From Schooling Goals to Learning Goals

How Fast Can Student Learning Improve?

Amanda Beatty and Lant Pritchett

Abstract

By 2015, the universal primary education Millennium Development Goal (MDG) will be met in nearly all countries. However, millions of students still finish formal schooling without mastering basic literacy and numeracy. Schooling doesn't necessarily produce learning or education.

In this paper, we measure the observed annual pace of progress for developing countries in three cross-nationally comparable assessments that have been repeated over time: TIMSS (mathematics and science), PISA (mathematics and reading), and SACMEQ (mathematics and reading).

The pace of progress is very slow. At "business as usual" progress, it would take a century or more for developing countries to reach current OECD assessment levels. Slow progress is not universal—some countries are making sustained progress and thus accelerating the pace of learning progress is not impossible. However, setting overambitious learning goals may be counterproductive. Sustained progress faster than four points a year (on this scale) seems unlikely.

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Updated Jan 29, 2013: "19 out of 112 countries" (p. 1) was incorrectly typed as "19 out of 212."

From Schooling Goals to Learning Goals: How Fast Can Student Learning Improve?

Kids are enrolling in and finishing primary school. By 2011, 90 percent of countries had met the universal primary school completion Millennium Development Goal (MDG), and only 19 out of 112 countries are unlikely to meet the goal by 2015 (World Bank, 2011). These MDG results represent the culmination of global success of international campaigns, government efforts and parental desires to expand school enrollment and completion rates (UNDP, 2011), (Clemens, 2004). School completion in developing countries has converged on that in developed countries, as the average years of schooling for the developing world labor force *more than tripled* from 1950 to 2010 – from 2.0 to 7.2 years (Barro & Lee, 2011)—and developing countries have now achieved levels of schooling only attained in the OECD countries in the 1970s.

However, there is accumulating evidence that meeting schooling targets (enrollment or completion) does not equate to children leaving school equipped with the skills and capabilities they need for the 21st century.[1] Many countries already exceeding MDG enrollment rate targets have only a small percentage of students meeting even low minimum competency levels in reading, mathematics and science (Filmer, Hasan, & Pritchett, 2006). As 2015 approaches, the international education community is beginning to shift attention from getting kids into school buildings to what they learn once there.[2] In the general discussion about development agendas in the post-2015 (and hence post MDG) period (e.g. (Karver, Kenny, & Sumner, 2012), (Melamed & Sumner, 2011), (Aryeetey, et al., 2012),

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[1] This accumulation of evidence has been the result of both national and international efforts in assessing student learning of both civil society and governmental organizations. The Third International Mathematics and Science Study (TIMSS) by the International Association for the Evaluation of Educational Achievement (IEA) and Programme for International Student Assessment (PISA) effort of the Organization for Economic Cooperation and Development (OECD) have been expanding their coverage of developing countries. The regional efforts of Southern and Eastern African Consortium for Measuring Education Quality (SACMEQ) in Southern and Eastern Africa, Programme d'Analyse des Systemes Educatifs de la CONFEMEN (PASEC) in Francophone Africa, and Second Regional Comparative and Explanatory Study (SERCE) and Third Regional Explanatory and Comparative Study (TERCE) in Latin America have created more regional comparability. The ASER reports in India (combined with Education Initiatives), the LEAPS report in Pakistan (combined with ASER-Pakistan) and the UWEZO reports in East Africa are examples of civil society and researcher efforts to bring the issues of learning quality to the fore.

[2] For example, World Bank's 2020 sector strategy and DFID's 2010 strategy are *learning for all*, USAID's strategy is *opportunity through learning,* and AusAID has also adopted learning goals (see (World Bank, 2011), (USAID, 2011), (DFID, 2010), (AusAID, 2011)). Hewlett Foundation's Global Development Program has been focused on quality of education and "access with learning," and the NGO Pratham has emphasized "every child in school and learning."

(Kenny & Sumner, 2011)), this new focus on learning raises the possibility that a post-2015 development goal will focus explicitly on goals around improving learning.

Moving from an idea to an actual feasible learning goal will take many steps.[3] This paper has the modest objective of building the empirical foundations for a goal for learning progress by answering two questions:[4] (a) how fast do national average assessed levels of learning increase *typically?* (b) how fast can national level progress in learning be? The quick answers: (a) really slowly, (b) modestly faster.

Ambitious learning goals—without wishful thinking

Before discussing the factual conditions for a learning goal, we need to address three questions quickly: Why a goal for learning? What kind of learning goals? Why are facts about progress needed?

Goals for learning to accelerate progress

The goal of education has always been learning. Schooling goals like enrollment or completion crept in to replace actual learning goals because they were easier to track. The assumption was that if kids attended, teachers would teach, children would learn, and more schooling would produce more learning. But what doesn't get measured often doesn't get done, and since it doesn't get measured, people don't even know it isn't getting done (or worse, can claim it is getting done when it's not).

