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GEEAP
Global Education Evidence Advisory Panel



2023 COST-EFFECTIVE APPROACHES TO IMPROVE GLOBAL LEARNING

What does recent evidence tell us are "Smart Buys" for improving learning in low- and middle-income countries?

Recommendations of the Global Education Evidence Advisory Panel (GEEAP)

The Panel is convened by the Foreign, Commonwealth & Development Office (FCDO), the World Bank, the United Nations International Children's Emergency Fund (UNICEF), and the United States Agency for International Development (USAID)

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Advisory Panel

Launched in July 2020, the Global Education Evidence Advisory Panel is an independent, cross-disciplinary body composed of leading education experts from around the world. Its mandate is to provide succinct, usable, and policy-focused recommendations to support policymakers' decision-making on education investments in low- and middle-income countries. The Panel is convened by the Foreign, Commonwealth & Development Office (FCDO), the World Bank, the United Nations International Children's Emergency Fund (UNICEF), and the United States Agency for International Development (USAID).



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GEEAP

Global Education Evidence Advisory Panel

This report was produced by the Global Education Evidence Advisory Panel, convened by FCDO, the World Bank, UNICEF and USAID, with the support of the GEEAP secretariat. The judgments are the Panel's own, drawing on their reading of the available research and evidence; their conclusions do not necessarily reflect the policy positions of the Panelists' institutions, or of the GEEAP convening institutions.

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Executive Summary

This report provides a guide for governments and other stakeholders in low- and middle-income countries about what works in improving learning and education outcomes. Produced by the Global Education Evidence Advisory Panel (GEEAP), an independent interdisciplinary panel of global experts in international educational evidence and implementation, the current report updates a previous version of the Smart Buys.

With this report, the Panel aims to summarize the best, most up-to-date evidence on cost-effectiveness at scale in a user-friendly way for policymakers. It groups many different types of education policies and programs into categories from Great Buys to Bad Buys, along with categories where more knowledge is needed.

Great Buys:

These interventions are highly cost-effective and are supported by a strong body of evidence.

- Providing information on the benefits, costs, and quality of education
- Supporting teachers with structured pedagogy (a package that includes structured lesson plans, learning materials, and ongoing teacher support)
- Targeting teaching instruction by learning level, not grade (in or out of school)

Good Buys:

There is good evidence that these interventions are cost-effective.

- Providing parent-directed early childhood stimulation programs (for ages 0 to 36 months)
- Providing quality pre-primary education (for ages 3 to 5)
- Reducing travel times to schools
- Giving merit-based scholarships to disadvantaged children and youth
- Administering school-based mass deworming where worm-load is high

Promising but Limited Evidence:

For these interventions, there are some rigorous studies that show high levels of effectiveness, but evidence on cost-effectiveness or examples of implementation at scale are lacking.

- Using software that allows personalized learning and adapts to the learning level of the child (where hardware is already in schools)
- Augmenting teaching teams with community-hired staff
- Providing mass school-based treatment of specific health conditions
- Leveraging mobile phones to support learning
- Safeguarding students from violence

- Teaching socio-emotional and life skills
- Involving communities in school management
- Targeting interventions towards girls

Effective but Relatively Expensive:

There is good evidence that these interventions are effective, but they are a relatively expensive way to deliver learning outcomes. They might be appropriate for school systems with larger budgets or to achieve non-education objectives.

- Transferring cash (as a tool for improving learning)
- Feeding in primary schools

Bad Buys:

Strong, repeated evidence shows that these interventions have not worked in the past in many situations or are not cost-effective.

- Investing in hardware like laptops, tablets and computers alone
- Providing additional inputs alone, when other issues are not addressed, including:
  - Textbooks
  - Additional teachers to reduce class size
  - School buildings
  - Grants
  - Salary
  - Libraries

For this update, the Panel carried out a systematic search of over 13,000 additional studies, through which it identified over 400 additional high-quality evaluation studies. The added studies bring the total number of evaluations referenced in the Smart Buys categorizations to over 550, and they expand the categories of interventions evaluated into new areas such as health, nutrition, and socioemotional development. These evaluations were reviewed based on various criteria—most notably, how cost-effective they were at improving learning and other outcomes, and whether they had been successfully implemented at scale. On the basis on this evidence, the Panel was able to classify many interventions into the above categories:

Context, political economy, and implementation details are all critical factors in the effectiveness of each of these interventions. Under each sub-section, we discuss the specific educational, developmental, and political economy contexts in which the interventions are most likely to be cost-effective based on the evidence and implementation challenges. We encourage policymakers to review both the contextual factors and the evidence on cost-effectiveness when contemplating scaling these interventions.



What does recent evidence tell us are “Smart Buys” for improving learning in low- and middle-income countries?

Introduction

This report was produced by the Global Education Evidence Advisory Panel (GEEAP), an independent interdisciplinary panel of global experts in education research and implementation. The Panel received support from its secretariat, which includes researchers at the U.K. Foreign Commonwealth and Development Office (FCDO), UNICEF, USAID, and the World Bank. The categorizations are based on available evidence and on the outcome of deliberations of the Panel members. This updated report relies heavily on a systematic search of the literature on interventions that have been shown to affect educational outcomes. The judgments are the Panel’s own, drawing on their reading and assessment of the available research and evidence; their conclusions do not necessarily reflect the policy positions of the Panelists’ institutions, or of the convening and hosting institutions.

About two-thirds of all children in low- and middle-income countries (LICs and MICs) do not learn to read with comprehension by age 10, despite the ambitions of Sustainable Development Goal 4 for “inclusive and equitable quality education and lifelong opportunities for all.” This high level of learning poverty in LICs and MICs is an indication of the inability of education systems to provide equitable and appropriate learning opportunities for all children. We need to understand not just what is effective at getting more children into school, but also, more importantly, how to ensure that, once in school, every child has an equal opportunity to maximize their learning. Given the scale of the challenge and the resource constraints facing nearly all countries, resources need to be focused on the most cost-effective ways to improve learning.

Research in the past decade on cost-effective ways to improve learning gives us an opportunity to increase the value for money of education programs and reforms. In this note, we classify interventions based on their cost-effectiveness at improving learning outcomes, especially in LICs and MICs. We also provide guidance on the contexts in which each specific intervention is likely to be useful in improving learning, recognizing that even the best interventions will not be effective if they are not based on a sound contextual understanding of the problem, or if they are implemented poorly.

Despite the rapid growth of available evidence in literature, there are many important interventions for which consistent, actionable evidence is still lacking. We discuss these under “Areas where governments nevertheless need to make decisions or take action, but evidence on how to do it effectively is low”. This category and the “Promising but limited evidence” category should help in setting future priorities for research and exploration.



How this report improves on previous "Smart Buys" reports

This new report reflects a major expansion of the evidence base reviewed by the Panel. This new report reflects a major expansion of the evidence base reviewed by the Panel. The first "Smart Buys" report, published in 2020, was based on 150 interventions and policies whose evaluations met the Panel's criteria for quality. For this updated report, a systematic search of over 13,000 studies was conducted. Based on this search, over 400 additional high-quality evaluation studies were identified and reviewed. Out of the total 550 studies, 120 studies include cost data, allowing cost-effectiveness comparisons (see Appendix A).

The Panel made several other advances. First, we expanded the categories considered in this update to cover additional important interventions categories: we surveyed the literature on health and nutrition interventions delivered through schools that could impact education outcomes, and the literature on socio-emotional interventions. Second, rather than focusing only on learning as an outcome, we expanded our search to include credible proxies for learning; this change allowed us to include many more studies of early childhood interventions. Third, we proposed an additional classification of smart buys: "Effective but relatively expensive." Finally, we placed even greater emphasis on scalability, giving higher weight to interventions that had been studied or implemented at larger scale and had been successfully adopted within government systems.

Cost-effective Approaches to Improve Global Learning Levels

What does recent evidence tell us are "Smart Buys"?

We group educational interventions and categories of interventions into the following tiers, reflecting their cost-effectiveness at improving learning and the strength of the evidence:

GREAT BUYS These interventions are highly cost-effective and are supported by a strong body of evidence.

GOOD BUYS There is good evidence that these interventions are cost-effective.

EFFECTIVE BUT RELATIVELY EXPENSIVE There is good evidence that these interventions are effective, but they are relatively expensive to deliver. They may be appropriate for systems with large budgets or to achieve non-education objectives.

PROMISING BUT LIMITED EVIDENCE For these interventions, there are some rigorous studies that show high effectiveness or cost-effectiveness, but either evidence on cost-effectiveness or evidence at scale is limited.

BAD BUYS Strong, repeated evidence shows that these interventions have not worked in the past in many situations or are not cost-effective.

GREAT BUYS	GOOD BUYS	PROMISING BUT LIMITED EVIDENCE	EFFECTIVE BUT RELATIVELY EXPENSIVE	BAD BUYS
These interventions are highly cost-effective and are supported by a strong body of evidence.	There is good evidence that these interventions are cost-effective.	For these interventions, there are some rigorous studies that show high levels of effectiveness, but evidence on cost-effectiveness or examples of implementation at scale are lacking.	There is good evidence that these interventions are effective, but they are a relatively expensive way to deliver learning outcomes.	Strong, repeated evidence shows that these interventions have not worked in the past in many situations or are not cost-effective.

Approach to Classification

To classify interventions, the Panel reviewed a range of rigorous evaluative research on education and learning, primarily in LICs and MICs, giving greater weight to those with some measure of cost-effectiveness. The interventions discussed in this note were chosen because they have been rigorously tested using methodologies that can distinguish the causal effect of an intervention. They are also backed up by a body of other evidence, including evidence that the problem targeted by the intervention is commonly found in LICs and MICs.

The panel's approach to classification is summarized below, and elaborated on in Appendix C:

- ***Outcome variable:*** This synthesis focuses on identifying interventions that are most cost-effective in improving learning in basic education, measured in terms of learning core cognitive skills (typically, literacy and numeracy in school-aged children, and cognitive proxies in early childhood). In addition, the Panel analyzed the impact of interventions on enrollment, attendance, and drop out.
- ***Learning and equity:*** Contrary to what is sometimes assumed under a dichotomous "access vs. learning" view, a focus on learning as the outcome variable in this context is a tool for improving equity, inclusion, and opportunity.
- ***Evidence base:*** The evidence in this note focuses on rigorous causal studies. This includes randomized controlled trials as well as quasi-experimental research (see Appendix A for more detail). In addition, the panel reviewed high-quality systematic reviews, meta-analyses, and work that was produced to feed into the Panel's deliberations.[1]
- ***Cost-effectiveness vs. effectiveness:*** Wherever possible, the Panel prioritized evidence of cost-effectiveness in making its determinations. Education systems face budget constraints, and they need to allocate scarce resources toward whatever interventions will deliver the most learning gains for the most children and youth on a given budget. However, because many evaluations lack cost data, we also draw on studies focused solely on effectiveness. In these cases, the assessments of intervention costs have to be more subjective, drawing in part on costs from other studies of similar interventions.
- ***Scale:*** The Panel has more heavily weighted the interventions that have been proven effective at a larger scale—whether systemwide or, at a minimum, in hundreds of schools. The areas that appear promising but have not yet been assessed at scale are included in the "promising but limited evidence" category.
- ***Duration of impacts:*** In making its assessments, the Panel gives more credit to interventions that have demonstrated long-term positive impacts.
- ***Interpretation of evidence:*** Classifications are not a counting exercise; rather, they reflect principles drawn from the evaluation results, combined with other knowledge about learning and behavior drawn from research in the fields of Education, Psychology, and Development Economics.

1 One input into the Panel report was Angrist, Evans, Filmer, Glennerster, Rogers, and Sabarwal (2020), which estimates cost-effectiveness in terms of the Learning-Adjusted Years of Schooling (LAYS) achieved by specific interventions. The LAYS indicator, the education measure incorporated into the Human Capital Index, provides a common metric that improves on the standard-deviation measure used in much past comparative research. In Angrist et al (2020), the preferred metric for cost-effectiveness is LAYS per $100; this measures how many years of high-quality schooling can be gained for an additional $100 spent on each intervention (see Appendix D for details). However, this report also includes many additional studies based on the systematic review as described earlier.

How to Use This Note

Audience

This note is intended to be helpful for technical staff in Ministries of Education, donor agencies, local education groups, implementers, and non-profit organizations in thinking through appropriate interventions. The global evidence it presents should be used alongside analyses of education challenges locally. The classification and descriptions in this note aim to offer a greater sense of prioritization and clarity than has been possible in the past.

