

A REVIEW ON INCREASING THE NUMBER OF STUDENTS' ENROLLMENT THROUGH TEACHERS' PROFESSIONAL TRAINING

¹Rimzia Batool Vardarli,

PhD Education Scholar, National College of Business Administration and Economics, Lahore.

Email: rimziavardarli@gmail.com

²Muhammad Nawaz,

PhD Education Scholar, National College of Business Administration and Economics, Lahore.

Email: nawazfgphd01@gmail.com

³Suleman Gill,

PhD Education Scholar, National College of Business Administration and Economics, Lahore.

Email: sulemangill55@gmail.com

Abstract

In Pakistan within a passage of time number of education policies was developed for the successful completion of the educational objectives. The success of these policies was only measured to assess the increasing number of students enrollment in schools and focus on the dropout ratio. Still this a major challenge for the education sector of Pakistan. The major objective of this research was to review on the increasing number of the students' enrollment in school with the professional training of the employees. While teachers specific characteristics, school specific characteristics and infrastructure specific characteristics were evaluated from 2013 to 2018. The findings indicated the total number of schoolteachers who received lengthier school-based professional development training had a stronger and larger positive correlation with student enrollment at a school. Second, the total number of schoolteachers who received school-based professional development training had a stronger and larger positive correlation with total enrollment at girls' schools, compared to boys' schools. Future research should focus on the mechanism behind the heterogeneous effects across gender as the literature quantifying the magnitude of such mechanisms is an emerging area of interest.

Keywords Students' Enrollment; Professional Training; A Systematic Review

INTRODUCTION

There is mixed evidence regarding the effects of teacher specific characteristics on educational attainment and student performance. On the one hand, an academically qualified teacher is expected to have a positive effect on a student's short- and long-term educational success (Lee, 2018; Phil-lips, 2010). The teacher's attitude, cognitive skills and attendance at teacher training can also have a significant impact on students' achievement and test performance (Hanushek et al., 2018; Miller et al., 2008; Palardy et al., 2008). Furthermore, students assigned to an academically qualified teacher during their early years of schooling have a higher probability of attending a higher-ranked university, earning a higher salary, and saving more for retirement (Chetty et al., 2011). Finally, increasing a teacher's pay reduces teacher turnover and improves student achievement (Britton et al., 2016; Hendricks, 2014). However, there is some evidence to suggest that the estimated impact of teacher-specific characteristics on student performance is statistically insignificant. A few teacher-specific characteristics e.g., the teacher's knowledge of the subject and the teacher's training attendance, that may influence educational outcomes may not provide much guidance for future policies and intervention programs (Glewwe et al., 2011; Orazem, 2008). Moreover, higher enrollment levels in schools may not be attained by improving teacher quality or other sup-ply-side constraints of schools, but in fact by policies more intimately linked to demand-side constraints (Filmer, 2007; Glewwe et al., 2016; Pal, 2003).

This paper examines the hypothesis that the larger number of schoolteachers who had received school-based professional development training was linked with higher enrollment at school. By using school-level data between the years 2013 and 2018 of over 21,000 schools in Pakistan

from the Annual Status of Education Report (ASER), this paper applies a fixed-effect estimation strategy, controlling for school-specific, teacher-specific, and infrastructure-specific characteristics, while accounting for district and year fixed effects. The results indicate a strong positive correlation for our estimation, when the entire school sample is chosen, with an additional teacher receiving school-based professional development training of up to 30 days linked with an increase of 29 students enrolled at a school. A gender-sensitive breakdown of results suggests the heterogeneity of effects by gender. An additional teacher receiving school-based professional development training of up to 30 days was correlated with an increase of 51 girls being enrolled at a girls' school, and an additional teacher receiving school-based professional development training of up to 30 days was correlated with an increase of 15 boys enrolled at a boys' school.

While considerable research has focused on the effects of teachers' psychological characteristics and academic qualifications on student achievement, scattered research highlights the effectiveness of school-based professional development training received by teachers. Valiandes et al. (2017) examined the characteristics of a teachers' professional development program and concluded that the program was effective in providing teachers with the knowledge, skills, and support to accomplish differentiated instructions. The main characteristics of the program that were found to be effective included the provision of pedagogical knowledge and content, the duration of the program, follow-up training sessions, and the development of personal skills of teachers for self-evaluation. Using data from high school economics students in Georgia, Swinton et al. (2008) assessed the impact of in-service teacher training on the performance of students in the end-of-year economics exam. Controlling for student characteristics and teacher fixed effects, they found a significant positive impact of teacher training attendance on student test scores. Fuje et al. (2018) presented evidence from a randomized controlled trial in Mongolia on the impact of teacher training and books on students' test scores. The results suggested that teacher training and books improved test scores weakly when provided individually, but the provision of books on top of teacher training raised students' achievement substantially. Goldhaber et al. (2013) investigated the relationship between teachers who had graduated from different training programs and student achievement on reading and mathematics tests. They found that training institution indicators explained a statistically significant portion of the variation in student achievement in reading, but not in mathematics. Andersson et al. (2011) applied an instrumental variable to estimate the effect of the proportion of non-certified teachers on student achievement in compulsory Swedish schools. They found that an increase

1.8 standard deviations per year. Aslam et al. (2011) used a unique dataset from a district in Pakistan and matched students' scores in language and mathematics to the characteristics of teachers who taught those subjects. Pupils' fixed effects findings revealed that the standard résumé characteristics of teachers did not affect pupil achievement significantly but teaching "processes" such as lesson-planning and asking questions during teaching influenced student achievement significantly. Feng et al. (2013) used state-wide data from Florida to analyze the impact of teacher training on the ability of teachers to promote academic achievement among students with disabilities. They found that students with disabilities, as well as non-disabled students, scored higher in mathematics and reading when paired with teachers who had received professional development training. Harris et al. (2011) studied the effects of different kinds of training on the productivity of teachers in promoting student achievement. They found that elementary school and middle school teachers' productivity increased with informal on-the-job training, with the largest gains occurring in the first few years of teaching. Klassen et al. (2014) conducted a meta-analysis of 43 studies to investigate the impact of teachers' psychological characteristics on teaching effectiveness. They found that self-efficacy was strongly associated with observed teaching performance and student achievement, whereas the

teacher's personality was also associated with observed teaching performance. Finally, Akalin et al. (2015) examined the effectiveness of performance feedback given daily to teachers following their training in classroom management and strategies on the outcome of teacher student dyads. They found that teacher training and the feed-back provided after the training had a positive effect on the classroom management skills of a teacher and improved the classroom performance of the teacher. As a result, the training program increased the academic engagement of students, with students displaying positive social behaviors.

