SPOTLIGHT 4

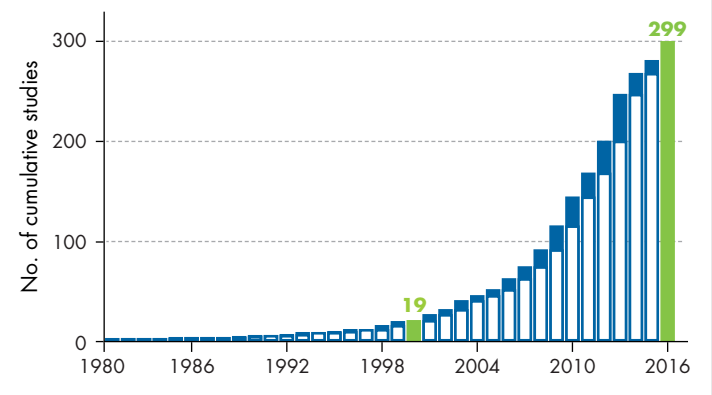
Learning about learning

Identifying gaps between evidence and practice helps set priorities for action.

As evidence of the learning crisis has grown, so has understanding of what produces learning. Cognitive neuroscience has evolved dramatically, with brain imaging revealing new insights into how children learn.[1] Over the last two decades, neuroscience has been instrumental to understanding early child brain development and the crucial nature of the early years.[2] Schools in many parts of the world are innovating in approaches to pedagogy, professional development, and the use of new technologies.[3] Governments and nonprofits are trying out innovative programs to upgrade teachers' skills on the job.[4]

At the same time, evidence on which programs most effectively boost learning is mushrooming. One example of that growth: the number of impact evaluations of interventions intended to improve learning outcomes in developing countries rose from 19 in 2000 to 299 by 2016 (figure S4.1).[5] This evidence translates into clearer insights into how to improve learning at the level of the student, the classroom, and the school. Beyond the increase in their number, these impact evaluations have also grown more sophisticated over time, making them more useful for policy making. They are now more likely to compare multiple interventions, more likely to study a wide range of interventions overall, and more likely to study interventions on a large scale. The evaluations show that many of these interventions have sizable impacts. Several pedagogical interventions, for example, deliver learning gains greater than what students would learn in a year of business-as-usual schooling.[6]

Figure S4.1 The number of experimental and quasi-experimental studies of interventions to improve learning has mushroomed in recent decades



Sources: WDR 2018 team, using data from 3ie (2016) and Evans and Popova (2016b). Data at http://bit.do/WDR2018-Fig_S4-1.

Note: The blue segment on the white bars represents the increment from the previous year.

Making better use of evidence

Not all evidence is created equal, but many different kinds of evidence can be credible. Scientific evidence demonstrates the pathways of brain development and functioning. Social science evidence can effectively answer the question of what would have happened in the absence of a reform or intervention (often called a counterfactual). Randomized controlled trials or analyses of "natural experiments" are useful tools for determining such a counterfactual. Implementation science and case studies can provide a detailed picture of how an intervention or a phenomenon works. The best evidence of what improves learning draws from a range of methods.

Even when an intervention in one education system has a positive impact, it may not work everywhere. Effects may differ when translating from one location to another or from a pilot study to a large-scale program. What works in Peru may not work in Burundi because the education systems and societies are different. A common intervention that has been tested in a range of settings is to reduce class size. But increasing

class size by 10 students reduced test scores by four times as much in Israel as it did in Kenya.[7] A pilot intervention may allow for more controlled conditions than an at-scale intervention. In Kenya, an intervention to hire contract teachers was effective on a small scale, but when it was implemented at scale through government systems, salaries were delayed and ultimately the contract teachers were converted to civil servants.[8] The scaled-up program no longer resembled the successful pilot, and the learning gains failed to materialize.