Context

Context is often crucial in determining whether an intervention will be successful or unsuccessful. Contexts vary by the stage of development of a country, but they also differ considerably within countries. To be used effectively, therefore, this guidance should be combined with assessing whether this intervention addresses a need in this particular context and whether the intervention can be implemented well at scale.

Implementation

In addition to overall effectiveness and cost-effectiveness, there is sizable variation in effectiveness of interventions within categories. For example, providing information on the returns to education can be highly cost-effective, but has high variance, whereas structured pedagogy can also be highly cost-effective, but has less variance. An intervention's placement in a category does not mean a new intervention in a new country will have the same impacts as the evidence described in this report. Context-appropriate design is crucial, and we therefore encourage readers to use the evidence as a starting point for national and local discussions, using insights that can only be gleaned from deep knowledge of particular contexts.

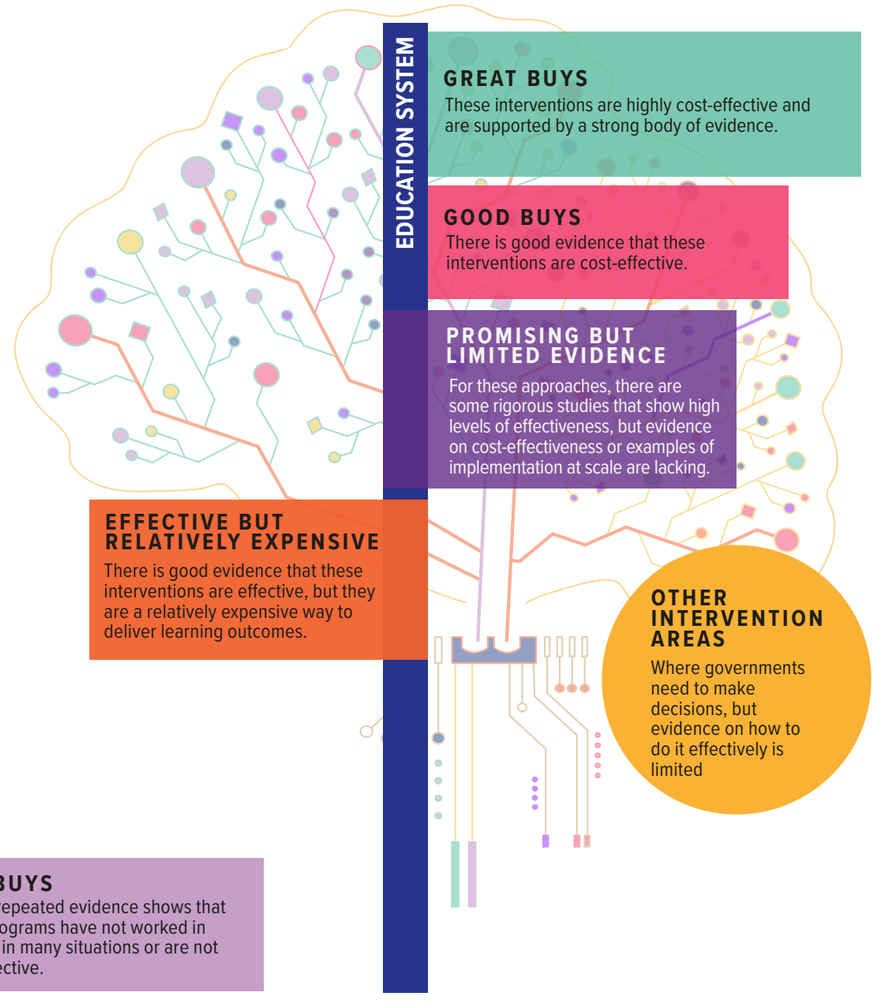
Implementation fidelity is a critical element of program impacts. In some settings and under some delivery models, cost-effectiveness could be high, while in other settings it might be much lower. Recommendations in this report should not be read as universally applicable. Rather, they should be used as a guide to understand the existing evidence and where interventions have worked well, and should then be adapted to local settings, and implemented carefully, with a focus on feasibility and scalability within a given government system.

Interpreting zero-size effects

Effects statistically not different from zero must be interpreted with caution. Sometimes, they are mistakenly understood as conclusive evidence that something would not work. But we may find zero-results for many reasons, including imperfect implementation, stakeholder opposition, low or poor compliance, or other binding constraints. A zero-result could even emerge just because the study does not have sufficient statistical power to detect small changes. The Panel's judgments in this report reflect this (for example by putting less weight on less precise studies), but readers are also advised to keep this in mind when they contextualize these findings and suggestions.

The importance of providing good information on effectiveness and cost-effectiveness

There can be substantial gains in children's learning when systems shift from less effective to more effective education programs. Most education spending in developing countries is by the governments themselves. Therefore, a cost-effective use of aid could be advising partner governments and other donors to invest their financing toward Great Buys or Good Buys, or toward the system reforms described below, and to design and implement those interventions and reforms in a context-specific way. (see Appendix A for more detail.)



The importance of systemic reform

Although this note focuses on the impacts of specific interventions aimed at improving learning, interventions are not all that matters. To drive system-wide improvements in learning and make them sustainable over the long term, systemic reform is likely to be extremely important. Ensuring learning for all children and youth requires an education system that is coherent and aligned toward learning. Which reforms should be prioritized will depend on the specific context, but this alignment toward learning should encompass the key actors, policies, incentives, pedagogy, and capacity.

This in turn requires political commitment to help systems escape low-learning traps—and it requires commitment not just from education ministers, but also from the heads of government. The Brazilian state of Ceará, for example, has made remarkable recent gains in learning during more than a decade of reforms, rising to become one of the country's top-performing states, despite also being one of the poorest.

Yet even without systemic reform, interventions like the Great and Good Buys described below can still substantially improve outcomes for millions of children and youth. They have improved learning at scale, often in systems that are not yet well-aligned toward learning. To maximize the chances for sustained success, policymakers should take several factors into account when they implement interventions, such as complementarities across interventions, dynamic complementarities, and the role of interventions in advancing or inhibiting systemic reform.

One major element of systemic reform, so comprehensive that it is hard to evaluate rigorously, is realigning the curriculum, assessment, and examinations—and the overall orientation of the system—away from elite students, and toward the actual skill distribution in the entire student population. Education systems in many LICs and MICs focus on schooling for the elite, at the expense of most students. This tendency may be compounded by international benchmarking against elite schools in other countries and by aspirational standards. Overly ambitious curricula, textbooks, and exams are the practical result of this focus on the elite. Many of the most effective interventions, including some that are included in the Great and Good Buys lists below, attempt to solve this curricula problem by going around it—for example, by providing catch-up classes, or encouraging teachers to use accurate assessments of student learning to reorganize the lessons. However, if there is political appetite for systemic change, addressing the curriculum and learning standards head-on could be highly cost-effective. It is not possible to cost out this type of change in the way that other interventions are costed, and it does require new materials and retraining of teachers, which could involve considerable outlays; but given the impacts are felt by all students in the system, the cost per student is likely to be low.

Governments should also consider investing in independent and good-quality measurement of student learning outcomes. Better data on learning outcomes can create scope for improved diagnosis and specific remediation through increased visibility of systemic shortcomings and even effectiveness of interventions.



Great Buys

The interventions in this category are likely to be highly cost-effective, either because of their large benefits, or because of their low costs. The cost-effectiveness of these interventions can be an order of magnitude greater than for interventions in even the Good Buys category.

Providing information on the benefits, costs, and quality of educatio n

Providing information on the benefits, costs, and quality of education

Providing information to parents and children on the income-earning benefits of education (where these are not known or not prominent in people's minds), on sources of funding available, and on the quality of local schools has increased attendance and learning at low cost. This information can be shared through text messages or videos (Chile and Peru), parents' meetings (Madagascar, Chile, and the Dominican Republic), or school report cards (Pakistan). In Mexico, information on the income benefits of education improved learning outcomes, but not dropout rates, with larger impacts for girls. An extension of this idea is providing information on student learning to educators; this proved very cost-effective in Argentina, though not in India, and not by itself in Liberia. These interventions have been tested at large scale, with a low cost per child when delivered at scale. Note that this is about providing specific and context-relevant information that shifts people's beliefs about the benefits of education or the quality of schooling, not general encouragement to consider education positively.

Context

This can be effective where specific, locally relevant information of decent quality from a trusted source is available. The delivery method of the information (for example, text messages or meetings) must be tailored to the country's specific needs. Also, recipients must have the means to act on the information; for example, there must be schools nearby so that families who are inspired to keep their girls in school are able to do so safely; and communities that receive the information need to have enough access to decision-making structures to spur action.



Supporting teachers with structured pedagogy (a package that includes structured lesson plans, learning materials, and ongoing teacher support)

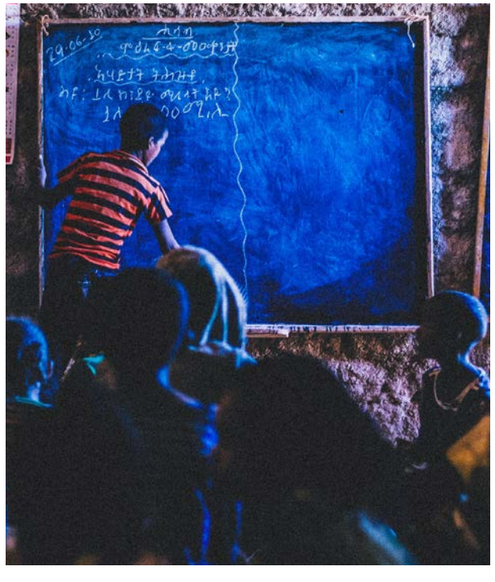


Supporting teachers with structured pedagogy

Structured pedagogy refers to interventions that include a set of integrated elements that focus on improving classroom instruction. While a wide variety of interventions call themselves structured pedagogy (see this article), we define structured pedagogy interventions as those with a coherent package of investments that include lesson plans, learning materials, skills-based ongoing teacher training, and teacher mentoring that are carefully coordinated to reinforce each other. This approach has increased learning at relatively low cost in Kenya-1, Liberia and South Africa-1, especially improving foundational literacy and numeracy. Most of the effective interventions provide support and clear guidance to teachers about what to cover in what order, but do not involve fully scripted lessons (Kenya-1, Liberia and South Africa), although there are cases where detailed scripts and daily lesson plans proved effective (Kenya-2). (For more detail see the Implementation Box). The support in teaching is meant to ensure that classroom instruction systematically builds on previous lessons with clarity, minimizing the risk that students misunderstand. Each component of the structured pedagogy package is designed to complement the others, and it is this interaction between package components that is essential to program impact (Kenya-3, South Africa). The approach has been introduced at large scale (nationwide in Kenya-4, large scale in Uganda and in several provinces in South Africa-1, 2, 3, 4).

Context

Countries seeking to improve pedagogy may want to use structured support of teaching to achieve a transformation in how foundational learning is delivered, and strengthen teacher professionalism and skills. A version with less structure could be utilized when teachers have strong content knowledge and high-quality pedagogical practice. A key benefit of structured pedagogy programs is that this approach can be effectively implemented even by teachers with limited training or poor outcomes, although structured approaches have also been effectively used in high-income countries with well-trained teachers (U.S.). Lesson plans and materials should be designed to suit the specific context, pitched at students' learning levels, and ensure that teachers are well prepared to teach the range of student skills in their classrooms, as well as to respond to students who are struggling or find the content too easy. Teachers will often welcome the chance to focus on classroom teaching rather than preparation; however, in other contexts, teachers may resist these programs, so it is important to get their inputs in design and buy-in first (for example, including teachers in the development of the program, and providing clear communication on how this intervention can improve teachers' pedagogical knowledge and by providing teachers additional support).