However, some studies have concluded that professional development training programs are not associated with improved teacher performance or educational attainment. Jacob et al. (2004) used a regression discontinuity strategy to estimate the effect of a teacher receiving training on performance in mathematics and reading of students enrolled in schools in areas of high poverty. They found that marginal increases in the training received by a teacher did not affect the performance of a student in either subject, highlighting that investment in professional development programs may not necessarily be sufficient to increase student achievement. Loyalka et al. (2019) conducted a large-scale, randomized evaluation of a national professional development program in China. Their estimates indicated that professional development interventions failed to improve teacher and student

after one year because teachers found the professional development content to be overly theoretical and the delivery too passive to be useful. Moreover, Ozler et al. (2018) used a randomized, controlled study in Malawi to evaluate a government-run program aimed to support student development through teacher training. Their results suggested that training a teacher did improve classroom organization and teachers' performance, but it did not translate into improved outcomes for a student. Finally, Zhang et al. (2013) exploited a randomized controlled trial to evaluate the impact of a teacher training program on the performance of English teachers in Beijing's migrant schools and their enrolled students. The results showed no significant impact of teacher training on either the teacher or the students' English test scores.

This paper adds to the existing literature in several ways. First, the effects of the different durations of professional development training received by teachers are compared for the first time. Second, the effect of teachers receiving school-based professional development training on enrollment is quantified for the first time. Third, this study highlights the significance of professional development training in increasing enrollment at schools in Pakistan, where barriers to schooling are high and access to education is still restricted. Fourth, the national-level data and the school-level observations used in this study are unique. Fifth, the results of this research pave the way for potential future research which should focus on the mechanism behind the heterogeneous effects of professional development training on enrollment across gender, as the literature quantifying the magnitude of such mechanisms is an emerging area of interest.

REVIEW OF RELATED LITERATURE

The importance of training has become increasingly evident in several fields of the labor market, with significant effects on individual firms (Addison et al., 2004; Mano et al., 2012), the health care system (Gracia-Pérez et al., 2018; Sendawula et al., 2018) and educational institutions (Foster et al., 2013; Gibbs et al., 2016; Kealay et al., 2000). Regarding firms, whether employees are provided with general training or job-specific training, training tends to improve attitudes toward work (Liang et al., 2014), results in increased wages without a rise in the overall cost to firms (Jones et al., 2012), and improves staff proficiency (Truitt, 2011). Such positive effects of training lead to improvement in a firm's demonstrable ability to innovate (Dostie, 2018; Nazarov et al., 2012) along with improved organizational performance and growth (Barba Aragon et al., 2014; Mpofu et al., 2015). In the health care system too, training workers

improves health outcomes (Ajuwon et al., 2008; Josiah Willock et al., 2015), increases the effectiveness of health advisors (Han, 2007; Majee et al., 2019) and improves child nutrition (Cattaneo et al., 2001; Sunguya et al., 2013).

In schools, providing teachers with training can lead to improved educational outcomes for students through several possible channels. Angrist et al., (2001) concluded that teacher training in schools provided a cost effective means of increasing the test scores of students. Bressoux et al., (2009) found that the final test score in mathematics for a student with a trained teacher was higher than the test score of a student whose teacher had not been trained. Furthermore, a direct correlation between the intensity of training received by a teacher in terms of delivering classroom lessons is established with the student task involvement by Djalil et al. (1989). Training in teaching skills is also seen as an effective strategy to improve the quality of supervision and monitoring. Teachers who have attended workshops linked to teaching skills report improved communication skills in the classroom and a positive change in teaching abilities (Bussari et al., 2006). At the same time, training designed to teach creativity in classrooms has a positive impact on a teacher's teaching and cognitive presence (Al-Balushi et al., 2015). Assigning a classroom to a teacher with training in behavior management improves students' and teachers' mental health and wellbeing, leading to reduced antisocial behavior by students (Ford et al., 2012). Training teachers in classroom management skills also promotes social competence and school readiness (Webster-Stratton et al. 2001), and reduces teachers' stress and student-related disciplinary problems (Merrett et al., 1993).

Professional Training of Teachers

Since its creation in 1947, Pakistan had used a centralized system of education under the jurisdiction of the federal government, with periodic updates to its National Education Policy to cater for the ever-evolving demands of schooling (Hunter, 2020). However, following modern global trends, by the early 2000s, the country had witnessed a notable trend toward decentralization of government portfolios, including that of the education sector. The Eighteenth Constitutional Amendment Act 2010 of Pakistan was a significant step in increasing the autonomy of the provinces (states) of the country, including major implications for the country's education sector. Under the Act, the responsibility for the curriculum, syllabus, planning, policy, and standards of education related to schooling up to and including secondary (high) school was transferred to the provinces (Dawn, 2010). Each province now funded its own education sector through an annual provincial budget and was responsible for ensuring free and compulsory education for all children between the age of 5 and 16. Moreover, after the amendment, the Education and Literacy Department of each province of Pakistan became responsible for providing voluntary school-based professional development training for teachers employed in public sector schools (ASER, 2022). Under the provinces' jurisdiction, school-based professional development training is conducted through capacity-building initiatives aimed at providing teachers with innovative teaching techniques and methodologies. The training methodologies include interactive lectures, panel discussions, group work, case studies, class visits, and the use of information and communication technology to support and enhance the delivery of content. The core objective of providing school-based professional development training to teachers is to increase participation in schools and improve the quality of learning in classrooms. By providing training and support materials, such training enables a teacher to optimize their classroom performance and acquire new skills related to various teaching strategies. As a result, teachers can replicate modified behavioral techniques in their own classroom environment and incorporate newly acquired strategies in their teaching and learning process. As a result, school-based professional development training enables a teacher to better understand their job description, enhance their effectiveness in delivering lessons, improve their communication skills and confidence, and motivate their behavior on a day-to-day basis. To provide accessible training across entire

provinces, the Education and Literacy Department of each province within Pakistan sets up a District Training and Support Center (DTSC) in every district of its respective province. Under each DTSC, based on the spread of schools in individual districts, an average of 30 to 60 Cluster Training and Support Centers are established in each district. One cluster covers approximately 30 schools within a radius of 15 km. At each cluster, 1 to 5 District Teacher Educators (DTEs) are placed depending upon the number of schools attached to a cluster. Each DTE is assigned 10 to 15 schools to implement professional development training at the cluster level.

