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Timeline

2010-2012

Research Implemented by IPA

Yes

Teaching Science and Environment in Peru

Abstract

Students in Peru have historically ranked poorly in math and science in comparative tests across South America. The Peruvian government is seeking to test a new science curriculum which moves away from traditional rote memorization to hypothesis testing and inquiry. In two pilots in Lima Province, a random sample of classrooms' teachers received training in a new style of teaching, and the classrooms were provided with hands-on materials to work with. Data from the first pilot suggest an improvement in one of the science modules, but only for boys who were already in the higher end of the distribution on the baseline test. Data from the second pilot, designed to improve implementation and provide further evidence, is forthcoming.

Policy Issue

In recent years the Peruvian education system has vastly improved its coverage, reaching populations that previously had no access. Unfortunately this increase in coverage has not resulted in improvements in educational quality, with tests in South America such as PISA and SERCE ranking Peruvian students low in math and science.¹ Additionally, science teaching in Peru relies largely on memorization, rather than critical thinking or practical exercises.

The Peruvian Ministry of Education is seeking to strengthen their national plan for basic environmental and natural sciences education. To this end, they worked with the Inter-American Development Bank on randomized evaluations in 2010 and 2012 for a new inquiry-based science curriculum (implemented by the Instituto Von Braun in 2010 and by the Universidad Cayetano Heredia in 2012). The studies examined the effects on student achievement of a new science curriculum for Lima Province public schools based on critical

reasoning and hypothesis testing.

Context of the Evaluation

The intervention took place in Lima province, with students representing both the “sierra” mountain and “costa” coastal regions. Classrooms were sampled from urban, peri-urban, and rural areas, and students tended to be from low income families, with about a third of the students also reporting they worked on a family’s farm or microenterprise during the school year.

Details of the Intervention

The studies looked at the effects of a new style of teaching based on scientific reasoning with a first pilot in 2010, followed by a 2012 pilot designed to replicate it and improve implementation. The new curriculum used experiments and practical activities in class to teach scientific reasoning (formulating hypotheses, testing them and analyzing results critically) and encouraged students to discover fundamental concepts of the lessons through hands-on scientific examination. In the first pilot, a set of LEGOs was distributed for classroom exercises, and classrooms were encouraged to grow vegetable gardens if materials were locally available. The new curriculum also introduced science fairs at the end of the year for students to showcase the experiments they had conducted, sometimes using recycled materials.

4,634 third-grade students in 104 schools from around Lima Province participated, data came from tests covering science (the 3 main topics covered by the traditional science curriculum: “the human body,” “the environment,” and “physical world”), reading and writing abilities, and mathematics. Surveys of school administrators measured characteristics of each school, and surveys of teachers collected data on individual students, as well as any changes in their own perceptions of how to best teach science. Classrooms were also videotaped for analysis of how well each classroom implemented the new style, and additional analysis of differences in teaching styles across classrooms and regions.

The 2012 study sought to improve on implementation of 2010 study and was implemented by Universidad Cayetano Heredia (UCH). In this second pilot, teacher training was implemented more uniformly, and intensified, with weekly training in groups and classroom visits focused on pedagogy and implementation of the classroom exercises.

Results and Policy Lessons

Results are currently available for the 2010 pilot, which was not implemented completely because of logistical problems. A positive impact was found on test scores for boys only in one of the three modules of the science test, the “physical world” module, with an increase of 0.18 standard deviations among students in the classrooms with the new teaching style. Furthermore, the effect was concentrated among boys who were above the median at baseline. The 2012 follow-up included a qualitative evaluation to examine these differences

in impacts in more detail.

The 2010 intervention was only implemented partially and appears to have been only partly successful in achieving its intended goal. The 2012 follow up was designed to examine the effects of the full program and in greater detail.

Read more about the findings and recommendations for future policies in a paper for the Inter-American Development Bank [here](#).

Sources

¹Citation: OCDE (2010), Pisa 2009 Results: What Students Know and Can Do - Student Performance in Reading, Mathematics and Science (Volume I). SERCE (2008), Primer Reporte.

July 17, 2014