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Title: Effectiveness of Interactive Distance Instruction: Experimental Evidence from Ghanaian Primary Schools

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Effectiveness of Interactive Distance Instruction: Experimental Evidence from Ghanaian Primary Schools

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Background

In rural areas of lower- and middle-income countries, learning outcomes are often only a fraction of those in urban areas. The same is true in Ghana where evidence suggests that students in rural areas significantly underperform their urban counterparts (GES, 2012; World Bank, 2012). While many barriers to learning exist, paramount among these may be the quality of teaching. Evidence strongly suggests that teaching quality matters for student learning (Boyd et al, 2008; Clotfelter et al., 2010; Rockoff, 2004; Rivkin, Hanushek and Kain, 2005). In remote rural areas in Ghana, schools struggle to attract and retain professionally trained teachers. In 2012, the World Bank reported that over half of primary teachers in Ghana lack any kind of professional training. High teacher absenteeism, coupled with rote-learning pedagogy, means that effective student time-on-task for learning is low (World Bank, 2012).

Evidence suggests structured pedagogy programs that introduce vetted high-quality content and sustained instructional support into under-resourced settings can bring about substantial gains in student learning. A systematic review conducted by the grant-making NGO 3ie found that pedagogy-focused interventions have the largest and most consistent positive average effects on learning outcomes in low-and middle-income countries like Ghana (Snilstveit et al., 2015). At the same time, while interventions of this nature appear more effective in comparison to more static interventions – like computer-aided instruction programs, which have mixed effectiveness (Banerjee et al, 2007; He, Linden and MacLeod, 2007; Osorio and Linden, 2009) – they can be heavy-handed and costly to maintain.

Objective

Our study examines the effectiveness of an interactive model of distance learning that has the potential to scale easily and cost effectively, particularly as advances in internet infrastructure are made. Specifically, through a cluster randomized controlled trial, we estimate the effects of a program that broadcasts live instruction via satellite to marginalized students in rural primary schools in Ghana. We investigate whether reliable, high-quality interactive distance instruction improves the literacy and numeracy skills of students. We also take advantage of teacher- and classroom-level data to identify mechanisms of the program—in particular, changes in pedagogical approaches and time on task in treatment classrooms. Additionally, we examine impacts on teacher capacity in treatment schools, which has implications for spillover effects among non-treated students, and have plans to conduct a cost benefit analysis in upcoming months.

Intervention

The program equipped classrooms in randomly selected schools with a technology package through which they could connect math and reading classrooms with a studio in Accra. The studio broadcasted daily live lessons taught by studio teachers, who received on-going training in student-centered teaching techniques. Studio teachers connect to roughly ten schools per lesson. Teachers in the satellite classrooms serve as facilitators of the distance instruction, monitoring
the satellite connection, overseeing classroom management and discipline, and filling in as instructors in the event of disruptions in the broadcast technology. The model is interactive, and students in satellite classes could communicate directly and in real time with studio teachers.

**Empirical Strategy**

The evaluation period covers two full academic years. At baseline, 70 primary schools were randomly selected for treatment and 77 schools serve as control. Within the 70 treatment schools, roughly 40 students across grades 2-5 (ranging in age between 6 and 15 years) attended the satellite transmitted classes as their core math and reading classes. We stratified randomization at the district level and use an intent-to-treat estimation strategy to examine impact on learning gains from baseline after each year of treatment. Treatment and control groups are balanced on observables, and we observe no differential attrition among treatment and control students.

**Data**

We utilize multiple sources of data: (1) student surveys and cognitive tests\(^1\) administered at baseline and after each year, (2) attendance records measured through school records and our own unannounced spot checks, (3) teacher surveys (including control school teachers and treatment school teachers serving as facilitators, as well as treatment school teachers teaching non-satellite classes), (4) classroom observations (of satellite classes and non-satellite classes at both treatment and control schools) using a quantitative tool adapted from the Stallings (1977) protocol\(^2\), and (5) open-ended interviews with students, teachers, and parents that complement quantitative data.

**Results**

We estimate significant gains (p<.05) in numeracy skills after one year (0.39 standard deviations) and significant gains in literacy skills after two years (0.28 standard deviations). We find no impact of the treatment on multiple measures of attendance (school recorded and unannounced spot checks), suggesting that the gains in skills are a result of instructional quality rather than increases in total quantity of instruction time. We are currently conducting an in-depth analysis of teacher and classroom observation data including a comparison of effective time on task. Preliminary analyses suggest that the intervention changes the pedagogical approaches used by teachers that facilitate the distance instruction in treatment schools. Qualitative interviews point to the training of the facilitators as well as the exposure to and interaction with the studio teachers as drivers of changes in pedagogy.

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\(^1\) We use the Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA), which are a component of a universal tool designed by the non-profit research group RTI to understand pupils learning and to enable comparison across different countries. The tool was adopted to the grade 2 Ghanaian national curriculum, and the assessment was developed and conducted specifically for English and the three local languages used in Ghana (Dangme, Twi and Ewe).

\(^2\) The Stallings Classroom Snapshot, also called the Stanford Research Institute Classroom Observation System, was first developed in 1977 and generates robust quantitative data across four main variables: 1) teachers’ use of instructional time, 2) teachers’ use of materials, 3) core pedagogical practices, and 4) teachers’ ability to engage students. The instrument has been used widely by the World Bank and has been shown to have a high degree of inter-rater reliability (0.80 or higher).
References


