REVIEW

The Challenge of Education and Learning in the Developing World

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Across many different contexts, randomized evaluations find that school participation is sensitive to costs: Reducing out-of-pocket costs, merit scholarships, and conditional cash transfers all increase schooling. Addressing child health and providing information on how earnings rise with education can increase schooling even more cost-effectively. However, among those in school, test scores are remarkably low and unresponsive to more-of-the-same inputs, such as hiring additional teachers, buying more textbooks, or providing flexible grants. In contrast, pedagogical reforms that match teaching to students' learning levels are highly cost effective at increasing learning, as are reforms that improve accountability and incentives, such as local hiring of teachers on short-term contracts. Technology could potentially improve pedagogy and accountability. Improving pre- and postprimary education are major future challenges.

Over the past two decades, a new wave of randomized evaluations has examined how developing countries can help (i) children who are not in school gain access to education and (ii) those in school improve their often abysmal learning levels. Randomized evaluations can help disentangle the causal impact of programs from mere correlations, but there has been debate about the extent to which results will generalize across different contexts. We review the evidence on program impact and present a new cost-effectiveness analysis. In most cases, we find a remarkable degree of consistency between the impacts of similar programs across different geographic areas. However, the impact of programs designed to improve teacher performance and school accountability seems more context-dependent and sensitive to small differences in program design.

Broadening Access to Education

Randomized evaluations consistently find that making school more financially attractive can increase school participation (*1*). Conditional cash transfer (CCT) programs provide financial support to poor mothers if their children obtain basic medical care and attend school regularly. Mexico's initial CCT program (PROGRESA) in 1998 increased girls' transition rate from elementary to junior secondary school by 14.8 percentage points and boys' by 6.5 percentage points (*2*). After the success of PROGRESA, more than 30 countries established similar programs. Many of these have been subject to randomized evaluations, yielding similar results (*3*).

Most CCT programs involve financial transfers that constitute a large fraction of income for poor households, but three studies show that even small transfers can have large effects. In Malawi, a monthly $5 CCT was as effective as one of $10 (*4*). In Kenya, providing a free school uniform (costing less than $8) reduced dropout rates among girls by 3.1% from a base of 18.8% (*5*).

The finding that small short-run costs can substantially influence life decisions with important long-run consequences is consistent with insights from behavioral economics (*6*). Behavioral economics also explains why matching the timing of payments under CCTs to the timing of school fees can raise the cost-effectiveness of these programs (*7*). Merit scholarship programs can simultaneously increase access to schooling and stimulate learning by motivating students to work harder, do more homework, and attend school more often (*8*).

In some regions of the world, gender gaps in enrollment are large. The studies cited above find substantial effects of financial incentives on girls' school participation. Despite much discussion, there is limited rigorous evidence on whether latrines increase girls' school attendance by allowing them to manage menstruation. A randomized trial in Nepal found no impact of providing sanitary products on school participation (*9*).

Beyond price, distance to school is also important for school participation, especially if social norms or safety concerns make it difficult for girls to travel far from home. In Afghanistan, a program that encouraged communities to donate space in existing buildings to establish local schools increased enrollment of girls by 42 percentage points. Girls' primary school enrollment fell 19 percentage points and boys' 14 percentage points per additional mile to school (*10*).

Two approaches to increasing school participation are particularly cost-effective (*11*). School-based deworming cut student absenteeism by a quarter in a study in western Kenya (*12*), and students in neighboring schools also attended more because the intervention interrupted the disease transmission cycle. One hundred dollars invested in mass school-based deworming would generate 14 additional years of schooling. Follow-up results from Kenya, as well as nonrandomized evidence from deworming in the U.S. South, suggests that deworming generates large, long-run educational and income benefits (*13*, *14*). Studies in the Dominican Republic and Madagascar found that simply informing those who underestimate the correlation between education and earnings about how average earnings vary with education can increase school participation at very low cost (*15*, *16*).

Education Quality

Although the quantity of schooling has expanded rapidly, quality is often abysmal. In India, 31% of children in third grade could not recognize simple words (*17*). Nineteen percent of teachers were found absent in unannounced visits to a sample of schools in six countries (*18*).

