Improving Learning Outcomes

Lessons from rigorous evidence

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Global efforts are underway to improve education quality—to ensure children are not only in school but learning and developing to their full potential. Although many theories exist on the best approaches to improve education quality, policymakers and implementers need evidence on which programs are effective at helping children actually learn while in school.

Innovations for Poverty Action (IPA) is a research and policy nonprofit that discovers and advances what works to reduce poverty and improve lives. In addition to conducting rigorous research, IPA reviews and consolidates research for policy makers and practitioners. The objective is to distill complex, nuanced, and dynamic research findings into focused and actionable recommendations.

This brief summarizes and provides key lessons from multiple meta-analyses and over two-dozen randomized evaluations (both IPA and non-IPA studies) on improving learning outcomes in low-income countries, with a focus on basic education. To identify relevant studies, we searched institutional websites (including IPA's and J-PAL's), Google Scholar, and the literature review sections of key papers. In addition, we consulted with leading experts in the field to identify any gaps.

Lessons on improving learning outcomes (supporting studies below)

Teacher professional development programs that provide teachers with concrete tools to improve the quality of instruction, and offer continued support, improved student outcomes.

Performance-based incentives can improve student learning, particularly when combined with other inputs—but the design of the incentive matters.

Inquiry and problem-based pedagogy—in which students learn by collaboratively solving real-life authentic problems—improved children's math and science abilities.

Distributing information communications technology (ICT) alone has not improved learning; but ICT can be an effective tool for delivering quality instruction when integrated into existing curricula and teaching processes.

Targeting instruction to students' achievement levels improved learning for low-performing pupils.

Important note: *While all the interventions in this brief have been rigorously tested in different countries and/or contexts, sometimes solutions that work in one or more situations may not work as well in another. Quality implementation and monitoring are key, and further evaluation is often needed as programs are adapted to a new context or at a new scale. In addition, these lessons will evolve and change as new evidence emerges.*

Teacher professional development programs that provide teachers with concrete tools to improve the quality of instruction and offer continued support improved student outcomes.

A meta-analysis of rigorous evaluations of education interventions in sub-Saharan Africa suggests that providing teachers with repeated teacher training with long-term mentoring or coaching can be effective at improving student performance.[1] The meta-analysis also suggests that pedagogical interventions involving teacher training can potentially affect cohort after cohort of students, producing a multiplier effect on student learning in the long-run.

Randomized evaluations from programs in Kenya and Uganda suggest teacher professional development programs that provide teachers with concrete tools (e.g., scripted lesson plans and/or step-by-step processes) to improve the quality of their instruction in a lasting manner can improve literacy. In Kenya and Uganda, for example, researchers evaluated the impact of the Reading to Learn program on early-grade literacy rates. The program trained lower primary school teachers on a highly structured five-step process for developing children's literacy skills, accompanied by resources and mentoring. This initiative started when students were in grades 1 and 2 and lasted for 1.5 to 2 years. During the follow-up, students' scores were higher on assessments of oral literacy in both countries and written literacy in Uganda.[2]

Another randomized evaluation of a literacy program in Kenya provided teachers with 140 sequential, semi-scripted lesson plans for literacy sessions in both Swahili and English. The program also conducted teacher training, including a three-day initial workshop, a problem-solving workshop four months into the school year, and a refresher training the following school year. Children who received the literacy intervention scored significantly higher in English spelling, Swahili letter reading, and the reading of words and passages in both English and Swahili. The program also reduced school dropout rates from five percent to two percent, suggesting that the problem of school dropout in Kenya could be tackled by improving education quality. Researchers reduced the cost of the program by sending weekly text messages to teachers that provided brief instructional tips and motivation to implement lesson plans.[3]

