Policy Research Working Paper 8752

Equivalent Years of Schooling

A Metric to Communicate Learning Gains in Concrete Terms

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WORLD BANK GROUP
Africa Region
Office of the Chief Economist
&
World Development Report 2018 Team
February 2019

Policy Research Working Paper 8752

Abstract

In the past decade, hundreds of impact evaluation studies have measured the learning outcomes of education interventions in developing countries. The impact magnitudes are often reported in terms of "standard deviations," making them difficult to communicate to policy makers beyond education specialists. This paper proposes two approaches to demonstrate the effectiveness of learning interventions, one in "equivalent years of schooling" and another in the net present value of potential increased lifetime earnings. The results show that in a sample of low- and middle-income countries, one standard deviation gain in literacy skill is associated with between 4.7 and 6.8 additional years of schooling, depending on the estimation method. In other words, over the course of a business-as-usual school year, students learn between 0.15 and 0.21 standard deviation of literacy ability. Using that metric to translate the impact of interventions, a median structured pedagogy intervention increases learning by the equivalent of between 0.6 and 0.9 year of business-as-usual schooling. The results further show that even modest gains in standard deviations of learning—if sustained over time—may have sizeable impacts on individual earnings and poverty reduction, and that conversion into a non-education metric should help policy makers and non-specialists better understand the potential benefits of increased learning.

This paper is a product of the Office of the Chief Economist, Africa Region and the World Development Report 2018 Team. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/research. The authors may be contacted at devans2@worldbank.org and fyuan@g.harvard.edu.

Equivalent Years of Schooling:
A Metric to Communicate Learning Gains in Concrete Terms

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JEL Classification: O1, I25, I26

Keywords: Education, Impact evaluation, learning outcomes, measurement

[1] This study was prepared as a background paper for the World Bank's "World Development Report 2018: Learning to Realize Education's Promise," with support from the Bill and Melinda Gates Foundation. It benefitted from guidance from Rafael de Hoyos, Alex Eble, Deon Filmer, Michael Kremer, Owen Ozier, Lant Pritchett, Jonah Rockoff, Halsey Rogers, and participants at various seminars. David Evans (devans2@worldbank.org) is at the World Bank, and Fei Yuan (fyuan@g.harvard.edu) is at the Harvard Graduate School of Education.

1. Introduction

The past 25 years have witnessed an unprecedented educational expansion in developing countries. Most children in the world now have access to school. By 2015, enrollment in primary education in low-income countries reached 80 percent, compared to 42 percent in 1990 (World Bank 2017).[2] Children also stay in school longer. Average years of schooling among adults almost doubled, from 3.9 years in 1980 to 7.5 years in 2010 (Lee and Lee 2016). However, increased schooling does not automatically translate into better learning outcomes for all children. In many places in Africa, Latin American, and South Asia, students who have completed primary education still cannot read or add two-digit numbers (Majgaard and Mingat 2012; Dundar et al. 2014; Pritchett, Banerji, and Kenny 2013). Even in middle-income countries, students learn much less than their peers in rich countries (World Bank 2018). The Programme for International Student Assessment (PISA) 2015 survey shows that the 15-year-old top performers (above the 75th percentile) in mathematics in the Dominican Republic, Algeria, Kosovo and Tunisia scored lower than those at the 25th percentile of the OECD average (Figure 1) (OECD 2016). Other international assessments show similar trends (Mullis et al. 2016; PASEC 2015; Pizarro et al. 2016).

Governments are searching for more innovative and effective ways to improve learning. This not only translates into ongoing efforts to try new education interventions, but also increased use of experimental or quasi-experimental methods to measure the impacts of these interventions. By 2016, there were more than 350 impact evaluation studies with learning outcomes from low- and middle-income countries; in 2000, there were only about 32 (Evans and Popova 2016; World Bank 2018). Indeed, there is a wide range of possible education interventions, from providing school meals to students to offering cash transfers conditional on school attendance; from giving free learning materials to students to training teachers in new instructional techniques; from constructing new schools to strengthening school management; and from increasing parental engagement to promoting community-based monitoring. Recent syntheses seek to evaluate the relative impact of these types of interventions.[3]

This paper has two objectives. The first objective is to propose widely comprehensible metrics for reporting the impact of interventions that seek to improve learning. Education economists and specialists generally report the effectiveness of an intervention in term of "standard deviations," which may be difficult for non-specialists to understand. For the vast majority of the population, from a Minister of Finance to a rural parent, what does it mean that a new educational policy increases student learning by 0.2 standard deviation? Not much. In this paper, we use two alternative approaches to quantify the impact sizes of different interventions. The first approach is to compare gains to learning in business-as-usual schooling, as above. We call these equivalent years of schooling (EYOS), as in, "A given learning intervention delivers the equivalent of 1.5 years of 'business-as-usual' schooling" in terms of learning outcomes. The second approach is to put a dollar amount on increased learning by estimating the long-term labor market returns, an approach often adopted in the cost-effectiveness analysis of health

[2] This is net enrollment, which is the percentage of children who are of primary-school age that are enrolled in primary school. Gross enrollment – the number of children of any age that are enrolled in primary school divided by the number of children of primary-school age – rose from 61 percent to 103 percent over the same period. Net enrollment numbers extend back to 1999, so previous years are a simple extrapolation relative to gross enrollment; however, that relationship was steady between 1999 and 2015.

[3] There have been many syntheses of evidence to improve learning in recent years. Evans and Popova (2016) synthesize six of these synthesis studies. A recent synthesis which covers a wide range of recent interventions is Snilstveit et al. (2015), summarized in Snilstveit et al. (2016).

interventions. If an intervention increases learning and the effects can be sustained in human capital accumulation, we can calculate the lifelong wage gains from that increased learning. We use the returns to cognitive skills among adults to project the effects of improved learning on lifetime earnings.[4] The net present value (NPV) of lifetime earnings is – on the one hand – a reductive way to think about the value of improved learning, but it has the distinct advantage of allowing concrete discussion of the potential returns to education interventions, which may facilitate discussions of education investments relative to other investments with non-education experts, such as Ministers of Finance.

The second objective is to characterize the size of the impacts of these interventions relative to learning in a business-as-usual setting. The motivation for the first objective is that a common critique of the learning interventions characterized above is that the average effect is inadequate to make a substantive difference (Alkire et al. 2018). For example, the median effect of pedagogical interventions from a recent review – including experimental and quasi-experimental studies – was 0.13 standard deviation in learning (Snilstveit et al. 2015). The median effect across randomized controlled trials in a recent systematic review (McEwan 2015) was 0.07 standard deviation. But how much do students learn in their education systems normally? Are these effects small or big next to a realistic counterfactual of education in low- and middle-income countries? This paper characterizes the size of a range of learning interventions relative to what students normally learn in school in low- and middle-income countries.

Of course, knowing the returns is only one side of the equation: adding cost data would allow policy makers not only to understand the metric by which the benefits are measured, but also to make fully informed decisions. Unfortunately, cost data are reported far less systematically and less often than impact estimates. However, recent work has provided estimates across a range of studies (J-PAL 2014). We use those estimates to demonstrate how our method – of translating learning gains into equivalent years of schooling and into increased potential earnings – could be extended to demonstrate the equivalent years of schooling (EYOS) per $100 and the benefit-cost ratio of investment.

To convert test score gains into additional years of schooling or increased wages, we use data on the relative wages and the relative schooling of individuals with different levels of cognitive performance. A group of new, comparable international assessments measuring adult cognitive skills in low- and middle-income countries, the Skills Towards Employability and Productivity program (STEP), along with some other, stand-alone surveys provide exactly that (Hanushek et al. 2015; Valerio, Sánchez Puerta, et al. 2016a; Díaz, Arias, and Tudela 2012; Aslam et al. 2011; Valerio, Sanchez-Puerta, et al. 2016).[5]

We find that across 5 STEP countries, one standard deviation gain in literacy skill is associated with between 4.7 and 6.8 additional years of schooling, depending on the estimation method. In other words, over the course of a business-as-usual school year, students learn between 0.15 and 0.21 standard deviation of literacy ability.[6] At the same time, one promising set of interventions – structured pedagogical improvements (or improving the quality of teaching with detailed guidance to instructors) – has an average effect size of 0.13 standard deviation, which means these interventions help students to learn what they would normally learn in between 0.6 and 0.9 years of business-as-usual schooling. Impact

[4] Muralidharan and Sundararaman (2011) use a similar approach for a single program, to calculate the internal rate of return of a teacher performance pay program in India.

[5] The Programme for the International Assessment of Adult Competencies (PIAAC) provides similar data for high-income countries.

[6] Because this compares individuals with different completed years of schooling, it is net of the depreciation that takes place during the holidays between school years.

evaluation studies in the areas of computer-assisted learning and school-based management yield an average impact that translates to 0.05 to 0.07 additional year of schooling. The impacts of the pedagogical improvements are sizeable, suggesting that interventions being explored to improve learning can make a significant difference. When one translates these learning gains into the wage gains associated with improved learning, the median wage gains across all pedagogical interventions with positive impacts are 8 percent, and the wage gains for the intervention with an effect size at the 75th percentile are 21 percent. In the latter case, that translates into a net present value of nearly US$24,369 in increased wages, with a number of interventions delivering even higher returns.

2. Empirical Strategy

2.1 Equivalent Years of Schooling (EYOS)

To report learning effects in terms of EYOS, ideally one would access a test that maps out the learning trajectory of how much students learn from each additional year of schooling. This requires administering a test with a vertical scale, which makes scores comparable across different grade levels. For example, the states of Utah and Texas in the United States assess student performance in grades 3-8 for reading and math using a vertical scale (Utah Education Association 2013; State of Texas Assessments of Academix Readiness 2013). However, to the best of our knowledge, no existing cross-country tests allow for that conversion. Some studies have attempted to estimate the learning gain from an additional year of schooling in other ways by comparing students of the same age in two different grades (e.g., with the Program for International Student Assessment, or PISA, which is applied to 15-year-olds across countries), either seeking to control for confounders in regressions (OECD 2014) or by using age-cutoffs for grade enrollment to exogenously identify differences (Strom 2004; Frenette 2008; Benton 2014; Khaw and Wong 2012; Lau and Wong 2013; Marchionni and Vazquez 2015). Neither of these methods maps out a trajectory beyond two years, whereas skills may accumulate at different rates over the primary school cycle.[7]

A few other tests assess reading and numeracy competencies of children in a wide age range, but the content of the tests is set at the level of early grades and provides limited information on the learning trajectory of later years in the education cycle. For example, the Annual State of Education Report (ASER) in India and Pakistan, Uwezo in East Africa, and the Independent Measurement of Learning (MIA) in Mexico test the basic reading and numeracy skills of children aged between 5 and 16 through household-based assessments. In addition, these tests are based on national curricula to guide domestic policy dialogue and are not necessarily comparable across countries (PAL Network 2017). Similar constraints apply to the Early Grade Reading Assessment (EGRA) and the Early Grade Math Assessment (EGMA), which have been widely used in Africa, the Middle East and South Asia (RTI International 2009).

