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Teacher Professional Development, Cooperative Learning and Student Performance: Evidence from Two Interventions in Thailand

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Extended Summary

Introduction and Background

Many countries attempt to improve quality of education by implementing academic intervention in various types, including after-school programs, coaching/ mentoring of students, coaching/mentoring of personnel, computer-assisted instruction, content changes, cooperative learning, summer programs, tutoring, and personnel development (Dietrichson and Jorgenson 2017). Two most common academic interventions are cooperative learning (CL) and teachers' professional development (PD) programs. Cooperative learning encourages students to cooperate and work together in small groups in order to maximize their own and each other's learning (Johnson and Johnson 1999). Teacher professional development usually offers in-service teacher training in the form of workshops or short-term courses, to provide teachers with new information and enhance their experience (Villegas-Reimers 2003).

Many developing countries implement CL and teacher PD programs, aiming to improve student performance. Over the past two decades, a growing literature on impacts of the programs on student academic achievement provides mixed evidence on large-scale interventions from many countries, ranging from successful (Albornoz et al. 2020; Sun and Du 2021; Cilliers et al. 2020) to ineffective (Mbiti I 2016; Loyalka et al. 2019; Abbiati et al. 2021; Schaffner et al. 2021; Carneiro et al. 2022). In Thailand, the total public expenditure on education as a percentage of GDP and of total government expenditure has been generous, at an average of 4 and 20 percent respectively, since 1999 (Office of the Education Council, 2017). According to National Statistical Office (NSO) Thailand, Ministry of Education's efforts have increased average years of schooling for the population aged above 15 from 7.4 years in 2002 to 8.6 years in 2018, whereas for those in the labor force, average years of schooling increased from 8.1 years to 9.6 years in the same period. Since 1999, Thailand has been working to increase educational opportunity nationwide; however, there is no broad agreement that academic achievement in the country has improved.

This dissertation examines effects of two at-scale government teacher training programs on student performance. Those two programs are Active Learning School (ALS) project and Science, Mathematics and Technology (SMT) promotion. ALS project combines CL concept with teacher PD program, while SMT promotion mainly applies teacher PD program. Our sample is drawn from officers of Thailand's Ministry of Education, the Institution for the Promotion of Teaching Science and Technology (IPST) and National Institute of Educational Testing Service (NIETS).

This paper is organized as follows. Chapter 1 broadly introduces types of academic intervention discussed in the paper and briefly provides the paper outline. Chapter 2 discusses Effects of Cooperative Learning on Student Performance: Evidence from Southern Thailand. Chapter 3 discusses Science, Mathematics and Technology Promotion and Student Performance: Evidence from Thailand. Chapter 4 concludes the research and provides policy implications.

Methodology 500

The estimation approaches used in this dissertation are regression discontinuity design (RDD) and difference-in-difference (DID) design. For ALS project, the causal effects were identified using RDD (Lee and Lemieux 2010; Van der Klaauw 2008) due to the project selection cutoffs which create a discontinuity in probability of treatment as a function of 2016 O-NET scores after the samples were pooled across districts. The technique locally identifies treatment effects in the neighborhood of the cutoff where the probability of receiving treatment changes discontinuously, for example, in ALS project where the schools, with similar performance measured by 2016 test scores, have significantly different probabilities of being treated. In order to analyze the pooled data across districts, I computed the normalized 2016 O-NET scores (X_{ij}) which is the difference between school's average scores and the district cutoffs. This normalization sets each district cutoff to zero where the normalized scores represent the score deviation from the cutoffs. The ideal selection should include all schools below the cutoffs and exclude all schools above the cutoffs. However, some schools below the cutoffs were not selected in the project, while some schools above the cutoffs were included. As a result, the jump in the probability of treatment schools at the normalized cutoff (c=0) is greater than zero but less than one, thus a fuzzy regression discontinuity design is applied in this analysis.

I use a rectangular kernel which gives an equal weight for all observations in the estimation sample, as suggested by Imbens and Lemieux (2008). For the bandwidth selection, Imbens and Kalyanaraman (2012) propose the Mean Squared Error (MSE) optimal bandwidth, which was developed from the Mean Integrated Squared Error criterion (MISE). I specify the bandwidth selection by allowing two different MSE-optimal bandwidth selectors, below and above the cutoff, for the RD treatment effect estimator. The standard errors provided in the estimation is the robust standard errors clustered at district level (Calonico et al. 2017).

I employ a difference-in-difference (DID) design to estimate the impacts of SMT project on mathematics and science test scores for grade six and nine students. I use OLS regressions with weights equal to the number of test takers in each school and cluster standard errors at school level to estimate the effects of the SMT project on school level test scores for all estimates except for unweighted estimates (section 2.6.1). The estimates were produced separately by subject, i.e. mathematics and science, and grade, i.e. grade six and nine.