There many reasons to think kids in the USA learn more in school today than did their parents 30 years ago. Think of all the "education reform," all the new science about learning and the brain, about how computers have transformed the classroom, about how many more teachers have master's degrees, about the doubling of expenditures per student, about the equalization of spending across districts, about all the ways kids today are just so much better off than kids in 1971. Without any evidence to the contrary, it would be easy to believe that learning increased. But it didn't. The US National Assessment of Education Progress (NAEP) tracked 17 year olds in reading from 1971 to 2004, and over 33 years, there was no progress.[5] The NAEP demonstrated that there is no "natural" trend to learning

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[3] Filmer, Hasan and Pritchett (2006) propose a *millennium learning goal* (MLG) based on levels of TIMSS and/or PISA scores or learning levels. But their proposal was meant to be illustrative of possibilities, not definitive of a single global goal.

[4] We stress this is "modest" and "empirical," as we do not address *causal* and hence *theoretical* questions like *why* we observe the pace of progress we observe or *how*, in a policy or programmatic way, a learning goal might be achieved.

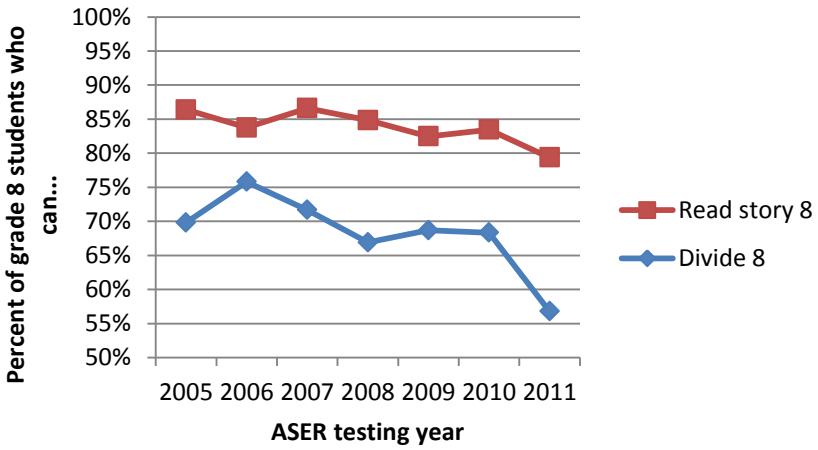
[5] The same fact of zero progress holds if one looks only at "advantaged" students--white students with a parent who graduated from college (data are only available from 1980). In 1980, these students scored 305 and in 2004 scored 303.

that just happens by getting kids in school or through just more inputs. Countries need to make a deliberate effort to promote learning.

Many countries have moved forward in what they measure, but stagnated in learning. For example, in India, the net enrollment ratio in primary school was 85 percent in 2000 and increased to 96.7 percent in 2011.[6] But during this expansion, there was no systematic governmental effort to measure or monitor learning. Only recently, in 2005, did the Indian NGO Pratham (now the Assessment Survey Evaluation Research, or ASER, Centre) start carrying out the ASER (Annual Status of Education Report) assessment exercise. Figure 1 shows Indian students' progress on two fundamental skills: division (one digit into three digits) and reading a several-paragraph story at a grade 2 level, in grade 8. Learning levels are appallingly low, even of those who have made it through eight grades of schooling: only 57 percent of grade 8 students could do a simple division problem (much less do applications) and one in five grade 8 students could not read a simple story.

Most worrisome is that the fraction of students mastering these very basic skills has been going down over the last seven years. Grade 8 enrollment rose by 5 percentage points from 82 percent in 2006 to 87 percent in 2011, but the fraction of those in grade 8 who could do division fell by 13 percentage points (from 70 percent to 57 percent). So the fraction of children of a given age who actually acquired the capability of doing arithmetic from schooling fell *in absolute terms*. Without a learning goal there is no guarantee schooling goals will even lead to progress in learning.

Figure 1: Indian student capability is declining—more and more children cannot read a story or do division



Source: http://www.asercentre.org/ngo-education-india.php?p=Query+ASER+data.

[6] Sources http://mdgs.un.org/unsd/mdg/Default.aspx and http://www.asercentre.org/ngo-education-india.php?p=Query+ASER+data

What kinds of learning goals? Cohort goals. Many Goals.

While we use existing assessments in specific domains of in-school children to document the pace of learning progress, we want to be clear that we are not insisting that learning goals be based on these assessments. In fact, there are two ways in which these assessments are not fully adequate for tracking learning goals: they don't assess *cohorts* of children and they only assess children in later grades.