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Another study in Kenya evaluated the impacts of an initiative that provided teachers with structured teacher lesson plans in combination with instructional support, coaching, and student books. The results demonstrated that adding structured teacher lesson plans was most effective in improving learning outcomes across grades and subjects.[4] The proven elements of the initiative are being scaled up across Kenya through the Tusome literacy program. A comparison of outcomes from 2015 to 2016 suggested the program improved English and Swahili learning outcomes.[5]
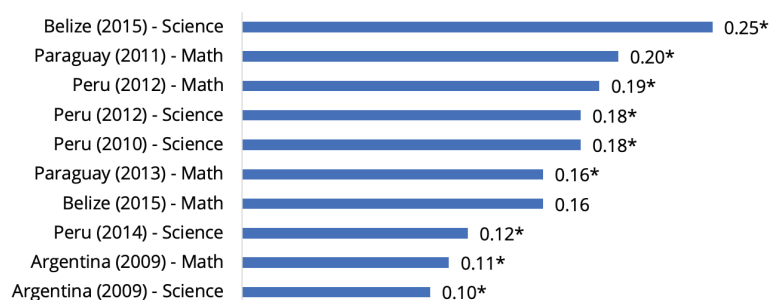
Performance-based incentives can improve student learning, particularly when combined with other inputs— but the design of the incentive matters.

A review of rigorous evaluations of education interventions in low- and middle-income countries suggests that teacher performance incentives, which reward teachers based on the performance improvements of their students, can improve learning outcomes. It also raises questions about how to best design such incentives to maximize learning, while minimizing strategic responses.[6]

Evaluations from Kenya, Tanzania, Uganda, India, and Pakistan also found performance-based teacher bonuses improved student performance, but that only some designs led to actual improved learning.

Impact of IPP on Student Performance

	Effect Size
Belize (2015) - Science	0.25*
Paraguay (2011) - Math	0.20*
Peru (2012) - Math	0.19*
Peru (2012) - Science	0.18*
Peru (2010) - Science	0.18*
Paraguay (2013) - Math	0.16*
Belize (2015) - Math	0.16
Peru (2014) - Science	0.12*
Argentina (2009) - Math	0.11*
Argentina (2009) - Science	0.10*

* Statistically significant at the $p < 0.05$ level

Effect Sizes (in Standard Deviations)

For example, in Kenya, researchers found that a program that gave teachers prizes based on student performance increased exam scores over a two-year period. However, the program did not improve students' scores on tests of the same subjects that were not linked to the incentives. Much of the increase in test scores was due to increased teacher test preparation sessions and improved test-taking skills such as strategies for answering multiple-choice questions or memorization, as opposed to increased overall knowledge.[7]

In Tanzania, researchers found some evidence that providing teachers with performance-based bonuses, linked to the number of their students who passed basic tests of math, Swahili, and English based on the national curriculum, improved learning outcomes. When provided with unconditional grants to schools, the incentives had larger, positive effects on learning (though grants alone had no impact). The results suggest that providing inputs to schools together with performance-based incentives has a greater impact than the sum of the individual effects.[8]

In Uganda, researchers used a different model of performance-based bonuses—pay for percentile (PFP). Under this scheme, teachers earned a bonus payment based on how well their students performed relative to other students with similar baseline test scores, effectively the student's percentile in their peer group. Teachers responded to the incentives by putting forth more effort, spending more hours per week preparing lessons and grading assignments. Further, the incentives increased student attendance. Achievement gains only occurred in schools that provided grade 6 math students with

textbooks and among those students whose learning levels were appropriate for those textbooks, pointing to the complementarity of incentives, appropriately-leveled teaching, and learning materials in increasing student achievement.[9]

In India, researchers found that linking student test performance to teacher pay significantly improved learning outcomes for students in government schools in Andhra Pradesh. Student learning improved significantly on math and language tests that were designed based on the syllabus. Incentive schools did significantly better on both mechanical and conceptual components of the test, suggesting that the gains in test scores represent an actual increase in learning outcomes.[10]

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In Pakistan, researchers evaluated a program offering yearly cash bonuses to teachers linked to gains in student exam scores, school enrollment, and the level of student exam participation. The program increased school enrollment and student exam participation rates but did not increase student exam scores. The findings suggest that when faced with incentives for multiple outcomes, teachers may try to influence the outcomes that they can improve most easily.[11]

Each program trained teachers (or in Peru, tutors) in IPP methods and lesson plans, provided didactic materials to enhance learning through hands-on activities, and provided ongoing supervision. All programs included a detailed lesson by lesson curriculum and a minimum of 20 hours of teacher professional development. The sessions aimed to have teachers learn through practice and interactions with other teachers. In addition, all programs provided continuous in-school teacher support.

