

## Education

### The Problem

Education plays a massive role in enhancing the human capital of the population and results in individuals and society achieving high rates of invention and innovation (Hanushek, 2005). In India, over a million schools are run by governments (UDISE, 2016). Even with the country having one of the largest public-school education systems in the world, the literacy rate stands at only 74 percent. Further, the government's ability to achieve high rates of enrolment, primarily as a result of the implementation of the Right to Education Act, is yet to translate into high learning outcomes. As established by the World Development Report 2018, 'schooling' is not the same as 'learning' and a core concern in the Indian education reality is just that.

The Annual Status of Education Reports (ASER) published by an Indian NGO (Pratham) have consistently brought the abysmal learning levels of Indian students into the limelight. Starting from 2005, first ASER showed that three out of five children in Grade 5 were able to read a Grade 2 textbook, the outcome deteriorated to only one out of two children being able to do that in 2016. The learning outcomes for basic arithmetic (such as subtraction and division) also saw a significant plunge in the same period from 48.6 percent of Grade 5 students who could do division in 2005 to 26 percent in 2016. Overall, the learning outcomes fell from 61 percent to 48 percent between 2005 and 2016 (ASER, 2005, ASER, 2016).

Andhra Pradesh (AP) is also impaired by low learning outcomes. With its current spending of about 15 percent of the state's GDP on education, AP spends substantially on education. In order to move towards a significantly improved system, a prudent step for the state government would be to improve the effectiveness of its spending on education.

The first three are teaching at the right level, computer assisted learning at the right level and performance-based incentives to teachers that are very cost-effective, evidence backed approaches to addressing declining student-learning outcomes in the state of Andhra Pradesh. The other two interventions are those that are given greater prominence after the enactment of the Right to Education Act. These interventions are expanding the in-service training of teachers and reducing the pupil-teacher ratios.

### Solutions

Interventions	BCR	Total benefit (INR)	Total cost (INR)
<b>Teaching at the Right Level</b>			
<b>Without an extra hour</b>	44	49,209	1,108
<b>With an extra hour</b>	21	49,209	2,296
<b>Computer Assisted Learning</b>	62	83,328	1,333
<b>Performance based incentives to teachers</b>	15	34,724	2,391
<b>In-service training of teachers</b>	~1		372
<b>50 percent Reduction of Pupil Teacher Ratio</b>	5	73,534	13,455

Total costs and benefits are discounted at 5%

The full paper by **Rajesh Chakrabarti, Kushal Sagar Prakash & Manasi Arora** of Sunay Policy Advisory is available on [www.appriorities.com/education](http://www.appriorities.com/education)

## Teaching at Right Level (TaRL)

### The Problem

Andhra Pradesh (AP) is impaired by low learning outcomes. The percentage of Grade 5 students who could do division decreased from 46.8 percent in 2007 to 37.2 percent in 2016. And while there is an increase in the percentage of Grade 5 students who could read a Grade 2 text book by about 13 percent in the decade leading to 2016, about 45 percent of the Grade 5 students in the state still cannot read a Grade 2 textbook.

### The Solution

Teaching at the right level (TaRL) refers to organizing children in groups based on their current learning levels, and then teaching them using level appropriate teaching, learning activities, and relevant materials. The approach does away with grade level curriculum completion and adopts teaching the children from the level at which they are.

TaRL can be done with extra time that is set aside exclusively for this, either outside or within the existing school time ('scaled' form of TaRL intervention).

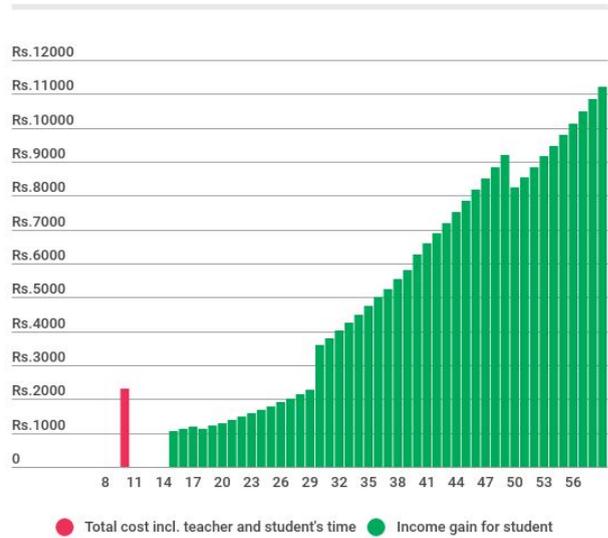
### Costs

The total cost per child per year under scenario 1 (without extra hour) is INR 1,108 which represents the direct costs and the opportunity cost of volunteers. For scenario 2 (with extra hour) the cost is INR 2,296 which also includes cost of teacher's and children's time.