Cohort learning goals. We advocate that learning goals be based on the assessment of cohorts or age groupings, like "all ten year olds should be able to read fluently" or "all fifteen year olds should be capable of interpreting graphical information." Cohort-based learning goals apply to children whether they are in or out of schooling. This avoids heated but pointless debates between "access" of children to enroll in school and "quality" defined as the learning of only those in school. To meet cohort learning goals, children have to be a) in school, b) progressing through grades, and c) making learning progress as they go from grade to grade.

Unfortunately, the testing data we use are based on sampling of in-school children for logistical reasons (as do many other cross-country tests, such as PASEC in Francophone Africa and SERCE/TERCE in Latin America) so we cannot track *cohort* progress, only the progress of those enrolled. Increasing enrollment rates mean that the proportion of untested, out-of-school children is declining. This is especially the case for many of the TIMSS and PISA countries shown below, which generally have higher primary and secondary completion rates compared to SACMEQ countries. But tracking cohort progress is still important if enrollment is high yet children are not in the appropriate grade for age and testing is grade-based. Additionally, tracking cohort progress becomes more important in later grades as enrollment rates decline. The fact that PISA (age 15), TIMSS (grade 8) and SACMEQ (grade 6) test older students means that there is even greater potential for overstating learning progress as out-of-school children are excluded from testing. For example, in Turkey in 2008, only about 70 percent of 10-19 year olds were enrolled in 9th grade, which means that PISA, which tests 15 year olds, had excluded a significant proportion of its target sample.[7] Fortunately, SACEMEQ tests children earlier than PISA and TIMSS, but in countries with lower attainment rates. The mean primary school completion rate for the 13 countries featured here is 87,[8] which means that indeed SACMEQ might be overstating progress by not testing out-of-school kids in Mozambique or Malawi, but not by much in Tanzania or Zambia. Cases like Mozambique and Malawi (with primary completion rates of 61 and 67 percent respectively), emphasize the need for a cohort learning goal.

Many goals. By measuring the pace of progress with specific assessments (e.g. PISA Mathematics or TIMSS Science) of children near the end of compulsory schooling (e.g. age 15 or grade 8), we are not prioritizing these as the only learning goals. Any performance-

[7] Data from http://iresearch.worldbank.org/edattain/.

[8] Data from http://data.worldbank.org/indicator/SE.PRM.CMPT.ZS/countries?display=default.

based schooling system focused on learning would have a wide array of objectives in learning domains and capabilities. Moreover, there would be goals at many stages of the educational process. Table 1 illustrates possibilities of goals at school entry for learning readiness, early goals, intermediate (e.g. primary completion) and terminal goals. The momentum should be for setting *learning goals* rather than debating particular goals, as there will naturally be goals that are sequential and cover many domains.

Dangers of Wishful Thinking

Learning goals as part of development goals to motivate progress for the next 25 years should be based on feasibility, not wishful thinking. Most important is that the goals are realistic such that they are a motivational device – countries or systems work at achieving them because they think they are important and have some evidence that they might meet them. Such evidence would be grounded in previous performance. Clemens (2004) and others have rightfully pointed out the perils of the MDGs being overambitious and inappropriate for some countries, especially several in Africa (Easterly, 2009), (Clemens, Kenny, & Moss, The Trouble with the MDGs: Confronting Expectations of Aid and Development Success, 2007). To use an enrollment MDG example from Clemens (2004), the MDG set for Niger was 100 percent net primary enrollment by 2015.

Yet based on Niger's historical pace and the fact that enrollment was 30 percent in 2000, 100 percent was completely unrealistic.[9] Goals that are overambitious deflate motivation for improvement. Instead of working to reach the goal, countries take the approach of "why should I bother if I will never get there?"

On many aspects of economic development, there is a long history of measurement and hence a well-established track record, both over time and across countries, for setting goals. For instance, GDP per capita growth over periods of a decade or longer has been on average two percent per annum, with a cross-national standard deviation of two percent per annum. This means that growing at six percent per capita over two decades is an extraordinary event. If a country were to create a national plan to achieve that goal, it might be feasible. However, if a country were to claim their target was to achieve a growth rate of 15 percent per capita over two decades, this would not really even be a goal – it would just be wishful thinking as this is so much faster than what any country, even the most successful, has ever achieved.