Structured Pedagogy Implementation Details

Structured pedagogy is a packaged intervention typically based on gradual, step-by-step introduction of skills in an order consistent with how children learn. It incorporates practical activities designed to build specific skills, teacher training, mentoring, and materials. Typically, teachers are provided lesson plans and/or teaching guides that can illustrate step-by-step learning activities, important lesson routines, concepts, and sometimes common mistakes students make, and ways to remedy them. Many structured pedagogy programs include support for continuous assessment so that teachers are able to revise their instruction based on whether children are learning at the expected pace, as well as respond to the range of skills in their classrooms. The teachers' guides range from providing specific lesson instructions to more general scaffolding for teachers, depending on the program, but all advise teachers on how to sequentially and incrementally build on students' existing skills through teacher demonstration, teacher and students practicing together, and independent practice activity. The integration of the lesson plans and student learning materials (typically including textbooks and sometimes including workbooks) is an important part of the approach. Designing context-appropriate teaching material is a long and iterative process involving experts, teachers, and ministry officials, with extensive piloting that takes into account appropriate pacing and sequencing, and provides guidance on reteaching if children are struggling and/or differentiate within classrooms. Programs are not one-size-fits-all and instead are designed based on local realities, reflecting the existing knowledge base of teachers and students, pedagogical content knowledge of teachers, gaps in current teaching, and the extent of learning diversity within and across classrooms. The level of specificity in scripting in teacher guides can be reduced over time or with level of teacher proficiency.

The design of the teacher support elements differs, but typically includes skills-based teacher training and some type of teacher support structures. Teachers are provided ongoing teacher training that emphasizes how to practically implement lessons in the classroom rather than discuss abstract concepts. As many teachers will adapt lesson plans to students' needs as well as their own, they are trained in how to do this well. Instead of introducing many new elements at once, teachers spend time practicing the pedagogical techniques. During training, these structured pedagogy programs should be presented as an aid to teaching which frees teachers to focus on instruction, student needs, and creativity.

In addition to training, teachers are supported with frequent feedback by trained coaches based on in-class observation and, in some cases, communities of practice to engage with other teachers in the process. Teachers are given an opportunity to reflect on their experiences and troubleshoot their challenges. This improves teachers' confidence in applying skills. It is important that the intervention has sufficient buy-in at all levels of the government and there is no conflict between what is covered in the program and other parts of the education system (e.g. curriculum, exams, teaching time etc).



Targeting teaching instruction by learning level, not grade (in or out of school)

Targeting teaching instruction by learning level, not grade (in or out of school)

Implementation approaches include providing targeted help for students who are falling behind, and grouping children for all or part of the day based on their learning level rather than their age. This can be done with government teachers, volunteers, or teaching assistants (see section on "Augmenting teaching teams with community-hired staff"), and implemented during school, through after-school make-up classes, or during holidays. Recent evaluations show that targeted teaching instruction has been increasingly implemented by government teachers. A version of this approach that includes an interactive pedagogy has been developed and rigorously tested at large scale in India and then tested in thousands of schools in Ghana and implemented at scale in Cote d'Ivoire and Zambia (see here for an overview of aspects of the most effective, scalable model). A less-intensive approach is to introduce tracking, where children are grouped by their initial level of learning without any change in pedagogy. This was highly cost-effective in Kenya, but met with resistance in India-1. Although conventional targeted teaching instruction interventions do not use technology, we discuss below how technology can be an effective medium for delivering personalized content at students' learning levels (see sections on software that allows personalized learning and use of mobile phones).

Context

These interventions are effective in contexts where there is a wide variety of learning levels within a class, and student learning levels are below grade-level curriculum expectations (as in many LICs and MICs).

School closures due to the COVID-19 pandemic have increased the variation in learning levels within many classrooms, making targeting instruction by learning level even more important in many contexts. This approach has been shown to be effective in primary grades, especially grades 3-5. Most interventions target the mastery of foundational reading and math skills.

Targeted instruction programs like Teaching at the Right Level (TaRL) have been implemented in a variety of settings and evaluated rigorously (India-1,2,3,4,5). These include conducting TaRL programs in school during school hours, in-school in additional working hours during summer vacations, and in community settings. Implementation has been done by teachers, supported by their superiors, and by community volunteers (paid and unpaid). There are models which have an in-school component as well as a community component.



Targeted instruction – Implementation Details for One Approach

For any intervention to be effective, it must be implemented well. While many versions of targeted instruction have proven to be effective, this box highlights the implementation details for Teaching at the Right Level (TaRL™), one type of targeted instruction program that has been shown to have positive impacts at scale.

Developed by the Indian NGO Pratham, TaRL focuses on ensuring that all children learn foundational reading and math skills. For a variety of reasons, many children get "left behind" and are not able to cope adequately with grade level curriculum. In the TaRL approach, grade level curriculum is put aside for some time each day, so that instruction can start at the level of the child. This enables acceleration in learning and assists in enabling the child to "catch up". TaRL focuses on basic literacy and math goals for children aged 7-8 years and above. Depending on class size, TaRL programs group children by their current learning levels either across grades or within the same class. In India this is usually done across grades 3, 4 and 5, but if class sizes are large, this grouping can be done within the existing class.

Teachers conduct simple one-on-one oral assessments with every student and then group them by their current learning level. The assessment is aligned to instructional practice, and helps to organize instruction and track students' learning progress. These assessments are easy to implement and interpret, and can be done periodically to regroup children as they progress (the ASER tool is often used in these programs). Data generated through this process are easy to aggregate, display and discuss, and is easily understood by instructors, teachers and parents.

TaRL instruction consists of simple and engaging daily learning activities appropriate for each learning level/group. TaRL incorporates level-appropriate, low-cost material for teaching (e.g., story or word cards or letter charts), which can be used by different- level children/groups in different ways.

Teachers implementing TaRL are trained by "leaders of practice" who themselves have conducted practice. Ideally, these trainers also provide on-going, in-class academic and practical support, and thus also serve as mentors and monitors. Learning data from assessments are reviewed frequently at the sub-district level to inform wider program delivery and course corrections, and the findings on children's progress are also discussed frequently with the teachers. As with other learning improvement programs, alignment with other elements in the system (training, monitoring, support from others higher up in the hierarchy) provides better support to classroom practice and helps to prioritize the program in the school system.



Good Buys

There is good evidence that the interventions in this category can be highly cost-effective across a variety of contexts.

Providing parent-directed early childhood stimulation programs (for ages 0 to 36 months)



Providing parent-directed early childhood stimulation programs (for ages 0 to 36 months)

Early childhood stimulation programs that train parents to provide more stimulation to their children can generate benefits that last into adulthood. Reviews have consistently found strong evidence of short-term impacts on children's cognition and language among disadvantaged populations (Report, Literature review, Meta analysis-1, 2, 3). Previous studies found gains in educational attainment, IQ, mental health, and earnings in adulthood of a home visiting program focused on early stimulation (Jamaica-1, 2). Moreover, home visiting stimulation programs have generally shown initial benefits in child development (Bangladesh, China-1, Colombia-1, India-1, and Pakistan) and have been effective at scale (Peru). Additional models that leverage community members to deliver home visits may be particularly scalable (Colombia-1 and China-2).

Furthermore, there may be ways to reduce delivery costs. For example, group sessions have been shown to be at least as effective as hybrid or home visit-only models (Kenya, India-2). Additionally, early childhood stimulation programs that target parents can have at least medium-term impacts; although there were no remaining benefits in Colombia-2 two years after an intervention, benefits persisted two and four years later (Pakistan, China-3, Jamaica-4) and into adulthood (Jamaica-5).

Context

Unlike primary and secondary education, most countries do not have established infrastructure or dedicated resources for large-scale programming directed at parents. However, some have leveraged existing platforms that serve large populations of disadvantaged families, like social protection-based platforms (e.g., Colombia-1, Rwanda). Healthcare delivery platforms, prominent in the first 1,000 days, are another promising approach for at-scale delivery (as has been done in Bangladesh). Still, whether these programs must be provided universally or targeted to specific populations (e.g., more disadvantaged, malnourished) is unclear. There is some indication from a parallel randomized controlled trial in 3 countries: India, Pakistan, and Zambia, suggesting that children from low-resource families benefit in cognition from a home-visiting parenting intervention, but those from high-resource families do not, thus reducing the wealth gap in child development.

While there is enormous potential for countries to invest in and cost-effectively improve early cognition and language through early childhood stimulation programs that target parents, it is essential they do so with monitoring and evaluation systems to understand how to target the program best. Furthermore, early childhood stimulation programs that target parents may be particularly cost-effective in contexts with cultural support and infrastructure for group delivery at the



community level, rather than contexts that would rely on home visits. When implementing programs with home visits, leveraging existing community health workers could decrease costs.

Providing quality pre-primary education (for ages 3 to 5)



Providing quality pre-primary education (ages 3 to 5)

Providing children with high-quality pre-primary education has the potential to improve their learning outcomes and provide long-term economic benefits. There is substantial evidence that millions of poor children show lower language and cognitive development levels than their better-off peers over the first five years of life, increasing the risk of inequality to grow (Report-1, 2). The deficit becomes quite large by the time these children enter primary school, which is likely to affect their ability to benefit from standard schooling. Many scholars have emphasized the importance of learning in the early years, and many countries are currently expanding coverage of pre-primary education. Rigorous literature shows that pre-primary interventions can have important long-term economic benefits in high- and middle-income countries, provided that children attend regularly and that the classroom experience is better than what children already experience in the home concerning early stimulation and social-emotional support. There is evidence from the US-1 of the dynamic complementarity of such programs, with the effects of pre-primary education on adult earnings and educational attainment compounding when followed by quality primary education systems and vice-versa. The evidence on the long-term impacts of pre-primary education for low-income countries is less extensive. However, there is now substantial and relatively consistent evidence from many different contexts that pre-primary education positively impacts learning and cognitive development for children ages 3-5 (Meta analysis-1, 2). Several of these studies have tested low-cost models at a large scale by leveraging existing infrastructure and improving quality by implementing multi-component interventions, including teacher training or hiring (India-1, Kenya- 1) or expanding the current infrastructure (Uruguay, which utilizes national systems), and have found positive impacts on learning, suggesting that these interventions can be implemented effectively at scale. Another model to increase access at scale is the construction of new pre- primary school facilities. While newly constructed facilities led to a sizable increase in school participation in Argentina-1 and higher cognitive skills in Mozambique, it reduced child cognition in Cambodia, where children switched from attending primary to the new pre-primary schools.

Some studies have found short-term but not long-term impacts (Brazil, Kenya-2, Indonesia, and India-2,), while other studies have found both short- and long-term effects, such as higher levels of enrollment in future schooling (Denmark, Uruguay, U.S.-2), and more rapid cognitive development and learning in primary school (Argentina-2, and Mozambique). Though increasing pre-primary school attendance does not necessarily improve cognition or school readiness (China, Indonesia), it suggests that dynamic complementarity between pre-primary and primary education in the U.S. may be relevant for LICs and MICs.

In addition to studies examining the effects of increasing access to pre-primary education, there is growing evidence on approaches to improving quality. Classroom quality in kindergarten is associated with later learning improvements and educational attainment (Ecuador, U.S.-3). There is some evidence that efforts to improve preschool quality through teacher training programs (Colombia, Jamaica, Ghana, Peru) and/or changes in pedagogy (India-2) can improve learning and cognitive outcomes, as well as bring socio-emotional benefits, though adding an extra teacher has led to mixed results (India-3, Thailand, Colombia). Together, these studies suggest that pre-primary education typically improves learning for children of ages 3-5, and it can be done cost-effectively. Additional evidence on making such



gains persist beyond pre-primary years would be a key area for future research.

Context

Gains made in pre-primary education may fade over time if children transition to low- quality or low conceptually and programmatically integrated primary education programs—making pre-primary investments seeming less cost-effective. However, those are the very settings in which expanded pre-primary education may be most needed in improving learning outcomes. Since poor children tend to arrive at school with lower cognitive and language development levels, creating challenges in the classroom from the earliest grades of primary school, improvements to preschool and primary education would ideally go together. Moreover, given the dynamic complementarity observed in both high- and low-income settings, further testing of pre-primary interventions in the context of weak primary education would be helpful in fully understanding this link. The quality of pre-primary education also matters a lot: interventions will be cost-effective only where they can provide more stimulation and care than the status quo (whether home-based care, private preschools, or early attendance at primary schools).

Reducing travel times to schools



Reducing travel times to schools

Where access to education is low, improving access to schools increases children's schooling and can also improve their learning. The approaches summarized here and which make this intervention cost-effective did not involve constructing new schools. School construction can pay off in settings where there are no schools nearby (for example, Indonesia's program increased both access to schooling and long-run labor-market outcomes), but it is often an ineffective and inefficient way of achieving the goal of increased access because it is expensive and is not always well targeted to the neediest areas. Fortunately, there are other, more cost-effective ways to reduce travel time and increase access to schooling. In areas where many children live far from a school, setting up community schools in existing community buildings or houses increases school participation and learning, and does so at lower cost than building new schools. Establishing new village-run schools with community teachers in rural northwestern Afghanistan increased enrollment and test scores among all children, particularly among girls. (However, it is important to note that the sustainability of community schools can be an issue, so there needs to be effective mechanisms for supporting them over the long term.) Improving education access is not just about setting up new schools. In many cases, access can be improved by providing transport. For example, studies in India and Zambia have found that providing bicycles to adolescent girls led to significant improvements in both school participation and learning outcomes. It is also cheaper than building a large number of small schools.