### Benefits

The benefits are measured as the implied wage gain from the boost to learning outcomes. The gain in the test scores is linked with the labour market outcomes to find that the net effect is a 3 percent boost to wages over the lifetime. The same is benchmarked against the income level associated with primary level completion to calculate the gain in income. We also assume that an individual start working at the age of 15 and works till the age of 59. The total benefits estimated for this intervention is INR 49,209 at 5 % discount rates.

Costs and benefits per student of Teaching at the Right Level



Yearly values by age of student. Source: Author's estimates

## Computer assisted learning at the right level

### The Problem

As mentioned in the previous section AP is impaired by low learning outcomes. Reaping higher benefits from its already large base of education spending (15 percent of the state's GDP on education) would enable AP to set an example for other states in the country.

### The Solution

Computer assisted learning (CAL) refers to the application of personalized technology for increased positive effect on the learning outcomes among students. This technology helps in effectively catering to the wide variations in student learning levels through instructions that are based on the level of students' preparations. The intervention has an interactive user interface, is adaptive, employs differentiated remedial instruction and aims at leveraging technology to improve education through an improvement in design details.

### Costs

The costs of the intervention include cost of infrastructure, hardware, staffing and pro-rated costs for software development. This was estimated at 15 USD per student per month. However, when the intervention is conducted at a scale of 50 schools for 5 months we apply the estimated cost reduced to USD 4 per child (INR 267 approx.). Hence the total cost is INR 1,333 (cost per student\* time duration of the intervention which is 5 months).

### Benefits

For calculation of benefits estimates have been made linking gain in test scores with labour market returns. It is assumed that an individual start working at the age of 15 and works till the age of 59. The total estimated benefits of this intervention are INR 83,328 at 5% discount rates.

## Performance based incentives to teachers

### The Problem

Developing nations often face resource constraints and have weak organizational mechanisms in place for teachers and staff management. This leads to poor motivation of teachers and as a result, poor quality of education imparted to students (Rabbani, 2016).

In the Indian government schools, teachers are often paid according to their education level and years of experience, rather than on the basis of the quality of their performance. Thus, they have limited incentives to be present to work, apply sincere effort and ensure that students in their classrooms are learning the skills they need to succeed.

### The Solution

The proposed intervention is those models that incentivizes teachers through bonus pay for improved performance of students.

### Costs

The estimated annual cost per student adjusted for inflation of this intervention is INR 552. Total cost of the intervention is INR 2,391 estimated at 5% discount rates.

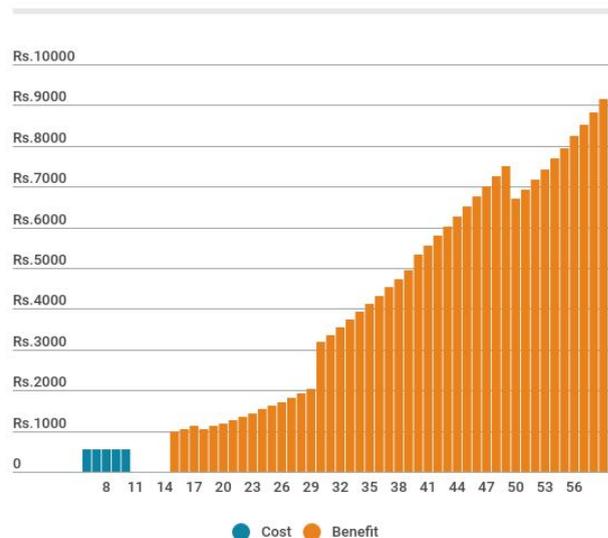
### Benefits

The benefits are measured as the implied wage gain from the boost to learning outcomes. It is estimated that the gain in the test scores, which is linked with the

labour market outcomes gives a net effect of 7.32 percent boost to wages over the lifetime. It is assumed that an individual start working at the age of 15 and works till the age of 59.