[9] Remarkably, Niger's net enrollment ratio was 63 percent in 2011, but this is still a long way off from universal. (Source: http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=589)

Table 1: There are a wide array of options for learning goals across domains and stages from childhood to adulthood

Domain	Level of the goal (summary statistic of the distribution)	Entry	Early (e.g. grade 3)	End primary (e.g. grade 5/7)	End of compulsory (e.g. age 15, grade 9/1)
Literacy	Minimum average percent above equality	reading ready, eg recognizes letters	children read fluently grade 2 story	children extract information from texts	functional literacy
Numeracy	Minimum average percent above equality	Recognizes numbers	mastery of arithmetic operations, concept of place	solve practical problems, abstract reasoning, eg, algebra	functional numeracy
Broad	Minimum average percent above equality	prepared to learn		Prepared for adolescence	children emerge from school prepared for their adult roles

Overambitious targets based on wishful thinking rather than actual possible pace of progress can be counter-productive (Pritchett, 2011). Unachievable targets can unleash negative organizational dynamics, as they can create vicious cycles of over-optimistic promises, failure to reach those promises, a pretense that promises might be reached even when front-line agents know they are impossible, followed by cynicism and de-motivation. As just one example among many in development, the series of wildly ambitious goals set for "governance" and "administrative capability" in Afghanistan set up all concerned for disappointment, disillusionment, cynicism and needless tension among those who needed to cooperate.

The average pace of learning improvement of tested students in developing countries

A key step in thinking about what countries should aim to achieve by 2040[10] is to ask how quickly countries are already moving – what is the distribution across countries in the historical and current pace of improvement in average learning? Unfortunately, there are few instances of learning being reliably tracked over time. But we were able to use three tests administered around the world, across multiple years, in a handful of developing countries, to look at the underlying pace of progress.

Learning progress over time

The Third International Math and Science Study (TIMSS) is conducted by the International Association for the Evaluation of Educational Achievement (IEA), and is designed by a panel of subject area experts from participating countries (Mullis, Martin, & Foy, 2008), (Martin, Mullis, & Foy, 2008), (Mullis I. , Martin, Robitaille, & Foy, 2009) (see *http://nces.ed.gov/timss/*). TIMSS tests grades 4 and 8, but we constrain this analysis to grade 8, as there are more participants at the grade 8 level, and students in grade 8 are closest in age to PISA participants.[11]

The Organization for Economic Cooperation and Development (OECD) runs the Programme for International Student Assessment (PISA), which tests broader, conceptual skills in math, science and reading to students between 15 years three months and 16 years two months who have completed at least six years of schooling (OECD, 2010) (see *http://www.pisa.oecd.org*). Our analysis focuses on reading and math, since science was just introduced in 2006 and we felt that three years between the 2006 and 2009 rounds was not a sufficient time gap on which to judge progress.

[10] Or any other target date. 2040 is 25 years (the duration of the original MDGS which were set for progress from 1990 to 2015) after the end of the current MDGs.

[11] Most PISA participants are in grade 10 and thus generally two grades above TIMSS participants.

The Southern and Eastern African Consortium for Measuring Education Quality (SACMEQ) tests grade 6 students in reading and math in fifteen Anglophone African countries (see *www.sacmeq.org*).[12]

While a country's participation in these three tests is voluntary, countries have no control over the schools or students tested, nor the testing content. These tests are administered to thousands of students every several years, which allows us to examine how test scores change over time (although they don't track the same students over time).[13] Each of these three assessments uses item response theory (IRT) to construct the scores, and items are anchored so as to be comparable over time. These tests are relatively recent (not administered for decades, which would be ideal for examining growth rates) but we examine results that range from six to twelve years in between tests, which provides some sense of the direction and magnitude of change.

Using the TIMSS, PISA and SACMEQ data, we focus on three main metrics, each of which is just a different way to summarize the underlying facts about progress relevant to learning goals.

- *Points per year.* While the scaling of any given assessment is arbitrary, all of these assessments are (or can be) scaled so that 100 points is an international student standard deviation (IASDD). If assessments are scaled in this way, then "points per year" has a reasonably common interpretation (this is a common scaling of learning (e.g. "effect sizes") in the empirical literature on learning are just fractions of a student standard deviation).
- *Years to improve average learning by one (international) student standard deviation.* With points per year it is easy to calculate how long it would take to make on IASSD (100 points) of progress.
- *Years to OECD levels.* We also calculate how long, at current pace of progress, it would take a country to reach a score of 500, or the OECD mean set in PISA, TIMSS and several other international assessments.[14]

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[12] We focus on only 14 of the countries, omitting Zimbabwe since the country's political history over the past twelve years has been so disruptive this is unlikely to be representative of a "typical" country's progress.

[13] One major shortcoming of all these tests, but especially SACMEQ since it is administered in countries with generally higher primary and secondary dropout rates than PISA or TIMSS participants, is that SACMEQ just tests in-school children. This may bias achievement upwards since lower performers are more likely to drop out of school. For example, the proportion of 10-19 year olds attaining grade 6 is approximately: Kenya (2008-09) 90 percent, Lesotho (2009) 80 percent, Malawi (2010) 80 percent, Mozambique (2003) 50 percent, Namibia (2006-07) 95 percent, South Africa (2005) 100 percent, Tanzania (2010) 90 percent, and Zambia (2007) 80 percent. Data from http://iresearch.worldbank.org/edattain/.