Context

This can be effective where marginalized, hard-to-reach, or conflict-affected children (especially girls) live far from school, and school participation is low. The appropriate response depends on safety considerations (e.g., the response in Afghanistan involved providing schools in existing buildings, while in very local contexts, bicycles were used).



Giving merit-based scholarships to disadvantaged children and youth



Giving merit-based scholarships to disadvantaged children and youth

Need-based aid (for example, through conditional cash transfers) can be useful for getting children to continue in school—especially at the secondary level, where families still incur costs (including opportunity costs), even for public schools. But need-based aid alone can fail to lead to learning gains, as was found in Cambodia. Merit-based scholarships, cash payments, or prizes targeted at disadvantaged children and youth can act as a complementary incentive to improve attendance and student effort, resulting in higher learning outcomes within the mainstream school system. In Kenya, scholarships were provided to girls who performed well in their 6th grade exams. Ten high-quality studies in 7 other countries further support the finding of the effectiveness of such incentives. Long-term impacts on learning were also found for merit-based programs in Cambodia.

Context

This approach can be helpful in areas where it is possible to design scholarships so that they do not only go to already highly advantaged students (for example, where inequality is low; or where scholarships go to the best-performing students from a disadvantaged group). On the other hand, where the school system as a whole is failing the typical child, this approach may not be the best way to tackle this wider problem. Note that this intervention does not include voucher programs that move students from public to private schools.

Administering school-based mass deworming where worm-load is high



Administering school-based mass deworming where worm-load is high

Mass treatment for parasitic worms has been shown to increase child attendance at school in contexts with high worm-load. Deworming has been implemented nationwide in many countries and studied at scale (Nigeria). In contexts with high worm-loads, school-based mass deworming improved attendance and labor market outcomes (Kenya, early 20th century USA, Nigeria, Cambodia). It has been shown to be cost-effective for improving attendance at schools. In contexts where the prevalence of worms was lower, deworming had no effect on attendance (China and Sri Lanka). In a high-prevalence context, a preschool deworming program had no measurable impact on enrollment or test scores 7 to 12 years after treatment, but the study was not designed to detect small effects (Uganda). The question of precisely how high the worm burden needs to be for deworming to measurably improve attendance, and the impact of deworming on test scores, is not settled.

Context

Worm-load, not just prevalence, is a key determinant of intervention impact. The impact of delivering deworming drugs through means other than schools has not been studied and, therefore, its effect and cost-effectiveness are unknown. The drugs used in the studies have been Albendazole or Mebendazole or Praziquantel, with dosage ranging from 400 mg to 600 mg. The frequency of the delivery has varied across interventions, but has been at least twice a year. Delivery is particularly low cost and administratively straight forward where deworming can be layered on school feeding.

Promising but Limited Evidence

For these interventions, the evidence is limited, either because there are no examples showing the approach can be implemented at scale, or because evidence on cost-effectiveness is missing. More testing to develop scalable models is recommended.

A note on ed-tech

Investing in education technology hardware alone is almost always a bad use of funds. What matters is how the technology is used by teachers, students, parents, and administrators. Purchasing new hardware like tablets or computers is expensive and does not improve learning outcomes on its own (see section on "Investing in hardware like laptops, tablets and computers alone"). However, existing technology devices can be used as a medium to effectively deliver quality content and improve learning outcomes when implemented carefully. Education technology should complement and enhance teachers' engagement and not seek to replace it (see here and here). Throughout this report we discuss evidence related to specific uses of

Using software that allows personalized learning and adapts to the learning level of the child (where hardware is already in schools)



Using software that allows personalized learning and adapts to the learning level of the child (where hardware is already in schools)

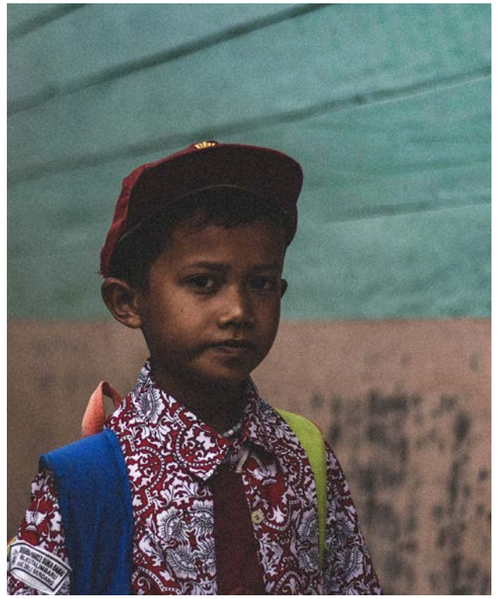
Computer hardware is not only expensive but school systems often struggle to integrate the technology into their teaching and learning (see "Bad Buys"). However, using adaptive or self-paced software that targets learning at the level of an individual child can be cost-effective if computers that can use the new software are already in place and can be maintained. Most evidence comes from out-of-school programs which avoid crowding out other learning. Studies from Cambodia, China (1, 2, 3, 4, 5, 6), India, and some advanced countries using different levels of personalisation and adaptiveness have shown these programs were effective when implemented after school. The evidence of using computer-assisted learning during school is less robust. While Uruguay implemented this approach at scale, with suggestive evidence of positive impacts that were larger for students from disadvantaged backgrounds, a program implemented by the government in China had no impacts on learning outcomes.

While any degree of personalization (see here) can be helpful, higher degrees of personalization and adaptiveness had larger impacts (India, Cambodia, Meta analysis). One study in China found that it was possible to reduce costs by using tablets with peers in pairs.

Note that these computer assisted learning programs vary in content—some teach to the level of the child, others remediate but within the curriculum, while others are based on class-level teaching. As there is very limited evidence at scale or with governments for this intervention, it is categorized as "Promising but limited evidence."

Context

This approach is relevant only where there is electricity, internet connection, teacher training, and widespread availability of hardware—including lower-tech devices in the home—to make this doable at low-cost and in a way that is inclusive, and where the software has been shown to be well-designed for learning. This would be very costly in settings without pre-existing hardware infrastructure, and governments in these settings should prioritize investing in other programs highlighted throughout this report to improve learning outcomes in a more cost-effective way. Furthermore, this intervention has more evidence from high-income contexts and limited evidence at scale or with government partners. Testing these programs at scale, with government, and in LICs should be a priority for future research. New research should seek to evaluate programs that replace regular instruction with computer-assisted learning.



Augmenting teaching teams with community-hired staff



Augmenting teaching teams with community-hired staff

To improve access to education, LICs and MICs governments (with constrained budgets) may consider augmenting the teaching team to include not just permanent regular teachers, but also community teaching assistants, apprentices, or volunteers. Indeed, an expanded learning team is common in countries at many levels of development. Delivering primary-level learning by expanding the team with community-level hires has been cost-effective in many settings (India-1, 2, Kenya-1), but implementing this approach at scale requires careful design and customization with attention paid to political considerations. Students taught by community teaching assistants had similar (India-1) or higher test scores (Kenya-1) than students taught by regular teachers. Hiring additional local education facilitators on part-time contracts was also found to increase average instructional time and improve learning outcomes at a very low cost in Indian Early Child Development programs (India-3). Often, those hired at the community level have lower formal qualifications or less experience and thus lower pay than permanent in- service teachers. But, a study in India found that these teachers might make up for lower formal training with higher effort (India-1). Moreover, in Kenya and India, these teaching assistants were present in school more frequently than permanent in-service teachers. In the Indian state of Tamil Nadu, an at-scale initiative hired over 200,000 volunteers to deliver remedial learning after school hours to over 3 million children as a part of a systemic initiative to address COVID- 19-induced learning losses. The program was both effective and cost-effective, and it also improved equity. The improvements in equity were driven by

children from less-advantaged backgrounds being more likely to participate in the program (India-2).

Context

Expanding the teaching team to supplement regular classroom teachers, though cost-effective, may face political resistance. The acceptability of the approach may well depend on whether there is a strong tradition of community assistant teachers locally, whether permanent teachers see them as helping them or replacing them, and what the pathway is to becoming a permanent teacher. There is considerable variation in qualifications, remuneration, pathways of hiring, and duration and nature of contracts in countries where expanding the learning team with community-level hiring exists (see discussion from Sub-Saharan Africa). In Kenya, the government came under pressure to make contract teaching assistants hired by communities permanent, not least after they had been unpaid for many months. Thus, scoping what alternative pathways are possible in a given context and proper implementation is crucial.

Professionalization of teachers is likely to be crucial in recruiting and motivating permanent teachers. The evidence reviewed here focuses on community-level hiring as a supplement rather than as an alternative to the existing teacher workforce, and does not assess how these community approaches do or do not alter who becomes a permanent teacher.



Providing mass school-based treatment of specific health conditions



Providing mass school-based treatment of specific health conditions

Children with untreated health conditions may miss school and/or learn less well in school. While many conditions require individualized diagnosis and treatment and are best provided through the health system, a few can cost-effectively be delivered through schools or preschools while also improving attendance, learning, or both. There are multiple studies on the cost-effectiveness of mass screening and provision of eyeglasses, multi-micronutrient supplementation, and preventative treatment for malaria, though only eyeglasses have been tested at scale (China-1).

Mass testing and distribution of eyeglasses to students with refraction errors improved test scores in two separate studies in four different locations in China (China-1, 2), although positive impacts were not found in all counties. The benefits were greater for underperforming students (China-1). Poor quality of schools might explain why glasses did not improve learning everywhere (China-2). At least one study was large-scale (2,500 schools). In these studies, eyeglasses have been shown to be highly cost-effective at increasing learning. Providing nutrient deficient children with multi-micronutrient supplementation daily at school/preschool improved test scores, early cognition, and later-life literacy at low cost (China- 4, China-5, China-6, Bangladesh, and Guatemala). Supplements were sourced locally, always included multivitamins, and often included iron, zinc and iodine. While cost-effective, evidence on implementation at scale is missing: one study with 2,400 participants had no effect on cognition (Tanzania). As supplementation has to be daily, this is a challenge. Multi-micronutrient supplementation appears more effective than providing one or two micronutrients on their own (there were positive impacts in China- 7 and India-1 but no impact in Sri Lanka-1, Sri Lanka-2, India-2, Ethiopia, and Tanzania).

Mass preventative malaria treatment where incidence is high has improved attendance and test scores (Sri Lanka), cognitive skills (Kenya and Uganda), and some measures of concentration (Mali). Screening and treatment programs are more expensive and have been less effective: a researcher-implemented program did not improve numeracy or cognition (Kenya). Asking teachers to screen children for malaria and then administer treatment was also not effective in reducing malaria or improving education outcomes (Malawi). Mass treatment in highly endemic areas is thus more cost-effective, but evidence at scale is lacking (the largest positive study had 1,300 students).

School feeding is often thought of as a health intervention, but most evidence is about its impact on attracting children to school. We therefore do not include it under health (see "Effective but relatively expensive"). While some studies do report a positive impact on learning when malnutrition is common, multi-micronutrient supplementation has a stronger cost-effectiveness evidence base than school feeding.

Context

Mass treatment is an effective approach when prevalence in the area is high, treatment is extremely safe, and/or individual diagnosis is more expensive or complex than treatment. As with many interventions that improve attendance, the impact on test scores is likely to vary with the quality of teaching. A key contextual factor for eyeglasses is the cost of the program and whether children are willing to wear free glasses (40 to 50% of students refused to wear glasses in studies). For malaria, programs that attempted to include diagnosis were less effective, but mass treatment for malaria without diagnosis is most appropriate in contexts and seasons when malaria is highly prevalent.

Leveraging mobile phones to support learning



Leveraging mobile phones to support learning

Leveraging technology that is already available in many households, like mobile phones, can be a cost-effective tool to reach students and their families and improve learning outcomes. Sending short text messages via mobile phones to nudge engagement with content has reduced dropout rates (Brazil) and improved learning (Costa Rica). In addition, informing parents about their pupil's performance in class via text message (Chile) has improved learning outcomes. However, in Botswana, using only text messages to deliver numeracy questions was not effective in improving test scores unless it was accompanied by live tutoring calls.