To make sense of the evidence, policy makers should consider the likely principles behind effective programs rather than fixating on results (or "point estimates") from individual studies.[9] For example, programs that provide financial incentives for teachers have had mixed effects. Rather than taking a simple average of the effects, a nuanced assessment would reveal that these programs tend to work better when improving quality is relatively simple and within a teacher's control—for example, when they increase teacher attendance or teaching time while at school.[10]

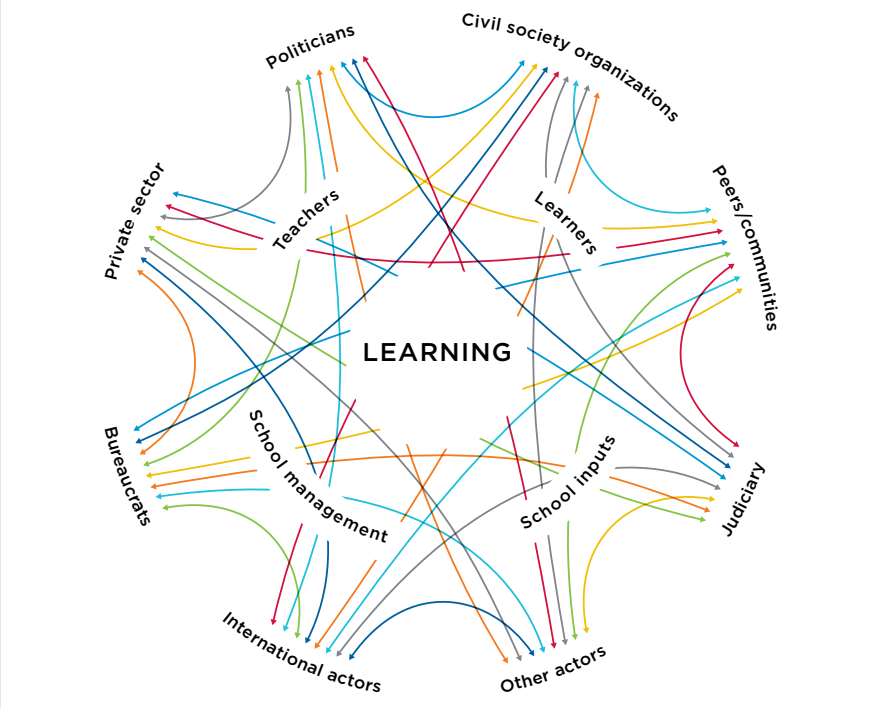
Viewing evidence through models of human behavior is one way to focus on principles. This means examining patterns of results and using models to infer why results vary across settings. The first step would be a nuanced synthesis, bringing together the results of a range of studies and examining empirical patterns. The second step would be using theory—models of human behavior—to explain why some proposed solutions work and others do not, as well as why the same solution may work in one locale or time but not in another.

Producing learning is complex, but investments that change what happens in the classroom are a good bet

Many actors contribute to the learning process, and they all face their own incentives. The direct inputs to the learning process include the choices made by learners themselves, as well as by their parents, teachers, and other school leaders, interacting with the available infrastructure and materials. Less immediate but still important, bureaucrats, politicians, and nonstate players make decisions that influence education quality. Understanding these relationships is crucial to interpreting evidence.

Each actor in the learning process reacts to the others, so changing one element of the process does not guarantee more learning. Many of the inputs to the learning process are choices made by the actors—choices made in reaction to the actual and anticipated choices of other actors (figure S4.2). Teachers react to

Figure S4.2 It's more complicated than it looks: People act in reaction to the choices of others throughout the system



Source: WDR 2018 team.

changes in school leadership, school directors react to community demands, and parents react to changes in government policy. In India and Zambia, grants to schools led parents to reduce their own investments in their children's schooling.[11] In a household with few resources, if the government begins providing textbooks, a parent may well reallocate education resources to other needs, such as health.

How can we make sense of all of these complex, dynamic relationships? Models of human behavior illuminate the motives for choices and actions, and they can help guide solutions. Simple optimizing behavior models—in which actors maximize their well-being subject to limited budgets and other constraints—explain why parents reduce their contributions when schools increase theirs. Principal-agent models that incorporate multiple actors with different objectives explain why teachers may fail to teach when not sufficiently motivated or monitored. Behavioral models also play a role: student learning and educational aspirations can be affected by the salience of stereotypes. Economic phenomena such as information, market, and coordination failures play a role in these models. The models can also illuminate why a gap is often observed between evidence on how to improve learning and actual practice.