[14] For SACMEQ, the scores are not comparable with PISA and TIMSS, but scores are naturally comparable across countries that participated in SACMEQ. So we show results for improving one student standard deviation using actual SACMEQ scores. But we show internationally comparable results by using results for countries that took both TIMSS and SACMEQ: Botswana and South Africa. We took the average of the Botswana and South Africa SACMEQ scores in 2000 and 2007, subtracted the Botswana and South Africa TIMSS 2003 scores (the

Table 2 summarizes the overall progress over time in average learning. We want to stress this is just "as is"—we have summarized what information is available but the participating countries are few, represent a small part of the developing world, and represent a narrow age or grade cohort. We find that progress is, on average, quite slow. In many countries there is little (or even negative) change in scores over time, while in other countries, there is quite rapid progress. Taking the crude summary (an average of the medians of the different assessments) progress is about 1.3 points per year on a scale of 100 points international student standard deviation. Obviously at 1.3 points per year of progress, it would take a very long time to gain 100 points (100 points/1.3 points/year=77 years).

Table 3 shows the results for the eight developing countries that participated in the TIMSS mathematics and science assessment in either 1995 or 1999 and 2007. Amazingly, in six of the eight countries, mathematics score fell between 1995/99 and 2007, in some countries by small amounts (Jordan and Indonesia), but some by more than 20 points (Thailand, Tunisia and Malaysia). Obviously if one is going backwards, it will take forever to move ahead.

Intriguingly, in science, performance was slightly better, with only four countries with negative trends, but still slow. At the pace of the median country in science, with a gain of 0.79 points per year, a country could gain an IASSD in 126 years. It would take at least five generations to reach OECD levels of learning in science. Or worse, if your country is now one IASSD behind the OECD, and progressing at the typical pace in mathematics, then students in your country will never catch up.

The results on the PISA in reading from 2000 to 2009 for the ten countries with comparable reading scores are modestly more optimistic—the median estimate is 2.6 point gain per year and hence "only" 38 years to gain 100 points. (For math, it would take nearly 50 years.) Thus if you have a child going into school now at age six, who has a child at age 25, in most countries, your *grandchild* would be at OECD levels of capability when he/she leaves high school in 2050.

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only year that both countries took TIMSS) from this average, and then averaged these two sums to get the SACMEQ-international test differential of 189 points.

Table 2: Several assessments in several domains in 28 countries demonstrate the median pace of learning in developing countries is slow

		Reading for PISA and SACMEQ (Science for TIMSS)			Mathematics		
Test	Number of countries	Median points per year progress	Years to gain 100 points (one IASSD)	Years to reach 500	Median points per year progress	Years to gain 100 points (one IASSD)	Years to reach score of 500
TIMSS	8	0.79	126	55	-0.98	Forever	Forever
PISA	10 reading, 7 math	2.6	38	32	2.13	47	38
SACMEQ	14	1.15	87	150	1.46	68	134

Table 3: The median developing country participating in TIMSS will never catch up to OECD levels in mathematics and take five generations to reach OECD learning levels in science

	Mathematics					Science				
Country (year if not 1999)	1995 or 1999	2007	Points per year gain	Years to gain 100 points (one IASSD)	Years to reach score of 500	1995 or 1999	2007	Points per year gain	Years to gain 100 points (one IASSD)	Years to reach score of 500
Colombia (1995)	332	380	4.00	25	30	365	417	4.33	23	19
Indonesia	403	397	-0.74	Forever	Forever	435	427	-1.06	Forever	Forever
Iran (1995)	418	403	-1.22	Forever	Forever	463	459	-0.34	Forever	Forever
Jordan	428	427	-0.10	Forever	Forever	450	482	3.92	25	5
Malaysia	519	474	-5.67	Forever	Forever	492	471	-2.70	Forever	Forever
Thailand	467	441	-3.25	Forever	Forever	482	471	-1.46	Forever	Forever
Tunisia	448	420	-3.44	Forever	Forever	430	445	1.92	52	29
Turkey	429	432	0.35	285	194	433	454	2.64	38	17
Median			-0.98	Forever	Forever			0.79	126	55

Results for grade 8 students. Data from http://nces.ed.gov/surveys/international/table-library.asp

Table 4: Half developing countries for which there are PISA data will potentially reach OECD learning levels in reading within a generation (three countries for math)

