604 ($P < 0.001$) for teacher engagement and 0.409 ($P < 0.001$) for teacher performance. This highlights the importance of fostering teacher engagement to improve program effectiveness. The findings indicate that professional development programs improve teacher performance directly and indirectly by increasing teacher engagement.

From this, we may conclude that professional development programs affect teacher performance in many ways. Program participation, appropriateness to teaching demands, and delivery techniques improve teacher performance. Teacher involvement mediates this link, improving program efficacy. According to the research, these programs increase teacher performance, but well-structured and appropriate program delivery may boost these impacts. Professional development programs must be engaging, relevant, and provided in a way that encourages teacher participation to be successful.

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