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**RESEARCH PAPER**

## Effect of Pedagogical Content Knowledge of Primary School Teachers on their Achievement in Pedagogy

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**ABSTRACT**

This study was conducted to find out the effect of pedagogical content knowledge training on primary school teachers' achievement in pedagogy. Pedagogical skills involve different methods of teaching which can be used effectively according to the need of the learners. The researchers used one group pre-test post-test experimental design to conduct pedagogical content knowledge related training of 40 hours for 140 teachers, clustered into 5 groups, and measure achievement scores of the subject in the area of pedagogy before and after the training. Pedagogical training related module was developed by an independent expert of the pedagogy. The study used descriptive as well as inferential statistics to analyze the data. Findings of the study revealed significant mean difference in achievement scores on the pretest and posttests of these teachers. The study recommends to conduct pedagogy related professional development trainings for primary school teachers to enhance their capabilities and pedagogical skills.

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**KEYWORDS** Assessment, Pedagogical Content Knowledge, Professional Development Training, Quality Education

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**Introduction**

The importance of primary education in any education system cannot be fabricated as it is the first step towards encouraging each child to grow at their pace, achieve the major life skills, and play their effective role in nation building. Primary education in Pakistan aims at developing each child's potential to the full, encourage a love of learning, and help children to develop lifelong learning skills. Keeping in view the importance of primary education, federal as well as provincial governments of Pakistan have been striving for providing quality education to primary school students and assisting them to achieve quality education. All the previous education policies as well as five-year plans have focused on improving the quality of educational services to the students (Muzaffar, 2016). Continuous efforts have been made to achieve the targets of universal primary education historically.

Pedagogical Content Knowledge (PCK) refers to the understanding of content knowledge and how teachers teach their students that content. PCK consist of two parts such as content and pedagogy. Content knowledge encompasses understanding of frameworks, theories, concepts and ideas. On the other hand, pedagogical knowledge is related to instructional strategies and procedures, such as planning, assignments, classroom management and student learning (Alka et al., 2023; Park et al., 2020). PCK's ability needs to be measured based on multiple factors. Several experts have described various aspects of PCK including Knowledge of Pedagogy, Knowledge of Learners,

Knowledge of Pedagogy and Knowledge of Material Mastery (Busch et al., 2022; Krepf et al., 2018; Magnusson et al., 2021; Rodríguez-Becerra et al., 2020; Shinana et al., 2021; Ling et al., 2020; Weitzel & Blank, 2020).

The main goal of teacher training programs is to concentrate on lifelong learning, leadership, improving classroom instruction, and assisting participants in developing their self-assurance and skills. Administrators ought to motivate educators to improve their work and keep them informed about new teaching styles and approaches to instruction (Roca-Campos et al., 2021). The study at hand used an experimental approach to find out the difference in the teachers' achievement after receiving pedagogical content knowledge related training.

## **Literature Review**

### **Quality Education and Primary Schools: National Perspectives**

In every country quality education is basic concern, in spite of that quality education is impacted by a range of institutional and socio-economic issues (Ahmed et al., 2023). The literature review of national and international studies evidenced that the reasons of failure of schools include less qualified teachers, teachers' poor content matter knowledge, poor teaching and assessment techniques, and lack of professional development training. The various studies found that the traditional teaching methods of teaching produce low quality of education especially at lower grades (Christie & Khushk, 2004, Kouser et al., 2011; Rehmani, 2003). Memon (2007) criticized the low teaching quality and poor use of student assessment techniques as two wide-ranging problems of declining student performance. Inappropriate teaching methods of teachers are found to be a major reason of poor grades of students in Pakistan. Ministry of Education (2009) endorsed that the modern assessment techniques are not used to measure the students' achievement.