Figure 1 presents new work comparing the cost-effectiveness of 30 primary school programs in raising test scores subject to randomized evaluation where study authors have made detailed cost information available. These comparisons should be considered as one input among others in assessing policy, especially because some approaches may create benefits beyond test scores and because a standard deviation of test scores may have different meanings in different contexts. Some interventions may be more applicable than others in two particular lotteries (*11*) (further comparisons, as well as the underlying calculations, will be made available at www.povertyactionlab.org/policy-lessons/education/student-learning). The left panel shows the estimated impacts measured in standard deviations (SDs) and the 90% confidence intervals. The right panel shows (on a log scale) how many SDs of test-score improvement could be gained from an investment of $100. In some cases, costs would likely fall if programs were implemented at scale, but for consistency we show costs from the study. We show effects over different time horizons where examined.

Many programs that increased quantity of education also promoted learning. For example, the program in Afghanistan raised scores dramatically (*10*), deworming increased Kenyan girls' passing rate on primary-school exams by 25% (*13*), and the Madagascar program increased test scores by 118 SDs for every $100 spent (*16*).

Despite very low levels of resources, providing more-of-the-same educational inputs without changing pedagogy or accountability typically has very limited impacts on test scores. For example,

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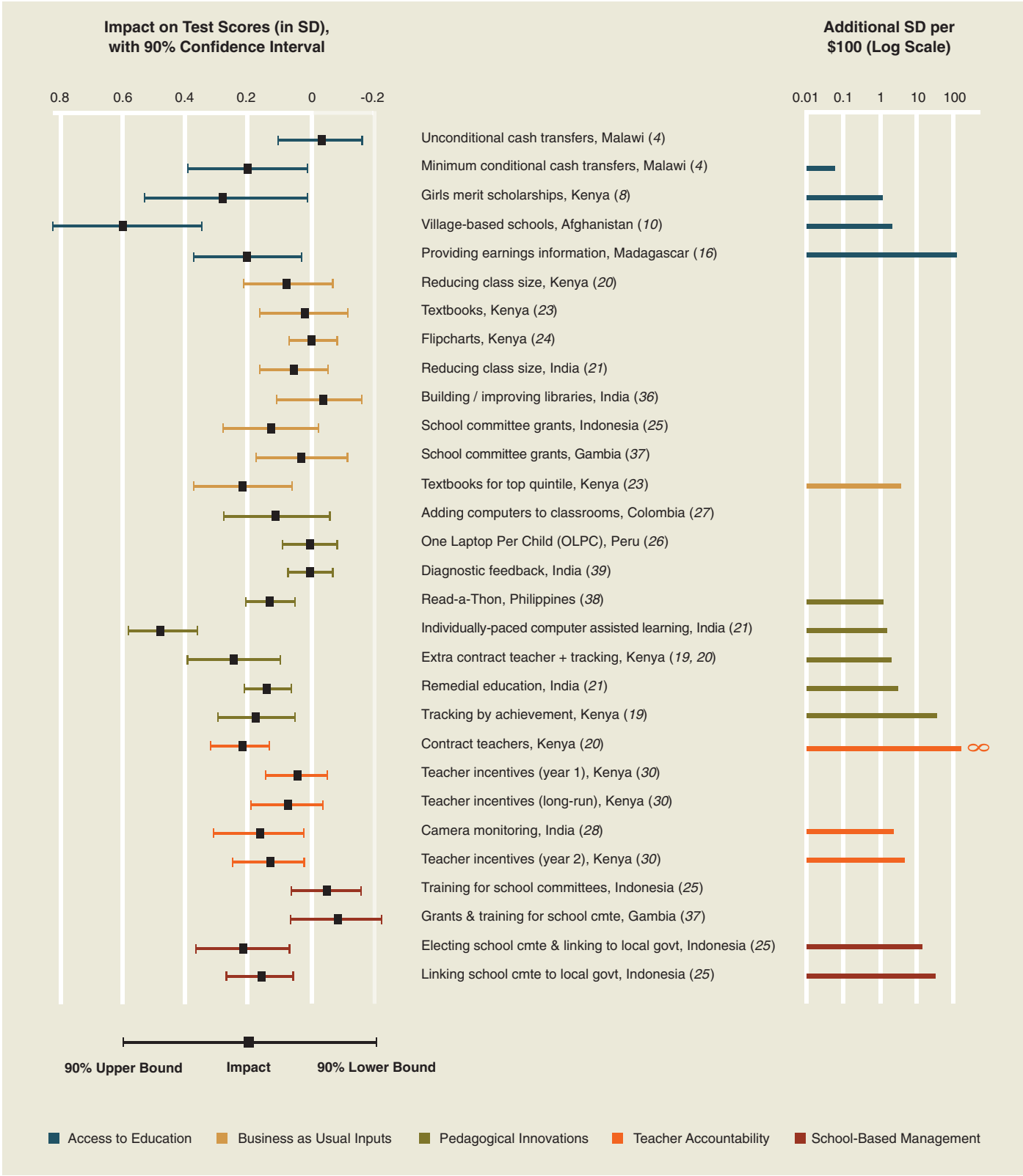