Focusing where the gaps between evidence and practice are largest

Gaps between evidence and actual practice provide entry points for efforts to improve education. These gaps come to light when evidence shows that certain approaches or interventions can improve outcomes, but the approaches used in practice are different.[12] For example, the accumulated research evidence demonstrates high returns to early investments in children, yet families and governments in low-income environments do not prioritize these investments. Evidence shows that certain types of teacher professional development deliver much higher learning gains than others, but outdated training methods persist.[13] Because the gap between evidence and practice requires good information on what the evidence says, as well as what current practice is, it is likely that many opportunities for improvement have yet to be discovered.

Intuition and common sense are not enough. One fundamental lesson from the growing evidence base is that intuition is not always a trustworthy guide. It may miss the complexity of motivations and reactions in the real world, as can happen when teacher financial incentives induce cheating rather than more effort.[14] Intuition may fail to capture the net effect of conflicting forces, such as when separating students by ability allows teachers to target teaching more specifically to students' level—which should increase their learning—but also distances them from their high-performing peers—which may decrease their learning.

Knowledge about improving learning must take both the costs and the benefits of learning interventions into account. A computer-assisted learning intervention in India increased learning more than employing contract teachers in Kenya, but hiring contract teachers was so much cheaper that it delivered a higher return on investment.[15] The evidence base on costs is much thinner than that on benefits, with a tiny fraction of studies examining both.[16] But some programs have been evaluated on both effectiveness and cost-effectiveness.[17] This evidence on costs—adapted to local contexts—should qualify policy recommendations.[18]

The gaps between evidence and practice signal promising places to start, rather than the end of learning how to improve learning. Interventions cannot simply be exported from one country to another. Indeed, at times the effectiveness of an apparently similar intervention can vary even within a country, depending on how the program is implemented.[19] The cost of implementation will also vary dramatically across contexts.[20] But this does not mean that evidence from other contexts is without value. On the contrary, successes in other environments—coupled with a careful analysis of why the programs work—provide a starting point. Policy makers can draw on this evidence and experiment in their own policy environment.

Notes

1. De Smedt (2014); Insel and Landis (2013); Kuhl (2010).
2. Dua and others (2016).
3. Chisholm and Leyendecker (2008); Schweisfurth (2011).
4. Popova, Evans, and Arancibia (2016).
5. Evans and Popova (2016b).
6. Evans and Yuan (2017).
7. Pritchett and Sandefur (2013).
8. Bold and others (2016); Duflo, Dupas, and Kremer (2015).
9. Muralidharan (2017).
10. Muralidharan and Sundararaman (2011).

11. Das and others (2013).
12. Montagu and Goodman (2016); Pakenham-Walsh (2004).
13. Lauwerier and Akkari (2015).
14. Glazerman, McKie, and Carey (2009); Jacob and Levitt (2003).
15. Kremer, Brannen, and Glennerster (2013).
16. McEwan (2015).
17. Kremer, Brannen, and Glennerster (2013).
18. Evans and Popova (2016a).
19. Bold and others (2016); Kerwin and Thornton (2015).
20. Evans and Popova (2016a).

References

3ie (International Initiative for Impact Evaluation). 2016. "Impact Evaluation Repository." 3ie, London. http://www.3ieimpact.org/en/evidence/impact-evaluations/impact-evaluation-repository/.

Bold, Tessa, Mwangi Kimenyi, Germano Mwabu, Alice Ng'ang'a, and Justin Sandefur. 2016. "Experimental Evidence on Scaling Up Education Reforms in Kenya." Economic Development and Institutions Project Working Paper, Institute for International Economic Studies, Stockholm University.

Chisholm, Linda, and Ramon Leyendecker. 2008. "Curriculum Reform in Post-1990s Sub-Saharan Africa." *International Journal of Educational Development* 28 (2): 195–205.

Das, Jishnu, Stefan Dercon, James Habyarimana, Pramila Krishnan, Karthik Muralidharan, and Venkatesh Sundararaman. 2013. "School Inputs, Household Substitution, and Test Scores." *American Economic Journal: Applied Economics* 5 (2): 29–57.

De Smedt, Bert. 2014. "Advances in the Use of Neuroscience Methods in Research on Learning and Instruction." *Frontline Learning Research* 2 (4): 7–14.

Dua, Tarun, Mark Tomlinson, Elizabeth Tablante, Pia Britto, Aisha Yousfzai, Bernadette Daelmans, and Gary L. Darmstadt. 2016. "Global Research Priorities to Accelerate Early Child Development in the Sustainable Development Era." *Lancet Global Health* 4 (12): e887–e889.

