Improving Education in the Developing World: Evidence from Randomized Evaluations

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Brookings

ADDRESSING THE GLOBAL LEARNING CRISIS: LESSONS FROM RESEARCH ON WHAT WORKS IN EDUCATION

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Outline

- Broadening access to education
  - Background
  - Prices, user fees, subsidies, and incentive payments
  - School health
  - Information

- Learning for All
  - Background
  - Increasing existing inputs
  - Inputs to correct systems distortions
  - Provider incentives
  - Decentralization, community monitoring, local control
  - Vouchers

- Impact on longer-run outcomes
Access to Education

- Average years of education in low-income countries
  - 1960: 1.6 years
  - 2000: 5.2 years

- 100 million primary-school age children (15%) out of school
  - 30 million in South Asia
  - 40 million in Sub-Saharan Africa
Strategies for increasing access

- Reducing costs, subsidizing education, and merit scholarships
- School health
- Information on returns to education
- Improving school quality
COST-EFFECTIVENESS: ADDITIONAL YEARS OF EDUCATION PER $100 SPENT

AFRICA

1. INFORMATION ON RETURNS TO EDUCATION, FOR PARENTS (MADAGASCAR)
2. DEWORMING THROUGH PRIMARY SCHOOLS (KENYA)
3. FREE PRIMARY SCHOOL UNIFORMS (KENYA)
4. MERIT SCHOLARSHIPS FOR GIRLS (KENYA)

SOUTH ASIA

5. IRON FORTIFICATION AND DEWORMING IN PRE-SCHOOLS (INDIA)
6. CAMERA MONITORING OF TEACHERS’ ATTENDANCE (INDIA)
7. COMPUTER-ACCREDITED LEARNING CURRICULUM (INDIA)
8. REMEDIAL TUTORING BY COMMUNITY VOLUNTEERS (INDIA)
9. MENSTRUAL CURVE FOR TEENAGE GIRLS (NEPAL)

LATIN AMERICA

10. INFORMATION ON RETURNS TO EDUCATION, FOR BOYS (DOMINICAN REPUBLIC)
11. PROGRESA CCT FOR PRIMARY SCHOOL ATTENDANCE (MEXICO)

PROGRAM ACHIEVES MULTIPLE OUTCOMES

World Poverty Action Lab (J-PAL)
www.povertyactionlab.org
**COST-EFFECTIVENESS:** ADDITIONAL YEARS OF EDUCATION PER $100 SPENT

<table>
<thead>
<tr>
<th>Program</th>
<th>Years of Education</th>
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<tbody>
<tr>
<td>Information on returns to education, for parents (Madagascar)</td>
<td>19.5 yrs</td>
</tr>
<tr>
<td>Deworming through primary schools (Kenya)</td>
<td>14.0 yrs</td>
</tr>
<tr>
<td>Free primary school uniforms (Kenya)</td>
<td>0.71 yrs</td>
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<tr>
<td>Merit scholarships for girls (Kenya)</td>
<td>0.27 yrs</td>
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PROGRAM ACHIEVES MULTIPLE OUTCOMES
Learning: Background

- Very low scores on international tests
  - Average science score in Peru equivalent to lowest scoring 5% in US on PISA

- 36% of 6th graders in India unable to answer: India (Lockheed and Verspoor, 1991), Bangladesh (Greany, Khandker and Alam, 1999)

The dog is black with a white spot on his back and one white leg.

The color of the dog is mostly: (a) black, (b) brown, or (c) grey
Education systems

- Typically centralized curriculum, testing, hiring,

- Elite orientation

- Spending per student low as fraction of GDP

- Budgets overwhelmingly on teachers
  - Salaries an average of 3.7x GDP/capita (UNESCO, 2005)
  - Account for $\frac{3}{4}$ of education budgets (Bruns et al, 2003) $\rightarrow$ high pupil-teacher ratios.
Provider incentives

- Government providers have weak incentives [Chaudhary et al. 2006]
  - 19% of teachers absent from school in 6 country absence survey
  - In India, 25% absent from school; only half teaching
Spending: Reducing pupil-teacher ratios

- **Extra Teacher Program in Kenya** (Duflo, Dupas, and Kremer, 2007)
  - Gave school committees funds to hire local contract teacher for grades 1 & 2
  - Brought class size down to 46 from 84
  - No test score impact for students assigned to civil service teachers in treatment schools

- **Balsakhi Program in urban India** (Banerjee, Cole, Duflo, and Linden, 2007)
  - Trained woman from community tutors 15-20 lowest performing students outside classroom for 2 hours/day
  - Remaining students have lower pupil-teacher ratio but no test score gains relative to comparison classrooms