Fig. 1. Impacts on test scores from randomized trials of primary school programs in the developing world. Results drawn from 18 randomized studies that report test-score outcomes. The charts also rely on detailed cost data provided by the authors of these studies and discussions with them about the most appropriate way to calculate cost effectiveness. The underlying data and calculations are available at www.povertyactionlab.org/policy-lessons/education/student-learning.

when a Kenyan program brought in local teachers, roughly halving class size (from a base of 80) test scores did not improve significantly for students remaining with the government teacher (*19*, *20*). A study in two Indian states found similar results (*21*). In contrast, a U.S. randomized evaluation found reducing class sizes improved test scores (*22*). One hypothesis is that extra resources have more impact when school accountability is stronger.

Evidence on nonteacher inputs is also discouraging. Neither providing additional textbooks nor supplying instructional flip charts increased test scores in Kenya (*23*, *24*). Providing grants to local school committees to support their schools did not improve test scores in Indonesia (*25*).

Some input studies provide clues to why test scores did not increase. Although provision of government-sanctioned textbooks in Kenya had no impact on the average student, it did improve learning for those that started the year with higher learning levels (*23*). This result suggests that the textbooks were tailored to the best performing children. This study led to a series of randomized evaluations examining the effectiveness of adjusting curricula to the child's level.

In many developing countries, educational systems and curricula focus on children with the highest learning levels. Several different pedagogical strategies designed to match the level of instruction to the child's level proved cost-effective at improving learning. A remedial education program in India generated a 3.01-SD test-score gain per $100 spent (*21*). A Kenyan program hired extra teachers, divided grade 1 classes into two, and compared learning when students were assigned to classes on the basis of initial preparedness or random assignment. Tracking by initial level of preparedness increased test scores at both higher and lower levels of initial preparedness. Technology can be used to tailor learning to a student: A computer-assisted learning (CAL) program in India, which used math software that allowed children to learn at their own pace, increased scores by 0.48 SD (*21*), or 1.54 SD per $100 spent. But there were no significant test-score gains in Peru from the One Laptop Per Child program or a Colombian CAL program (*26*, *27*), potentially because the programs did not tailor instruction to each student's level of knowledge and because the computers in Colombia were not tied to the curriculum and therefore not widely used.

Evidence from India suggests that incentivizing teacher presence in class can improve test scores (*28*). However, the effectiveness of several approaches to improving teacher incentives seems to differ across studies. Tying teacher pay to student test scores improved learning in India (*29*), but in Kenya teachers responded primarily by teaching to the test (*30*). Some argue that informing parents about school conditions can lead them to demand better services from public schools. An evaluation of this approach in India found no impact (*31*). In contrast, a program in Pakistan found providing parents with information on both public and private (nonelite) schools caused low-performing schools to improve their performance and higher-performing private schools to reduce their fees (*32*). An important topic for future work is whether these contrasting results are due to differences in the details of the program or differences in context.