In this paper, we use an adult skill assessment to estimate the relationship between learning gains throughout the primary cycle. The advantage of using adults is that the analysis avoids selection in terms of who has achieved a certain grade by a certain age. Selection in total years of schooling remains, to a degree that varies by the estimation method. We employ two alternative methods to estimate the EYOS associated with one standard deviation in learning. The first uses simple descriptive data to characterize

[7] Another, related effort seeks to combine the quality and quantity of education into a single cross-country measure – the Learning Adjusted Years of Schooling, or LAYS – to allow comparison of education systems across countries (Filmer et al. 2018). While the LAYS allows an aggregate measure of the quantity and quality of education in an education system, it is not naturally suited to characterizing the gains from a given intervention.

the learning gains through the school career (2.1.1 Method 1: Descriptive learning trajectory). The second uses multivariate regression to estimate the learning gains associated with an additional year of schooling, accounting for a number of background variables (2.1.2 Method 2: OLS model of skills and years of schooling). Both methods have advantages and disadvantages, but ultimately, both point to sizeable impacts from learning interventions.

2.1.1 Method 1: Descriptive learning trajectory

In this section, we create an approximate learning trajectory using descriptive statistics. We first calculate standardized reading proficiency scores by completed years of schooling, and then we calculate the increased proficiency for individuals with an additional year of schooling. For example, if the average reading proficiency score of people who have *i* years of schooling is L_i and those who have (*i+1)* years of schooling is L_{i+1}, the learning gain from one additional year of schooling will be $\Delta_L = L_{i+1} - L_i$. We then take the simple average of learning gains from grade 1 to grade 12 as the mean reading proficiency improvement from an additional year of schooling. The EYOS are estimated as $1/\Delta_{L\_average}$. We use grades 1 through 12 because we observe significant gains in literacy throughout those grades and because education past grade 12 no longer focuses on fundamental reading skills.

Although all curricula mandate that these skills be learned in primary school, the poor quality of education in many countries extends that learning curve into secondary school (Figure 2). Moreover, due to the limited sample size of each country, we include all age groups in the calculation, aware of the fact that the quality of the education system varies across generations and there might be potential catch-up or decay effects of learning during adulthood. The advantage of this method is its simplicity; its disadvantage is its failure to deal with selection in total years of schooling.

2.1.2 Method 2: OLS model of skills and years of schooling

In this section, we adopt a statistical model of an individual's skills as a simple and restricted function of completed years of schooling, following Mincer (1970).

$$C = \beta S + \epsilon \qquad (1)$$

Where cognitive skills *(C)* are measured by skill assessment scores and *S* is school attainment. We fully acknowledge that there are factors other than schooling that determine the formulation of skills, as discussed in Hanushek (2002). The purpose of this paper is to characterize potential gains rather than make a strict causal claim.

Following this conceptualization, we estimate the following equation for our analysis:

$$L_{i=}\beta_0 + \beta_1 S_i + \beta_2 Age_i + \beta_3 S_i Age_i + \beta_4 G_i + \varepsilon_i \qquad (2)$$

Where L_i is the standardized reading proficiency score of individual *i*, *S* is the number of years of schooling, *G* is an indicator of gender, and ε is a stochastic error. We include age effects in the specification, considering the potential learning decay or catch-up effects in adulthood, which allows the learning gradient associated with additional schooling to vary by age. We then use that relationship, expressed in β_1, β_2, β_3, to estimate the learning gradient back in one's school age. Therefore, the learning gain for an individual from an addition year of schooling in terms of standard deviation can be estimated as:

$$\Delta L = \beta_1 + \beta_2 + \beta_3 (S_i + Age_i + 1) \qquad (3)$$

Correspondingly, one standard deviation in learning gains is associated with $1/\Delta L$ EYOS. With equation (3), we can derive an estimate of a full learning profile for each country based on a representative sample of the population with different educational attainment, rather than concentrating on a specific age or grade group. A standard caveat in a model like equation (2) is that a degree of selection takes place at each grade. However, previous research work has shown that the simple OLS and quasi-experimental designs yield very similar estimates of schooling impacts on learning and earnings (Chetty, Friedman, and Rockoff 2014).

For the conversion of EYOS, we again limit the sample to individuals with up to 12 years of schooling for the same reason described in 2.1.1, that learning gains on the skills we measure are sizeable through 12 years of schooling but smaller after. We report the EYOS estimated based on the learning gain from grade 6, usually the last year of primary school, as the primary results. We report specifications pooled across countries that both include and exclude country fixed effects, and we give each country the same weight to compensate for differing sample sizes across countries.

2.2 Net Present Value of Increased Learning

There is a vast labor literature examining how wages of workers are determined. A simple estimate of individual earnings can be written as in Equation 4, following Hanushek and Woessmann (2008):

$$y = \gamma H + \varepsilon \qquad (4)$$

where earnings (y) are a function of the labor-market skills or human capital of the individual (H). ε is a stochastic error, representing idiosyncratic differences in earnings and orthogonal to *H*.

Human capital (*H*) is a latent variable that is hard to measure. A preponderance of empirical research has adopted the Mincerian earning equation (5) (Mincer 1970, 1974), where human capital is measured by educational attainment (i.e., years of schooling) and on-the-job training (i.e., work experience).

$$ln\, y_i = \alpha_0 + \alpha_1 S_i + \alpha_2 E_i + \alpha_3 E_i^2 + \alpha_4 G_i + \varepsilon_i \qquad (5)$$

y_i is the weekly wage of individual i, S is the number of years of schooling, E is potential years of work experience calculated as *Age-Years of education-6*, and *G* is an indicator for gender.

An alternative approach is to use directly measured cognitive skills as a proxy for human capital – that is, standardized literacy and numeracy tests. The empirical model is an analog to a Mincer equation replacing years of schooling with measured literacy skills *C*. Potential working experience is replaced by age, as experience might be endogenous to schooling (Patrinos and Sakellariou 2005).

$$ln\, y_i = \beta_0 + \beta_1 C_i + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 G_i + \varepsilon_i \qquad (6)$$

We estimate the labor market value of improved test scores, conditional on the assumption that increased learning from interventions corresponds to a long-term human capital gain. This is a strong assumption. Most impact evaluations of education interventions measure impacts over only a short period; McEwan (2015) found the average period between treatment and follow-up measurement across 70 instructional evaluations was 13 months. In some cases, where impacts have been measured over time, the effects have been sustained (Ou 2005; Muralidharan 2012); in others, the effects have diminished or disappeared (Andrabi et al. 2011; Jacob, Lefgren, and Sims 2010). There are too few long-term evaluations to draw strong conclusions. As such, this exercise seeks to translate the potential long-term impact of human capital gains into broadly understandable metrics – increased earnings – without intending to be strictly predictive, given the uncertainty of the time path of returns.

We assume that wage returns to skills are constant across one's working life (Buchmann et al. 2016). Improvement from the same intervention I translates to a $\Delta L \cdot \beta_1$ predicted wage increase. The average annual income of a worker in country j is w_j, measured by the labor share of the Gross National Income (GNI) per capita. Hence, intervention I yields an additional income of $\Delta L \cdot \beta_1 \cdot w_j$ per year, assuming no wage growth,[8] following Miguel and Kremer (2004) and Muralidharan and Sundararaman (2011). Students receive the intervention at age a_i and they are expected to enter the labor market at age 20 (Muralidharan and Sundararaman 2011). Wage gains will be further discounted by (20-a_i) years. The net present value of additional wage gains can be written as:

$$NPV = \sum_{k=20-a_i}^{n} \frac{\Delta L \cdot \beta_1 \cdot w_j}{(1+i)^k} \qquad (9)$$

where *n* = number of years in the workforce and *i* = discount rate.

In this paper, the expected work life is assumed to be 40 years and discount rate is taken at 3%, a standard social discount rate in public finance (Hanushek and Woessmann 2010; Hagist et al. 2005; Börsch-Supan 2000).

2.3 Cost Effectiveness of Learning Interventions

Building on the impact metrics, this paper also presents cost-effectiveness analysis and benefit-cost ratios of a range of programs with available cost data from J-PAL (2014). The cost-effectiveness of selected interventions is estimated in terms of EYOS per US$100. For instance, we first multiply the point estimate of improved learning by ΔL to get the amount of EYOS for each participant by the program. We then divide the present value of total costs of the program (including costs to both the implementer and the beneficiary) by the number of participants to determine the program cost per beneficiary. And we divide the amount of EYOS by the cost per individual, then multiply by 100 to express the outcome per a US$100 investment.

Benefit-cost ratios or return to investment (ROI) ratios are calculated as the NPV of lifetime increased wage income divided by the NPV of the program costs per individual. All conversions and calculations follow the methodology described previously in this section.

3. Data

The primary data used in this paper are the World Bank's STEP Skills Measurement Program. The STEP household surveys measure skills of the adult population in low- and middle-income countries and provide comparable international scores of reading proficiency on the scale of OECD's assessment of adult skills, the PIAAC (World Bank 2016a). We use the STEP survey data collected between March 2012 and July 2014 in five countries with available literacy assessment data: Bolivia, Colombia, Ghana, Kenya, and Vietnam.[9]

[8] Wages are highly likely to increase over time and assuming no wage growth is a conservative approach. Nevertheless, the net present value of increased learning from interventions is considerable.

[9] Data are also available for Armenia, Ukraine and Georgia but not included for the reason that over 50 percent of the population in these countries have more than 12 years of formal education, which dramatically reduces the sample size for the analysis in this paper.