Reaching students at home through tutoring phone calls, in addition to text message approaches, is also cost-effective. For example, personalized phone calls and instruction delivered by teachers or volunteers improved learning in multiple settings (Botswana, Bangladesh-1, and Nepal). In some contexts, this low-tech approach was more effective for children with lower initial test scores, less educated parents, and for low-income families (Bangladesh-1). Implementation fidelity has been shown to improve with repeated experimentation in delivering foundational literacy and numeracy over mobile phones when implemented by NGOs as well as by government teachers (see here). Mobile phones can be combined with targeted instruction (see section on targeting teaching instruction by learning level, not grade) to facilitate cost-effective delivery. When instruction is not targeted, phone calls alone might not work (Sierra Leone). More automated phone call approaches, such as audio-based

interactive voice response have also been effective in Bangladesh-2, although not in Ghana.

Context

Mobile phones do not work by themselves; they are a tool that can connect educators with students and deliver targeted instruction, and can be particularly useful in remote areas or during school disruptions. More evidence is needed on evaluation and at-scale adoption by governments in public schools. Given many of these interventions were tested as substitutes for regular schooling during the COVID-19 pandemic, evidence is also needed on effectiveness when they are implemented as complements to schooling. Lastly, low-tech devices like phones are well placed to deliver simple activities, and are unlikely to be effective delivering complicated or high-competence activities.



Safeguarding students from violence

Despite legal prohibitions, corporal punishment and other violence inflicted on and perpetrated by students are prevalent in many countries. Children deserve to be safe from violence whether or not it improves educational outcomes. However, violence may also have educational impacts because it discourages access to schooling and hinders learning. If students feel safe, there are likely to be knock-on effects on enrolement and learning. However, while there is promising research on effective ways to mitigate school violence, evidence in LICs and MICs is nascent. In El Salvador, after-school clubs that taught students how to be less impulsive and resolve conflict reduced absenteeism, improved social behavior, and math and science test scores, but had no effect on reading.

In Jamaica, an intervention that taught teachers ways to develop positive relationships with high-risk preschoolers using praise and rewards led to a higher attendance, language, and math scores. In addition, a government-run program in Peru that raised awareness about bullying and encouraged reporting bullying led to a decrease in dropout rate but did not affect test scores. A school-based, gender-related, violence mitigation program in Uganda, aimed at retention in primary grades, did improve student retention. Evidence is needed on which of the violence mitigation interventions are most effective and cost-effective, as well as the best way to incorporate effective approaches into existing, pre- or in-service teacher training or after-school clubs.

Context

While all children deserve to be safe, the main threat of violence is likely to differ by country, age, and gender. Different responses will therefore be needed, for example, for preventing bullying vs. corporal punishment, or for supporting children who have suffered from war- or gang-related violence.



Teaching socio-emotional and life skills

Evidence on the effects of teaching life skills like negotiation, conflict resolution, or leadership on students' academic and later-life outcomes in LICs and MICs is limited. Similarly, there is limited evidence on the educational impact of programs designed to reduce anxiety or support students coping with trauma or conflict. The largest body of evidence is on teaching life skills to girls.

Teaching girls life skills like negotiation, leadership, conflict resolution, and critical thinking has been shown to improve their enrollment rates and labor market participation (Zambia, Uganda, India). These skills have been taught through structured in-school curriculum (for skills like negotiation, problem-solving) as well as through activities in after-school clubs (for skills like leadership and conflict resolution). Additionally, games that taught self-regulation in Kenya improved children's inhibitory control task scores, but had no impact on most other executive functions. Most of these interventions did not improve test scores; however, encouraging competitive behavior (grit) among students in Turkey through curriculum and activities did improve performance in language and math.

In China, a program that used scripted counseling to reduce anxiety by teaching skills like goal-setting, emotion management, and self-awareness also reduced dropout rates. However, there was a long-term effect only for students already at risk of dropping out, especially because most other students lost interest in taking the counseling.

Supportive and predictable environments through healing classrooms are designed to help students who lived through trauma or conflict to cope with social and emotional hurdles to learning. However, the evidence on their effectiveness is scarce and has shown no effect on literacy skills and little to no effect on numeracy skills (Sierra Leone, Congo, Lebanon). While such interventions may affect non-cognitive outcomes for children, like school perception or mental health, more evidence is needed about their effectiveness on education.

More evidence is needed on how to implement socio-emotional and life skills development programs well and on the cost-effectiveness of these interventions at scale in both formal and non-formal settings, especially as governments are increasingly incorporating them into their curricula.

Context

After-school social clubs can be most cost-effective when leveraging existing infrastructure. Maintaining students' interest in these interventions might be important for their success, as evidenced by the study in China.



Targeting interventions towards girls

Girls' participation rates remain lower than those of boys in 53 developing countries, with particularly large disparities in West Asia and Sub-Saharan Africa. This is especially true for adolescent girls: gender disparities are highest at that age, and enabling girls to stay in school has major benefits (including for health outcomes). In other contexts, including much of Latin America, boys participation rates lag those of girls. Many non-targeted interventions (such as reducing the cost of school) disproportionately benefit the gender that is falling behind (Meta analysis), but in some contexts, girls continue to face girl-specific barriers (see this review).

Some targeted interventions to increase girls' enrollment have been successful, including programs teaching girls to negotiate with their parents, enrollment drives that spread awareness about benefits of girls' education, female-only toilets, take-home rations on attending school, and constructing girl-friendly schools, with the highest effect seen for building girl-friendly schools (India, Zambia, and Uganda-1, 2). However, only studies on take-home rations and girl-friendly schools examine the adaptability and scaling-up of the interventions. As some girl-targeted interventions (e.g., construction of schools and washrooms) are quite costly, more evidence is needed on which interventions can bridge the gender gap cost-effectively.

Context

It is important to understand gender gaps in each context, because they vary both within and between countries, and by age. Gender gaps also vary between participation and learning: girls may lag in participation but once in school their learning rates may be high. Understanding the drivers of gender gaps helps identify appropriate policies: for example, general education programs that make school cheap and convenient are useful when girls' participation is not prioritized but also is not opposed by families, while more gender-targeted policies may be needed in other cases.

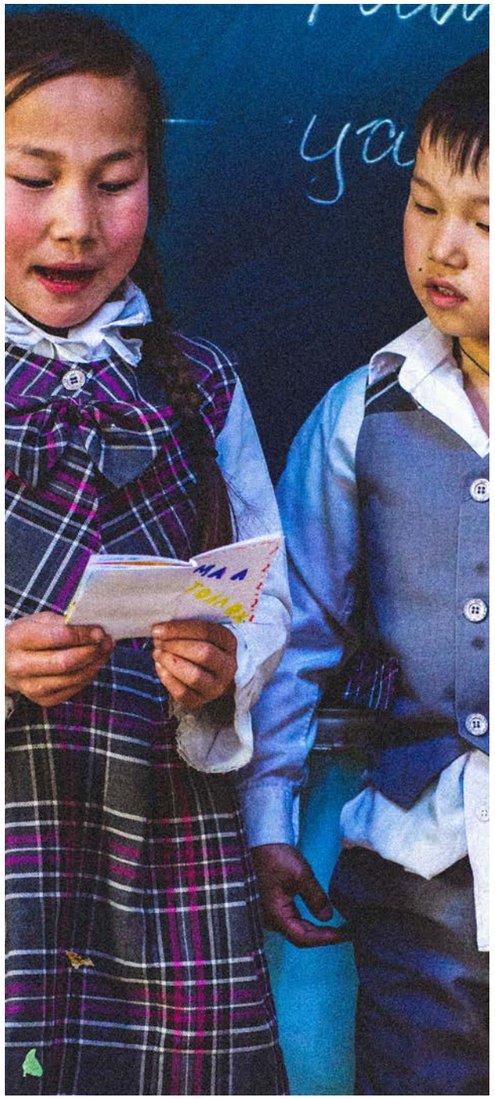
Involving communities in school management

Involving communities in school management

Providing feedback to schools through community involvement (as has been done in India, Indonesia, and Gambia) or gathering better data on teachers and students (Indonesia) has often had little impact. Where involving community members in school management has worked, however, (as in Indonesia's alternative approach, Uganda, and Kenya), it is very cost-effective. One feature of successful interventions, as in Indonesia and Kenya, has been explicitly linking school committees that involve community members that have high levels of authority. More work in testing various designs is needed to understand when and why this works, including a study of the composition, government structures, and complementary mechanisms, all of which appear to be important for effectiveness.

Context

This approach may be most promising where power asymmetries between school authorities and parents is not too great, and where there are potential complementary sources of accountability for schools (such as well-functioning local governments to which community members have good access); unfortunately, these are also the settings where the need for these interventions might be less acute.



Effective but Relatively Expensive

There is good evidence that these interventions are effective, but they are a relatively expensive way to deliver learning outcomes.

Transferring cash (as a tool for improving learning)

Transferring Cash (as a tool for improving education outcomes)

Cash transfers have consistently been found to have beneficial effects on school participation (both enrollment and dropout rates) where participation is low, and have been adopted and tested at scale. Relatively few studies have found statistically significant impacts on learning. This may reflect the fact that the impacts on attendance are relatively small, partly because many of the studies were done in countries where most children were already attending school. Cash transfers are also expensive (the cost of targeting cash to the most needy is often costly), further reducing their cost-effectiveness. Cash transfer programs are therefore not a cost-effective tool for improving learning. This may be unsurprising, since they aim to increase incomes substantially and promoting education is not the primary objective of the transfers, despite the large literature on their impacts on education outcomes. Analysis of cash transfers' impact on Learning-Adjusted Years of Schooling (LAYS) suggests that they are not as cost-effective as other interventions—although they are effective for other objectives, such as social protection. (see examples from Malawi, Mexico, Mexico).

Feeding in primary schools

Feeding in Primary Schools

While school feeding provides a range of benefits, from an education perspective, it mainly improves enrollment and attendance, likely by reducing the cost of schooling. Cost-effectiveness evidence is lacking. Though relatively expensive and logistically challenging to implement, school feeding has been implemented successfully at scale (Cambodia, India-1) and has been shown to increase school enrollment (Jamaica). A combination of school feeding for all students and take-home rations for girls increased attendance in both the morning and the afternoon (Uganda). Further, though their cost is similar, on-site cooked meals were more effective in improving attendance than packaged food. In India, shifting from packaged food to on-site cooked meals increased attendance (India-2). If school feeding is taking place, it is highly cost-effective to add deworming where parasitic worms are an issue (Cambodia).

School feeding can also improve cognition, mainly where malnutrition is common (Burkina Faso, Ghana, Argentina, Jamaica, and India). Providing meals of low nutritional value in schools in China (eggs) and Kenya (beans and cornmeal) had no effect on test scores

while meals that had meat or milk in them in Kenya improved test scores. However, multi-micronutrient supplementation has a stronger cost-effectiveness evidence base than school feeding (see 'Promising but Limited Evidence').

Context

Though extensively adopted at scale, school feeding requires a daily logistical effort and cost, which is challenging in the poorest contexts. Yet it is contexts with low attendance and high malnutrition where school feeding has the biggest impact. Areas with poor nutrition in otherwise reasonably well-funded and well-functioning education systems are thus good targets for this policy. In many contexts where the cost and logistics of school feeding are easier but enrollment and attendance is already high, school feeding might be seen as a social support (much like cash transfers) rather than an education program. The impact of this intervention has been largely tested in primary school grades. The effects are larger on students in lower grades and for girls (India-1, Uganda).



Bad Buys

There is good evidence that these interventions are effective, but they are a relatively expensive way to deliver learning outcomes. Any of the approaches listed above, if implemented poorly or in inappropriate contexts, could be classified as "Bad Buys." But there are also other interventions where the evidence has repeatedly shown that the approaches—as typically implemented—are either not effective or not cost-effective. While it may not be politically or practically realistic to cut spending on these "Bad Buys," school systems should strongly consider prioritizing the much more cost-effective interventions.

Investing in hardware like laptops, tablets and computers alone

Investing in hardware like laptops, tablets and computers alone

Computers and other educational technology are often especially enticing to policymakers and other stakeholders (and are expensive). As discussed below, adding inputs alone has not been shown to be effective at improving learning outcomes. As with other inputs, investing in hardware alone is a bad buy. When not accompanied by well-thought-out complementary measures—including personalized adaptive software and teacher training on how to use the software–adding computers has had no impact at all in Peru, Colombia, and many other countries, or negative impacts on learning outcomes (Israel, Costa Rica). This is also true in the U.S. and other advanced countries, even though the level of computer literacy is higher there. Implementation issues are a recurring challenge in hardware programs; an example is the lack of a coordinated approach in the One Laptop per Child scheme in Brazil. While it is ineffective to invest in hardware alone to improve learning outcomes, it can be cost-effective to improve learning using technology that is already available, such as mobile phones (see section on leveraging mobile phones to support learning).