School-based professional development training has two components. The first component, known as induction training, is targeted at identifying, exploring, and aligning the objectives, methodology, and outcomes of key classroom-related learning skills, techniques, and processes. The second component, known as post-induction training, relates to the behaviors and strategies required by a teacher to ensure optimum learning and of a student in a classroom. Collectively, school-based professional development training varies in duration depending on the content of training and in-depth sessions of study scheduled in a training course. Training is available for either 15 days or 30 days. Participation in these training sessions is not mandatory but rather, is undertaken voluntarily.

Descriptive Statistics

The data used for this study are provided by ASER Paki-stan. ASER Pakistan is the largest citizen-led, household-based initiative in Pakistan, and is active in all the districts of the country. "Each year, 30 villages per district are selected randomly using the Probability Proportional to Size (PPS) technique from the village directory of the 1998 Population Census. From each selected village, one government school is chosen, resulting in an average of 4,500 schools chosen every year across Pakistan. More-over, each year, 20 villages from the previous year are retained and ten new villages are added. The data used for this study are from the years 2013 to 2018, with the exclusion of 2017 as ASER did not release any statistics related to education in that year." (ASER, 2022).

Students' Enrollment and Professional Training

We first provide a descriptive analysis of the main variables used for the estimation of correlation, i.e., the number of teachers who received school-based professional development training and total enrollment at school. The data include two distinct categories of school-based professional development training, (i) the number of teachers who received training of up to 15 days and (ii) the number of teachers who received training of up to 30 days. Training received up to 30 days is superior to training received up to 15 days as the content studied in the former category of training is more intense and in-depth and covers a wider range of topics. Data gathered on the training received is recorded yearly, suggesting that the number of teachers who received training of up to 15 days, or up to 30 days, is not a cumulative figure over time, but rather, the number of teachers receiving a particular category of training in each academic year corresponds to the specific outcome enrollment period.

Figures 1,2, 3 shows the time trend in average enrollment per school and the average number of teachers per school who received training, for all schools, boys' schools, and girls' schools. Average enrollment per school is represented by the vertical axis on the left-hand side of the graph, whereas the trend in the average number of teachers per school with up to 15 days of training, and up to 30 days of training is represented by the vertical axis on the right-hand side of the graph. The average enrollment per school in Figs. 1–3 above shows a consistent negative trend for all schools, boys' schools, and girls' schools. At the same time, the average.

Fig. 1 Year-wise trend of average enrollment per school of all schools and average number of teachers per school with up to 15 days of training and up to 30 days of training

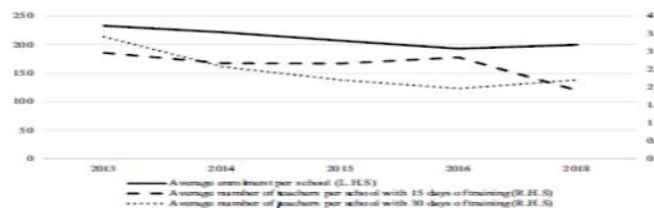


Fig. 2 Year-wise trend of average enrollment per school of boys' schools and average number of teachers per school with up to 15 days of training and up to 30 days of training

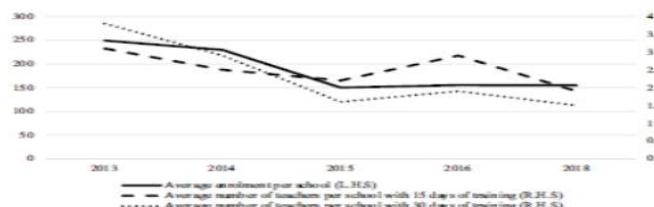
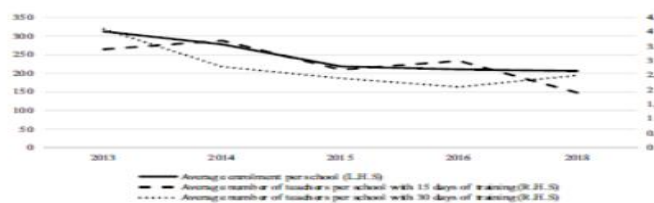


Fig. 3 Year-wise trend of average enrollment per school of girls' schools and average number of teachers per school with up to 15 days of training and up to 30 days of training



In figure number of teachers per school with up to 30 days of training depicts a similar negative trend for all schools, boys' schools, and girls' schools as average enrollment per school, suggesting a possible correlation between the two variables. The trend shows even more similarities between the average enrollment per school and the average number of teachers per school with up to 30 days of training for girls' schools than for boys' schools. Finally, the similarity in trends between average enrollment per school and the average number of teachers per school with up to 15 days of training is less evident for all schools, boys' schools, and girls' schools.

DATA ANALYSIS

Of the estimated 0.6 million teachers employed at government schools in Pakistan, 43 percent have not received any professional development training. A considerable amount of research has focused on the effects of teachers' psychological characteristics and academic qualifications on subsequent student achievement but there is limited evidence on the related effectiveness of school-based professional development training received by teachers on the educational outcomes of students. By using school-level data between 2013 and 2018 from over 21,000 schools in Pakistan from the Annual Status of Education Report (ASER).

Teacher Specific Characteristics

Descriptive statistics on teacher-specific characteristics are presented in Table 1 below. Teacher-specific characteristics include the average number of teachers appointed per school and the educational level of an individual teacher appointed at a school. The educational level of a teacher indicates the number of teachers employed at a school with education less than secondary level, with secondary level education, with high school education, with undergraduate level education, with graduate level education, and with an educational level higher than graduate level.

Table 1 shows that the average number of teachers per school and the total number of teachers sampled every year only varied incrementally from 2013 to 2016 but then showed a sharp decline in 2018. This decline could be due to a decrease in the size of the schools sampled or a decrease in the number of school-age children present in a given household. To check this, although ASER Pakistan does not provide specific information on the "number of school-age children in each household," it does provide information more generally on the "total number of children in each household." The data show that the average number of children per

household saw a slight downward trend, declining from 3.18 children per household in 2016 to 2.98 children per household in 2018 and 2.90 children per household in 2019. However, this decline is only marginal, which means that the decline in the average number of teachers per school and the total number of teachers sampled in 2018 was also due to sampling changes made in 2018.