The STEP survey includes background information of respondents including demographic characteristics, education, employment history, and earnings. It also includes a reading literacy assessment, administered along with the household survey to a representative sample of urban adults aged 15-64 in participating countries. Respondents were asked to take a paper-based literacy test that was designed to measure the level of proficiency in literacy with respect to word meaning, sentence processing and basic passage comprehension, in the language of their resident country. Scores were given based on accuracy (the number of correct answers) and rate (the time taken to answer correctly) on a scale from 0 to 500, as in the PIAAC (Pierre et al. 2014).[10] For analytical purposes, we standardize scores to have a mean of zero and a within-country standard deviation of one in country-specific analyses and standardize scores across countries when analyzing the pooled sample, following Hanushek et al. (2015) and Valerio, Sánchez Puerta, et al. (2016b).[11] There is a consistent sampling strategy (see Pierre et al. (2014)) across all STEP participant countries and this paper employs the sample weights within each country in the estimation. Pooled analyses give each country the same weight.

In both our descriptive learning trajectory model and the linear regression model, we limit the estimation sample to survey respondents who have 1-12 years of schooling. This gives us sample sizes ranging from 1,558 in Bolivia to 2,503 in Vietnam, as Table 1 Panel A shows. The average age of the pooled sample across 5 countries is 32.9 years old, ranging from 28.5 years old in Kenya to 38.1 years old in Vietnam. The average years of schooling is 8.9 years, with about 21.2% still at school. Respondents in Vietnam achieve the highest reading proficiency score (234) while respondents in Ghana have the lowest (126).

For the analysis of labor market returns and the net present value of lifetime earnings, we restrict the sample to adults between 25 and 64 years old who are in the labor force regardless of employment status, since the level of skills matters in both job seeking and job performance. It includes the following groups: (1) the full-time and part-time employed (including self-employed) population, and (2) those who are unemployed but have been looking for jobs in the past four weeks and will be available in the next two weeks. We exclude individuals who are not in the labor force, specifically those who are not employed and did not look for work in the past four weeks, either because they self-identify as housewives (47.0%), are retired or in old age (24.0%), are ill or disabled (7.9%), are currently attending school (6.1%), do not want to work or believe there are no jobs (3.4%), and for other reasons (11.6%). The earnings measure used is weekly wages in US dollars. The top 1 percent of weekly earners (likely due to reporting error) are excluded from the sample, as were those who did not report their wages (5% of those who report working). The earnings of unemployed people and unpaid workers are set at 0.00001 for estimation purposes.

Table 1 Panel B provides summary statistics of this subsample. The sample size ranges between 1,228 in Bolivia and 1,948 in Kenya, with a total of 8,156 observations in the pooled sample. Vietnam has the highest employment rate at 98.0%, and the lowest rate is 83.1% in Kenya. Hourly wage ranges from $2.8 (PPP 2011) in Ghana to $4.6 in Bolivia. Respondents in Vietnam achieve the highest literacy score (237) and respondents in Ghana the lowest (121). The average years of schooling ranges from 11.1 in Bolivia to 7.8 years in Ghana.

[10] The STEP survey also collected data on socioemotional skills, but we focus on the measured cognitive skills (i.e., reading proficiency) in the empirical specification, as this is the most consistently measured learning outcome in education impact evaluations.

[11] All 10 plausible values of the STEP reading proficiency scores are taken into account using the STEP module in Stata 14 (Macdonald 2014).

For interventions, we begin with the sample of impact evaluation studies in the areas with the largest number of measured learning outcomes in a systematic review (Snilstveit et al. 2015): structured pedagogy (e.g., introducing new lesson content and providing teachers with training on how to teach), computer-assisted learning, and school based management. We only include studies with any measure of the three building blocks of the STEP literacy assessment – word meaning, sentence processing and basic passage comprehension – to ensure the comparability to the extent possible, and sort them by standardized effect size.[12] Forty-nine of the total 63 reading outcomes analyzed in this paper are from impact evaluations that employ randomized controlled trials (RCTs), and the rest are from studies using either difference-in-differences (DID) or multivariate regression evaluation designs. In order to estimate the potential increase in average annual income associated with an intervention, we use the GNI per capita, PPP (current international $) combined with the labor share of national income of the country where the intervention was implemented (World Bank 2017; Neiman and Karabarbounis 2013). To compare all the interventions in the same time frame, we assume that all interventions began in 2015 (Buchmann et al. 2016).

For cost-effectiveness analysis, a recent study by J-PAL (2014) provides standardized effect sizes and program costs of 27 education interventions with student learning outcomes across Sub-Saharan Africa and Asia. Our analysis includes 14 of those 27 programs with a significant impact at the 10% level. We estimate the equivalent years of schooling per $100 and the rate of return on investment. The cost data from J-PAL in general consider costs to the implementer such as administrative and monitoring costs and the opportunity costs of the beneficiary and their family (see Dhaliwal et al. (2013) for details on methodology). To follow the time frame of J-PAL's data, all calculations related to cost-effectiveness and cost-benefit analysis are expressed in USD (2011 PPP).

4. Results

4.1 Increased Learning as EYOS

Across five STEP countries, we find that one standard deviation improvement in reading proficiency is associated with 4.7 to 6.8 EYOS, estimated by using our two different methods (Table 2).[13] In other words, it takes between 4.7 and 6.8 years of "business-as-usual" schooling to produce one standard deviation of learning. The descriptive method (Method 1) indicates the biggest EYOS of 6.8, while the estimate from the OLS model without country fixed effects (Method 2b) corresponds to 4.7 EYOS. However, Method 1 does not consistently predict larger EYOS across countries. In Colombia, the smallest EYOS of 4.8 is estimated through Method 1 and the largest (9.3) through Method 2. In Ghana, Method 2 indicates an EYOS of 4.4 and Method 1 yields an EYOS of 7.3. Nevertheless, although each method is based on a different set of reasonable assumptions, the results consistently demonstrate the sizable impacts of improved reading proficiency.

EYOS estimated through alternative benchmarks

Our results from the pooled sample show that an additional year of schooling increases reading proficiency by 0.15 standard deviation (method 1), that is how much a student learns if she studies in a hypothetical "STEP" school, which reflects a mix of the education systems of the 5 countries. How much

[12] Table A1 lists all the language learning outcomes reported in Snilstveit and others (2015) in the area of structured pedagogy; 30 out 68 tests (shown in bold) are included in the analysis of this paper.

[13] Tables A2, A3 and A4 provide details on learning gains associated with an additional year of schooling that are used to estimate EYOS.

is the "STEP" school gain in cognitive skill compared to that in other education systems? First, we can compare the absolute learning gains. Using PIACC data from Hanushek et al. (2015) and the same descriptive method (method 1), we estimate that students from Finland – one of the top performing education systems – improve reading proficiency by approximately 0.3 standard deviation with an additional year of schooling, or one standard deviation is an equivalent of 3.3 years of Finnish schooling. Similarly, the average improvement in reading from an additional year of schooling in grades 3-8 in Texas is also about 0.3 standard deviation, or one standard deviation is an equivalent of 3.3 EYOS of Texas education. Hence, in absolute terms, students in these two countries learn about twice as much as students in the 5 STEP countries.

However, taking the quality of education systems into account, students in high-performing systems learn even more. Although one additional year of schooling is associated with 0.3 standard deviation in both Texas and Finland, it does not mean that students in Texas and Finland make the same improvement within one school year, because the quality of the two education systems is not the same. This can be illustrated by the fact that within the PIAAC pooled sample, with a common test, an additional year of schooling in the US is associated with 0.2 standard deviation of reading proficiency improvement, while that number is 0.3 standard deviation in Finland.[14] In this paper, we propose the pooled STEP standard as a metric for low- and middle-income countries for two reasons. First, we do not have data for all countries where the interventions were implemented; second, we try to evaluate the impacts of interventions using the same STEP EYOS to avoid biases from the variance in the quality of different education systems.

4.2 Impacts of Increasing Cognitive Skills

The data available to calculate the relationship between cognitive skills and earnings are available in only a limited number of countries. In fact, only two countries (Colombia and Kenya) have both data on cognitive skills and earnings as well as impact evaluations results from an expansive database (Snilstveit et al. 2015). As a result, we use the return to learning estimated using the pooled sample to demonstrate the potential impacts of interventions. Taking these numbers as predictive would require strong assumptions that interventions across countries would have the same effect, which is not the case. However, these estimates are intended to be demonstrative rather than predictive. Again, we acknowledge the limitations of this extrapolation, but we propose that this work still serves to demonstrate the potential returns to learning interventions. Over time, more data on the return to cognitive ability will improve the precision of this exercise.

Table 3 shows the effect sizes at the 25th, 50th and 75th percentiles of three categories of interventions: structured pedagogy, school-based management and computer assisted learning. Table A5 shows the full list of interventions. These impacts correspond to EYOS estimated through three sets of methods. Across all pedagogical interventions that have been evaluated, the median effect size is 0.13 standard deviation.[15] If the effect were sustained over time, the increased learning from this program would have an impact equivalent to an additional 0.52 to 0.88 EYOS, depending on the estimation method. Likewise, a more promising intervention – a decentralized schooling system intervention in Brazil that provided new curriculum, teaching materials and teacher training – yielded an impact that corresponds to 1.16 EYOS under the most conservative approach and reaches 2 years of equivalent schooling using the descriptive

[14] Calculations are available upon request.

[15] That median effect is from an intervention in Kenya that provided teachers with teaching manuals, training and follow-up workshops (Jukes and Dubeck 2015).

method. For school-based management and computer-assisted learning interventions, the effect sizes are smaller and the effect sizes at the 25th percentile are negative. However, the median effect size of computer-assisted learning interventions is 0.01, from a computer-assisted remedial program in China (Lai et al. 2011), which is associated with 0.04 - 0.07 EYOS. The impact of one of the most promising school-based management interventions (75th percentile) – a school grant program in Senegal (Carneiro et al. 2015) – is equal to 0.27 EYOS.

Furthermore, there are labor market returns to increased learning, as discussed earlier. Returns to one standard deviation higher literacy score in different regions are shown in Table 4. Based on returns to literacy skills, we can estimate the net present value of increased lifetime earnings from a certain education intervention, as shown in Table 5 (for a sample of interventions) and Table A6 (for all interventions). The underlying assumption is that the effects will be sustained over one's lifetime.