Providing additional inputs alone, when other issues are not addressed, including: Textbooks, Additional teachers to reduce class size, School buildings, Grants, Salary, Libraries

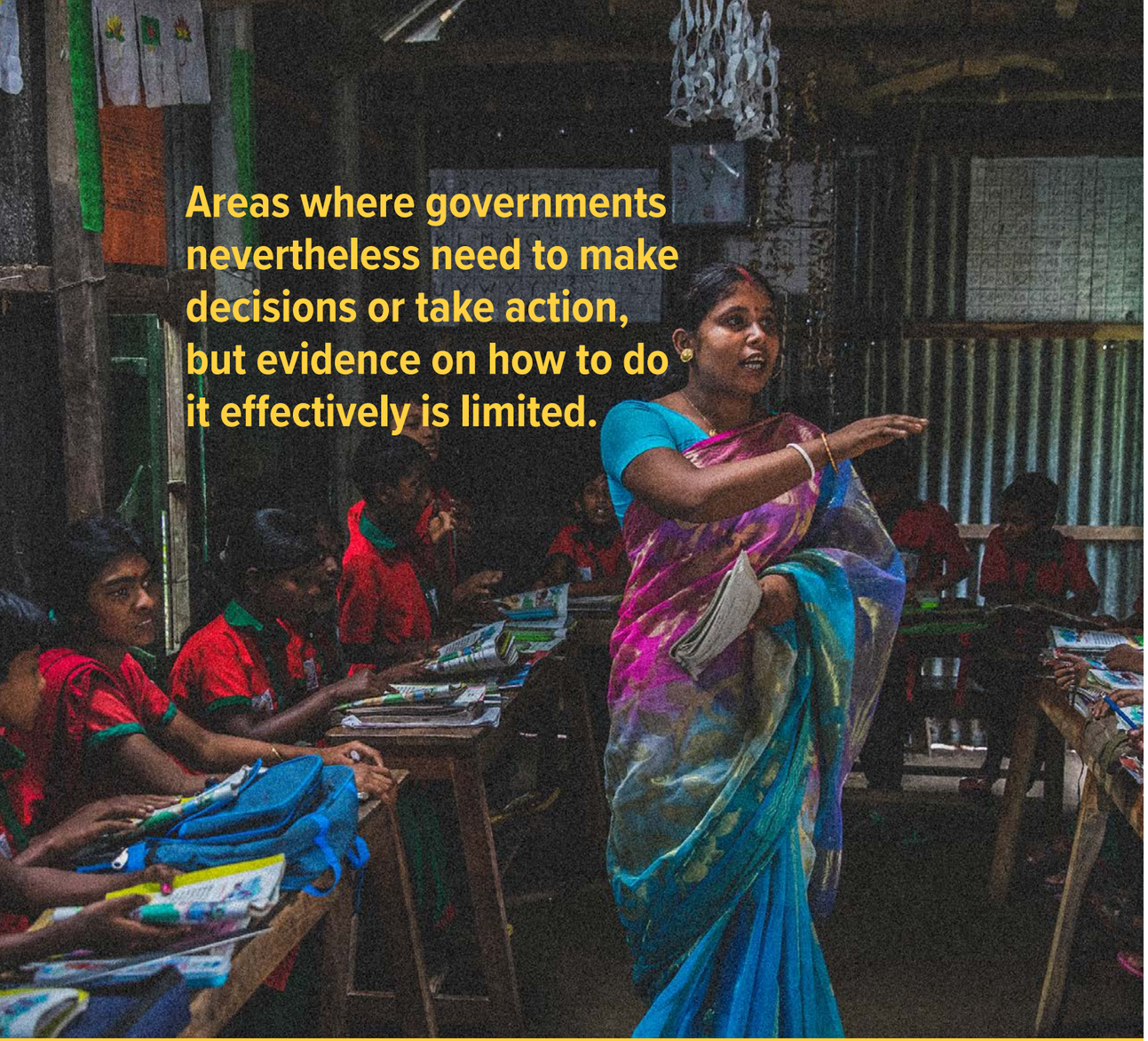
Providing additional inputs alone, when other issues are not addressed, including: textbooks, additional teachers to reduce class size, school buildings, grants, salary, libraries

One mistake that many systems make is to assume that simply investing more in inputs on the margin, without improving how they are used or for whom, will improve learning. This approach can be tempting if the intention is to show that something is being done about education, because new materials and infrastructure are more visible than some of the cost-effective approaches to pedagogy and classroom organization listed as "Good Buys" above. It is also tempting, because of course schools must have textbooks, other learning materials, teachers, and buildings in order to operate.

However, studies in many different settings have found that additional inputs alone, used in support of "business as usual," without improving how they are being used, are not effective. Examples include textbooks (Kenya-1, Sierra Leone), teachers (Kenya-2, India), flip charts (Kenya-3), flexible grants to schools (Gambia, Indonesia, Tanzania), salaries (Indonesia), and libraries (India).[2] In many education systems, a combination of rote learning, teaching to the top of the class, and an overly ambitious curriculum means that providing additional inputs has no impact on learning, unless those inputs are accompanied by fundamental changes in how teachers teach. This does not mean that inputs are unimportant. Most of the "Good Buys" discussed above involve providing new inputs as part of a strategy to change pedagogy. Good materials, including appropriate-level textbooks and instruction at the right level, provided alongside pedagogical improvements, can make a big difference in learning outcomes, as discussed above. This is especially true in systems that lack even minimal levels of resources, such as those with badly overcrowded classrooms.



2 In a few cases, providing additional inputs such as textbooks alone has been shown to have significant impacts on learning in rigorous studies, as in a very early randomized controlled trial from Nicaragua. However, even that case emphasized the importance of complementary interventions like programs to improve teaching. That study noted that a radio-lessons intervention evaluated in parallel had much larger effects, probably because of the "inconsistent application of the textbook treatment (in the hands of teachers with relatively low levels of education)."



Beyond the interventions categorized above, there are many areas in which governments consistently invest, but where, unfortunately, there is little evidence on how to do it well, at least as the interventions are typically framed. For example, governments must train, select, and allocate teachers, make education inclusive for students with disabilities, and ensure student safety. These are aspects of schooling and learning where the government is obliged to act, but there is relatively little robust evidence of ways to do so successfully. This may be because too little evaluation has been done, as with interventions to improve access for children with disabilities; or because the evidence that is available is inconclusive, or even discouraging, as in the case of in-service teacher training on general skills. There is an urgent need for more research and careful evaluation in these areas, to find the most cost-effective approaches.

Illustrative examples of areas where governments consistently invest:

Reforming teacher accountability and incentives

Low levels of teacher attendance and low levels of effort (based on what is observable) are pervasive in LICs and MICs, compared to what is observed in high-performing systems. A considerable part of this is due to failings in the support and motivation provided by the education system, rather than the failings of individual teachers, but it is costly to student learning nonetheless. Test scores increase with more teacher presence (even when teacher quality is very weak). For this reason, there have been many attempts to improve the accountability of teachers. However, linking teachers' pay to student performance can lead to gaming the system (Kenya), is extremely hard to implement appropriately (Pakistan), may work only with other inputs (Tanzania), and thus often fails to improve student learning outcomes (in Kenya, Pakistan, Tanzania, U.S.). Moreover, data on student performance to benchmark such incentives against in public schools can be of poor quality (India-1). The examples where this approach has been successful (India-2, Rwanda and Mexico) underline the importance of teacher accountability even if linking pay to performance is extremely hard to do in practice, as discussed above. Incentives based on average performance were seen to improve learning only in high performing schools or for high-performing students (Tanzania, China). Pay-for-performance programs are also hard to introduce because of resistance from both teachers and unions.

Training in-service teachers with focus on general skills

In-service teacher training as typically provided often is generalized, overly theoretical, off-site, does not respond to demonstrated teacher needs, and thus is usually not a good investment. Of course, professional development for teachers is essential, and specific, practical professional development (for example, through in-school mentoring and induction programs) that supports specific, well-evidenced changes in pedagogy can be highly effective. In fact, it is an integral part of most of the "Great Buy" and "Good Buy" interventions, such as structured lesson plans. However, there is little evidence showing that the typical stand-alone, general-skills in-service training is cost-effective. Indeed, much of the rigorous evidence that is available suggests that it does not improve student learning outcomes, because the typical training rarely incorporates the characteristics that make some professional development programs effective. For example, a large-scale randomized controlled trial of a national teacher professional development program in China showed no impacts from 15 days of training at a centralized location, even when the training was reinforced with follow up reminders or evaluation. And in Costa Rica, a program to train teachers in active techniques (such as promoting discussion and project work) in math at the secondary school level actually resulted in lower rates of learning. However, in Uganda, an 11 day-long intervention with training and regular mentoring that taught teachers to help students to pose sharp questions, frame hypotheses, and check them using information gathered from everyday life over rote memorisation and assimilating information found large effects (24 pp over a 51% baseline) on passing rate in the primary leaving exam and students' test scores.

Context

In-service professional development can be effective when it is an integral part of a well-evidenced, specific pedagogical reform (see “Good Buys” for a list of such programs); and when it includes practical training, classroom practice, and reinforcement over time. It is most likely to be effective where targeting teachers for training based on pedagogical gaps is feasible, and where the environment allows a focus on practical training. It is unlikely to be effective where there is strong institutional inertia favoring the delivery of low-quality, overly theoretical training to all teachers.

Selecting and allocating teachers

All countries must select and allocate teachers, and high-performing systems appear to do it well based on objective factors. But there is a shortage of good evidence on how to do this effectively, making this an important area for further experimentation and research. Patronage-based recruitment of teachers likely undermines system credibility and learning, and some work on the effects of a new meritocratic hiring system for teachers in Mexico found that even though the test wasn’t good at predicting who would be a good teacher, simply having the test weeds out a lot of bad candidates. (The test’s lack of predictive power is consistent with findings of earlier work in Ecuador.) Given that the allocation of teachers across schools can be quite uneven, and driven by favoritism, information about how to improve this process would also be helpful. However, there is little evidence yet on how such reforms affect learning.

Targeting support for children with special needs

Over half of the 65 million children with special-needs in LICs and MICs are not in school. Some interventions, such as special schools with trained teachers and special need-specific learning material, training for parents, and some computer-based interventions, might be effective in improving the foundational skills of primary-school-aged children with special needs (Kenya, Report). However, the quality of evidence is generally limited, in part because small sample sizes make these programs difficult to evaluate. More research on the best way to provide need-specific support to these learners is important, given the gap in learning due to disabilities in LICs and MICs.



Appendices

APPENDIX A

Research methods for this update

This update to the Smart Buys report was based on a systematic search of the literature for interventions that have educational outcomes (attendance, enrollment, dropout, test scores, or cognitive proxies). A more detailed description of the research methods used to update the report (including a detailed cost-effectiveness analysis) is available in the Online Appendix.

To conduct this search, the research team downloaded papers from 18 databases. The team looked for papers that focused on education or learning and were evaluated to find out their impact. The research team shortlisted studies that were conducted in LICs and MICs, were studied using a rigorous causal design, and were either a peer-reviewed article or an academic working paper. The team also included the results of meta-analyses and used the results of systematic reviews to ensure the list of studies was complete.

Using these criteria, the research team analyzed the titles and abstracts of 13,262 new papers and shortlisted 725 papers for further review. The full list of studies is here. Looking at the most prevalent categories from this list, the Panel decided to focus on five subcategories of topics: Early Childhood Development, Health, Teachers and Pedagogy, Ed-tech and Inputs, and Socio-Emotional and Gender. Of the papers in these topics, approximately 320 papers passed a review for research rigor. These 320 papers were not originally included in the 2020 Smart Buys. In this review, the team ensured that basic rules of causal studies applied. For example, if the study was a randomized controlled trial, the checks included ensuring that the outcomes were collected in the same way for the treatment and control groups, that the study did not have large differential attrition, that the researcher clustered the standard errors at the level of randomization, and that there were at least 20 units of randomization. For quasi-experimental methods such as regression discontinuity design, difference-in-difference, and propensity scoring matching, the team ensured the research methods were strong such as including appropriate controls, mapping pre-trends, and reviewing robustness checks. For all studies, the team ensured the researchers looked at the precision of the estimates, such as by including standard errors or confidence intervals.