School Specific Characteristics

Descriptive statistics on school-specific characteristics are presented in Table 2 below. School-specific characteristics include the grade level of the school, type of school, the medium of instruction at school, and the age of the school. The grade level of the school shows whether a school is primary level, secondary level, high school, or any other grade level. The type of school contains information on whether a school is a boys' school, a girls' school, or a mixed-sex school. Moreover, the medium of instruction at school demonstrates whether learning at a school is in English, Urdu, a regional language such as Pashto and Sindhi, or any other regional language. Finally, the age of school represents the number of years a school has been in operation.

Table 2 suggests that boys' schools accounted for more than half of all the schools in the sample in 2013, with girls' schools only having a 15.2% proportion. However, by 2018, the proportion of schools that were boys' schools declined significantly to just one-third of the sample, whereas the proportion of schools that were girls' schools increased to more than half of the total sample. The proportion of schools that were mixed witnessed a decline between 2014 and 2018, which could have resulted in these schools being converted into girls' schools. This can be validated by noting a sharp increase in the proportion of girls' schools from 2014 onwards.

Infrastructure Specific Characteristics

Descriptive statistics on infrastructure-specific characteristics are presented in Table 3. Infrastructure-specific characteristics are defined as facilities available at individual schools. These facilities include a boundary wall, available drinking water, toilets, electricity, a playground, a science laboratory, and books in a library. Table 3 suggests that the majority of the schools selected in the sample have basic facilities such as a toilet, a boundary wall, drinking water, a playground, and electricity.

Table 1: *Descriptive Analysis about Teachers' Specific Characteristics*

Variable	2013	2014	2015	2016	2018
Employed teachers					
Average number of teachers employed per school	8.25	9.51	7.38	7.07	4.20
Education level of teachers					
Average teachers per school with less than secondary level education	0.00	0.57	0.21	0.26	0.32
Percentage of teachers with less than secondary level education	0.00	1.96	2.55	2.93	2.26
Average teachers per school with secondary level education	1.95	1.86	1.63	1.53	1.32
Percentage of teachers with secondary level education	17.82	17.16	13.75	12.68	9.59
Average teachers per school with high school education	2.12	2.00	1.89	1.92	1.69
Percentage of teachers with high school education	23.69	23.48	23.02	24.35	23.88
Average teachers per school with an undergraduate level of education	3.60	3.52	3.18	2.91	2.50
Percentage of teachers with an undergraduate level of education	30.47	29.68	30.92	30.11	34.58

<i>education</i>					
Average teachers per school with a graduate level of education	4.56	4.69	4.23	4.30	3.74
<i>Percent of teachers with a graduate level of education</i>	<i>25.05</i>	<i>24.62</i>	<i>24.93</i>	<i>24.21</i>	<i>25.82</i>
Average teachers per school with education higher than graduate level	1.03	1.15	1.14	1.08	1.25
<i>Percent of teachers with education higher than graduate level</i>	<i>2.97</i>	<i>3.11</i>	<i>4.83</i>	<i>5.71</i>	<i>3.87</i>
Total number of teachers	10,200	10,655	11,583	9697	5089

Table 2: *Descriptive Analysis about School Specific Characteristics*

<i>Variable</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2018</i>
Grade-level of school					
Total primary level schools	2345	2482	3081	2633	2827
<i>Percentage of schools which are primary level</i>	<i>55.70</i>	<i>57.69</i>	<i>66.69</i>	<i>65.73</i>	<i>66.14</i>
Total secondary level schools	674	654	575	544	582
<i>Percentage of schools which are secondary level</i>	<i>16.00</i>	<i>15.20</i>	<i>12.45</i>	<i>13.58</i>	<i>13.62</i>
Total high schools	831	756	685	652	698
<i>Percentage of schools which are high schools</i>	<i>19.74</i>	<i>17.57</i>	<i>14.83</i>	<i>16.28</i>	<i>16.33</i>
Total schools with other levels of schooling	360	410	279	177	167
<i>Percentage of schools with other levels of schooling</i>	<i>8.55</i>	<i>9.53</i>	<i>6.04</i>	<i>4.42</i>	<i>3.91</i>
Type of school					
Total boys' schools	2251	2147	1518	1386	1325
<i>Percentage of schools which are boys' schools</i>	<i>53.47</i>	<i>49.91</i>	<i>32.86</i>	<i>34.60</i>	<i>31.00</i>
Total girls' schools	669	759	2355	1910	2207
<i>Percentage of schools which are girls' schools</i>	<i>15.89</i>	<i>17.64</i>	<i>50.97</i>	<i>47.68</i>	<i>51.64</i>
Total mixed schools	1290	1396	747	710	742
<i>Percentage of schools which are mixed</i>	<i>30.64</i>	<i>32.45</i>	<i>16.17</i>	<i>17.72</i>	<i>17.36</i>
Medium of instruction at school					
Total schools with Urdu as a medium of instruction	2243	1931	2875	2547	2809
<i>Percentage of schools with Urdu as a medium of instruction</i>	<i>53.28</i>	<i>44.89</i>	<i>62.23</i>	<i>63.58</i>	<i>65.72</i>
Total schools with English as a medium of instruction	960	409	860	639	652
<i>Percentage of schools with English as a medium of instruction</i>	<i>22.80</i>	<i>9.51</i>	<i>18.61</i>	<i>15.91</i>	<i>15.26</i>
Total schools with Pashto as a medium of instruction	115	1287	65	84	49
<i>Percentage of schools with Pashto as a medium of instruction</i>	<i>2.73</i>	<i>29.92</i>	<i>1.41</i>	<i>2.10</i>	<i>1.15</i>
Total schools with Sindhi as a medium of instruction	594	576	676	612	628
<i>Percentage of schools with Sindhi as a medium of instruction</i>	<i>14.11</i>	<i>13.39</i>	<i>14.63</i>	<i>15.28</i>	<i>14.69</i>
Total schools with other regional language as a medium of instruction	298	99	144	124	136
<i>Percentage of schools with other regional language as a medium of instruction</i>	<i>7.08</i>	<i>2.30</i>	<i>3.12</i>	<i>3.10</i>	<i>3.18</i>
Age of school					
Average number of years a school has been operational	44.12	36.31	35.15	34.42	33.67
Total school-level observations	4210	4302	4620	4006	4274

Table 3: *Year-wise descriptive statistics of Infrastructure-specific characteristics*