	Reading					Mathematics				
Country (year if not 2000)	2000/03	2009	Points per year gain (loss if neg)	Years to gain 100 points (one SSD)	Years to reach score of 500	2003	2009	Points per year gain (loss if neg)	Years for a 100 point (one SSD) gain	Years to reach score of 500
Argentina	418	398	-2.22	Forever	Forever	n/a	n/a	n/a	n/a	n/a
Brazil	396	412	1.75	57	51	356	386	4.97	20	23
Chile	410	449	4.42	23	11	n/a	n/a	n/a	n/a	n/a
Indonesia	371	402	3.45	29	28	360	371	1.86	54	69
Mexico	422	425	0.37	272	204	385	419	5.55	18	15
Peru	327	370	4.73	21	28	n/a	n/a	n/a	n/a	n/a
Thailand	431	421	-1.03	Forever	Forever	417	419	0.27	374	304
Tunisia (2003)	375	404	4.84	21	20	359	371	2.13	47	60
Turkey (2003)	441	464	3.87	26	9	423	445	3.67	27	15
Uruguay (2003)	434	426	-1.36	Forever	Forever	422	427	0.77	130	95
Median			2.60	38	32			2.13	47	38

Results for age 15 students. Data from: http://www.oecd.org/dataoecd/11/15/48852742.pdf

Table 5: SACMEQ country students could take four to five generations to catch up to OECD learning levels

	Reading					Mathematics				
Country (year if not 2000)	1995/ 2000	2007	Points per year gain (loss if neg)	Years to gain 100 points (one IASSD)	Years to reach score of 500	2000	2007	Points per year gain (loss if neg)	Years to gain 100 points (one IASSD)	Years to reach score of 500
Botswana	333	346	1.93	52	80	324	332	1.09	92	155
Kenya (1995)	355	355	-0.02	Forever	Forever	375	368	-0.90	Forever	Forever
Lesotho	263	279	2.39	42	92	259	288	4.24	24	50
Malawi (1995)	274	245	-2.43	Forever	Forever	244	258	2.01	50	120
Mauritius (1995)	362	385	1.94	52	59	396	435	5.53	18	12
Mozambique	328	287	-5.81	Forever	Forever	341	295	-6.60	Forever	Forever
Namibia (1995)	284	308	1.99	50	96	242	282	5.73	17	38
Seychelles	393	387	-0.99	Forever	Forever	366	362	-0.51	Forever	Forever
South Africa	304	306	0.37	269	521	298	306	1.24	80	156
Swaziland	341	361	2.83	35	49	328	352	3.47	29	43
Tanzania	357	389	4.56	22	24	334	364	4.33	23	31
Uganda	294	290	-0.53	Forever	Forever	318	293	-3.49	Forever	Forever
Zambia (1995)	289	246	-3.59	Forever	Forever	247	247	0.00	Forever	Forever
Zanzibar (1995)	301	348	3.97	25	38	290	301	1.69	59	118
Median			1.15	87	150			1.46	68	134

Results for grade six students. Data from http://www.sacmeq.org/statplanet/StatPlanet.html. OECD equivalency created using TIMSS 1999, 2003 and 2007 from http://nces.ed.gov/surveys/international/table-library.asp for Botswana and South Africa

Fifteen countries or regions in eastern and southern Africa have been participating in the SACMEQ since 1995 or 2000.[15] Note that while SACMEQ scores as reported in the original documents are not comparable with PISA and TIMSS as they are internally normed to produce a mean of 500 and student standard deviation of 100 in SACMEQ II for participating countries we rescale using the comparison of countries that have participated in both SACMEQ and TIMSS.[16] We find results more dire than those from TIMSS and PISA. The median southern or eastern African country will take 150 years to reach OECD reading and 134 years to reach math levels, with countries like Kenya, Malawi, Mozambique, Uganda and Zambia taking forever as their progress is negative.

One important caveat in extrapolating "business as usual" changes in national averages is that this confounds progress of those in school and the changing mix of students as expansion in enrollment rates pulls in weaker students (more first time school goers, children with more difficult household backgrounds). Of course this simple comparison over time of those who are tested (which is different grades or ages for different assessments) mixes both changes in learning and changes in the composition of those tested. And part of the slow pace may be due to the influx of less learning-ready students attending school for the first time, and hence "masking" underlying progress. At this stage, we have no way of knowing just how important this impact is.

Comparison with OECD

Hanushek and Woessmann (2009) compile assessments from various sources and domains and years to estimate as best as possible the trend in gains in what they call "cognitive skills" which is their omnibus measure. The advantage of this measure is that they can calculate it from 1975 to 2000, which is much longer time span. Their finding in Table 6 is that the typical OECD country only saw scores improve by 0.4 points per year from 1975 to 2000. The fastest pace, of Canada, Finland, Netherlands was around 1 point per year.

What is reasonable progress?

One main conclusion from the PISA, TIMSS and SACMEQ results is that across many developing countries, the typical pace of improvement is slow, and for some countries infinite. While data aren't as long-term as long as we'd like and ideally we would run comparisons with more countries, with the learning data we have, the pace of progress is mixed.