For example, Table 4 suggests returns of 59 percent for scoring 1 standard deviation higher on the literacy assessment in Kenya. The Health and Literacy Intervention (HALI) (Jukes et al. 2016) helped students achieve 0.13 standard deviation higher in a Swahili passage reading fluency (words per minute) test (Table 5). The long-term impact of this program would be an 8 percent increase in wages [0.59 * 0.13 SD]. The average annual income of a Kenyan worker in 2015 was $1,079 (PPP, current US$) [3,060 * 0.35 SD] and an 8 percent increase in wage would correspond to additional income of $86 per year. Over a 40-year work life, this fixed additional income has a present value of $1,907, if discounted at 3 percent. Since the students are in Grade 2 or on average 8 years old and they are assumed to start to enter the labor market at age 20, the $1,907 is further discounted by 3 percent for another 12 years. The net present value of the learning improvement from the HALI for each student is $1,338 (Table 5). Similarly, the Brazilian decentralized schooling system which implemented new curriculum and teacher training (Leme et al. 2012), can potentially yield an NPV of $24,369 by improving students' Portuguese proficiency by 0.29 standard deviation.

The computer-assisted intervention with the 75th percentile effect size is a program implemented in Ecuador, which provided computer labs and learning software and increased students' learning outcome by 0.06 standard deviation, as shown in Table 5 (Carrillo, Onofa, and Ponce 2010). Since we do not have data on the return to learning in Ecuador, we use that of Colombia, the country in Latin America closest to Ecuador in income for which we have data in our sample. The 0.04 standard deviation improvement in language skills corresponds to a 4 percent increase in wages, with an NPV of $3,093. Likewise, the median effect size of school-based management interventions, from a school grant program in The Gambia (Blimpo et al. 2015), can potentially translate to a wage increase of NPV $20.

4.3 The Cost Effectiveness of Increased Learning

While Sections 4.1 and 4.2 have demonstrated the potential impacts of increased learning from improving pedagogy in terms of increased years of schooling and lifetime increased wage income. In this section, we present cost-effectiveness and cost-benefit ratios of a group of programs, by adding the data on program costs. We include 14 education programs that cover a wide range of intervention categories, including conditional cash transfers, teacher incentives, computer-assisted learning, school-based management and providing textbooks (Table 6). Following the practice in the previous sections, we group and compare these interventions by region. While we can compare specific interventions in this way, we have data on too few interventions to responsibly make generalizations about the cost-effectiveness of entire categories of interventions to set policy priorities (e.g., computer-assisted learning versus school-based

management). However, this exercise demonstrates the potential of cost-effectiveness analysis in complementing our analysis to inform policy decisions.

Across all 14 included programs, the average total cost per participant is US$75 (2011, PPP), with the cheapest at US$0.40 (from providing earnings information for school finishers in Madagascar (Nguyen 2008b)) and the most expensive at US$749 (from the minimum-size conditional cash transfer program in Malawi (Baird, McIntosh, and Özler 2011)) (Table 6).

In Sub-Saharan Africa, the most cost-effective program provided households in Madagascar with information on returns to education (Nguyen 2008a). As Table 6 shows, this program increased students' learning performance by 0.2 SD at a cost of US$0.4 per student. As described in section 4.1, 1 one SD gain in learning is associated with 6.5 years of equivalent schooling (method 2a). Thus, the effect of the Madagascar program translates into 1.5 additional years of schooling for each participant at a total cost of US$0.4 from implementer and beneficiary. In other words, an investment of US$100 can yield 430 additional years of equivalent schooling (if that were possible). Furthermore, considering the long-term wage income effects described in section 4.2.2, an 0.2 SD improvement in learning by this program can yield an NPV of US$694 from lifetime increased wage income (discounted at 3%), which provides a benefit-cost ratio of 1,957, when taking into account the NPV of the program cost (US$0.4). The median cost-effective program in Sub-Saharan Africa took place in Kenya and provided teachers with incentives based on students' test scores and improved learning by 0.14 SD at a cost of US$4.2 per beneficiary (Duflo, Dupas, and Kremer 2011). For every US$100 invested in this program, it is associated with additional 21.3 years of equivalent schooling and the benefit-cost ratio reaches 156, when benefits are estimated in terms of life-time increased earnings. The big returns indicate the high cost-effectiveness of these interventions that effectively increased learning.

Establishing new schools is considered to be one of the most expensive education investments. However, building these new schools can still be cost-effective as long as children get sizeable learning gains. In Afghanistan, placing village-based schooling helped children improve their performance by 0.5 SD at a higher cost of US$111.2 per student enrolled (Burde and Linden 2013). 18.1 additional years of equivalent schooling can be achieved per US$100 and the benefit-cost ratio is 19 (Table 6). In East Asia, the impact of an school-based management intervention in Indonesia (Pradhan et al. 2014) that linked school committees to local government translates to 187 additional years of equivalent schooling for every US$100 invested, generating a benefit-cost ratio of 3,810. Similarly, in India, a remedial education program improved students' performance by 0.14 SD, which yields a benefit-cost ratio of 143.

5. Discussion

5.1 Poverty impacts

A wide range of interventions have increased learning outcomes in low- and middle-income countries. This increased learning can translate into labor market gains, as adults with higher learning scores have higher wages. An 11 percent increase in wages, the projected increase associated with a teacher training program in Uganda, or a 33 percent increase in wages, associated with a reading program in Kenya, mean a sizeable difference for those countries, with roughly one-third of the population living under the $1.90 per day poverty line (World Bank 2016b).[16] If that one-third were to have income uniformly distributed

[16] The last available poverty estimates for Uganda are from 2012 (34.6 percent) and for Kenya are from 2005 (33.6 percent).

under $1.90 poverty (a conservative assumption), then an 11 percent increase in wages would translate to a reduction in extreme poverty from 34 percent to 30 percent (more than one million people in Uganda), and a 33 percent increase in wages would translate to a reduction in extreme poverty of 23 percent (more than three million people in Kenya). These are not small or trivial changes.

5.2 How reliable are the assumptions on which this is based?

Of course, these numbers are based on a wide range of strong assumptions. First, there is an assumption that cognitive impacts endure from the time of the intervention into adulthood. As discussed earlier, the evidence on the endurance of cognitive gains is extremely limited. Few education interventions measure outcomes over a significant period of time. Impacts likely endure in some cases and not in others.

Second, because we do not have data on the gradient between cognitive skills and earnings for every country, we use that of the country in the same region that has the closest income to the country where the intervention took place. For example, we only have data on returns to schooling in Ghana and Kenya in the Sub-Saharan Africa region. When we estimate the economic return to an intervention in Tanzania, we will use the gradient of Kenya, since Tanzania's income is closer to Kenya's than to Ghana's. But the returns to schooling in terms of weekly earnings vary greatly within the region, from 9.8 percent in Ghana to 21.8 percent in Kenya. There is clearly no reason to be confident that the gradient in Tanzania will in fact be 15.8 percent. As such, estimates for countries where data are available on the learning-earnings gradient will likely be more accurate. Likewise, calculating the EYOS from five pooled countries and then using that pooled estimate to scale up the effect sizes assumes consistency in the estimates across countries, which – as shown above – is not met. The objective of the metric is to provide a rule of thumb rather than a measure that will be precisely accurate in every setting, which would be impossible.

Third, if one were to use these estimates to think about poverty reduction or income gains on a national scale, then they assume a lack of general equilibrium effects: Specifically, if one were to scale up an education intervention nationwide, would the size of the impacts on earnings be consistent? This could prove false because the quality of the program diminishes in the context of scaling it up, as documented in Kenya in Bold et al. (2015). This could also prove false if the population as a whole achieves higher cognitive ability and so the returns fall in response to the increased supply of cognitive ability, as documented in India in Khanna (2015).

Fourth, one of the metrics that this paper uses is "equivalent years of schooling." However, this only captures the cognitive gains from additional years of schooling. Insofar as schooling produces socioemotional skills – as documented in the United States by Jackson (2016) – the equivalent years of schooling are an incomplete representation of total skills.

5.3 What is the ultimate value of these estimates for education policy?

Despite their limitations, these alternative units allow both education and non-education specialists to characterize gains in learning in terms that are understandable and are clearly linked to positive life outcomes. A statement such as, "The gains from this literacy intervention are the same as the difference between someone who earns $60,000 a year and someone who earns $70,000 a year," arguably carries much more intuitive meaning – even with all the necessary caveats – than "This intervention increased learning by 0.22 standard deviation."

The sizeable impact of some of these interventions – for example, that structured pedagogy interventions help students to learn what they would normally learn in between 0.6 and 0.9 years of business-as-usual

schooling – is in part driven by the low quality of "business as usual" schooling in many countries. The same interventions implemented in Finland or Singapore might have a much smaller relative impact. However, "business as usual" schooling is the current reality and the interventions discussed in this study have the potential to significantly increase its productivity.