Programs that go further in empowering, rather than just informing, local communities seem more successful. Introducing local school committees does not in itself seem to improve performance, nor does training these committees (*25*) or informing members of their duties and levers for improving quality (*31*). However, giving school committees more formal links to government and making them more representative through elections did improve test scores in Indonesia (*25*).

Studies in both Kenya and India found test-score gains from supplementing civil-service teachers with locally hired teachers hired on short-term contracts (*20*, *21*). The Kenya study suggests that if the government planned on hiring enough teachers to have a class size of 40 students in first grade, initially hiring teachers locally on short-term contracts at about one-fourth the salary, would in theory be infinitely cost-effective: It would improve learning while reducing costs relative to the current system. Another study in Kenya highlighted the pressures governments may face to turn locally hired contract teachers into civil servants—a move that can undermine their effectiveness (*33*).

A more radical step would be to provide parents with vouchers and allow them to choose private schools for their children. A program in Colombia that combined elements of vouchers and merit scholarships (vouchers were contingent on grade completion) led to higher rates of secondary school completion (*34*). More evidence from other developing country contexts would be very useful. Evidence on the overall test-score impact of vouchers in the United States is mixed, but there is at least some evidence that disadvantaged African-American populations gain (*35*). One hypothesis is that these programs have a bigger impact where governance problems in public schools are more severe.

We have learned a great deal about how to help those children who are not in school obtain access to schooling, and a number of general themes have emerged from research on how to ensure children in primary school are learning. Providing additional inputs without changing pedagogy or governance has had limited impact, whereas adapting teaching methods to reach the varied learning levels in developing countries is highly effective. There are three major challenges for education in developing countries, including using technology to improve pedagogy and school accountability, cost-effectively improving education access and quality outside primary school, and understanding the role of private education. In all of these areas, it will be important to study long-term impacts on learning, noncognitive skills, labor market outcomes, health and family outcomes, and civic attitudes and behavior. We have much more to learn.

Grand Challenges

Use technology to improve pedagogy, management, and accountability. Most developing-country classrooms contain a dramatic range of learning levels. Programs that seek to tailor teaching to children's learning level have proved effective, and educational technology that tailors instruction to students' knowledge levels could play an important role. In addition, monitoring technologies could help improve accountability and facilitate better incentives in education systems where one in five teachers is absent.

Improve access to, and the quality of pre- and postprimary education. Substantial evidence exists on how to increase the quantity and quality of education in primary schools. But much more research is needed at other education levels. There is intriguing evidence that preprimary and early childhood programs could be highly effective in improving learning, but we need to know more. Secondary, vocational, and tertiary schooling are also important areas for research because of the rapid rise in attendance, high costs, concerns about curricular relevance, and the patchy state of current knowledge.

Develop appropriate policies for regulating and supporting the private sector in education. In large part because of the poor quality of government-run education, private schools are increasingly common, even for the poor. But many of these schools are of low quality, and we know little about how to improve their performance or the potential role of government in supporting and regulating them.

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REVIEW

Understanding Neurocognitive Developmental Disorders Can Improve Education for All

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Specific learning disabilities (SLDs) are estimated to affect up to 10% of the population, and they co-occur far more often than would be expected, given their prevalences. We need to understand the complex etiology of SLDs and their co-occurrences in order to underpin the training of teachers, school psychologists, and clinicians, so that they can reliably recognize SLDs and optimize the learning contexts for individual learners.

In the not-too-distant past, children who were unable to learn the usual school subjects to a normal level were classified as having mental retardation, or what we would now call "intellectual disability" (U.S.) or "learning disability" (UK). These labels are still sometimes applied to children with severe delays in learning to read and spell, whom we would now call dyslexic, or those with serious social difficulties, whom we would now call autistic (*1*).

Extensive research in cognitive development shows that children with normal or even superior IQs, and who clearly are not mentally retarded, can fail to reach acceptable standards in key curriculum areas, such as literacy (*2*) and numeracy (*3*). The terms intellectual or learning disability are currently reserved for those whose score on an IQ test is below 70 (the lowest 2%, approximately).

The evidence outlined in this Review presents multiple reasons why it is difficult to define neurocognitive developmental disorders. Complex genetic, brain, and cognitive processes underlying these conditions remain poorly understood.

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