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[15] As mentioned above, we are omitting Zimbabwe because of it's disruptive political situation.

[16] See earlier footnote for discussion of how we calculated equivalency.

Out of the 122 data points we have across tests, countries and metrics, there are 26 instances of countries being able to reach an international standard (score of 500 or one IASSD) in 25

Table 6: Progress in OECD countries is also slow

Country	Average points per year gain in "cognitive skills" (international student standard deviation=100)
Canada	1.39
Finland	1.13
Netherlands	0.89
UK	0.65
Sweden	0.63
Australia	0.60
New Zealand	0.42
USA	0.39
Belgium	0.34
Korea	0.31
France	0.18
Japan	0.11
Germany	-0.18
Italy	-0.43
Norway	-0.63
Median	**0.39**

Source: Adapted from (Hanushek & Woessmann, 2009), figures 2 and B3.

years or less, and 45 instances in 50 years or less. As shown in Table 7, out of 28 countries for which we have data across multiple years, nine countries (two in Africa) could feasibly get to the OECD mean score of 500 in at least one subject in one test in 25 years, and 15 countries in 50 years. Twelve out of 28 countries – nearly half – could improve by one student standard deviation in at least one subject in one test in a generation and 17 countries in two generations.

Regarding reasonable yearly point changes, the maximum is around five (Peru and Tunisia PISA reading, Brazil and Mexico PISA math) and minimum is negative six (Mozambique SACMEQ, and Malaysia PISA). Countries aren't moving around more than five or six points either way per year, which means that a target such as 10 points per year would be totally unreasonable. Just like setting a MDG target for Niger to move from 30 to 100 percent enrollment in 25 years would have been too overambitious to have Niger take the target seriously, moving 10 points a year on an international standardized test is unreasonable for any country.

What about a goal that aims for improving scores by one IASSD in a generation? If one IASSD is 100 points, then 100 points in 25 years would mean four points per year. As shown in Table 8, four points per year or more is realistic for a little less than half of participating countries. (Twelve countries were in either the six or four point categories on

two or more tests.) Eleven countries could likely only gain two points per year or less, and four countries, like Mexico or South Africa, straddled the two categories.

Among the many criticisms of the MDGs, one was that they were realistic for many developing countries yet not those in Africa (Easterly, 2009), (Clemens, 2004). So is four points a year overambitious for Africa? While only one country (Tanzania and Zanzibar are represented separately in SACMEQ but making similar progress) is currently gaining four points per year, another six out of 14 are at a pace of two points per year, and thus moving to a goal of four points per year doesn't seem unrealistic. Even Kenya, Seychelles and Uganda are only slightly negative and thus four points could be ambitious yet achievable. The problem comes with Malawi, Mozambique and Zambia are the most negative performers ranging from -2 to -6 points per year, so for these cases, just getting greater than zero may be sufficiently ambitious. Thus the four points per year proposed here is a general rule of thumb that seems to fit for many countries for which we have data, but not all, including some in Africa, but also for others like Malaysia, which is making fairly remarkable negative progress in math and science, and should also just aim to see positive gains.

Table 7: Out of 28 countries, nine could improve by IASSD and 12 could reach a score of 500 in 25 years, at their current pace of learning

A. Countries that could **improve by one IASSD** in 25 or 50 years

25 years, Total: 12			50 years, Total: 16		
Reading	Math	Science	Reading	Math	Science
Chile, Peru, Tanzania, Tunisia, Zanzibar	Brazil, Colombia, Lesotho, Mauritius, Mexico, Namibia, Tanzania	Colombia, Jordan	Chile, Indonesia, Lesotho, Namibia, Peru, Swaziland, Tanzania, Tunisia, Turkey, Zanzibar	Brazil, Colombia, Lesotho, Malawi, Mauritius, Mexico, Namibia, Swaziland, Tanzania, Tunisia, Turkey	Colombia, Jordan, Turkey

B. Countries that could **reach score of 500** in 25 or 50 years

25 years, Total: 9			50 years, Total: 15		
Reading	Math	Science	Reading	Math	Science
Chile, Tanzania, Tunisia, Turkey	Brazil, Mauritius, Mexico, Turkey	Colombia, Jordan, Turkey	Chile, Indonesia, Peru, Swaziland, Tanzania, Tunisia, Turkey, Zanzibar	Brazil, Colombia, Lesotho, Mauritius, Mexico, Namibia, Swaziland, Tanzania, Turkey	Colombia, Jordan, Tunisia Turkey

Notes: all countries represented in 25 years are included in 50 years. Totals do not double count countries across subjects.