The previous literature further tells that the teachers generally use outdated teaching methods, the assessment takes place is sporadic and subjective, policy implementation is not successful and it provides little feedback to children for improvement (Ministry of Education, 2009; Muhammad & Iqbal, 2015). In Pakistan, Akram and Butt (2021) found that the reasons of failure of primary education system include memory-based assessment rather than testing analytical ability, endemic administrative issues in the conduct of examinations, and low teacher quality. Another study found lack of financial resources, insufficient teaching staff and ineffective use of assessment techniques as indicators of lower quality teaching. Moreover, teachers' absence, lack of professional development opportunities, insufficient educational services especially in rural areas, and incompetent and untrained teachers have also been found as the main reasons of students and education system failure in Pakistan (Ahmad et al., 2013).

Ahmed et al. (2023) found a positive correlation between teacher training, teaching methods, content knowledge, teaching experience, motivation, and teachers' qualification. However, there was a negative correlation found between teacher absenteeism and high-quality instruction. The study concluded that hiring highly skilled and experienced educators for primary school will enhance the standard of instruction, among other things. Based on literature, in overall, there were three wide-ranging problems of poor student performance that needed immediate attention of the researchers: (a) poor subject matter knowledge of the teachers, (b) poor use of student assessment techniques by the teachers, (c) and poor use of the teaching strategies.

Elementary schools in Punjab are failing and the government is paying the administrators of these failing schools billions of rupees, instead the imperative initiative government need to take is to offer trainings and recommend corrective measures to ensure that the system functioned properly. This research was conducted to address these challenges properly and find out the proper solutions to educational improvement of these schools.

### **Pedagogical Content Knowledge Training and Its Effect on Teachers' Knowledge**

There are various studies which reveal the importance of professional development trainings to enhance the pedagogical skills of teachers. Prihidayanti et al. (2019) conducted the study on improving the pedagogical and professional competencies of teachers through professional development trainings in Indonesia. This experimental study revealed the difference in the pedagogical competence and concluded that professional development trainings affected the pedagogical skills of teachers which ultimately impacts teachers' performance and students' achievement.

Jan et al. (2023) conducted a study that shows the crucial role of teachers' pedagogical knowledge, teaching practices and content knowledge in attaining learning outcomes. Fernandes et al. (2023) examined the effect of pedagogical trainings on professional development of teachers. This study used mixed method research approach and collect data from higher education teachers. The results revealed that teachers show satisfaction towards pedagogical trainings, they further suggested that such type of training are really needed for teacher's development.

Rehman et al. (2020) investigated the importance of continuous professional development on enhancing the pedagogical skills of teachers. The study reviewed 60 previous studies involving journal articles, conferences proceedings, and research reports and found the positive impact of CPD on the pedagogical skills of teachers. Similarly, Ha et al. (2021) conducted a study which found that professional development trainings and pedagogical skills are linked with the inadequacy of learners' need in pedagogical program such as training plans, contents, and curriculum which should be improved through taking efficient measures to enhance the level of quality education.

Ferreira (2015) found the similar results that professional development trainings were found to be highly contributing factor to maximize the pedagogical skills of teachers which are most essential for the provision of quality education to learners. In the same way, Melnychuk et al. (2019) also revealed that professional development of teachers is essential to enhance the pedagogical skills of teachers. Furthermore, Apriliyanti (2020) conducted study to investigate how teachers enhance pedagogical skills through professional development programs which revealed that both these variables are associated with each other and suggested to overcome with all problems and challenges to enhance the effectiveness of development programs. These studies confirmed about the substantial role of professional development trainings to maximize the teachers' pedagogical skills which further strengthen of quality education and produce the quality learners to meet the national expectations.

### **Conceptual Framework**

This study followed Adult Learning Theory of Knowles (1984) which assumes that adults are required to know the reason and have experience for learning; they are responsible for self-concept, and they demonstrate readiness for learning and motivation. This experimental research emphasizes the involvement of teachers in

solving problems in their own classrooms and has its primary goal to provide in-service training and development to the teacher rather than the acquisition of general knowledge in the field of education (Borg, 1998). The underlying idea behind this study was to design a robust conceptual model accompanied by rigor by being open to the data and applying research methodology effectively. Figure 1 depicts the model of the study that reveals the visual description of the interconnected processes.