The Panel members discussed the evidence for interventions in each of the above five topics as small groups. They decided how to categorize each intervention, including discussing whether to move existing interventions to a new category, whether to create new subsections, and how to categorize these new subsections. Where available, the team analyzed the cost data reported in the studies and updated the earlier cost-effectiveness analysis (see Appendix E for detailed cost-effectiveness analysis). The Panel was consulted on the resulting list and added additional papers based on their expertise.

APPENDIX B

More Detail on How to Use This Note

Audience

This note is intended to be helpful for technical staff in Ministries of Education, donor agencies, local education groups, and nonprofit organizations in thinking through appropriate interventions. It should be used along with context-specific analyses and system diagnostics. The classification and descriptions are not definitive; they simply aim to offer a greater sense of prioritization and clarity than has been possible in the past, in part due to the paucity of data concerning costs until recently. It will be especially useful in thinking through where to invest additional marginal resources—for example, is it better to invest new resources in general teacher training, or in training focused on the use of structured lesson plans? But it can also help in more closely examining where large parts of the education budget are being spent, and exploring whether that money could be used more cost-effectively.

Context

Context is often crucial in determining whether an intervention will be successful or unsuccessful. Contexts vary by the stage of development of a country, but also differ considerably within countries. To be used effectively, therefore, this guidance should be combined with an assessment of context-specific educational needs and implementation constraints. This starts with prioritizing objectives, given that in some countries the key challenge is still increasing access to education, while in others, children are in school but are not learning; and in still others, learning has improved on average, but disadvantaged children do much more poorly than the average. With these objectives set, as an aid, the tables above have described the types of contexts in which each intervention is most likely to be cost-effective. For example, information interventions can be incredibly cost-effective, because they are inexpensively delivered; however, exactly what kind of information is useful and relevant to parents and children in shaping their decisions about education will differ in different contexts. One key element of context is political economy. The categorization in the table does not reflect the political feasibility of each intervention, but only its cost effectiveness at improving outcomes. But because political economy is central, the descriptions do note which interventions are likely to be more politically challenging to deliver. The impacts on learning also depend on the quality of implementation. For example, although “teaching at the right level” interventions have typically been very cost-effective, just calling a program “teaching at the right level” will not automatically make it a Great Buy; it needs to be effectively implemented in order to have an impact.

Interpreting zero-size effects

Effects statistically not different from zero must be interpreted with caution. Sometimes, they are mistakenly understood as conclusive evidence that something would not work. But, we may find null results if implementation is imperfect or contextual implications were such that the effects were nullified through some other simultaneous counter-effect emerging due to the intervention. Sometimes, compliance with the intervention could be poor or some crucial elements for the intervention to be successful are lacking and hence the potential effectiveness arising out of complementarity of inputs is not realized. A zero-result could even emerge just because the study does not have sufficient statistical power to detect small changes. When interpreting null effects we have tried to be careful in noting which pieces of the intervention did not work and to provide careful reasoning about mechanisms to nuance our findings and such discretion is advisable for the readers too.

The importance of providing good information on effectiveness and cost-effectiveness

Moving from less to more effective education programs delivers substantial gains in learning, and most education spending in developing countries is by the governments themselves.

Therefore, advising partner governments and other donors to invest their financing toward Great Buys or Good Buys, or toward the system reforms described below, could be a very cost-effective use of aid. Some recent experimental work indicates that policymakers value good evidence, and act on it when they receive it. However, providing such advice requires substantial advisor time, very high quality embedded technical assistance, or research teams, and the advice needs to be closely tied to the evidence or it can be counterproductive. That said, where education spending is inefficient but there is the will and capacity to improve, the provision of good evidence-based information on the relative cost-effectiveness of various approaches and interventions could in itself be highly cost-effective.

This note is not intended to provide a comprehensive view on all possible interventions in the education sector. As governments and teams design programs and portfolios, they should be drawing on context-specific diagnostic work and evidence from a range of sources.

Comparable evidence does not yet cover the universe of all possible interventions in this sector. Despite all the progress made in recent years, the evidence base in education remains small and fragmented (compared to the evidence base in the health sector, for example); and only a small number of evaluation studies collect data on costs. Some interventions have had too few rigorous evaluations to be assessed well. Even where there is evidence, many of the evaluations looked at single interventions rather than packages of interventions, even though a growing literature shows that greater impact is often achieved when several good interventions are combined. In addition, for some interventions that might be Great or Good Buys, we still know too little about the politics of effective implementation at scale. While many

of the interventions discussed above have been delivered in challenging contexts, the capacity and accountability of the education system is likely to have major effects on the sustainability and scalability of impacts. Finally, some very large-scale interventions have not been evaluated rigorously at all. For all of these reasons, expanding this evidence base should be a priority, with more investment in building the data and the evaluation capacity of low- and middle income countries.

Beyond the well-evaluated and well-researched interventions summarized in this note, there are other policies and programs that may be appropriate in specific contexts. However, policymakers should strongly consider whether any of the well-researched, highly cost-effective approaches (Great and Good Buys) are relevant in their context, especially as many of those interventions address problems that are very common. If there is a strong case for an intervention that has not been well researched, especially in secondary schooling, policymakers should include a careful monitoring plan and consider whether a robust evaluation of impact is possible (recognizing that a poor evaluation will not add to the knowledge base). There should be a higher burden of justification for investing in Bad Buys: the business case for an intervention identified as rarely cost-effective should have a well-developed and well-supported theory of change, including consideration of the opportunity cost of the intervention, and a plan for monitoring its effectiveness.

Future "Smart Buys": The Panel will convene periodically to review additional categories of interventions, and to review the evolving evidence base for past categories.





APPENDIX C

More Detail on the Importance of Systemic Reform

Although this note focuses on the impacts of various interventions on learning, interventions are not all that matters. To drive system-wide improvements in learning and make them sustainable over the long term, systemic reform is likely to be extremely important. Ensuring learning for all children and youth requires an education system that is coherent and aligned toward learning. While which reforms should be prioritized in a particular setting will depend on the context, alignment toward learning should encompass the key system actors, policies, incentives, pedagogy, and capacity. This in turn requires political commitment, to help systems escape low-learning traps—and the commitment needs to be not just from the education minister, but from the head of government as well. This includes a durable commitment to consistent implementation and regular review of what is working. Good examples of sustained systemwide reform are rare, but it can happen with strong and consistent political leadership. The Brazilian state of Ceará has made remarkable recent gains in learning during more than a decade of reforms, rising to become one of the country's top-performing states despite being among the poorest.

Yet even without systemic reform, interventions like the Great and Good Buys discussed in this note can still substantially improve outcomes for millions of children and youth. Indeed, they have already been shown to improve learning at scale, typically in systems that are not yet well-aligned toward learning. To maximize the chances for sustained success, policymakers should take several factors into account when they implement interventions like those discussed below:

They should look for horizontal complementarities across interventions. A deep understanding of the specific context is essential in order to design programs that have a chance of success; and part of this context is how a given program interacts with other interventions. In the example of Ceará, Brazil, numerous interventions that supported each other were combined—the setting of clear foundational learning goals for all children; regular assessment to inform teaching; practical teacher training; and financial incentives provided to municipalities. Another example of complementarities is pairing the right curricula and the right kind of coaching in kindergarten, as has been done in the U.S.

They should also recognize the importance of dynamic complementarities. Complementarities in interventions over time also matter. For example, in the U.S., higher-quality preschool delivers larger long-term gains in educational and life outcomes when it is followed by higher-quality primary schooling, and vice versa.

They should think about how the interventions will advance (or inhibit) systemic reform. Systemic reform takes at least several years to show substantial impacts on a range of outcomes. In the meantime, policymakers should focus on interventions that will not inhibit that reform. Some implementation challenges involve behavioral change needed from key stakeholders and may require more political and systemic reform; others are technical challenges with implementing the reforms with fidelity at scale. Noting these differences is important for systemic reform. Some interventions may make complementary interventions more effective or easier to introduce later. For example, if a country already has a system of practical, classroom-based professional development for its teachers, introducing an improved curriculum is more likely to be implementable and to have the desired effects in the classroom.

Governments should also consider investing in independent and good-quality measurement of student learning outcomes. Bureaucracies and political systems can respond better to specific issues in teaching and learning when deficits are measured accurately. If data generated within the schooling-system are not representative of student learning, it is reduced to burdensome paper trails without being practically useful. Better data on learning outcomes can create scope for improved diagnosis and specific remediation through increased visibility of systemic shortcomings as well as effectiveness of interventions.

APPENDIX D

More Detail on Classification Parameters

Detailed considerations made in assessing the evidence for inclusion within this report include:

Outcome variable

This synthesis focuses on identifying the interventions that are most cost-effective in improving learning in basic education, measured in terms of core cognitive skills (typically literacy and numeracy). These skills are relevant everywhere around the world: they improve employment, income, health, civic participation, and a host of other development goals.

Consequently, children who do not acquire them will be at a disadvantage throughout their lives. Educational interventions also have other important impacts, such as reduced crime, improved employment prospects, and better health status, that are not always mediated by improvements in learning; future meetings of the Panel will consider interventions that advance those goals directly. Moreover, because improving learning has proved far more challenging than expanding access to education, this note has focused on that goal. In cases where impacts on cognitive skills are often not measured, such as in early childhood development, the Panel has relied on proxies, such as the effects on school readiness.

Learning and equity

Contrary to what is sometimes assumed under a dichotomous "access vs. learning" view, a focus on learning as the outcome variable in this context is a tool for improving equity, inclusion, and opportunity. There is a reason that Sustainable Development Goal 4 highlights foundational literacy and numeracy skills as a key indicator to be tracked: because the children and youth most harmed by the learning crisis are those who fail to acquire those skills during basic education. The Panel's goal is to highlight those interventions that will advance learning for those students. The evaluations it draws on generally either focus on disadvantaged schools and children, or have been tested system-wide; in the latter case, the Panel recommends only those interventions that are shown to be effective for less advantaged students.

Evidence base

The evidence reflected here includes the many high-quality systematic reviews and meta-analyses published over the past decade, as well as newer work that was produced to

feed into the Panel's deliberations (see References).[3] Of course, this rigorous evaluation literature, although it has greatly expanded over the past 20 years, still has numerous gaps; so the Panel has supplemented it with other types of evidence where necessary. While the primary evidence base is from low- and middle-income countries, the Panel has also drawn on evidence from high-income countries, where relevant and necessary, to fill out the evidence base.

Cost-effectiveness vs. effectiveness

Wherever possible, the Panel prioritized evidence of cost-effectiveness in making its determinations; education systems face budget constraints, and they need to allocate scarce resources toward whatever interventions will deliver the most learning gains for the most children and youth on a given budget. However, because many evaluations lack cost data, we have also drawn on data on effectiveness—evidence on which interventions tend to produce the largest learning gains, independent of cost. Because the estimated impacts from this larger group of effectiveness interventions appears to share the same range as the cost-effectiveness group, drawing on those findings is a reasonable strategy.[4]

Scale

Many interventions that succeed as smaller pilots fail to achieve results when scaled up, whether because in scaling up implementation quality declines, or because political resistance to the intervention increases. Therefore, while it has considered a range of evidence, the Panel has weighted more heavily the interventions that have been proven effective at a larger scale—whether systemwide or, at a minimum, in hundreds of schools. The areas that appear promising but have not been assessed at scale are included in the "promising but limited-evidence" category.

Duration of impacts

In making its assessments, the Panel gives more credit to interventions that have been shown to have long-term positive impacts. However, this criterion cannot be applied blindly. Interventions are often evaluated over only a couple of years, so there is not always evidence of whether the impacts persist or fade over time. Furthermore, in many cases the initial intervention may need to be repeated or complemented by other policies or programs to have its full impact. Therefore, the Panel has considered the duration of impacts only as one of multiple factors. Unlike most of the other categories, preschool and early stimulation interventions do have long-term evidence, which has influenced the categorization of those two sets of interventions.

Interpretation of evidence

Synthesizing these lessons is not just a counting exercise, both because there are gaps in the evidence and because the context of the implementation matters. Therefore, the classifications also reflect principles drawn from the evaluation results, combined with other knowledge about learning and behavior from educational research, psychology, and development economics.