Variable	2013	2014	2015	2016	2018
Facilities available at school					
Total schools with a boundary wall	2745	2964	3245	2890	3199
<i>Percentage of schools with a boundary wall</i>	<i>66.45</i>	<i>69.38</i>	<i>71.68</i>	<i>72.69</i>	<i>74.85</i>
Total schools with drinking water	3100	2843	3081	2697	3062
<i>Percentage of schools with drinking water</i>	<i>74.95</i>	<i>66.64</i>	<i>67.79</i>	<i>68.04</i>	<i>71.64</i>
Total schools with a toilet	2463	2624	2835	2509	2747
<i>Percentage of schools with a toilet</i>	<i>59.68</i>	<i>61.48</i>	<i>62.13</i>	<i>63.09</i>	<i>64.27</i>
Total schools with electricity	–	2726	3049	2467	2699
<i>Percentage of schools with electricity</i>	–	<i>64.04</i>	<i>67.40</i>	<i>61.58</i>	<i>63.15</i>
Total schools with a playground	1759	1811	2075	1772	1853
<i>Percentage of schools with a playground</i>	<i>42.86</i>	<i>42.79</i>	<i>46.00</i>	<i>44.66</i>	<i>43.36</i>
Total schools with a science laboratory	748	745	725	642	661
<i>Percentage of schools with a science laboratory</i>	<i>18.27</i>	<i>17.51</i>	<i>16.18</i>	<i>16.18</i>	<i>15.47</i>
Total schools with books in a library	1114	1061	970	652	840
<i>Percentage of schools with books in a library</i>	<i>27.12</i>	<i>24.92</i>	<i>21.58</i>	<i>16.44</i>	<i>19.65</i>

Training is the explanatory variable of interest representing the total number of schoolteachers i that received a type of school-based professional development training j and belonged to district d in year t . The type of school-based professional development training has two categories, namely, the number of teachers who received training of up to 15 days and the number of teachers who received training of up to 30 days.

The set of control variables $X'_{i,d,t}$ includes school-specific characteristics, infrastructure-specific characteristics, and teacher-specific characteristics. School-specific characteristics control for the medium of instruction at a school, level of teaching at a school, type of school, and the total number of teachers employed at a school. Within school-specific characteristics, the medium of instruction is defined as an ordinal variable that indicates whether learning at school i belonging to district d in year t was in English (equals one), or in Urdu (equals two), or a regional language Pashto (equals three) and Sindhi (equals four), or in any other regional language (equals five). Moreover, the level of teaching is also defined as an ordinal variable that indicates whether school i belonging to district d in year t was only primary level (equals one), or middle level (equals two), or high school (equals three) or any other classification (equals four). Furthermore, the type of school is defined as an ordinal variable that indicates whether school i belonging to district d in year t was a boys' school (equals one), or a girls' school (equals two) or a mixed school (equals three). Lastly, the age of a school represents the number of years school i belonging to district d in year t had been operational.

Moving on, infrastructure-specific characteristics control for the facilities available at each school i belonging to district d in year t . The controls are binary variables, each variable individually representing whether school i belonging to district d in year t had drinking water available, had a play-ground, a science laboratory, a boundary wall, electricity available, and books in a library. Each binary variable takes a value equal to one if the facility was available at a school, otherwise, the binary takes a value equal to zero.

Teacher-specific characteristics control for the number of teachers appointed at school i belonging to district d in year t , and the educational level of teachers at school i belonging to district d in year t . The educational level of teachers includes controls for the number of teachers at a school with education less than secondary level, with secondary level education, with high school education, with an undergraduate level of education, with a graduate level of education,

and with education higher than graduate level.

Finally, the estimation equation also includes district fixed effects, δ_d , and year fixed effects, γ_t , to account for any variation in the total enrollment due to unobservable time in various district-specific or year-specific characteristics, respectively.

It provides the results for the correlation between the number of teachers who received professional development training and the total enrollment at school for all schools, boys' schools, and girls' schools. Table 4 provides results for the OLS estimations with the number of schoolteachers who received up to 15 days of training as the main explanatory variable in Columns (1), (2), and (3), and the number of schoolteachers who received up to 30 days of training as the main explanatory variable in Columns (4), (5), and (6). The total enrollment at school is the main dependent variable, with estimations of normal

Table 4: *Correlation between the numbers of teachers at a school who received training*

Number of days of training received by teacher up to 15 days Number of days of training received by teacher up to 30 days and total enrollment at a school	Variables	(1)	(2)	(3)	(4)	(5)	(6)
Training		12.79***	12.79*	12.79	29.32***	29.32*	29.32***
All schools		(3.72)	(7.59)	(8.88)	(6.60)	(15.85)	(9.86)
School-level observations		303	303	303	285	285	285
Training		25.72***	25.72***	25.72**	51.15***	51.15***	51.15***
Girls' schools		(4.78)	(8.86)	(12.53)	(8.23)	(13.35)	(7.85)
School-level observations		114	114	114	108	108	108
Training		-9.61	-9.61	-9.61	15.05**	15.05**	15.05*
Boys' schools		(6.59)	(8.75)	(12.01)	(7.51)	(6.27)	(8.06)
School-level observations		99	99	99	95	95	95
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard errors	Normal	Robust	Cluster	Normal	Robust	Cluster	

***Significant at 1% level, **significant at 5% level, *significant at 10% level

Standard errors in Columns (1) and (4), robust standard errors in Columns (2) and (5) and clustered standard errors at the district level in Columns (3) and (6). Control variables include the medium of instruction at a school, level of teaching at a school, type of school, total number of teachers employed at a school, aggregated education levels of teachers and an individual binary variable for whether a school had a boundary wall, available drinking water, a toilet facility, electricity, a playground, available science laboratory, and books in a library. Finally, district fixed effects and year fixed effects are also included. The positive coefficient of training in Column (1) in Table 4 is significant at the 1 percent level when estimated for a sample that separately includes all schools and girls' schools, suggesting a strong correlation between the number of teachers who received up to 15 days of training and the total enrollment at a school for these sample sets. The coefficient is insignificant for boys' schools suggesting no correlation between the number of teachers who received up to 15 days of training and the total enrollment at a school. When standard errors are made robust in Column (2) to account for any bias in estimation that may arise due to heteroscedasticity in the error term, or when standard errors are clustered at a district level in Column (3) to allow for correlation in school-level observations within each district, the results remain significant at the 1 percent level for girls' schools. Each additional teacher who received up to 15 days of training was associated with an increase in enrollment by 26 students at a girls' school.