- **Extra teacher program in non-formal schools in rural India** (Banerjee, Jacob, Kremer, Lanjouw, and Lanjouw, 2005)
  - No impact on test scores

- **Influx of students after free uniform provision in Kenya** ((Kremer, Moulin, and Namunyu, 2003)
  - Treatment schools receive 9 additional students (base class size: 27)
  - No impact on test scores
Non-teacher inputs

- Provision of official government textbooks in rural Kenya (Glewwe, Kremer, and Moulin, 2009); (Lockheed and Hanushek, 1988)
  - No impact on test scores for typical student
  - No impact on dropout or repetition

- No impact of flipcharts presenting material from government curriculum (Glewwe, Kremer, Moulin, and Zitzewitz, 2004)
System distortions undermine impact of spending

- **Extra Teacher Program in Kenya (Duflo, Dupas, and Kremer, 2007)**
  - Contract teachers reduced likelihood that civil service teachers in class and teaching by 12.9 percentage points (base: 58.2%)

- **Textbooks (Glewwe, Kremer, and Moulin, 2009); (Lockheed and Hanushek, 1988)**
  - Pupils in top 2 quintiles in pre-test score 0.14 - 0.22 SD higher
  - Higher transition rate to secondary school
  - Typical student can’t effectively use textbooks
Working around system distortions

- Inputs that allow shifts in pedagogy to adapt to weak teacher incentives and to match teaching to students’ level

- Technology-assisted learning
  - Radio mathematics in Nicaragua (Jamison, Stearle, Galda and Heyneman, 1981)
    - 1.5 SD increase in math scores after 1 year from radio instruction
    - 1/3 SD increase for supplemental workbooks
  - Computers with math games in India (Banerjee, Cole, Duflo, and Linden, 2007)
    - 0.47 SD increase in math test scores after 2 years
    - Gains of 0.10 SD persist one year after program end
  - Electronic machine or flash cards to teach English in India
    - 0.3 SD increase in English test scores
Working around system distortions

- Remedial education (Banerjee, Cole, Duflo, and Linden, 2007)
  - 2 interventions in India show that training community members with 10-12th grade education to provide remedial education can be very effective
  - Reading intervention in rural India (Banerjee, Banerji, Duflo, Glennerster, and Khemani, 2008)

- Tracking in Kenyan ETP program (Duflo, Dupas, and Kremer, 2011)
  - 0.14 SD test score gains for both high and low achieving students
  - Civil service teachers in tracked schools 11.2 percentage points more likely to be in class teaching than in untracked schools
Provider incentives:
Attendance bonus

- Informal schools in India
  - Cameras for teachers to take pictures with students w/ time-date stamps (Duflo, Hanna, and Ryan, 2007)
  - Pay based on presence documented in photos
- Impact
  - 21 percentage point decrease in teacher absence rate (base: 44%)
  - No effect on activity while in school
  - 0.17 SD increase in test scores after 1 year
  - 10 percentage point increase in graduation rate to mainstream primary schools (base: 16%)
Provider incentives:
Attendance bonus (cont’d)

- Preschools in Kenya (Kremer and Chen, 2001)
  - Bonuses paid for presence
  - Headmasters gave bonuses regardless of presence
  - No impact on teacher attendance

- Nurse compensation in rural India (Banerjee, Duflo, and Glennerster, 2008)
  - Time and date stamp machines for attendance; no recording if machine broken
  - First 6 months: ANM presence T group = 60% (C: 30%)
  - After 15 months: ANM presence in T group = 25% (C: 35%)
Provider incentives:
Linking teacher pay to student test scores (Kenya) (Glewwe, Ilias, and Kremer, 2003)

- Bonus of 21-43% of monthly salary for top scoring or most improved schools on annual district exams
- Increase in test-taking but no impact on dropout, repetition, or graduation
- 0.14 SD gain on incentivized tests during program; gains don’t persist
- No improvement on non-incentivized test w/ different format
- No effect on teacher absence
- Increase in test-preparation sessions outside of school hours
- Evidence of improved test-taking techniques
- Teacher seems focused on short-term signaling rather than long-run learning
Provider incentives:
Linking teacher pay to student test scores (India)
(Muralidharan and Sundararaman, 2010)

- Paid for every percentage point increase in test scores (10 percentage points ≈ 30% of monthly salary)
- 0.22 SD test score increase over 2 years
- No change in teacher absence or activity in classroom
- 38 percentage point increase in test preps (base: 25%)

Evidence on long-term learning
- Equal gains on questions w/ unfamiliar format
- Program effect increases
- Bigger gains with individual than school-wide incentives
Community monitoring:
Extra Teacher Program in Kenya
(Duflo, Dupas, and Kremer, 2009)

- Randomly selected school committees receive training to monitor contract teacher