Duflo, Esther, Pascaline Dupas, and Michael R. Kremer. 2015. "School Governance, Teacher Incentives, and Pupil-Teacher Ratios: Experimental Evidence from Kenyan Primary Schools." *Journal of Public Economics* 123 (March): 92–110.

Evans, David K., and Anna Popova. 2016a. "Cost-Effectiveness Analysis in Development: Accounting for Local Costs and Noisy Impacts." *World Development* 77: 262–76.

———. 2016b. "What Really Works to Improve Learning in Developing Countries? An Analysis of Divergent Findings in Systematic Reviews." *World Bank Research Observer* 31 (2): 242–70.

Evans, David K., and Fei Yuan. 2017. "Economic Returns to Interventions That Increase Learning." Background paper, World Bank, Washington, DC.

Glazerman, Steven, Allison McKie, and Nancy Carey. 2009. "An Evaluation of the Teacher Advancement Program (TAP) in Chicago: Year One Impact Report, Final Report." Mathematica Policy Research, Princeton, NJ.

Insel, Thomas R., and Story C. Landis. 2013. "Twenty-Five Years of Progress: The View from Nimh and Ninds." *Neuron* 80 (3): 561–67.

Jacob, Brian A., and Steven D. Levitt. 2003. "Rotten Apples: An Investigation of the Prevalence and Predictors of Teacher Cheating." *Quarterly Journal of Economics* 118 (3): 843–78.

Jinnai, Yusuke. 2016. "To Introduce or Not to Introduce Monetary Bonuses: The Cost of Repealing Teacher Incentives." Economics and Management Series EMS-2016-08 (January), IUJ Research Institute, International University of Japan, Minamiuonuma, Niigata Prefecture, Japan. http://www.iuj.ac.jp/research/workingpapers/EMS_2016_08.pdf.

Kerwin, Jason T., and Rebecca L. Thornton. 2015. "Making the Grade: Understanding What Works for Teaching Literacy in Rural Uganda." PSC Research Report 15-842, Population Studies Center, Institute for Social Research, University of Michigan, Ann Arbor.

Kremer, Michael R., Conner Brannen, and Rachel Glennerster. 2013. "The Challenge of Education and Learning in the Developing World." *Science* 340 (6130): 297–300.

Kuhl, Patricia K. 2010. "Brain Mechanisms in Early Language Acquisition." *Neuron* 67 (5): 713–27.

Lauwerier, Thibaut, and Abdeljalil Akkari. 2015. "Teachers and the Quality of Basic Education in Sub-Saharan Africa." ERF Working Paper 11, Education Research and Foresight, Paris.

McEwan, Patrick J. 2015. "Improving Learning in Primary Schools of Developing Countries: A Meta-Analysis of Randomized Experiments." *Review of Educational Research* 85 (3): 353–94.

Montagu, Dominic, and Catherine Goodman. 2016. "Prohibit, Constrain, Encourage, or Purchase: How Should We Engage with the Private Health-Care Sector?" *Lancet* 388 (10044): 613–21.

Muralidharan, Karthik. 2017. "Field Experiments in Education in Developing Countries." In *Handbook of Field Experiments*, edited by Abhijit Vinayak Banerjee and Esther Duflo, Vol. 2, 323–88. Handbooks in Economics Series. Amsterdam: North-Holland.

Muralidharan, Karthik, and Venkatesh Sundararaman. 2011. "Teacher Performance Pay: Experimental Evidence from India." *Journal of Political Economy* 119 (1): 39–77.

Pakenham-Walsh, Neil. 2004. "Learning from One Another to Bridge the 'Know-Do Gap.'" *BMJ* 329 (7475): 1189.

Popova, Anna, David K. Evans, and Violeta Arancibia. 2016. "Training Teachers on the Job: What Works and How to Measure It." Policy Research Working Paper 7834, World Bank, Washington, DC.

Pritchett, Lant, and Justin Sandefur. 2013. "Context Matters for Size: Why External Validity Claims and Development Practice Do Not Mix." *Journal of Globalization and Development* 4 (2): 161–98.

Schweisfurth, Michele. 2011. "Learner-Centred Education in Developing Country Contexts: From Solution to Problem?" *International Journal of Educational Development* 31 (5): 425–32.