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Slow down, you're going too fast: Matching curricula to student skill levels

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ABSTRACT

Learning profiles show changes in student skills per year of schooling. Profiles are often shockingly shallow in developing countries in part because curricula move faster than the pace of learning. To demonstrate the consequences of curriculum mismatch, we construct a model that portrays learning as the result of synchronizing student skill and instructional levels. Our simulation shows that countries with identical *potential* learning could have divergent learning outcomes due to a gap between curricular and actual pace, and the country that goes *faster* has much *lower* cumulative learning. Paradoxically, there is greater learning potential if curricula and teachers slow down.

> *If the curriculum were radically simplified, if the teacher's mission were squarely defined as making everyone master every bit of it, and if children were allowed to learn at their own pace, by repeating if necessary, the vast majority of children would get something from the years they spend in school.*
>
> Banerjee and Duflo, *Poor Economics* (2011)

The expansion in schooling around the world is one of the amazing successes of our time. More children are in school, longer, and completing more grades that ever before in history. The average years of schooling of the labor force in the developing world *more than tripled* from 1950 to 2010–from 2.0 to 7.2 years. The average worker in Bangladesh in 2010 completed more years of schooling than the typical worker in France in 1975 (Barro and Lee, 2011). While the world may miss reaching the Millennium Development Goal of universal primary school completion by 2015 – it will not be by much.[1] However, as the world nears a *schooling* goal, there is rising concern this expansion might not coincide with *education* or *learning* goals (Filmer et al., 2007; Pritchett, 2013). There is cumulating evidence that *learning profiles* – the relationship between years of schooling and measures of student mastery – are in many countries far too flat.[2] Children are learning so little from each year of instruction that the completion of even basic schooling leaves children lacking necessary skills. Thus, some development and education organizations are reorienting their programming and goals from schooling to learning.[3] As they do so a key question is *why* there is so little learning and what can be done about it.

1. The puzzle of flat learning profiles

Many studies start from an assessment of student learning tested in a given grade and hence start from the *level* of student achievement. But every student's level of mastery is just the accumulation of their lifetime learning. Once one begins to investigate the *dynamics* of learning in developing countries the immediate question is: "how can it possibly be that so many children are learning so very little during a year's worth of schooling?"

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[1] The net enrollment rate in primary education as of 2012 is 90 percent worldwide (United Nations, 2014). Of the 117 countries reporting, 22 met the goal, 41 countries have enrollment rates of over 90 percent and 83 countries have enrollment rates of over 80 percent. See http://www.cgdev.org/page/mdg-progress-index-gauging-country-level-achievements.

[2] The learning profile is a purely *descriptive* graphic device – there is no implication of causation.

[3] For example, the World Bank's 2020 sector strategy and DFID's 2010 strategy are *learning for all*, USAID's strategy is *opportunity through learning*, and AusAid/DFAT's strategy is *promoting opportunities for all* which includes improving learning outcomes.

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Table 1
Studies across India demonstrate very little conceptual or procedural learning in mathematics as children progress through school.

	Skill/competency (examples from each assessment)	Average percentage point increase per year of schooling	Of students who did not know skill, percent who learned in the next grade
APRESt (five districts of Andhra Pradesh)	Vertical single digit addition (w carry)	10.0	17.6
	Identify which shape is a triangle	5.3	7.0
	11 common questions, grades 2–5	6.1	9.4 (≈1 in 11)
ASER (nationwide, rural)	**Division (3 digit by 1 digit), grades 2–8**	7.2	9.3 (≈1 in 11)
ASER (five states, rural)	**11 questions in mathematics (numerical and word problems), from grade 4 to 5**	9.5	12.7 (≈1 in 8)
Education initiatives (18 states)	$19+X=32$	7.5	16.9
	Measuring length with ruler (when object is placed at 1 cm)[a]	2.9	3.9
	All items asked across grades (4 and 6, 6 and 8, or 4, 6 and 8)	4.9	8.5 (≈1 in 12)