- No impact on absence of contract teacher

- Civil service teachers 7.3 percentage points more likely to be in class teaching relative to unmonitored program schools

- Students with monitored civil service teachers relative to program counterparts without monitoring
  - Attendance 2.8 percentage points higher (base: 86.1)
  - Score 0.18 SD higher in math
Information to parents in Pakistan

- Information on child, school (Das et al. 2010)
  - Increased learning achievement 0.1 to 0.15 s.d. in government schools and low-quality private schools
  - Reduced fees at higher-quality private schools by 21 percent
Community monitoring:
Other cases

- **Interventions in rural communities in India** (Banerjee, Banerji, Duflo, Glennerster, and Khemani, 2008)
  - Meetings on school conditions
  - Meetings plus community participation in student testing
  - High household participation but no impact on
    - performance of village education committees
    - school involvement/knowledge of parents
    - teacher absence

- **School committees evaluate teachers and give prizes in Kenya** (de Laat, Kremer, and Vermeersch, 2008)
  - No change in teacher absence
  - Little systematic and significant evidence of changes in pedagogy, student attendance, test scores
  - More educated and older people become committee members over program duration

- **Para-worker in rural Rajasthan to check presence of providers** (Banerjee, Deaton, and Duflo, 2003)
  - Prevailing rate: 44%
  - No external punishment for provider but potential social pressure
  - No effect of para-worker
Local hiring

- Contract teachers in Extra Teacher Program in Kenya (Duflo, Dupas, and Kremer, 2007)
  - Same qualifications as regular teachers, paid 1/4 as much
  - 16 percentage points more likely to be in class teaching than civil service teachers in comparison schools (base: 58.2%)
  - 29.1 percentage points more likely than civil service teachers in program schools
  - Students’ performance relative to those assigned to civil service teachers in program schools
    - Scored 0.23 SD higher
    - Attended 1.7 percentage points more often (base: 86.1%)

- India (Muralidharan and Sundararaman, 2010)
  - Contract teachers much less qualified than civil service teachers
  - 10.8 percentage points less likely to be absent (base: 26.8%)
  - 8.4 percentage points more likely to be engaged in teaching (base: 39%)
  - 0.12 SD increase in student test scores
  - Civil service teachers in schools w/ contract teachers increase absence by 2.4 percentage points and decreased teaching by 3.2 percentage points
School vouchers

- Colombia PACES program
  - Demand for vouchers exceeded supply → lottery
  - Allowed to attend private schools
  - Renewable conditional on satisfactory performance

- Impact
  - Short-run (Angrist, Bettinger, Bloom, King, Kremer, 2002)
    - Lottery winners complete 0.12 -0.16 more years of schooling from base of 7.5 yrs, scored 0.2 SD higher on standardized tests, worked 1.2 fewer labor hours/week from base of 4.9
  - Medium-run (Angrist, Bettinger, Kremer, 2006)
    - Winners were 5-7% more likely to graduate high school, on a base of 25-30%; higher test scores
  - Strong impacts for applicants to vocational schools, despite weak peers
Impact over time

- School-Based Deworming (Baird, Hamory, Kremer, and Miguel, 2011) one decade on
  - 0.1 more meals per day
  - Work 3 more hours per week (if not still in school)
  - 20% plus increase in earnings for wage earners, sectoral shifts

- Columbia voucher program seems to lead to significant wage increases.
Social and political impact

- Reduced cost of education for girls/conditional cash transfers
  - reduced teen child bearing, STI risk
- Merit scholarship for girls (Friedman, Kremer, Miguel, Thornton, 2011)
  - reduction in arranged marriages
  - reduced acceptance of husband’s right to beat wife and children
  - Lower political satisfaction, less willingness to accept authority
Implications

- **Expanding Access**
  - Eliminating fees, providing subsidies can expand access
    - Spillover effects
    - Impact of program design – timing of payment, merit scholarship component
  - School-health programs and provision of information on earnings extremely cost effective

- **Improving Learning**
  - Limited impact of increases in existing inputs; evidence due in part to systems distortions (teacher incentives, curricula)
  - Changes in pedagogy to work around these distortions (technology-assisted learning, remedial education, tracking) dramatically improve learning at low cost
  - Students learn more when teachers given incentives to attend
  - Mixed evidence on merit pay tied to students’ test scores, providing information to communities
  - Locally hired contract teachers: much cheaper, absent less, and students learn more
  - School voucher program effective in Colombia

- Huge adult impact of successful programs
Areas Where More Work Needed

- ECD, secondary education, vocational education, tertiary education
- Pedagogy
- Long-term impact on learning, wages, health and social outcomes
- System-wide effects
- Political economy
END
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- Education and opportunity
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    - Prices, user fees, subsidies, and incentive payments
    - Information
    - Complementary inputs
  - Learning for All
    - Background
    - Increasing existing inputs
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    - Vouchers
Policy Lessons