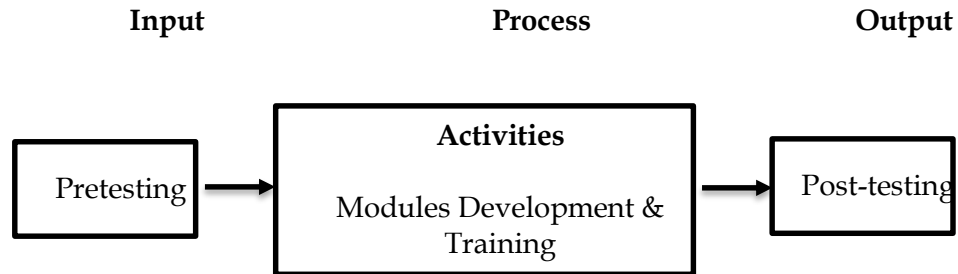


Figure 1 Conceptual framework of the study

### Material and Methods

The study started with pretesting pedagogical content knowledge of 140 primary school teachers – already grouped by the school administration into 5 clusters based on their nearby school locations, in district Sheikhpura. A single group pretest posttest design was used to conduct this study. A pedagogical content knowledge-based training module was developed by an independent assessment and pedagogy expert. After pretesting, the teachers were given training to improve the pedagogical knowledge and skills. The training was delivered by the first author of this study. The training continued for 40 hours, with 8 hours training for each cluster. The same trainer trained the teachers in all the five clusters. Teachers' posttests were conducted and the difference between their scores on the pretests and posttests was calculated to measure the effect of the training.

### Threats and Control

Research studies in education that employ the single group "pre- and post-test" design are exposed to a variety of biases. Participant selection, pre-testing, exposure to an educational intervention, and post-testing are typical step in this design (Marsden & Torgerson, 2012). History, maturation, instrumentation, and testing are among the potential threats that frequently arise during a single group pre-test post-test design (Creswell, 2012). To maintain confidently of the results of the experiment, the researchers controlled all these threats. The possibility of historical events influencing the experiment's outcome between the pre- and post-test is linked to the threat posed by history. The one-week training period in this experiment reduced the possibility of maturation and the occurrence of any event that might have an impact on the training's outcomes. The cluster-wise sample size is given below:

**Table 1**  
**Cluster-Wise Sample Distribution**

S. No.	Name of Cluster	Participants (f)
1	Cluster 1	30
2	Cluster 2	27
3	Cluster 3	30
4	Cluster 4	30

5	Cluster 5	23
	Total	140

The following pie chart shows percent of teachers according to their academic qualification. According to Figure 2, only 3% teachers held Secondary School Certificate (SSC), 30% Intermediate, 43% Bachelor, and 24% held Master degree. It shows that 76% of the teachers held qualification less than Master level degree.

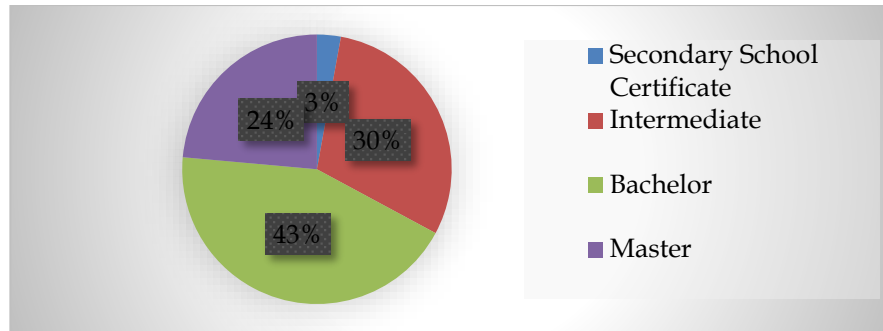


Figure 2: Academic Qualification-wise Distribution (%)

Similar data were analyzed for teachers based on their professional qualification. Figure 3 shows that 1% of the teachers held Primary Teaching Certificate (PTC), 1% held Certificate in Teaching (CT), 23% held Bachelor of Education (B-Ed.) degree, 3% held Master of Education (M-Ed.) degree, while a vast majority of the teachers (72%) did not hold professional certificate or degree of teaching at all.