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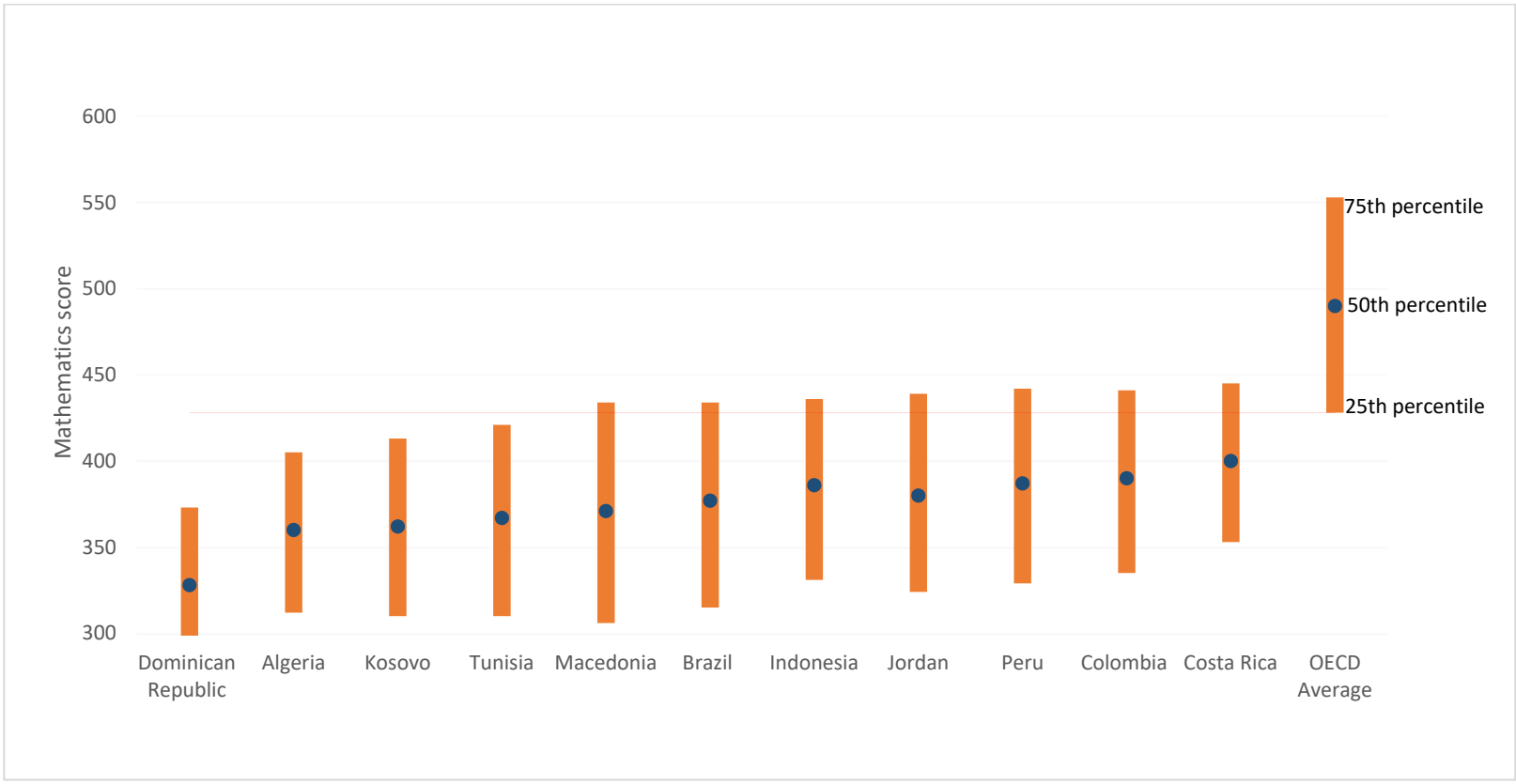
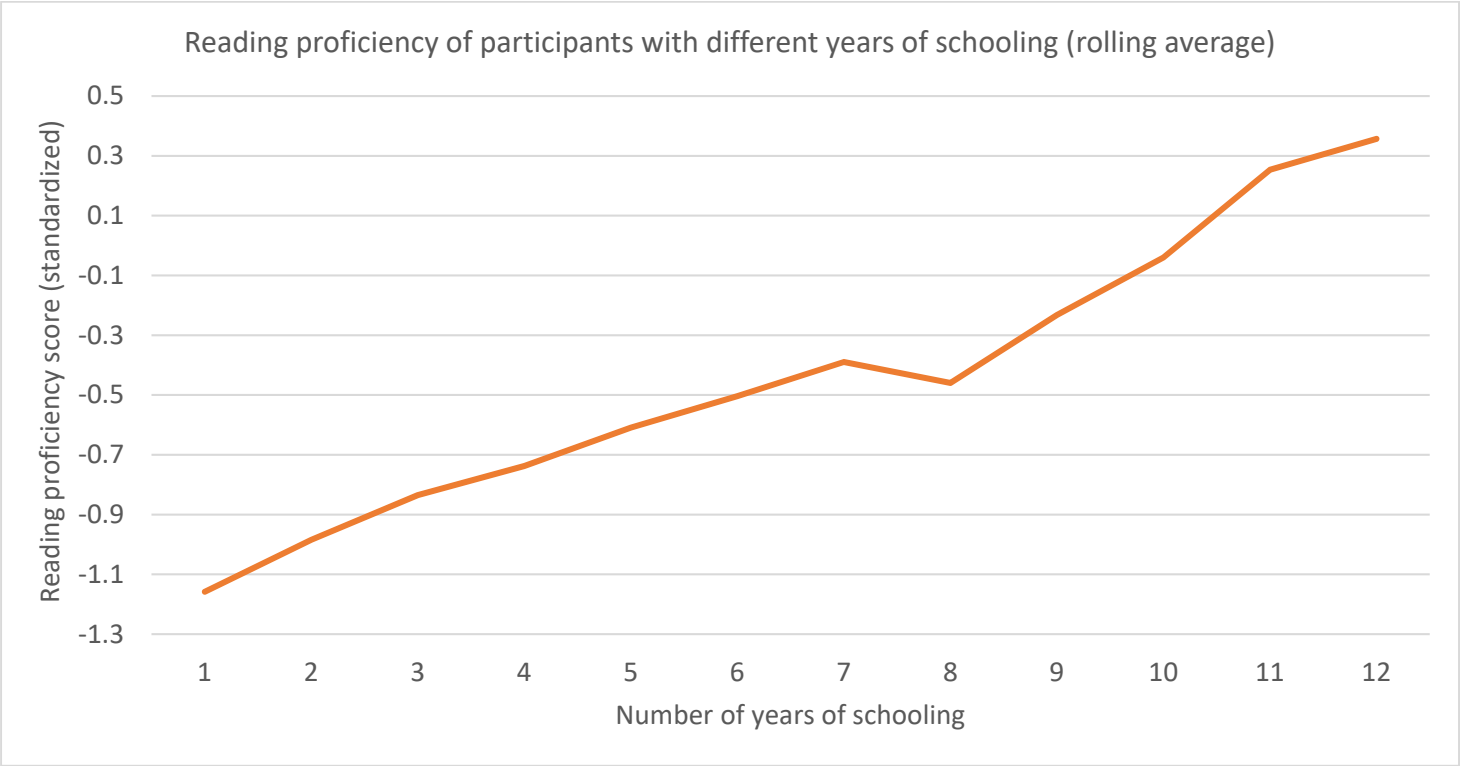
Tables and figures

Figure 1: 2015 PISA mathematics performance of selected countries



Source: Authors' calculation based on OECD (2016)

Figure 2: Fundamental reading skills acquired and improved in both primary and secondary education



Note: Sample of participants from 5 STEP countries and reading proficiency score is standardized in pooled data.
Source: Authors' calculation based on World Bank (2016a)

Table 1: Descriptive statistics of analytical sample

Country	Pooled	Bolivia	Colombia	Ghana	Kenya	Vietnam
Panel A	**Population with 1 to 12 years of schooling**					
Average age	32.9	31.4	34.8	31.4	28.5	38.1
Average years of schooling	8.9	8.9	8.5	8.2	9.6	9.4
Still at school (%)	21.2	35.1	16.0	19.7	17.8	17.6
Literacy scores (0-500)	187	181	223	126	170	234
Female (%)	58.9	60.4	59.9	58.1	56.3	59.6
Observations	10,665	1,558	1,888	2,227	2,489	2,503
Panel B	**Workforce aged 25-64**					
Hourly wage (PPP 2011 $)	3.8	4.6	4.5	2.8	3.1	3.8
Employment rate (including self-employed) (%)	92.1	94.3	89.7	94.5	83.1	98.0
Average age	39.3	39.8	40.3	39.1	35.4	41.7
Average years of schooling	9.9	11.1	9.8	7.8	10.1	10.9
Literacy scores (0-500)	188	185	227	121	170	237
Female (%)	56.3	60.1	55.4	59.3	48.7	57.2
Observations	8,156	1,228	1,450	1,717	1,948	1,813

Note: Pooled specification gives same weight to each country.

Source: World Bank (2016a)

Table 2: Equivalent years of schooling (EYOS) associated with one standard deviation improvement in reading proficiency

	Pooled	**Bolivia**	**Colombia**	**Ghana**	**Kenya**	**Vietnam**
Method 1: Descriptive learning trajectory	6.8	13.0	4.8	10.1	7.3	5.8
Method 2a: OLS model of skills and years of schooling with country fixed effects	6.5	6.8	9.3	4.4	10.3	7.3
Method 2b: OLS model of skills and years of schooling without country fixed effects	4.7					

Table 3: Equivalent Years of Schooling of selected learning interventions

	Effect size percentile	Intervention	Effect size	Effect size in Equivalent Years of Schooling		
				Method 1	Method 2a	Method 2b
Structured pedagogy	25th	India PicTalk	0.06	0.41	0.39	0.28
	50th	Kenya HALI	0.13	0.88	0.85	0.61
	75th	Brazil new curriculum	0.29	1.97	1.89	1.36
Computer assisted learning	25th	Peru OLPC	-0.02	-0.14	-0.13	-0.09
	50th	China remedial class	0.01	0.07	0.07	0.05
	75th	Ecuador learning lab	0.06	0.41	0.39	0.28
School based management	25th	Senegal school grant, grade 5 female	-0.06	-0.41	-0.39	-0.28
	50th	Gambia school grant	0.01	0.07	0.07	0.05
	75th	Senegal school grant, grade 6 male	0.04	0.27	0.26	0.19

Notes: EYOS of each method is based on Table 2 Column 2 (pooled) and multiplied by the effect size of each intervention.
References of included interventions: India Pic Talk: He, Linden and Macleod 2009; Kenya HALI: Jukes and Dubeck 2015; Brazil new curriculum: Leme 2010; Peru OLPC: Quispe et al. 2013; China remedial class: Lai et al. 2011b; Ecuador learning lab: Carillo et al. 2010; Senegal school grant, grade 5 female: Carneiro et al. 2015; Gambia school grant: Blimpo et al. 2015; Senegal school grant, grade 6 male: Carneiro et al. 2015.
Sources: Authors' calculations and Snilstveit et al. (2015)

Table 4: Returns to reading proficiency as a percentage change in weekly earnings

VARIABLES	(1) Pooled	(2) Bolivia	(3) Colombia	(4) Ghana	(5) Kenya	(6) Vietnam
Reading proficiency	0.365***	0.095	0.724**	0.178	0.588***	0.251**
	(0.089)	(0.239)	(0.326)	(0.143)	(0.184)	(0.122)
Age	0.300***	0.323*	0.246	0.213*	0.387***	0.176**
	(0.068)	(0.179)	(0.170)	(0.110)	(0.141)	(0.088)
Age^2	-0.004***	-0.004*	-0.003	-0.002*	-0.004**	-0.002**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Female	-1.247***	-1.912***	-1.633***	-0.864***	-1.951***	0.059
	(0.144)	(0.341)	(0.407)	(0.267)	(0.365)	(0.199)
Colombia FE	-0.720**					
	(0.284)					
Ghana FE	-0.450*					
	(0.244)					
Kenya FE	-2.116***					
	(0.260)					
Vietnam FE	0.628***					
	(0.213)					
Constant	-2.073	-1.906	-1.439	-1.544	-6.228**	0.873
	(1.397)	(3.524)	(3.433)	(2.348)	(2.823)	(1.785)
Observations	8,144	1,227	1,450	1,708	1,948	1,811
R-squared	0.059	0.048	0.037	0.014	0.045	0.014

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Notes: Least squares regressions weighted by sampling weights. Dependent variable: log gross weekly wage. Sample: workforce aged 25-64. Pooled specification includes country fixed effects and gives same weight to each country.