- Elimination of fees for basic education highly desirable
- School preparedness for young children: ECD with locally hired teachers
- Incentives designed to address behavioral issues
- Investigation of ECD, curricula reform, teacher monitoring
Alternates
Newspaper readership, political knowledge

- Reduced satisfaction with economic and political situation in Kenya
- No increase in support for democracy, increased willingness to accept violence in politics.
Decentralization

- Pitfalls of mismatches between authority and responsibility under partial decentralization

- Kenyan Harambee system
  - Local school committees pay for construction, central government pays teacher salaries
  - Incentives for local school committees to build many small schools and set fees and requirements higher than what median parent could afford

- Influx of students following provision of free uniforms
  - Median parents prefers combination of lower-costs, more non-teacher inputs, and much higher PTRs

- Multiparty democracy
  - Move towards preferences of median parent
  - Abolition of school fees and surges in enrollment
Education and opportunity

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Health education

- HIV/AIDS education and teen childbearing
  - No impact of teacher training with government HIV/AIDS curriculum
  - 65% reduction in childbearing with older men after NGO provided info on risks of cross-generational sex (“Sugar daddies”)

- Deworming
  - No effect of health education on wearing shoes, clean hands, exposure to fresh water/swimming in fresh water
  - Knowing treated pupils reduces take up
Progress in Education

- Average years of education in low-income countries
  - 1960: 1.6 years
  - 2000: 5.2 years

- 85% of world’s primary-school age children in school
  - 100 million remain: 40 million in Sub-Saharan Africa; 30 million in South Asia
  - Most have school nearby
Fees in education:
Free uniforms in Kenya

- De facto requirement for school – cost $6

- 3 separate programs of free uniform provision
  - Reduced dropout rate by 14-17% for 6th grade girls.
    - Teen childbearing rate down by 1.5 percentage points from base of 15%
  - Reduced absence rate by 13 percentage points (64%) for younger students with no uniform originally
  - Induced 0.5 more years of education over primary school
Subsidies:
Conditional cash transfers: PROGRESA in Mexico

- Cash transfers (1/4 of household income) conditional on school attendance and preventive health behaviors
- Premia for older children and girls

Results
- 11.1 percentage point increase in transition rate to junior secondary school from base of 58%
- Attendance spillovers to ineligibles
Subsidies:
Conditional cash transfers: Bogota, Colombia

- Program variants
  - Part of monthly payment withheld and saved until time to pay school fees following year
  - Increased current attendance by 2.8 percentage points from base of 79.4%, like basic CCT
  - *And* increased secondary and tertiary school enrollment by 3.6 percentage points (base: 69.8) and 8.8 percentage points (base: 22.7%) following year, *unlike* basic CCT
  - Negative spillovers to untreated within the home in a Colombian CCT program, positive to treated friends
    - Evidence of positive spillovers consistent with a model in which children choose between schooling and social activity with peers.
Incentive payments

- **Merit scholarships for 6th grade girls in top 15% on govt exams in western Kenya**
  - Girls eligible to compete score 0.19 SD higher
  - Teacher absence lower by 4.8 percentage points (base: 16%)
  - Some evidence of lower student absence and benefits to ineligibles (boys and initially weaker performing girls)
  - Impact on political and social attitudes

- **Graduation/matriculation treatment in Colombia CCT program**
  - Forced savings treatment + transfer ≈ 73% of first year tuition in voc school
  - 5 percentage points higher contemporaneous secondary school attendance (base: 79.3%)
  - 49.7 percentage points higher enrollment in tertiary institution in subsequent year (base: 19.3%)
Information on returns to education

- **Returns to education**
  - Providing information about primary-secondary school earnings difference to 8\textsuperscript{th} grade boys in Dominican Republic
    - Increased enrollment in secondary school next year by 17\% (base: 30\%)
    - Increased educational attainment 4 years later by 0.20 years (base: 9.66 yrs)
  - 4\textsuperscript{th} graders in Madagascar
    - 0.20 SD increase in test scores
School-based health programs

- School-based mass deworming treatment in Kenyan primary schools
  - Reduced infection rates by 25 percentage points (base: 52%)
  - Reduced absence by 7 percentage points (base: 30%)
  - Health and education externalities to non-treated students, nearby schools
  - Cost per additional year of schooling = $3.50; benefit/cost ratio

Graphs showing cost per extra year of education induced with comparisons between India, Kenya, and Mexico.
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Education and Opportunity

- Indonesian school construction
  - Decent returns
  - No magic spillover