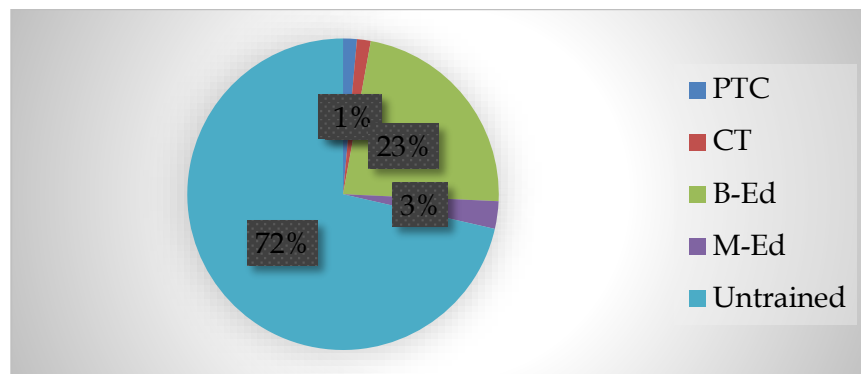


Figure 3: Professional Qualification-wise Distribution (%)

## Testing

The major segment of the study was testing teachers' current knowledge in Pedagogy. To serve this purpose, the first author developed the test of Pedagogy from the content of Bachelor of Education (B.Ed.) syllabus approved by the Higher Education Commission (HEC). The test of *Pedagogy* comprised 60 marks with 10 extended responses (essay type) questions. The extended response questions were asked to measure teachers' knowledge about different teaching methods (such as lecture, inductive-deductive, analytic, laboratory, direct method of teaching, grammar translation, project, problem solving, and cooperative learning) and how they use these methods while teaching. The content validity of the test was ensured by the experts and practitioners. Five content experts with the background in Pedagogy were requested to validate the content of the test. Their comments in terms of language clarity, avoidance in redundancy of the questions, and minor typographical mistakes were incorporated accordingly.

## Pre-Testing

The sampled teachers were pretested at five cluster centers. Proper seating arrangements were made for this purpose. Sealed bundles of question papers were opened in front of the examinees. Strict invigilation was ensured by the researchers and the assistants. The tests were marked by the first author based on the rubrics developed by the researchers for extended-response questions.

## Interventions

The training session on *Pedagogy* training included detailed description of various teaching methods that could be used to teach primary classes such as lecture method, deductive method, inductive method, demonstration method, discussion method, cooperative learning method, and grammar translation method. For each type of method, the trainer taught the salient features and demonstrated how to use that method while teaching different subjects. The advantages and limitations of each method were also taught. The trainer conducted series of activities while teaching the content related to all teaching methods mentioned above. Further, the trainer also asked trainees to teach the topics to their colleagues and use different teaching methods to develop their understanding. The active involvement of trainees was given careful consideration for this training.

## Post-Testing

The examinees were post-tested after one week of training. The seating plans was carefully designed. The process of the posttests was same as of the pretests. The posttest was conducted using the same question papers. The 2 days training for each cluster comprised 4 hours a day, total of 8 hours. The post-tests were marked by the first author according to the keys and rubrics. The scores of each examinee were entered into SPSS for conducting relevant analyses. Data were cleaned before running analysis.

## Results and Discussion

Data were analyzed using SPSS involving descriptive statistics (Mean & SD) and Paired sample t-test in the given study.