Table 8: Four or more points per year gain (100 points in a generation) is a reasonable target for about half of developing countries (for which we have data)

6+ points/ year			4+ points/ year		
Reading	Math	Science	Reading	Math	Science
Chile, Colombia, Indonesia, Peru, Swaziland, Tanzania, Tunisia, Turkey, Zanzibar	Brazil, Colombia, Lesotho, Mauritius, Mexico Namibia, Swaziland, Tanzania	Colombia, Jordan, Turkey	Botswana, Brazil, Lesotho, Mauritius, Namibia	Botswana, Malawi, South Africa, Turkey, Zanzibar	Tunisia

2+ points/ year			> 0 points/year		
Reading	Math	Science	Reading	Math	Science
Kenya, Mexico, Seychelles, South Africa, Thailand, Uganda, Uruguay	Indonesia, Jordan, Kenya, Seychelles, Tunisia, Uruguay, Zambia	Indonesia, Iran	Argentina, Malawi, Mozambique, Zambia	Iran, Malaysia, Mozambique, Thailand, Uganda	Malaysia, Thailand

Robustness checks

One might look at the standard errors in the PISA, TIMSS and SACEMQ reports and say that many countries have a standard error of plus or minus three or four points and hence our calculations could be wild underestimates. What if, under the best case scenario, the last data point for every country was raised by two times the standard error of the estimates? Would progress be remarkably better? We show that the odds that our estimates would be remarkably thrown off by imprecision are low. There aren't any countries that are reportedly making four points a year progress when they are "actually" making ten points per year progress – imprecision in the tests isn't drastically altering perceptions of progress. For example, in TIMSS, as shown in Table 3, six out of eight countries would take forever to gain 100 points or reach a score of 500 in math (four countries in science). Under this new scenario, only four countries would take forever to gain 100 points (three in science). Or in Africa, with SACMEQ, the current scenario is that it will take on average 150 years reach a score of 500 in reading (134 years in math). Under the optimistic scenario, this is cut nearly in half to 79 years for reading and 81 years for math, yet is still a very long way to go.

As shown in Table 9, using the same crude summary measure as was done in Table 2 (an average of the medians of the different assessments), progress is about 2.21 points per year on a scale of 100 points international student standard deviation, compared to 1.3 in Table 2, or about slightly less than half. At 2.21 points per year of progress, it would take 45 (100 points/2.21 points/year=45 years) instead of 77 years to gain 100 points. Two generations is certainly better than three, but in no way is this remarkable progress.

Table 9: If somehow scores were systematically lower than reported, countries would still progress slowly – around 2 points per year rather than 1 point per year

		Reading for PISA and SACMEQ (Science for TIMSS)			Mathematics		
Data source	Number of countries	Median points per year progress	Years to gain 100 points (one IASSD)	Years to reach 500	Median points per year progress	Years to gain 100 points (one IASSD)	Years to reach score of 500
TIMSS	8	1.36	73	27	-0.18	Forever	Forever
PISA	10 reading, 7 math	4.66	21	18	3.12	32	25
SACMEQ	14	2.08	48	79	2.34	43	81

Conclusions and recommended next steps

This paper demonstrates that setting targets for learning progress is feasible. Although we have a less-than-comprehensive and less-than-representative group of countries, we can get some idea of what ranges of progress over the next 25 years are feasible.

Some countries will be capable of reaching ambitious targets. Thirteen out of 28 countries could either gain one internationally-adjusted student standard deviation or reach a score of 500 in a generation. Most of these countries are improving at a pace of four to five points per year. But the typical country has yet to embark on sustained and rapid progress in learning.

We feel learning targets are important. Enrollment and completion goals will not prepare children for the world economy of today or tomorrow. Any education goal needs to focus on learning, not just outputs (see (Filmer, Hasan, & Pritchett, 2006), (Pritchett, 2012) for detailed discussion). Without effort at learning, there is no "natural" tendency for countries to just improve learning by enrolling more children. In order to improve, countries need to make a deliberate effort to focus programming around learning.

In order for learning goals to capture progress of all children, they should be formulated for an age-specific cohort, not just in-school children. Cohort achievement goals move the discussion away from a quantity vs quality tradeoff and instead allow policymakers to focus on improving capabilities for an entire distribution of competencies.

While we used TIMSS, PISA and SACMEQ to illustrate progress quantitatively, we are not wedded to these metrics. Countries are encouraged to use their own homegrown series of tests and set country-specific goals. More countries are encouraged to participate in tests like TIMMSS, PISA and SACMEQ in order to facilitate comprehensive international comparison. The international community is encouraged to use additional metrics for cross-country comparisons.

Any goal must be realistic to be motivating. Some countries could achieve six or more point improvement per year, but others just need to focus on escaping stagnation or deterioration in learning. A general goal of more than four points per year (or its equivalent in any metric) would likely just mean failure for most countries, which risks rendering the goal pointless, particularly if goals are set over long horizons so that as countries fall behind the rate for "catch-up" to the original target gets unrealistically faster and faster.

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