Data source: World Bank (2016a)

Table 5: Net present value of increased learning

	Effect size percentile	Intervention	Effect size	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Structured pedagogy	25th	India PicTalk	0.06	6,020	0.29	1,769	0.51	0.03	959
	50th	Kenya HALI	0.13	3,060	0.35	1,079	0.59	0.08	1,338
	75th	Brazil new curriculum	0.29	15,020	0.44	6,552	0.72	0.21	24,369
Computer assisted learning	25th	Peru OLPC	-0.02	11,960	0.23	2,736	0.72	-	-
	50th	China remedial class	0.01	14,160	0.49	6,941	0.24	0.002	274
	75th	Ecuador learning lab	0.06	11,190	0.37	4,140	0.72	0.04	3,093
School based management	25th	Senegal school grant, grade 5 female	-0.06	2,390	0.21	497	0.59	-	-
	50th	Gambia school grant	0.01	1,580	0.25	397	0.59	0.01	40
	75th	Senegal school grant, grade 6 male	0.04	2,390	0.21	497	0.59	0.02	213

Notes: Return to literacy is based on coefficients in Table 6.

References of included interventions: India Pic Talk: He, Linden and Macleod 2009; Kenya HALI: Jukes and Dubeck 2015; Brazil new curriculum: Leme 2010; Peru OLPC: Quispe et al. 2013; China remedial class: Lai et al. 2011b; Ecuador learning lab: Carillo et al. 2010; Senegal school grant, grade 5 female: Carneiro et al. 2015; Gambia school grant: Blimpo et al. 2015; Senegal school grant, grade 6 male: Carneiro et al. 2015.

Sources: Authors' calculations, Snilstveit et al. (2015), World Bank (2016b) and Neiman and Karabarbounis (2013).

Table 6: Cost-effective analysis of selected interventions

	Effect size	Added years of equivalent schooling	Return to impact (%)	Program cost per individual, 2011 PPP	EYOS per $100	Net Present Value of increased income, PPP current international $	Benefit-cost ratio	References
	Sub-Saharan Africa							
Teacher incentives (year 2), Kenya	0.14	0.88	8.0	4.2	21.3	$652	155.9	Glewwe, Ilias, and Kremer (2010)
Streaming by achievement, Kenya	0.18	1.14	10.3	1.0	117.6	$707	725.4	Duflo, Dupas, and Kremer (2015, 2011)
Providing earnings information, Madagascar	0.20	1.31	11.9	0.4	370.4	$694	1957.3	Nguyen (2008a)
Minimum conditional cash transfers, Malawi	0.20	1.31	11.9	748.5	0.2	$675	-0.1	Baird, McIntosh, and Özler (2011)
Textbooks for top quintile, Kenya (grades 3-8)	0.22	1.42	12.8	2.6	54.7	$1,046	402.9	Glewwe, Kremer, and Moulin (2009)
Extra contract teacher + streaming, Kenya	0.25	1.61	14.6	24.2	6.7	$996	40.2	Duflo, Dupas, and Kremer (2011, 2015)
Girls Scholarships, Kenya	0.27	1.76	15.9	41.3	4.3	$1,295	30.4	Kremer, Miguel, and Thornton (2009)
	South and East Asia							
Village-based schools, Afghanistan	0.50	3.22	18.s1	111.2	2.9	$2,262	19.3	Burde and Linden (2013)
Read-a-thon ,Philippines (after 3 months)	0.06	0.39	1.5	19.2	2.0	$640	32.3	Abeberese, Kumler, and Linden (2014)

	Effect size	Added years of equivalent schooling	Return to impact (%)	Program cost per individual, 2011 PPP	EYOS per $100	Net Present Value of increased income, PPP current international $	Benefit-cost ratio	References
Linking school cmte to local govt, Indonesia	0.17	1.07	4.1	0.6	186.6	$2,190	3809.7	Pradhan et al. (2014)
Electing school cmte & linking to local govt, Indonesia	0.22	1.40	7.9	2.0	71.9	$4,186	2142.1	Pradhan et al. (2014)
Remedial education, India	0.14	0.90	5.0	10.7	8.4	$1,533	142.6	Banerjee et al. (2007)
Camera monitoring, India	0.17	1.11	6.2	17.7	6.2	$1,780	99.5	Duflo, Hanna, and Ryan (2012)
Individually-paced computer assisted learning, India (Yr 2)	0.48	3.09	17.3	72.7	4.2	$5,275	71.6	Banerjee et al. (2007)

Source: Data from J-PAL (2014). Calculations by authors.

Table A1: Structured pedagogical interventions

Country	Intervention	Method	Test	Effect Sizes	Reference
Brazil	Decentralised schooling system, Grade 4	DID	**Portuguese proficiency**	**0.19**	Leme, 2010
Brazil	Decentralised schooling system, Grade 8	DID	**Portuguese proficiency**	**0.29**	Leme, 2010
Cambodia	The School Readiness Programme (SRP)	Multivariate analysis	**Khmer language**	**0.5**	Nonoyama-Tarumi and Bredenberg, 2009
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	Multilevel analysis	**Vocabulary**	**-0.1**	Pallante 2013
			Nonword reading fluency	0.11	
			Reading comprehension	**-0.06**	
			Word reading	**0.14**	
India	Year 2, Machines and activities	RCT	**English test**	**0.06**	He, Linden and Macleod, 2007
India	The Pratham PicTalk programme: Year 2, Machines only	RCT	**English test**	**0.06**	He, Linden and Macleod, 2007
India	The Pratham PicTalk programme: Year 2, Activities only	RCT	**English test**	**0.06**	He, Linden and Macleod, 2007
India	The Pratham PicTalk programme: Year 1	RCT	**English test**	**0.08**	He, Linden and Macleod, 2007
India		RCT	**Burt reading test**	**0.48**	Dixon, Schagen and Seedhouse, 2011
			Schonell spelling test	0.58	

Country	Intervention	Method	Test	Effect Sizes	Reference
	Synthetic Phonics: decoding and synthetic phonics pedagogy + teacher training		Letter matching test	0.22	
			Sound blending word test	0.72	
			Dictation	0.29	
India	The Shishuvachan programme: reading classes (teacher training) and provision of a library	RCT	**Normalised reading level (Hindi, Marathi, Urdu**)	**0.13**	He, Linden and Macleod, 2009
Kenya	Health and Literacy Intervention (HALI): teaching manuals and training	RCT	English letter knowledge	-0.02	Jukes and Dubeck, 2015
			Swahili passage reading fluency (words per minute)	**0.13**	
			Swahili passage reading comprehension	**0.11**	
			Swahili letter sounds	0.33	
			Swahili word identification (words per minute)	0.15	
Kenya	Reading to Learn (RtL): teacher preparedness,school leadership, classroom learning environments	RCT	**Written literacy exam**	**0.02**	Lucas et al. , 2014
			Oral literacy exam	0.05	
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	RCT	Kiswahili letter sound fluency	0.76	RTI International, 2015
			Kiswahili syllable fluency	0.31	
			Kiswahili decoding fluency	0.19	

Country	Intervention	Method	Test	Effect Sizes	Reference
			Kiswahili reading comprehension	**0.23**	
			Kiswahili reading fluency	**0.56**	
			Kiswahili listening comprehension	0.9	
			Kiswahili ability to decode words and read aloud to listener	0.17	
			Kiswahili high reading fluency	**0.14**	
			Kiswahili basic reading fluency	**0.57**	
Liberia	EGRA Plus	RCT	Letter naming fluency	0.7	Piper and Korda, 2011
			Phonemic awareness	0.59	
			Familiar word fluency	0.8	
			Unfamiliar word fluency	0.87	
			Oral reading fluency	0.81	
			Reading comprehension	**0.81**	
			Listening comprehension	0.49	
Mali		RCT	Orientation to print	0.21	Spratt, King and Bulat, 2013

Country	Intervention	Method	Test	Effect Sizes	Reference
	Read-Learn-Lead: reading and teaching materials, teacher training Grade 1		Phonemic awareness	0.23	
			Listening comprehension	0.12	
			Correct letters per minute	0.51	
			Correct familiar words per minute	0.54	
			Correct invented words per minute	0.32	
			Oral reading fluency (connected text)	0.23	
Mali	Read-Learn-Lead: reading and teaching materials, teacher training Grade 2	RCT	Orientation to print	0.05	Spratt, King and Bulat, 2013
			Phonemic awareness	0.17	
			Listening comprehension	0.04	
			Correct letters per minute	0.37	
			Correct familiar words per minute	0.4	
			Correct invented words per minute	0.27	
			Oral reading fluency (connected text)	0.19	

Country	Intervention	Method	Test	Effect Sizes	Reference
Philippines	Reading materials, teacher training to incorporate reading into curriculum	RCT	**Filipino test**	**0.09**	Tan, Lane and Lassibille, 1999
Philippines	The Dropout Intervention programme		**Reading**	**0.06**	Abeberese, Kumler and Linden, 2011
South Africa	English and Operacy programme (EOP): suggestopic pedagogy	RCT	**English test**	**0.6**	Mouton, 1995
Uganda	Reading to Learn (RtL): teacher preparedness,school leadership, classroom learning environments	RCT	Oral literacy exam	0.12	Lucas et al. , 2014
			Oral literacy exam	0.13	
Uganda	Northern Uganda Literacy Project (NULP): teacher training and parent engagement; Gov treatment arm	RCT	**English word recognition**	**-0.1**	Kerwin and Thornton (2015)
			EGRA test	0.08	
			Oral English score	-0.06	
			Writing test score	**-0.09**	
Uganda	Northern Uganda Literacy Project (NULP): teacher training and parent engagement;NGO treatment arm	RCT	**EGRA test**	**0.3**	Kerwin and Thornton (2015)
			Oral English score	0.09	
			Writing test score	0.19	
			English word recognition	-0.14	

Source: Snilstveit et al. (2015)

Notes: Tests and effect sizes in bold are included in the calculation of the results in this paper.