**Table 2**

Descriptive Statistics – Pre-Test and Post-Test Achievement Scores in Pedagogy				
Subject		N	Mean	SD
Pedagogy	Pre-test	140	11.12	8.839
	Post-test	140	35.19	8.552

Table 2 revealed that teacher achievement scores in post-test for the area of pedagogy (M=35.19, SD=8.552) was found better as compared to teacher achievement scores in pre-test for the area of pedagogy (M=11.12, SD=8.839).

**Table 3**

Paired Samples t-test for Comparisons of Achievement Scores in Pedagogy							
Subject		M	SD	t	df	Sig	Effect Size
Pedagogy	Pre-test	11.12	8.839	26.635	139	.000	2.767
	Post-test	35.19	8.552				

Paired samples t-test was used to compare the trainees' performance in pretest and posttest in Pedagogy. According to Table 3, there was a statistically significant difference in mean score of the trainees in pretest (M=11.12, SD=8.839) and posttest

( $M=35.19$ ,  $SD=8.552$ ) in pedagogy. The teachers significantly performed better in posttest. The Effect size of Cohen's  $d$  ( $d=2.767$ ) was significantly larger (2.767) than the limit, i.e., 0.80.

## Discussion

The study at hand was designed to find out the effect of professional development training on the pedagogical skills and knowledge of teachers through employing an experimental approach. The study revealed the difference in the achievement scores in pre-test and post-test for the pedagogy which confirmed that professional development training significantly affected the pedagogical knowledge and skills of teachers. The results of the study are in line with various of previous research, theories and models that pedagogical skills might be enhanced through arranging the professional development trainings for teachers (Apriliyanti, 2020; Ferreira, 2015; Ha et al., 2021; Melnychuk et al., 2019; Prihidayanti et al., 2019; Rehman et al., 2020).

There are various studies which revealed the importance of professional development trainings to enhance the pedagogical skills of teachers. Prihidayanti et al. (2019) revealed the difference in the pedagogical competence after arranging the professional development trainings and concluded that professional development trainings affect the pedagogical skills of teachers. Rehman et al. (2020) also found the positive impact of continuous professional development on the pedagogical skills of teachers.

Similarly, Ha et al. (2021) also revealed that professional development trainings and pedagogical skills are interlinked with each other. Fernandes et al. (2023) also reported that the significant effect of pedagogical trainings was self-reported by teachers. Teachers show confidence towards pedagogical trainings because such type of trainings improve their teaching practices. Further, it reveals that trainings are more effective when based on specific topic having with certain goals and materials that supports participants learning. Secondly, techniques that used in training must develop the active engagement of teachers and boost their confidence in their certain field.

Ferreira (2015) also found the similar results that professional development trainings were highly contributed to maximize the pedagogical skills of teachers which are most essential for the provision of quality education to learners. Melnychuk et al. (2019) also revealed that professional development of teachers is essential to enhance the pedagogical skills of teachers.

Moreover, Apriliyanti (2020) revealed that both these variables are associated with each other and suggested to overcome all problems and challenges to enhance the effectiveness of professional development programs. All the provided studies are in line and confirmed about the substantial role of professional development trainings to maximize the teachers' pedagogical skills at primary school level in Pakistan.

## Conclusion

The study mainly focused to determine the effect of professional development training on the pedagogical skills of teachers using an experimental approach. The achievement scores in post-test were better than pre-test for the pedagogy and significant difference in achievement scores of the pre-test and post-test for pedagogy was found which confirmed that professional development training affected the pedagogical skills of teachers.

### **Recommendations**

Based on the findings of the results, the researchers made following recommendations to study beneficiaries:

1. Conduct professional development trainings for primary school teachers to enhance the capabilities in their pedagogical skills.
2. Policy makers and district authorities should make plan for the trainings that improve their content knowledge as well.
3. Ensure the training effectiveness plan for continuous evaluation to improve the training patterns at primary school level.



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