Total benefits due to this intervention are INR 34,724 at 5 % discount rates.

Costs and benefits per student of well-structured incentives to teachers



Yearly values by age of student. Source: Author's estimates

## In-service training of teachers

### The Problem

As per the 2016 DISE report, 88 percent of government teachers in India are professionally trained. However, for the teachers who taught only at the primary level in 2015-2016, only about 20 percent availed any form of in-service training. Thus, the gap in in-service training is much larger than pre-service training. It has also been reported that the quality of in-service training is often not personalized to the needs of the teacher, and they hence fail in enhancing effective teaching (Vyas, 2015).

The New Education Policy (2016) reiterated that in order to improve the quality of a teacher and the quality of education in the country, comprehensive teacher training must be undertaken (Vakil, 2016).

**The Solution**

Teacher training refers to the process of building necessary skills and values in teachers that are required for them to be effective, as well as to improve their confidence to teach.

The Right to Education Act (RTE), under section 29, requires the state governments to develop its in-service training design by notifying the State Council of Educational Research and Training (SCERT) or its equivalent body.

**Costs**

The calculation of costs and benefits in the paper is one for the in-service training of teacher that takes place periodically during the year.

The costs involved in execution of the in-service teacher training intervention include direct costs of training the teacher, as well as training the trainers for the same. Indirect cost associated with the intervention in terms of opportunity cost of teachers' time that is spent on availing the training forms another cost component. On a per student basis the cost is merely Rs. 372 in AP.

**Benefits**

The recognized benefits of teacher training include increased standards of pupil achievement, high-quality learning and teaching in schools, positive and sustained impact on the outcomes students achieve, enabling learners to become more engaged, effective and motivated, and developing a common vocabulary to enable practitioners to converse across all sectors, settings and phases (Estyn.gov.wales, n.d.).

The benefit can be measured as the implied wage gain from the boost to learning outcomes of the students.

The Benefit Cost Ratio (BCR) of this intervention to be around 1, though the quality of evidence behind this is limited.

## 50 percent Reduction of Pupil Teacher Ratio

**The Problem**

The Right to Education Act passed in 2009 and enacted in 2010 mandates pupil teacher ratios across the country of 30:1 in primary school and 35:1 in upper primary. Under this metric, AP is well within the target. However, further reductions in PTRs could be considered on the grounds that there is reasonably

robust empirical evidence that reductions to 15-20 students per teacher would have even greater effects on learning (Giridar and Karopady, 2005, Muralidharan and Sundararaman 2013).

**The Solution**

This intervention deals with reducing the pupil-teacher ratio (PTR) in a given geography or unit. PTR is defined as the average number of pupils per teacher at a given level of education, based on the headcounts of both teachers and students. The Right to Education Act, 2009 mandates the pupil teacher ratio 30:1 at the primary level and 35:1 at the upper primary level. Under this metric, Andhra Pradesh is well within the target, with a PTR of 22:1.

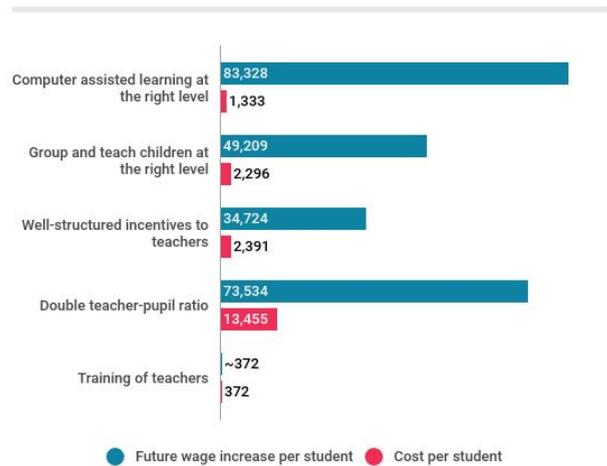
**Costs**

It has been estimated that cost per student would be approx. INR 13,455

**Benefits**

In India it has been largely observed that a reduction in PTR has resulted in improved student outcomes. The estimated benefits due to this intervention is INR 73,534.

Total costs and benefits Rs. per student



Assuming 5% discount rate for costs and benefits. Source: Author's estimates