Sources and notes: All stats show average yearly gain from grades 2–5. Bold indicates individual assessment summary statistics.
APRESt: four districts in Andhra Pradesh. Data from Karthik Muralidharan.
ASER nationwide, rural: 2013. Grades 2–8. Sample is every district in India, 30 villages per district and 20 households per village. Average yearly gain grades 2–8 since division and reading are grade 2 competencies as stipulated by the national curriculum (ASER India, 2014).
ASER five-state (Assam, Andhra Pradesh, Himachal Pradesh, Jharkhand, Rajasthan) report by Bhattacharjea, et al. (2011) follows the same children across grades. Sample is three districts per state, 60 government primary schools per district.
EI: 18-state average for grades 4, 6, 8 with grades 5 and 7 imputed. (Educational Initiatives, 2010).
[a] One remarkable finding regarding this question is that ASER used it in a five-state study, yet for teachers. Only 82 percent of teachers willing to participate in the testing were able to answer this correctly. See Bhattacharjea et al. (2011).

1.1. Learning profiles in India

Learning progress per year of schooling in one of the world's most populous countries is terribly slow. The Andhra Pradesh Randomized Evaluation Studies (APRESt) tracks learning progress across grades by asking the same questions of the approximately 150,000 children in grades 2–5 in four districts of Andhra Pradesh, India. APRESt shows that even for the most mechanical arithmetic operations, there is amazingly slow progress from grades 2 to 5. For a basic competency like "two digit addition without carry," 40 percent of children in grade 2 answer correctly and yet only 70 percent answer correctly by grade 5. This means that of the 60 percent of children who did not already master addition by grade 2, less than half gained the skill in *three full years of additional schooling*. Three of every 10 children who enrolled school, stayed in school until grade 5, never learned even the simplest addition.[4]

The assessment company Educational Initiatives (EI) conducted a study of conceptual understanding of in-school children in grades 4, 6 and 8, in government schools in 18 states in India, representing about 74 percent of the Indian population. EI asked a common set of three questions in the same grades in language and mathematics. For the language questions (e.g., adding a word to complete a sentence), the percent correct only increased from 51 percent to 57 percent from grades 4 to 8. In math, the average percent correct went up by only 7.1 percentage points per year (Educational Initiatives, 2010).

Even most studies from which one can generate learning profiles are synthetic in that they compare children in different grades rather than the same children over time. One study conducted by ASER, the NGO that runs the Annual Status of Education Report (ASER), tracked roughly 22,000 children across grades 2–5, testing them in a set of language and mathematical capabilities (Bhattacharjea et al., 2011). Progress was similarly slow. Using synthetic cohorts, for instance, 41 percent of children could write a dictated word in grade 2 yet only 55 percent could do so by grade 3. On average, across the 11 items in mathematics (all relatively simple numerical or word problems) the percent of gain as a fraction of those who did not already know was only 12.7 percent, implying *seven of eight* children made no progress on the assessment questions.

Table 1 combines selected mathematics questions from four Indian studies – APRESt, EI, and two ASER studies – and demonstrates terrible results. Looking at all questions for which we have learning profiles, there is just a 3–10 percentage point increase in student mastery of basic mathematics per year. The last column shows the percent of students who learned to answer the question in a typical additional year of instruction.[5] *Learning*, measured as the net addition in percent correct, is only about 9–13 percent per year. That is, of children lacking the ability to answer these simple curricular-based questions going into a typical grade, only about 1 in 8 demonstrate that skill after an additional year of schooling. This means that *seven out of eight* children made no progress on a typical item after an entire year of schooling. Even *at best*, with the simplest skills like reading a simple passage, four out of five children who go into a grade not able to read will finish the grade still unable to read.

These numbers are shocking. How can learning profiles be so flat? What is going on inside the classroom such that *nearly all students* who cannot read going into grade 4 do not learn to read while in grade 4? How can a child sit through an entire year of schooling not knowing how to do simple addition and not learn to add? What is going on in the schooling process that children can spend *thousands of hours* in school and yet not master even the basic competencies?

1.2. Learning profiles and cumulative achievement in the developing world

This problem of a flat learning profile is not unique to India. Several other countries have implemented ASER-like assessments

[4] While it is possible to track the learning dynamics of individual students with the APRESt data, those data were not available to the authors and thus the above uses synthetic cohorts and describes the performance of students across grades. We thank Karthik Muralidharan for providing these data.

[5] Again, this is the net gain not tracking of individual students, which is what we would ideally do were such data available, so it does not capture the "churn" in the learning individual students or students' learning decay.