Learning by Doing:
Experimental Evidence on a Teacher Residency Program in India

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1. Motivation

Improving teacher effort and capacity is one of the most pressing challenges in India and the rest of the developing world. Many teachers are absent to school (Kremer et al., 2005; Chaudhury et al., 2006). Even when teachers are in school, they are not always teaching (Sankar & Linden, 2014). Even when they are teaching, they do not engage all students (World Bank, 2016). Many teachers do not understand their students' misconceptions (World Bank, 2016).

Teacher residencies (i.e., programs that recruit college students or graduates to co-teach with a teacher while in pre-service training) offer a promising approach to raise teacher effort and capacity. Evidence from developed countries suggests that residencies help trainees improve faster on their first years on the job (Papay et al., 2012). These programs combine evidence-based insights on teacher policy from developing countries: emphasis on content knowledge (Bold et al., 2017); lesson scripting (e.g., Piper, 2009; Naslund et al., 2014; Lucas et al., 2014); opportunity for practice and feedback (Cilliers et al., 2019). There are many teacher residency programs in the U.S. (NCTR, 2019), but they are less known in developing countries.

2. Experiment

Sample. The sample for our study included 50 public and "charter" primary schools in city of Pune, in the state of Maharashtra. Out of all 286 primary schools in Pune, we excluded: 118 schools in remote rural areas; 30 Urdu-medium schools; 46 English-medium schools; 13 "model schools"; 20 schools with low enrollment; and nine schools already in the program.

Randomization. We used a randomization similar to that of Banerjee et al. (2007) to encourage all schools to participate in all data collection rounds. We randomly assigned all 46 schools in the sample to: the offer of a fellow in grade 5 (23 schools, group A); or the offer of a fellow in grade 6 (23 schools, group B). In group A, grade 5 classes are in the treatment group and grade 6 classes are in the control group. In group B, the opposite is true. Control and treatment students were comparable on demographic characteristics, socio-economic status, and initial achievement on standardized tests of math, science, and language at baseline.

Intervention. The SEI fellowship aims to recruit, train, and place college students majoring in math and science in primary schools in Pune. Applicants are selected through a four-stage process: (a) written assessment on math and science; (b) short demonstration lesson on a topic of the applicant's choice; (c) Interview panel to assess applicants' scientific aptitude, leadership qualities, and motivation to lead change; and (d) longer demonstration lesson on a pre-selected topic. Admits complete a three-week summer training program focusing on pedagogy, class management, and content knowledge.

3. Data

Student assessments. We administered student assessments of math, science, and language at baseline (Jul 2017), endline (Mar 2018), and follow-up (Jun 2018). At baseline, we added Raven's progressive matrices (for controls). Each test included ~30 multiple-choice items. Scores were scaled using a 2PL Item Response Theory model.

Student surveys. We also administered a short survey of students at baseline, focused on demographics (for controls), and a longer survey at endline, covering attendance, beliefs and attitudes, and perceptions of teachers using Tripod (for impact).

Unannounced school visits. We also conducted unannounced school visits during the school year to measure teacher attendance and collect student attendance records.

Announced class observations. We observed lessons during the school year to track time allocation. We used Stallings, with alternating "snapshots" to keep track of both SEI fellows and PMC teachers in treatment classrooms.

Teacher surveys. We surveyed teachers at endline to compare SEI fellows and PMC teachers on demographics, education, training, and experience.

Teacher assessments. We also assessed SEI fellows and PMC teachers on instructional practice, understanding of student misconceptions, and content knowledge. The test included 36 multiple-choice items drawn from domestic and international assessments.

4. Results

Differences between fellows and teachers. Fellows have less experience and education than teachers, but similar experience teaching math and science and higher performance.

Instructor attendance and punctuality. Teachers in treatment grades were no less likely to attend school than their counterparts in control grades. Fellows had similar attendance and punctuality as teachers in control grades. However, most teachers were found at the principal's office during the unannounced visits, indicating that even when they were at school, they were not always teaching in the classroom.

Lesson time allocation. The introduction of fellows in treatment grades led teachers to devote less time to instruction. Yet, fellows did not spend a larger share of time on instruction than teachers in control grades. They did not use time on task, classroom management, or off task differently from teachers either.

Instructional practices. Fellows used different instructional practices than teachers in control grades, demanding more of students and supporting them more. They were also more likely to engage students, but no less likely to avoid negative practices.

Student attendance. Most students attended school regularly, as measured by observations, registers, and self-reports. The program had a null effect on student attendance.

Student attitudes. Most students enjoyed learning math and science and found them helpful. Yet, many felt nervous and some quit when these subjects become challenging. The program did little to change these attitudes. It had no impact on students' beliefs about the malleability of intelligence or perceptions of teacher effectiveness.

Student achievement. The program had positive and moderate-to-large effects on student achievement in all three subjects assessed at endline. These effects can be seen in math (.26 SD), science (.19 SD), and language (.11 SD), across nearly all content and cognitive

domains. The effects found at endline persisted in math (.28 SD) and science (.1) at follow-up (three months after the end of the program), but they were imprecisely estimated in language.

Student aspirations. The program did not make students more likely to want to study STEM subjects in secondary school, aspire to higher education, or want to pursue a STEM-related job after graduation.