The positive coefficient of training in Column (4) in Table 4 is significant at the 1 percent level when estimated for a sample that separately includes all schools and girls' schools, and significant at the 5 percent level when estimated for a sample that includes boys' schools. This suggests a strong correlation between the number of teachers who received up to 30 days of training and the total enrollment at a school for all the sample sets. When standard errors are made robust in Column (5) to account for any bias in estimation that may arise due to

heteroscedasticity in the error term, or when standard errors are clustered at a district level in Column (6) to allow for correlation in school-level observations within each district, the positive coefficient is still significant for all sample sets. Each additional teacher who received up to 30 days of training was associated with an increase in enrollment of 51 students at a girls' school. Similarly, each additional teacher who received up to 30 days of training was associated with an increase in enrollment of 15 students at a boys' school.

The estimation reveals two important results. First, the total number of schoolteachers who received lengthier school-based professional development training had a stronger and larger positive correlation with student enrollment at school. This is evident from the sample of girls' schools where each additional teacher who received up to 30 days of training was associated with a higher increase in enrollment when compared to the correlation between each additional teacher who received up to 15 days of training and the total enrollment at a girls' school. Second, the total number of teachers at a school who received school-based professional development training had a stronger and larger positive correlation with enrollment at a girls' school compared to a boys' school. Both these results highlight the heterogeneous effects of professional development training on enrollment across gender-based schools, with a greater effect on girls' schools. This is particularly important in the context of Pakistan, as for several other underdeveloped and developing countries, where the barriers to entry to education for girls are higher relative to boys, and thus, improving any factors related to schooling may provide a greater change in enrollment for girls compared to boys (Insiya, 2018).

CONCLUSIONS AND DISCUSSION

Considerable research has focused on the effects of teachers' psychological characteristics and academic qualifications on student achievement. However, there is limited evidence of the effectiveness of school-based professional development training received by teachers on the educational outcomes of students. Many underdeveloped and developing countries, including Pakistan, are lagging on one of the key aims of the SDGs, which is to ensure free, equitable and high-quality education for all children by the year 2030 (Lee, 2019). Global progress on the SDGs is slow as more than one-third of teachers, even in the developed countries, work in schools with significant shortages of qualified teachers (Holmqvist, 2019). In developing countries, where barriers to entry for schooling are high, especially for girls, the relevance of high-quality teachers who have received professional training becomes increasingly important to address serious concerns facing access to education.

This research highlights the significance of school-based professional development training by examining the association between the number of schoolteachers who received school-based professional development training and the total enrollment at school. By examining two distinct types of training that varied in duration, this study provides evidence that the total number of schoolteachers who received lengthier school-based professional development training had a stronger and larger positive correlation with the student enrollment at school. Furthermore, the total number of schoolteachers who received school-based professional development training had a stronger and larger positive correlation with total enrollment at girls' schools compared to boys' schools.

Several policy recommendations arise from this study. First, this study conclusively supports the hypothesis of an immediate need to provide professional training to teachers to improve student participation. This is especially relevant for female students in underdeveloped and developing countries where barriers to schooling are disproportionately high for girls. Second, there is no teacher certification authority in Pakistan, which may be a significant factor behind untrained teachers in Pakistan. This raises an immediate need to establish training certification centers to improve the quality of teachers in the country. Third, active engagement at the local community level, especially with households and schools, is required to identify

those areas with a low proportion of qualified teachers. Policies and incentives must be devised to provide school-based professional development training to teachers in such areas to increase student participation. Fourth, support programs and greater incentives should be provided to teachers to encourage their participation in school-based professional development training which may be linked to higher returns and improved career prospects. Fifth, routing, funding, and allocating resources toward providing professional training to teachers should be a priority for the policymakers and the government; otherwise, substantial gains in achieving the SDGs may not materialize.

In the education sector, the global progress on the UN's Sustainable Development Goals (SDGs) related to universal quality education is facing severe challenges, as 69 million new teachers are needed to achieve the target at a time when teachers are undertrained, undervalued and underpaid (Bok-ova et al., 2016). Even in Pakistan, of an estimated 0.65 million teachers employed at government schools, 43.1 percent have received no professional training (Express Tribune, 2016). This is at a time when 22.8 million children between the ages of 5 and 16 are out of school in Pakistan (Abbasi, 2018). In sub-Saharan Africa, only 64 percent of primary school teachers and 50 percent of secondary school teachers have received minimum training, with the proportion declining steadily (Rosa, 2017). However, efforts are being made to improve the quality of teachers through school-based professional development training. In Egypt, 500 million dollars have been earmarked for the improvement of teaching and learning conditions in schools, including professional training for 500,000 teachers and school officials (World Bank, 2018). In Nigeria, 12,000 teachers received professional training which had a positive impact on educational outcomes of 300,000 children, resulting in a success story for the public sector education system (Ifedi, 2019).

The analysis presented in this paper extends the current discussion on the advantages of school-based professional development training in two key aspects. First, while school-based professional development training may be linked to higher enrollment at schools, the effects are heterogeneous across gender, and potentially other demographics and socio-economic cohorts, if tested. Future research should focus on the mechanism behind the heterogeneous effects as they may offer greater insight into the possible interventions required to further reduce barriers to schooling in underdeveloped or developing countries. Second, although the comparative analysis provided between the two different types of training is limited to a duration of training of up to 15 days and 30 days, the results highlight the importance of quality training to achieve the desired outcomes. Training that was of a longer duration and thus, more intense in learning processes and strategies yielded higher enrollment, confirming the need to not only provide school-based professional development training to teachers but also focus on their quality.

We acknowledge the limitations of this study. First, the analysis presented is on an aggregate school-level comparing the total number of teachers in schools who received professional development training and total enrollment at schools.

The data do not match the total number of teachers in each classroom who received school-based professional development with the total enrollment in that particular classroom. Second, although receiving training may be voluntary, teachers' choice to receive training may be due to non-random factors that may bias the estimates. Third, the demand-side constraints to schooling, the role of government policies toward schools and training, and those financial constraints on schools that may affect enrollment are not tested in this study. Fourth, the estimation results are carefully interpreted to not suggest causality but only correlation between the total number of teachers who received professional development training at a school and the total enrollment at school.