3 One new addition to the literature on which this note draws is Angrist, Evans, Filmer, Glennerster, Rogers, and Sabarwal (2020), which estimates cost-effectiveness in terms of the Learning-Adjusted Years of Schooling. (LAYS) achieved by specific interventions. The LAYS indicator, which is the education measure incorporated in the Human Capital Index, provides a common metric that improves on the standard-deviation measure used in much past comparative research. In Angrist et al (2020), the preferred metric for cost-effectiveness is LAYS per $100, which measures how many years of high-quality schooling can be bought for an additional $100 spent on each intervention. (see Appendix D for details.

4 Angrist, Evans, Filmer, Glennerster, Rogers, and Sabarwal (2020).

APPENDIX E

Effectiveness and Cost-Effectiveness Measured in Terms of LAYS

The key to making judgments about relative cost-effectiveness (and effectiveness in general) is to have good data and a common metric. Past studies (such as Kremer, Brannen, and Glennerster 2013) have made these comparisons by measuring effectiveness in standard-deviation improvements on learning assessments and then dividing by cost. The paper that informed this and our previous note (Angrist, Evans, Filmer, Glennerster, Rogers, and Sabarwal 2020) assesses cost effectiveness in terms of Learning-Adjusted Years of Schooling (LAYS), a measure of education that was introduced in the 2018 World Development Report and that forms a core component of the World Bank's Human Capital Index (HCI) (see also the background paper introducing LAYS; published version here.) LAYS combines the quantity and quality of schooling into a single metric of progress. It is calculated by multiplying a country's average number of years of schooling by its average test score performance relative to a high-performance benchmark. For example, if this high-performance benchmark is Singapore's performance, this procedure produces a measure of learning-adjusted years of schooling expressed in Singapore-equivalent years. LAYS was initially developed for country-level comparisons; it has since been expanded to compare specific interventions and policies evaluated in over 250 studies across 46 countries (see Angrist, Evans, Filmer, Glennerster, Rogers, and Sabarwal 2020). The LAYS conversion uses globally comparable learning outcomes produced by the World Bank for the HCI (Angrist, Djankov, Goldberg, and Patrinos 2019).

LAYS offers two advantages over previous metrics for making such comparisons. First, because it expresses intervention impacts in terms of additional years of high quality schooling delivered, it allows direct comparison of the interventions that affect both the quantity and the quality of schooling. By contrast, previous analyses have typically looked at either one or the other. Second, the notion of "additional years of high-quality schooling" or "additional years of schooling, adjusted for quality" is easier for a non-specialist audience to understand than "standard deviations of learning."

In total, this note used over 400 sources, with more than 100 including cost data. The original report included 150 studies, 70 of which have cost data. Out of the 250 new studies used to update this note, 58 included data on the cost of the intervention. When available, we took the cost effectiveness measures reported by the authors of the papers. When these measures were not explicitly reported, we calculated the intervention's cost-effectiveness as standard deviations per $100 2015 USD, before transforming those estimates to LAYS per $100 2015 USD. For this analysis we focused on learning impacts. This new data was combined with the data from Angrist et al. (2020), which includes effects on both learning and access. The comparison is reproduced in Figures 1 and 2. Figure 1 shows cost-effectiveness, and is the

most relevant guidance for policy. Figure 2 shows effectiveness, and is included as background to show that the effect sizes from interventions in Figure 1 are reasonably representative of the effect sizes from the larger set of well-evaluated interventions.

It is important to note that interventions that report impacts on cognitive proxies rather than learning or access measures were not included in this analysis. Additionally, no assumptions were made to weight interventions based on their number of beneficiaries. However, as noted earlier, this analysis was not the only evidence that the categorization in this note relies upon, but it was one important input to the Panel's judgment. The Panel recognizes the importance of these caveats and encourages the production of research that addresses them, while commiting to continue updating this analysis as the evidence base grows. Overall, the purpose of the analysis was not to provide a precise assessment and ranking of the cost-effectiveness of different interventions. Instead, its purpose was to inform the discussion presented in the note by considering differences in orders of magnitude between the interventions in terms of their cost-effectiveness.

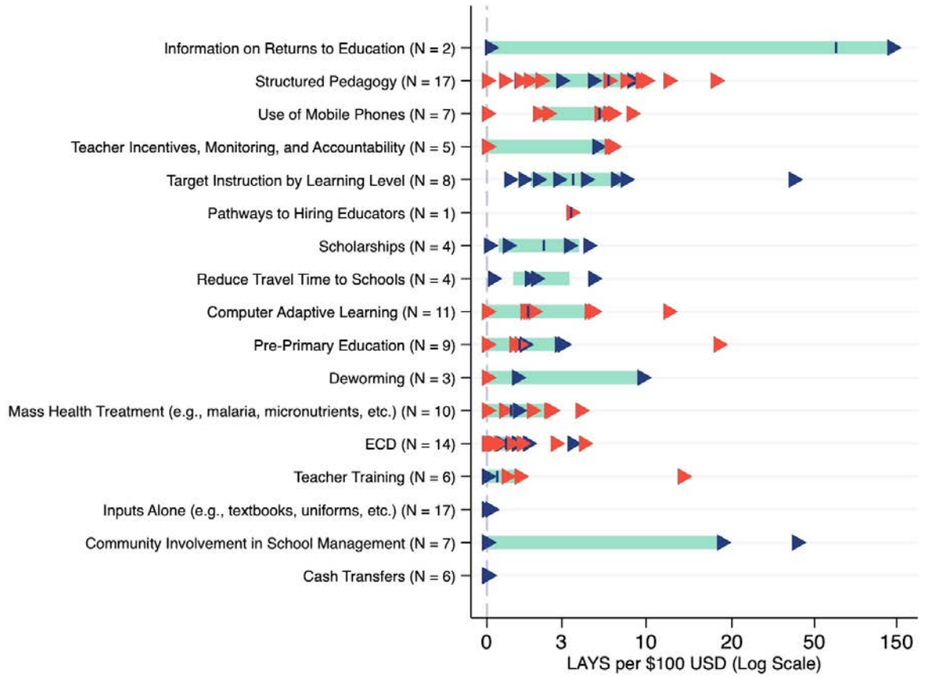


Figure 1: Learning Adjusted Years of Schooling (LAYS) per $100 USD, by Intervention Type

Source: Data adapted from Angrist et al (2020) shown in blue.

Notes: Subsections are ranked by median impact. The boxplot delineates the 25th and 75th percentiles. The x-axis is reported on a natural log scale. New data includes

learning outcomes. Data from Angrist et al (2020) includes both learning and access outcomes. No data was included for School Feeding; Latrines, Water, and Sanitation Awareness; Safeguarding from Violence, Socio-Emotional and Life Skills Development; and Maternal Mental Health Counseling, due to lack of availability of cost estimates.

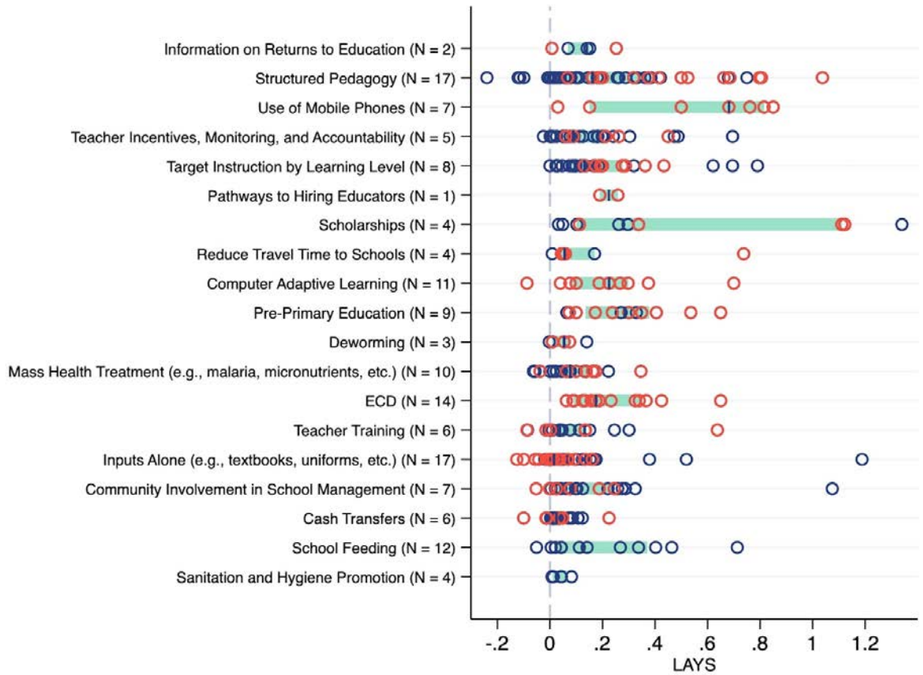


Figure 2: Learning Adjusted Years of Schooling (LAYS) Gained, by Intervention Category

Source: Additional data adapted from Angrist et al (2020).

Notes: Categories are ranked by median impact. The boxplot delineates the 25th and 75th percentiles. Data points in blue represent studies from Angrist et al (2020) that do not include cost effectiveness information.

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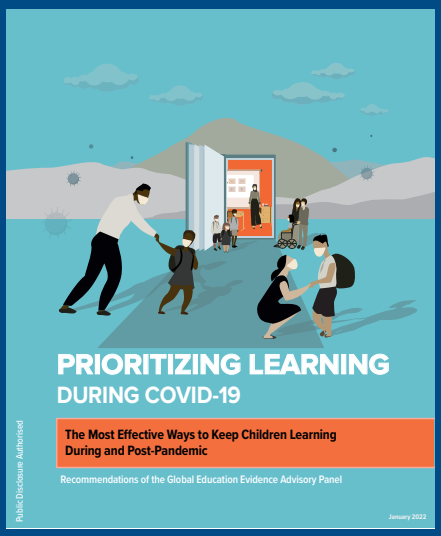
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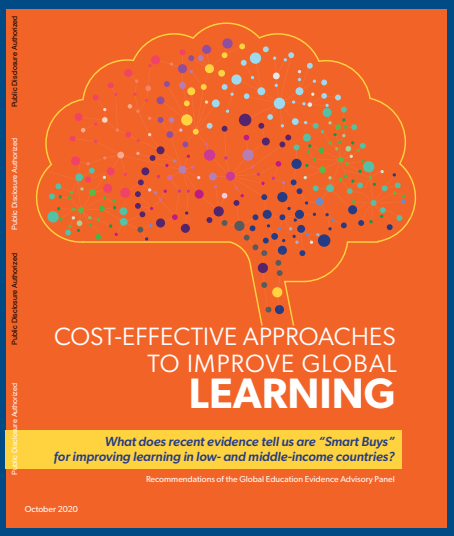
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The full list of studies identified through the systematic search can be accessed here:
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Photos in this report were sourced from Unsplash, 2023

This third Global Education Evidence Advisory Panel (GEEAP) report provides a guide for governments and other stakeholders in low- and middle-income countries about what works in improving learning and education outcomes. The current report, based on a review of over 13,000 additional studies, updates a previous version of the 'Smart Buys'. With this report, the Panel summarizes the best, most up-to-date evidence on cost-effectiveness at scale in a user-friendly way for policymakers. It groups many different types of education policies and programs into categories from Great Buys to Bad Buys, along with categories where more knowledge is needed.





Prioritizing Learning During Covid-19: The Most Effective Ways to Keep Children Learning During and Post-Pandemic. This second Global Education Evidence Advisory Panel (GEEAP) report draws on insights from the latest research to document the impacts of and responses to Covid-19. It offers guidance on how education systems in LICs and MICs can respond to the damage caused by the pandemic and ensure that the learning needs, especially of marginalized and disadvantaged groups, are addressed. The report provides practical, focused advice for policymakers—advice that represents the consensus recommendations of an independent, interdisciplinary panel of global experts, based on the best evidence available during a rapidly changing crisis.

Link: http://bitly.ws/Dv4o

In this first GEEAP report on Cost-effective Approaches To Improve Global Learning: What does recent evidence tell us are "Smart Buys" for improving learning in low- and middle-income countries? the Panel provides evidence-based recommendations to improve learning outcomes. Even pre-pandemic, more than half of all children in low- and middle-income countries did not learn to read with comprehension by age 10, despite the ambitions of Sustainable Development Goal 4 for "inclusive and equitable quality education and lifelong opportunities for all."

Link: https://bit.ly/3nHwzEu

GEEAP

Global Education Evidence Advisory Panel