Table A2: Descriptive learning trajectory and EYOS

	Pooled	Bolivia	Colombia	Ghana	Kenya	Vietnam
Panel A	**Standardized reading proficiency scores**					
No education	-1.36	-0.77	-2.19	-0.45	-1.41	-1.79
1 year	-0.95	-1.09	-1.41	-0.60	-1.34	-2.65
2 year	-0.64	-1.17	-0.99	-0.65	-0.38	-1.96
3 year	-0.92	-1.60	-1.07	-0.74	-1.14	-1.81
4 year	-0.66	-1.51	-0.85	-0.76	-1.45	-1.37
5 year	-0.25	-1.32	-0.63	-0.59	-1.35	-0.96
6 year	-0.60	-1.11	-0.66	-0.38	-1.23	
7 year	-0.32		-0.26	-0.26	-0.65	
8 year	-0.46	-0.20	-0.09	-0.44	-0.31	
9 year	0.08		0.15	-0.14	0.18	-0.04
10 year	0.26		0.33	0.61	0.17	
11 year	0.42	0.10	0.18	0.65	0.25	
12 year	0.39	0.15	0.31	0.73	0.23	0.28
Panel B	**Year-to-year learning gains (standard deviation)**					
1 year	0.41	-0.32	0.79	-0.15	0.07	-0.86
2 year	0.32	-0.08	0.41	-0.05	0.96	0.69
3 year	-0.28	-0.43	-0.08	-0.09	-0.76	0.15
4 year	0.26	0.09	0.23	-0.02	-0.31	0.44
5 year	0.41	0.19	0.22	0.17	0.10	0.41
6 year	-0.35	0.21	-0.03	0.21	0.11	0.23
7 year	0.29	0.46	0.39	0.13	0.59	0.23
8 year	-0.15	0.46	0.17	-0.19	0.34	0.23
9 year	0.54	0.10	0.24	0.31	0.50	0.23
10 year	0.18	0.10	0.18	0.75	-0.02	0.11
11 year	0.15	0.10	-0.15	0.04	0.08	0.11
12 year	-0.02	0.05	0.13	0.08	-0.01	0.11
Average learning gain	0.15	0.08	0.21	0.10	0.14	0.17
EYOS	**6.8**	**13.0**	**4.8**	**10.1**	**7.3**	**5.8**

Table A3: Correlation between reading proficiency, schooling and age

	(1) Pooled (country FE)	(2) Pooled	(3) Bolivia	(4) Colombia	(5) Ghana	(6) Kenya	(7) Vietnam
Years of schooling	0.172***	0.230***	0.188***	0.132***	0.263***	0.099***	0.153***
	(0.011)	(0.014)	(0.033)	(0.037)	(0.024)	(0.034)	(0.035)
Age	-0.001	0.016***	-0.007	-0.007	0.013**	-0.019*	-0.016**
	(0.003)	(0.004)	(0.009)	(0.007)	(0.006)	(0.010)	(0.006)
Age*years of schooling	-0.001***	-0.002***	-0.002	-0.001	-0.003***	0.001	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.129***	-0.114***	-0.073	-0.019	-0.340***	-0.139***	-0.053
	(0.022)	(0.025)	(0.054)	(0.054)	(0.056)	(0.048)	(0.035)
Colombia FE	0.568***						
	(0.043)						
Ghana FE	-0.523***						
	(0.047)						
Kenya FE	-0.263***						
	(0.046)						
Vietnam FE	0.634***						
	(0.041)						
Constant	-1.227***	-1.902***	-1.228***	-0.574	-1.925***	-0.889**	-0.604
	(0.118)	(0.139)	(0.326)	(0.433)	(0.445)	(0.371)	(0.501)
Observations	10,627	10,627	1,550	1,878	2,221	2,487	2,491
R-squared	0.411	0.200	0.315	0.274	0.264	0.125	0.362

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.

Notes: Least squares regressions weighted by sampling weights. Dependent variable: standardized reading proficiency score. Sample: population with 1-12 years of schooling. Pooled specification includes country fixed effects and gives same weight to each country.

Data source: World Bank (2016a)

Table A4: Equivalent Years of Schooling based on the regression results

	Pooled with country FE	Pooled	Bolivia	Colombia	Ghana	Kenya	Vietnam
Panel A	Learning gains (standard deviation)						
1 year	0.16	0.23	0.17	0.12	0.26	0.09	0.14
2 year	0.16	0.23	0.16	0.12	0.25	0.09	0.14
3 year	0.16	0.22	0.16	0.11	0.24	0.09	0.14
4 year	0.16	0.22	0.16	0.11	0.24	0.09	0.14
5 year	0.16	0.22	0.15	0.11	0.23	0.10	0.14
6 year	0.15	0.21	0.15	0.11	0.23	0.10	0.14
7 year	0.15	0.21	0.14	0.11	0.22	0.10	0.14
8 year	0.15	0.20	0.14	0.10	0.21	0.10	0.14
9 year	0.15	0.20	0.14	0.10	0.21	0.10	0.14
10 year	0.14	0.19	0.13	0.10	0.20	0.11	0.14
11 year	0.14	0.19	0.13	0.10	0.20	0.11	0.14
12 year	0.14	0.19	0.12	0.10	0.19	0.11	0.14
Panel B	EYOS						
1 year	6.1	4.3	6.0	8.5	3.9	11.5	7.3
2 year	6.2	4.4	6.1	8.6	4.0	11.2	7.3
3 year	6.3	4.5	6.3	8.8	4.1	11.0	7.3
4 year	6.3	4.5	6.5	8.9	4.2	10.8	7.3
5 year	6.4	4.6	6.6	9.1	4.3	10.5	7.3
6 year	6.5	4.7	6.8	9.3	4.4	10.3	7.3
7 year	6.6	4.8	7.0	9.4	4.6	10.1	7.3
8 year	6.7	4.9	7.2	9.6	4.7	9.9	7.3
9 year	6.8	5.0	7.4	9.8	4.8	9.7	7.3
10 year	6.9	5.2	7.9	10.2	5.1	9.3	7.3
11 year	6.9	5.2	7.9	10.2	5.1	9.3	7.3
12 year	7.0	5.3	8.1	10.4	5.3	9.2	7.3
EYOS	6.5	4.7	6.8	9.3	4.4	10.3	7.3

Table A5: EYOS of all learning interventions

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Structured pedagogy						
Uganda	Northern Uganda Literacy Project (NULP) NGO treatment arm	English word recognition	RCT	-0.14	-0.91	Kerwin and Thornton (2015)
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	English word recognition	Multivariate analysis	-0.1	-0.65	Kerwin and Thornton (2015)
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	Vocabulary	RCT	-0.1	-0.65	Pallante 2013
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	Writing test score	Multivariate analysis	-0.09	-0.59	Kerwin and Thornton (2015)
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	Reading comprehension	RCT	-0.06	-0.39	Pallante 2013
Kenya	Reading to Learn (RtL)	Written literacy exam	RCT	0.02	0.13	Lucas et al. , 2014
Philippines	Reading materials, teacher training to incorporate reading into curriculum	Reading	RCT	0.06	0.39	Abeberese, Kumler and Linden, 2011
India	PicTalk: Year 2, Machines and activities		RCT	0.06	0.39	He, Linden and Macleod, 2007
India	PicTalk : Year 2, Activities only	English test	RCT	0.06	0.39	He, Linden and Macleod, 2007

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
India	The Pratham PicTalk programme: Year 2, Machines only	English test	RCT	0.06	0.39	He, Linden and Macleod, 2007
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	EGRA test	RCT	0.08	0.52	Kerwin and Thornton (2015)
India	PicTalk: Year 1	English	RCT	0.08	0.52	He, Linden and Macleod, 2007
Philippines	Reading materials, teacher training to incorporate reading into curriculum	Filipino test	RCT	0.09	0.59	Tan, Lane and Lassibille, 1999
Kenya	Health and Literacy Intervention (HALI)	Swahili passage reading comprehension	RCT	0.11	0.72	Jukes and Dubeck, 2015
Kenya	Health and Literacy Intervention (HALI)	Swahili passage reading fluency (words per minute)	RCT	0.13	0.85	Jukes and Dubeck, 2015
India	The Shishuvachan programme: reading classes (teacher training) and a library	Normalised reading level (Hindi, Marathi, Urdu)	RCT	0.13	0.85	He, Linden and Macleod, 2009
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	Kiswahili high reading fluency	Multivariate analysis)	0.14	0.91	RTI International, 2015
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	Word reading	RCT	0.14	0.91	Pallante 2013

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Uganda	Northern Uganda Literacy Project (NULP)	Writing test score	DID	0.19	1.24	Kerwin and Thornton (2015)
Brazil	Decentralised schooling system	Portuguese proficiency	RCT	0.19	1.24	Leme, 2010
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	Kiswahili reading fluency	DID	0.23	1.50	RTI International, 2015
Brazil	Decentralised schooling system	Portuguese proficiency	RCT	0.29	1.89	Leme, 2010
Uganda	Northern Uganda Literacy Project (NULP)	EGRA test	RCT	0.3	1.95	Kerwin and Thornton (2015)
India	Synthetic Phonics: kids teached to read using decoding and synthetic phonics skills, teacher training	Burt reading test	Multivariate analysis	0.48	3.12	Dixon, Schagen and Seedhouse, 2011
Cambodia	The School Readiness Programme (SRP)	Khmer language	RCT	0.5	3.25	Nonoyama-Tarumi and Bredenberg, 2009
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	Kiswahili reading fluency	RCT	0.56	3.64	RTI International, 2015
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	Kiswahili basic reading fluency	RCT	0.57	3.71	RTI International, 2015
South Africa	English and Operacy programme (EOP)	English test	RCT	0.6	3.90	Mouton, 1995

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Liberia	EGRA Plus: teacher training, assessment and supervision, provision of materials	Reading comprehension	RCT	0.81	5.27	Piper and Korda, 2011
Computer-Assisted Learning						
Country	**Intervention**	**Test**	**Evaluation Method**	**Effect Size**	**EYOS_STEP**	**Reference**
Peru	One Laptop Per Child + applications	Grade 5	RCT	-0.36	-2.34	Quispe et al. 2013
India	Curriculum substitution	Grade 2 & 3	Controlled Before-After	-0.11	-0.72	Linden et al. 2008
Nepal	One Laptop Per Child	Grade 2, 3 & 6	RCT	-0.11	-0.72	Sharma 2014
Peru	One Laptop Per Child	Grade 1-5	Controlled Before-After	-0.02	-0.13	Cristia et al. 2012
Uruguay	One Laptop Per Child + Internet Access	Grade 3	RCT	0	-	De Melo et al. N.d
India	Shared computer time during and after class	Grade 4	RCT	0	-	Banerjee et al. 2008
China	CAL remedial sessions	8.5	RCT	0.01	0.07	Lai et al. 2011b
Colombia	ICT in pedagogy	12	RCT	0.03	0.20	Barrera-Osorio et al. 2009
Peru	ICT in pedagogy	7	RCT	0.04	0.26	Humpage 2013