According to researchers' estimates, the cost of a 0.10 standard deviation increase in math test scores overall is $14.53 per student. This estimate varies from $6.90 per student in Argentina 2009 to $22.48 in Paraguay 2013. The cost of a 0.10 standard deviation increase in science test scores overall is $14.64 per student and varies from $8.40 per student in Belize 2015 to $17.52 in Peru 2010 (where tutors, who were more expensive, were used).

From this ten country study, researchers concluded that implementing IPP learning in Latin America, if not worldwide, would greatly enhance students' learning in math and science.

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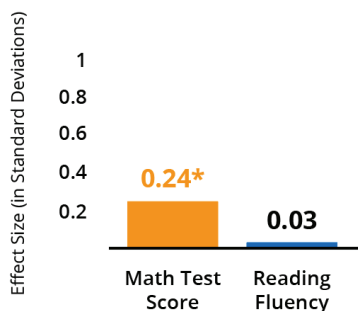
Distributing information communications technology (ICT) alone has not improved learning; but ICT can be an effective tool for delivering quality instruction when integrated into existing curricula and teaching processes.

A meta-analysis of randomized evaluations of education interventions in developing country primary schools suggests that ICT programs are most effective when they are a complement to, rather than a substitute for, classroom instruction.[14] The meta-analysis indicates that ICT interventions have smaller effects when they are unaccompanied by parent or student training, or when ICT use appears to substitute away from useful instructional time during school hours.
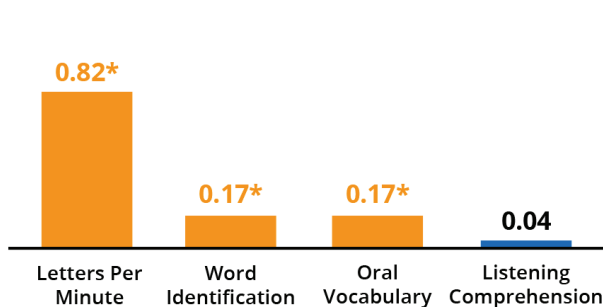
Evidence from India, Ghana, Kenya, and Pakistan found certain ICT interventions made it easier to deliver high-quality instruction and/or the official curriculum, leading to positive improvements in student learning that are tailored to student levels. For example, rigorous research in India found that Computer Assisted Learning (CAL) programs that integrate a targeted educational software to the regular school curriculum led to some higher learning outcomes. The math test scores of those who participated in the program significantly increased after two years in the program.[15]

Inquiry and problem-based pedagogy—in which students learn by collaboratively solving real-life authentic problems—improved children's math and science abilities.

Ten randomized evaluations from four countries in the Americas—Argentina, Belize, Paraguay, and Peru—found that using inquiry and problem-based pedagogy (IPP) increased pupils' math and science scores on standardized tests.[12] The evaluations were conducted across a wide range of geographic, socio-economic, teacher background, and age and grade contexts (preschool, 3rd grade and, 4th grade).[13]

While the interventions varied by grade level, national curriculum, and subject area (mathematics or science), all shared three central elements of IPP: (1) instruction organized around core concepts that were developed over many lessons, (2) classes organized around inquiry and problem-solving opportunities, and (3) use of structure and scaffolding to help students do more complex activities and make sure that they have close guidance.

Across the ten studies, researchers found that IPP led to a 0.18 standard deviation increase in math test scores overall and a 0.16 standard deviation increase in science test scores overall.

MGCubed Program Improved Math, Reading, Foundational Literacy

Impacts on Math and Reading

Impacts on Foundational Literacy

Effect Size (in Standard Deviations)

0.24* Math Test Score	**0.03** Reading Fluency

0.82* Letters Per Minute	**0.17*** Word Identification	**0.17*** Oral Vocabulary	**0.04** Listening Comprehension

Grades 2-5, At Least One Year of Remote Instruction

* Statistically significant at the p < 0.05 level

In India, researchers also studied the impact of the "Mindspark" program, a CAL software that provides students with personalized instruction, on the learning outcomes of middle school students. Mindspark uses a set of games, videos, and activities that pull from a database of over 45,000 questions to test students and provide explanations and feedback. A key feature of the Mindspark program is its ability to use data to identify the learning level of every student, deliver customized content targeted at this level, and dynamically adjust to the student's progress. Also, as an after school program, it doesn't take away from class time. Researchers found that the Mindspark program improved performance in both math and Hindi across multiple grade levels.[16]