REFERENCES

- Abbasi and Kashif. (2018). *22.84 m children in pakistan still out of school, says official report*. Karachi: DAWN.COM.
- Addison, J. T., & Belfield, C. R. (2004). *Unions, training, and firm performance: evidence from the british workplace employee rela-tions survey* (p. 582303). SSRN Scholarly.
- Ajuwon, A., Funmilayo, F., Oladepo, O., Osungbade, K., & Asuzu, M. (2008). Effects of training programme on HIV/AIDS prevention among primary health care workers in oyo state, Nigeria. *Health Education, 108*(6), 463–474.
- Akalin, S., & Sucuoglu, B. (2015). Effects of classroom management intervention based on teacher training and performance feedback on outcomes of teacher-student dyads in inclusive classrooms. *Educational Sciences, 15*(3), 1.
- Al-Balushi, S. M., & Al-Abdali, N. S. (2015). Using a moodle-based professional development program to train science teachers to teach for creativity and its effectiveness on their teaching prac-tices. *Journal of Science Education and Technology, 24*(4), 461–475.
- Andersson, C., Johansson, P., & Waldenström, N. (2011). Do you want your child to have a certified teacher? *Economics of Education Review, 30*(1), 65–78.
- Angrist, J. D., & Lavy, V. (2001). Does teacher training affect pupil learning? Evidence from matched comparisons in Jerusalem pub-lic schools. *Journal of Labor Economics, 19*(2), 343–369.
- Annual Status of Education Report. (2022). Accessed March 28, 2022. Aragón, B., Isabel, M., Jiménez, D. J., & Valle, R. S. (2014). Training and performance: The mediating role of organizational learning. *BRQ Business Research Quarterly, 17*(3), 161–173.
- Aslam, M., & Kingdon, G. (2011). What can teachers do to raise pupil achievement? *Economics of Education Review, 30*(3), 559–574.
- Bokova, I., Ryder, G., Clark, H., & van Leeuwen, F. (2016). *Nearly 69 million new teachers needed to achieve global education goals, UNESCO reports*. UN News.
- Bressoux, P., Kramarz, F., & Prost, C. (2009). Teachers’ training, class size and students’ outcomes: Learning from administrative fore-casting mistakes. *The Economic Journal, 119*(536), 540–561.
- Britton, J., & Propper, C. (2016). Teacher pay and school productiv-ity: Exploiting wage regulation. *Journal of Public Economics, 133*, 75–89.
- Busari, J. O., Scherpbier, A. J. J. A., van der Vleuten, C. P. M., & Essed, G. G. M. (2006). A two-day teacher-training programme for medical residents: Investigating the impact on teaching ability. *Advances in Health Sciences Education, 11*(2), 133–144.
- Cattaneo, A., & Buzzetti, R. (2001). Effect on rates of breast feeding of training for the baby friendly hospital initiative. *BMJ, 323*(7325), 1358–1362.
- Chetty, R., Friedman, J. N., & Rockoff, J. E. (2011). “The long-term impacts of teachers teacher value-added and student outcomes in adulthood.” working paper 17699. working paper series. *National Bureau of Economic Research*. <https://doi.org/10.3386/w17699>
- Dawn. (2010). *18th amendment and education*. Karachi: Dawn.
- Djalil, A., & Anderson, L. W. (1989). The impact of a research-based teacher training program on indonesian teachers, classrooms, and students. *Teaching and Teacher Education, 5*(3), 165–178.
- Dostie, B. (2018). The impact of training on innovation. *ILR Review, 71*(1), 64–87.
- Feng, Li., & Sass, T. R. (2013). What makes special-education teachers special? Teacher training and achievement of students with dis-abilities. *Economics of Education Review, 36*, 122–134.
- Filmer, D. (2007). Full article: If you build it, will they come? School availability and school enrolment in 21 poor countries. *The Jour-nal of Development Studies, 43*(5), 901–928.
- Ford, T., Edwards, V., Sharkey, S., Ukoumunne, O. C., Byford, S., Norwich, B., & Logan, S.

- (2012). Supporting teachers and children in schools: The effectiveness and cost-effectiveness of the incredible years teacher classroom management programme in primary school children: a cluster randomised controlled trial, with parallel economic and process evaluations. *BMC Public Health*, 12(1), 719.
- Foster, J. M., Toma, E. F., & Troske, S. P. (2013). Does teacher professional development improve math and science outcomes and is it cost effective? *Journal of Education Finance*, 38(3), 255–275.
- Fuje, H., & Tandon, P. (2018). When do in-service teacher training and books improve student achievement? experimental evidence from mongolia. *Review of Development Economics*, 22(3), 1360–1383.
- Gibbs, G., & Coffey, M. (2016). The impact Of training of university teachers on their teaching skills, their approach to teaching and the approach to learning of their students. *Active Learning in Higher Education*. <https://doi.org/10.1177/1469787404040463>
- Glewwe, P., & Muralidharan, K. (2016). Improving education out-comes in developing countries: Evidence, knowledge gaps, and policy implications. *Handbook of the Economics of Education*, 5, 653–743.
- Glewwe, P. W., Hanushek, E. A., Humpage, S. D., & Ravina, R. (2011). *School resources and educational outcomes in developing countries: A review of the literature from 1990 to 2010* (pp. 218–252). National Bureau of Economic Research.
- Goldhaber, D., Liddle, S., & Theobald, R. (2013). The gateway to the profession: Assessing teacher preparation programs based on student achievement. *Economics of Education Review*, 34, 29–44.
- Gracia-Pérez, M. L., & Gil-Lacruz, M. (2018). The impact of a continuing training program on the perceived improvement in quality of health care delivered by health care professionals. *Evaluation and Program Planning*, 66, 33–38.
- Han, H.-R., Kim, K. B., & Kim, M. T. (2007). Evaluation of the training of korean community health workers for chronic disease management. *Health Education Research*, 22(4), 513–521.
- Hanushek, E. A., Piopiunik, M., & Wiederhold, S. (2018). The value of smarter teachers: International evidence on teacher cognitive skills and student performance. *Journal of Human Resources*. <https://doi.org/10.3368/jhr.54.4.0317.8619R>
- Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, 95(7–8), 798–812.
- Hendricks, M. D. (2014). Does it pay to pay teachers more? Evidence from texas. *Journal of Public Economics*, 109, 50–63.
- Holmqvist, M. (2019). Lack of qualified teachers: A global challenge for future knowledge development. *Teacher education in the 21st century* (pp. 1–13). Intech Open.
- Hunter, R. (2020). *Education in Pakistan*. Pakistan: World Education News + Reviews.
- Ifedi, A. (2019). *These nigerian schools are teaching more in a term than they used to in a year. here's how*. Cologny: World Economic Forum.
- Jacob, B. A., & Lefgren, L. (2004). The impact of teacher training on student achievement: Quasi-experimental evidence from school reform efforts in chicago. *The Journal of Human Resources*, 39(1), 50–79.
- Jones, D. C., Kalmi, P., & Kauhanen, A. (2012). The effects of general and firm-specific training on wages and performance: Evidence from banking. *Oxford Economic Papers*, 64(1), 151–175.
- Kealey, K. A., Peterson, A. V., Gaul, M. A., & Dinh, K. T. (2000). Teacher training as a behavior change process: Principles and results from a longitudinal study. *Health Education & Behavior*, 27(1), 64–81.
- Klassen, R. M., & Tze, V. M. C. (2014). Teachers' self-efficacy, personality, and teaching