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Ecuador	Computer lab + learning software	10	Controlled Before-After	0.06	0.39	Carillo et al. 2010
Peru	One Laptop Per Child + applications	Grade 6	RCT	0.07	0.46	Quispe et al. 2013
India	Curriculum supplement	Grade 2 & 3	RCT	0.07	0.46	Linden et al. 2009
China	CAL sessions to minority students	Grade 3 (9-11)	Controlled Before-After	0.13	0.85	Yang et al. 2013
School Based Management						
Senegal	School grant application	Grade 2 female	RCT	-0.42	-2.73	Carneiro et al. 2015
Senegal	School grant application	Grade 3 female	RCT	-0.21	-1.37	Carneiro et al. 2015
Senegal	School grant application	Grade 3 male	RCT	-0.14	-0.91	Carneiro et al. 2015
Mexico	Grant+school plan+parent association	Grade 6	CBA (PSM, DID)	-0.07	-0.46	Santibanez et al. 2014
Mexico	School grant to parent association	Grade 9	RCT	-0.07	-0.46	Bando 2010
Senegal	School grant application	Grade 5 female	RCT	-0.06	-0.39	Carneiro et al. 2015
Niger	training+plan+grant	Grade 2	RCT	-0.05	-0.33	Beasley et al. 2014

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Senegal	School grant application	Grade 4 female	RCT	-0.05	-0.33	Carneiro et al. 2015
Sri Lanka	School development committee+school management+plan	Grade 8	RCT	-0.03	-0.20	Aturupane et al. 2014
Sri Lanka	School development committee+school management+plan	Grade 4 female	RCT	-0.03	-0.20	Aturupane et al. 2015
Senegal	School grant application	Grade 4 male	RCT	0.01	0.07	Carneiro et al. 2015
Gambia, The	training+grant+management manuals	Grade 3 & 5	RCT	0.01	0.07	Blimpo et al. 2015
Senegal	School grant application	Grade 5 male	RCT	0.01	0.07	Carneiro et al. 2015
Senegal	School grant application	Grade 6 female	RCT	0.02	0.13	Carneiro et al. 2015
Senegal	School grant application	Grade 6 male	RCT	0.04	0.26	Carneiro et al. 2015
Senegal	School grant application	Grade 2 male	RCT	0.05	0.33	Carneiro et al. 2015
Mexico	Grant+school plan+parent association	Grade 3	CBA (PSM, DID)	0.15	0.98	Santibanez et al. 2014
Philippines	Community involvement+staff training+school improvement plan+grant	Grade 6	CBA (PSM, DID)	0.16	1.04	Yamauchi 2014

Country	Intervention	Test	Evaluation Method	Effect Size	EYOS_STEP	Reference
Philippines	School development plan+principal training+grants+parental involvement	Grade 4	Natural Experiment	0.16	1.04	Khattri et al. 2010
Indonesia	grant+plan	Grade 4	RCT	0.2	1.30	Pradhan et al. 2014

Table A6: Net present value of increased learning (all interventions)

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Structured pedagogy								
Uganda	Northern Uganda Literacy Project (NULP) NGO treatment arm	-0.14	1,780	0.25	447	0.59	-0.08	-596
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	-0.1	1,780	0.25	447	0.59	-0.06	-426
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	-0.1	21,740	0.38	8,235	0.72	-0.07	-9,385
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	-0.09	1,780	0.25	447	0.59	-0.05	-383
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	-0.06	21,740	0.38	8,235	0.72	-0.04	-5,631
Kenya	Reading to Learn (RtL)	0.02	3,060	0.35	1,079	0.59	0.01	206

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Philippines	Reading materials, teacher training to incorporate reading into curriculum	0.06	8,900	0.28	2,481	0.25	0.02	643
India	PicTalk: Year 2, Machines and activities	0.06	6,020	0.29	1,769	0.51	0.03	959
India	PicTalk : Year 2, Activities only	0.06	6,020	0.29	1,769	0.51	0.03	959
India	The Pratham PicTalk programme: Year 2, Machines only	0.06	6,020	0.29	1,769	0.51	0.03	959
Uganda	Northern Uganda Literacy Project (NULP): Gov treatment arm	0.08	1,780	0.25	445	0.59	0.05	339
India	PicTalk: Year 1	0.08	6,020	0.29	1,769	0.51	0.04	1,279
Philippines	Reading materials, teacher training to incorporate reading into curriculum	0.09	8,900	0.28	2,481	0.25	0.02	1,023
Colombia	Teacher incentives	0.1	13,520	0.33	4,431	0.72	0.07	6,397

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Kenya	Health and Literacy Intervention (HALI)	0.11	3,060	0.35	1,079	0.59	0.06	1,132
Kenya	Health and Literacy Intervention (HALI):	0.13	3,060	0.35	1,079	0.59	0.08	1,338
India	The Shishuvachan programme: reading classes (teacher training) and a library	0.13	6,020	0.29	1,769	0.51	0.07	1,792
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	0.14	3,060	0.35	1,079	0.59	0.08	1,440
Chile	The Collaborative Language and Literacy Instruction Project (CLLIP)	0.14	21,740	0.38	8,235	0.72	0.10	13,138
Uganda	Northern Uganda Literacy Project (NULP)	0.19	1,780	0.25	447	0.59	0.11	809
Brazil	Decentralised schooling system	0.19	15,020	0.44	6,552	0.72	0.14	15,966

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	0.23	3,060	0.35	1,079	0.59	0.14	2,366
Brazil	Decentralised schooling system	0.29	15,020	0.44	6,552	0.72	0.21	24,369
Uganda	Northern Uganda Literacy Project (NULP)	0.3	1,780	0.25	447	0.59	0.18	1,278
India	Synthetic Phonics: kids teached to read using decoding and synthetic phonics skills, teacher training	0.48	6,020	0.29	1,769	0.51	0.24	7,020
Cambodia	The School Readiness Programme (SRP)	0.5	3,290	0.29	951	0.25	0.13	1,824
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	0.56	3,060	0.35	1,079	0.59	0.33	5,762
Kenya	The Primary Math and Reading (PRIMR) Rural Expansion Programme	0.57	3,060	0.35	1,079	0.59	0.34	5,865

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
South Africa	English and Operacy programme (EOP)	0.6	12,830	0.46	5,850	0.18	0.11	11,069
Liberia	EGRA Plus: teacher training, assessment and supervision, provision of materials	0.81	720	0.25	181	0.59	0.48	1,395
	Computer Assisted Learning							
Peru	One Laptop Per Child + applications	-0.36	11,960	0.23	2,736	0.72	-0.26	-12,635
India	Curriculum substitution	-0.11	6,020	0.29	1,769	0.51	-0.06	-1,609
Nepal	One Laptop Per Child	-0.11	2,500	0.41	1,025	0.51	-0.06	-932
Peru	One Laptop Per Child	-0.02	11,960	0.23	2,736	0.72	-0.01	-642
Uruguay	One Laptop Per Child + Internet Access	0	20,360	0.34	6,997	0.72	-	-
India	Shared computer time during and after class	0	6,020	0.29	1,769	0.51	-	-
China	CAL remedial sessions	0.01	14,160	0.49	6,941	0.24	0.00	274
Colombia	ICT in pedagogy	0.03	13,520	0.33	4,431	0.72	0.02	1,756

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Peru	ICT in pedagogy	0.04	11,960	0.23	2,736	0.72	0.03	1,247
Ecuador	Computer lab + learning software	0.06	11,190	0.37	4,140	0.72	0.04	3,093
Peru	One Laptop Per Child + applications	0.07	11,960	0.23	2,736	0.72	0.05	2,530
India	Curriculum supplement	0.07	6,020	0.29	1,769	0.51	0.04	1,024
China	CAL sessions to minority students	0.13	14,160	0.49	6,941	0.24	0.03	3,725
School Based Management								
Senegal	School grant application	-0.42	2,390	0.21	497	0.59	-0.25	-1,991
Senegal	School grant application	-0.21	2,390	0.21	497	0.59	-0.12	-1,026
Senegal	School grant application	-0.14	2,390	0.21	497	0.59	-0.08	-684
Mexico	Grant+school plan+parent association	-0.07	17,150	0.28	4,738	0.72	-0.05	-4,382
Mexico	School grant to parent association	-0.07	17,150	0.28	4,738	0.72	-0.05	-4,788

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Senegal	School grant application	-0.06	2,390	0.21	497	0.59	-0.04	-311
Niger	training+plan+grant	-0.05	950	0.15	145	0.59	-0.03	-69
Senegal	School grant application	-0.05	2,390	0.21	497	0.59	-0.03	-252
Sri Lanka	School development committee+school management+plan	-0.03	11,480	0.53	6,078	0.51	-0.02	-1,800
Sri Lanka	School development committee+school management+plan	-0.03	11,480	0.53	6,078	0.51	-0.02	-1,599
Senegal	School grant application	0.01	2,390	0.21	497	0.59	0.01	50
Gambia, The	training+grant+management manuals	0.01	1,580	0.25	397	0.59	0.01	40
Senegal	School grant application	0.01	2,390	0.21	497	0.59	0.01	52
Senegal	School grant application	0.02	2,390	0.21	497	0.59	0.01	107
Senegal	School grant application	0.04	2,390	0.21	497	0.59	0.02	213
Senegal	School grant application	0.05	2,390	0.21	497	0.59	0.03	237

Country	Intervention	Effect Sizes	Country GNI Per Capita, 2015 PPP	Labor Share of Income, latest available year	Average income, 2015 PPP	Return to literacy	Percentage change in earnings	NPV$
Mexico	Grant+school plan+parent association	0.15	17,150	0.28	4,738	0.72	0.11	8,593
Philippines	Community involvement+staff training+school improvement plan+grant	0.16	8,900	0.28	2,481	0.24	0.04	1,739
Philippines	School development plan+principal training+grants+parental involvement	0.16	8,900	0.28	2,481	0.24	0.04	1,639
Indonesia	grant+plan	0.2	10,680	0.29	3,087	0.24	0.05	2,548