Researchers conducted a randomized evaluation assessing whether reliable, high-quality interactive distance-learning classes improved learning outcomes among marginalized school children in rural Ghana. The program, called Making Ghanaian Girls Great (MGCubed), used solar panels, a satellite modem, projector, webcam, microphones, and other technologies to transmit mathematics and English instruction by well-trained instructors in real-time. The program also trained school-based facilitators to manage classrooms and contribute to the instruction in case the technology failed. After two years, the program significantly improved students' numeracy skills, foundational and pre-reading skills, and word-naming fluency.[17]

In Kenya, researchers conducted a randomized evaluation testing the impacts of providing tablets to instructional supervisors and teachers and providing e-readers to students on learning outcomes. Teachers were trained for ten days on how to use the tablets, and the content and tools were designed to supplement the Kenyan curriculum.[18] All three interventions, which were part of the PRIMR initiative, led to significant improvements in English and Swahili literacy assessments, specifically in oral reading fluency.[19] The use of tablets for instructional supervisors and teachers is being scaled up across Kenya through the Tusome literacy program.[20]

The eLearn program implemented through the government of Punjab, Pakistan created short videos that corresponded to the official curriculum in 8th-grade math and science. Teachers in treatment schools received tablets with these videos pre-loaded and training on how to use them to augment, not replace, their existing teaching practices. In each classroom, LED screens were installed in the front of the classroom to display these videos. After only four months, the program significantly increased student math and science achievement.[21]

Yet not all ICT programs have been effective. For example, in Peru, 40,000 laptops were distributed to about 500 schools in the country's poorest regions as part of the One Laptop per Child (OLPC) program. After 15 months, those who received the program showed no improvement in math or language test scores, but some positive effects were found in their cognitive skills. There was also no effect on the motivation of students to attend school and do homework as compared to students in other schools.[22]

Similarly, in Colombia, the *Computadores para Educar* program aimed to not only increase computer units in schools but also train teachers on how to use the technology in teaching specific subjects, particularly Spanish. Teachers underwent a 20-month training program. However, the program did not improve students' math and Spanish test scores. There was no effect on other academic outcomes, such as on the hours of study, students' perception of school, and their relationships with peers.[23]
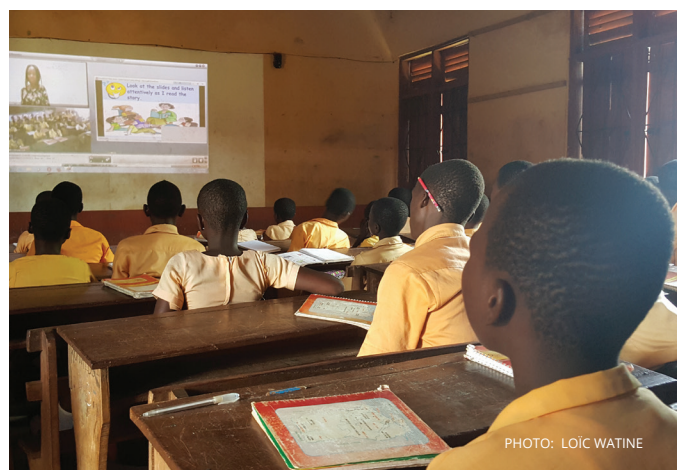

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The findings suggest that while ICT has the potential to improve instructional quality, it is not a solution in and of itself and runs the risk of being a waste of resources if it fails to be incorporated into existing educational processes and curricula or is not accompanied by sufficient teacher training and support.

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Targeting instruction to students' achievement levels has been shown to improve learning for low-performing pupils.

According to a narrative review of randomized evaluations of interventions designed to increase attendance and/or learning, pedagogical interventions that match teaching to students' learning levels are effective at improving learning.[24] Targeting instruction to a student's initial level of preparedness increases test scores and both higher and lower levels of initial preparedness.