- effectiveness: A meta-analysis. *Educational Research Review*, 12, 59–76.
- Lee, S. W. (2018). Pulling back the curtain: Revealing the cumulative importance of high-performing, highly qualified teachers on students' educational outcome. *Educational Evaluation and Policy Analysis*, 40(3), 359–381.
- Lee, J. (2019). *6 Reasons to keep pushing on the sustainable development goals*. Washington: Unfoundation. Org.
- Liang, H.-M., Kao, R.-H., Chung-Cheng, Tu., Chin, C.-C., & Chung, W.-C. (2014). The influence of education and training on work attitudes and the moderating effect of supervisor attitudes: Examining chinese employees. *Social Indicators Research*, 119(2), 853–875.
- Loyalka, P., Popova, A., Li, G., & Shi, Z. (2019). Does teacher training actually work? Evidence from a large-scale randomized evaluation of a national teacher training program. *American Economic Journal: Applied Economics*, 11(3), 128–154.
- Majee, W., Anakwe, A., Johnson, L., Rhoda, A., Frantz, J., & Schopp, L. (2019). A self-management training intervention: Perceptions and practices of community health workers in south africa. *Health Promotion Practice*. <https://doi.org/10.1177/1524839918820038>
- Mano, Y., Iddrisu, A., Yoshino, Y., & Sonobe, T. (2012). How can micro and small enterprises in sub-saharan africa become more productive? The impacts of experimental basic managerial training. *World Development*, 40(3), 458–468.
- Merrett, F., & Wheldall, K. (1993). How do teachers learn to manage classroom behaviour? A study of teachers' opinions about their initial training with special reference to classroom behaviour management. *Educational Studies*, 19(1), 91–106.
- Miller, R. T., Murnane, R. J., & Willett, J. B. (2008). Do teacher absences impact student achievement? Longitudinal evidence from one urban school district. *Educational Evaluation and Policy Analysis*, 30(2), 181–200.
- Mpofu, M., & Hlatywayo, C. K. (2015). Training and development as a tool for improving basic service delivery; The case of a selected municipality. *Journal of Economics, Finance and Administrative Science*, 20(39), 133–136.
- Nazarov, Z., & Akhmedjonov, A. (2012). Education, On-the-Job training, and innovation in transition economies. *Eastern European Economics*, 50(6), 28–56.
- Orazem, P. F., & King, E. M. (2008). Schooling in developing countries: The roles of supply, demand and government policy. In *Handbook of Development Economics*, 4, 3475–3559.
- Özler, B., Fernald, L. C. H., Kariger, P., McConnell, C., Neuman, M., & Fraga, E. (2018). Combining pre-school teacher training with parenting education: A cluster-randomized controlled trial. *Journal of Development Economics*, 133, 448–467.
- Pal, S. (2003). "Child schooling in peru: Evidence from a sequential analysis of school progression." 0309001. *labor and demography*. Labor and Demography: University Library of Munich, Germany.
- Palardy, G. J., & Rumberger, R. W. (2008). Teacher effectiveness in first grade: The importance of background qualifications, attitudes, and instructional practices for student learning. *Educational Evaluation and Policy Analysis*, 30(2), 111–140.
- Phillips, K. J. R. (2010). What does 'highly qualified' mean for student achievement? Evaluating the relationships between teacher quality indicators and at-risk students' mathematics and reading achievement gains in first grade. *The Elementary School Journal*, 110(4), 464–493.
- Rosa, W. (2017). *Goal 4. ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*. New York: In A New Era in Global Health.
- Sendawula, K., Kimuli, S. N., Bananuka, J., & Muganga, G. N. (2018). Training, employee engagement and employee performance: Evidence from uganda's health sector. *Edited by Isaac Wanasika Cogent Business & Management*, 5(1), 1470891.
- Sunguya, B. F., Poudel, K. C., Mlunde, L. B., Shakya, P., Urassa,

- D. P., Jimba, M., & Yasuoka, J. (2013). Effectiveness of nutrition training of health workers toward improving caregivers' feeding practices for children aged six months to two years: A systematic review. *Nutrition Journal*, 12(1), 66.
- Swinton, J. R., De Berry, T., Scafidi, B., & Woodard, H. C. (2008). Does In-service professional learning for high school economics teachers improve student achievement? *Education Economics*, 18(4), 395–405.
- Syed, I. (2018). *'Shall i feed my daughter, or educate her?': Barriers to girls' education in Pakistan*. New York: Human Rights Watch.
- The World, & Bank. (2018). *World bank provides US\$500 million to egypt for improving teaching and learning conditions in public schools*. Washington: The World Bank.
- Tribune, E. (2016). *Over 40% teachers received no training in Paki-stan*. Bilal Ali Lakhani: The Express Tribune.
- Truitt, D. L. (2011). *"The effect of training and development on employee attitude as it relates to training and work proficiency."* SAGE Open: SAGE Publications.
- Valiandes, S., & Neophytou, L. (2017). Teachers' professional development for differentiated instruction in mixed-ability class-rooms: Investigating the impact of a development program on teachers' professional learning and on students' achievement. *Teacher Development*, 22(1), 123–138.
- Webster-Stratton, C., Jamila Reid, M., & Hammond, M. (2001). Preventing Conduct problems, promoting social competence: A parent and teacher training partnership in head start. *Journal of Clinical Child & Adolescent Psychology*, 30(3), 283–302.
- Willock, J., Robina, R. M., Mayberry, F. Y., & Daniels, P. (2015). Peer training of community health workers to improve heart health among african american women. *Health Promotion Practice*, 16(1), 63–71.
- Zhang, L., Lai, F., Pang, X., Yi, H., & Rozelle, S. (2013). The impact of teacher training on teacher and student outcomes: Evidence from a randomised experiment in beijing migrant schools. *Journal of Development Effectiveness*, 5(3), 339–358.