The SMT school project targets mathematics, science and technology, thus it is reasonable to compare the effect of the project between groups of schools with high and low science and mathematics performance. As a result, I created subgroup using the national test scores prior to the implementation of the project, i.e. academic years 2015-2017, as a proxy of their students' performance. High (low) performance schools are schools with average mathematics or science scores above (below) national average for 3 consecutive years. I ran regression on mathematics and science test scores separately for all subgroups in both grades. As a result, the estimates presented the impacts of the project on the following four subgroups of schools: high mathematics performance, low mathematics performance, high science performance, low science performance. Moreover, I checked whether the results are robust when regressing without test taker weights and with different base years, i.e. 2016 and 2017 instead of 2015 in the main results.

Results and Discussion

ALS Project, which is intended to improve student performance, has been implemented since the beginning of the academic year 2017. The authorities analyzed the problem and developed an intervention, the active learning concept teaching model. The first training session was conducted in November 2017, near the end of academic year 2017. As expected, we did not find any improvement of student performance on 2017 test scores. The second training session was conducted in July 2018, at the beginning of academic year 2018, followed by coaching and monitoring activities. Similarly, no significant effect was found in the 2018 and 2019 test scores. Schools near the cutoff performed very similarly and there was no noticeable jump at the cutoff. The RD estimates of test scores are insignificantly different from zero, with the 95 percent confidence interval estimates ranging from -0.1 to 0.1 test score standard deviation. I also evaluated the effects of the project on student literacy and found no statistically significant difference between first and third grade reading and literacy test scores for the treatment schools and those for the control schools. Nevertheless, the results in this section only explain effects of ALS project on student performance at aggregate level, i.e. at school level. It is possible that gain by some students is cancelled out by loss of some others within the same schools; therefore, we found null effects at school level. Similar results were reported in robustness check section when the effects of ALS Project were estimated in a manner similar to that of the main results but weighed using the number of test takers in each school with robust standard errors clustered at district level .

The effects of SMT project on national test scores, i.e. mathematics and science scores, of grade six and nine students were estimated using Difference-in-Difference (DID), with test taker weights and standard errors clustered at school level. According to the project timeline, the implementation of the project has started in academic year 2018; therefore, O-NET scores of academic years 2016 – 2017 (2018 – 2020) are pre- (post-) treatment outcomes. The coefficients of interaction terms between SMT and post treatment academic years, i.e. 2018, 2019 and 2020, represent the first, the second, and the third year effects of teacher professional development program on mathematics and science performance of grade six and nine students. The results suggest that the project does not significantly improve student performance as measured by national test scores.

For subgroup analysis, the results suggest that the project significantly improves both mathematics and science performance of grade six students in high performance schools. On the contrary, the project fails to improve both mathematics and science performance of students in low performance schools. Similar results without test taker weights obtained from DID estimation are presented in robustness check section. The results are also robust in changes of base year.

Conclusion and Policy Implications

In 2017 and 2018, ALS and SMT projects have been implemented by Thailand's Ministry of Education, to improve academic achievement of students. The projects combine concepts of cooperative learning and teacher professional development, two popular academic interventions. This study evaluates the effects of the projects on student performance as measured by national test scores. The effects, estimated using a fuzzy regression discontinuity design (for ALS project) and difference-in-difference (for SMT project), suggest that, overall, the projects did not substantially improve student performance when considering the effects at school level. Our finding regarding the effects of large scale academic intervention in Southeast Asia are consistent with studies conducted by, for example, Loyalka et al. (2019) and Thurston et al. (2019). However, SMT project improved science and mathematics scores of grade six students in the top performance schools by 0.1 standard deviation, on an average.

In addition to quantitative evidence, this study conducted an online survey to gather information from SMT teachers who participated in training session(s). The survey revealed a few possible explanations for the project not being more effective, for instance, informative but one-way communication training sessions; unexpectedly low participation rate; weak motivation and accountability; inadequate material distribution; insufficient support and follow-ups. The problems in policy design, which arose in SMT project, are not unique; these issues also existed in projects in African and South Asian countries (Schaffner, et al. 2021, Popova, et al. 2022).

The findings in this study contribute some useful policy implications to policymakers and project implementers, including teachers, supervisors, and education professionals. In order to fill the voids and develop more effective policies, policymakers may consider the following details for future policy designs. Firstly, it might be helpful to include more practical lessons and ready-to-implement teaching plans in in-service training sessions. Secondly, project supervisors may want to consider whether the number of trained teachers in each school should be proportional to the school size. Other important factors are duration and frequency of training sessions which are limited and subject to resource allocation. In addition to the project design, the online survey reveals significant difference between ideal and actual participation rates which could be another important issue that hinders the success of the projects. Last but not the least, weak accountability and motivation diminish the training quality; therefore, these two factors should be prioritized and taken into consideration.