Evidence from Kenya, Ghana, and India also supports tailoring instruction to students' level, rather than to the curriculum, as a way to improve learning outcomes.
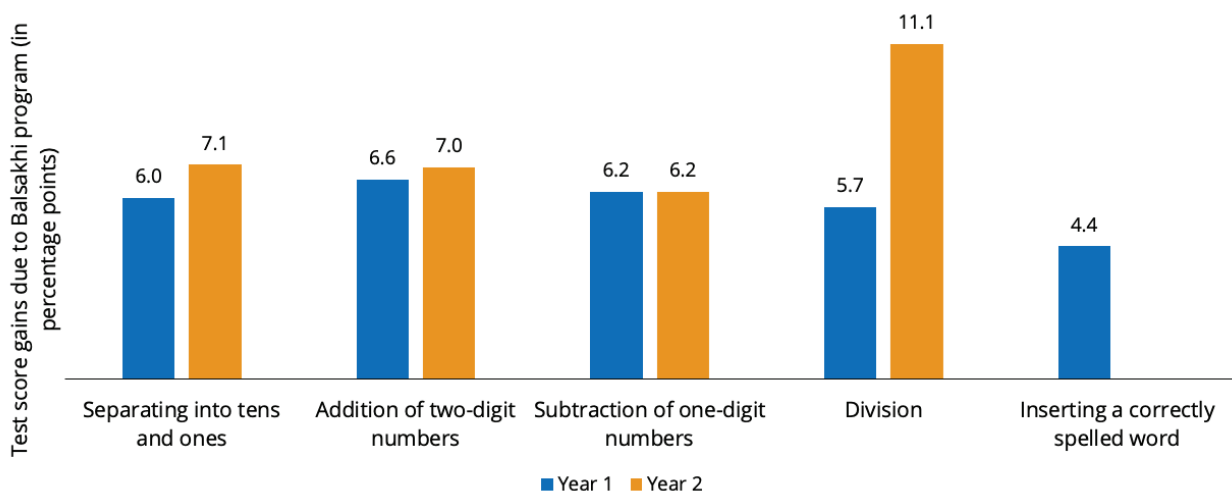
Balsakhi Program Substantially Improved Learning Levels

Test score gains due to Balsakhi program (in percentage points)

Category	Year 1	Year 2
Separating into tens and ones	6.0	7.1
Addition of two-digit numbers	6.6	7.0
Subtraction of one-digit numbers	6.2	6.2
Division	5.7	11.1
Inserting a correctly spelled word	4.4	

In India, for example, results from multiple evaluations, beginning as early as 2001, show that programs that teach at the level of the child are consistently effective in raising student test scores. In one of these landmark studies, researchers worked with the education NGO, Pratham, to evaluate the Balsakhi Program, a remedial education intervention in which a tutor met with small groups of children every day who were falling behind their peers to work on basic numeracy and literacy skills. The program had substantial positive impacts on children's academic achievement.[25]

In India, researchers evaluated efforts to scale up Pratham's approach to teaching children according to their learning level in the government school system in four Indian states. In the first two instances (Bihar and Uttarakhand), the targeted instruction methodology was not adopted by government schoolteachers, despite training sessions and Pratham support. Researchers adapted the evaluation in Haryana and Uttar Pradesh to include improved monitoring support and "learning camps" that took place during school hours, with additional 10-day summer camps. Both models proved effective, with increases in language test scores for students enrolled in these schools.

These two models provide blueprints that can be replicated in other government systems and contexts.[26]

In Kenya, tracking students by prior achievement raised scores for all students, even those assigned to lower-achieving peers. On average, after 18 months, test scores were 0.14 standard deviations higher in tracking schools than in non-tracking schools.[27]

In Ghana, a nationwide evaluation across 500 schools found significant improvements in numeracy and literacy on average, with regional variations highlighting the importance of implementation quality. The Ghana evaluation tested four different variations of the program: in-school remedial lessons with an assistant, after-school remedial lessons with an assistant, in-school curriculum level lessons with an assistant, and teacher-led targeted instruction during school. When considering results from oral tests, all program variations performed approximately equally well and better than the comparison group. The in-school and after-school remedial lessons delivered by teacher community assistants had the most consistent positive impact on pupil achievement, including on tests that involved harder, written content.[28]

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