



# from EVIDENCE to POLICY

a note series on learning what works, from the Human Development Network

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## Does linking teacher pay to student performance improve results?

Educators and education policy makers are concerned with creating the best possible learning environment for students. How to do this, especially in primary school, where reading, writing and mathematical skills are first acquired, is the subject of policy debates in many parts of the world. Should teachers be paid more? Can students be rewarded for good test results? Do schools need more supplies and better infrastructure? Should parents have access to better information about the quality of schools and parental rights and responsibilities? There are no clear answers yet.

At the World Bank, we are working to help achieve universal primary education for every child, one of the United Nations Millennium Development Goals. To help

ensure that children not only go to school, but also get a good education, the World Bank supported a study of government-run primary schools in the state of Andhra Pradesh in India. The project, incorporating 500 schools, concluded that giving teachers cash bonuses based on the improvement in student performance was more effective at raising test results than giving schools cash grants for supplies or additional teachers. This project, which looks at only one school system in one country, will not end the debate over how to boost student performance. But it does offer a piece of the puzzle to help steer policy makers and educators as they move forward with new educational programs and projects.

### Case Study Andhra Pradesh, India

Researchers set out to study what works better at improving student test scores—paying teachers bonuses based on results or giving schools cash grants for supplies or cash grants to hire one extra teacher. The test site was Andhra Pradesh, the fifth most populous state in India with more than 80 million people, of whom 73 percent live in rural areas. More than 80 percent of children in the rural parts of the state attend government-run schools.

The study encompassed 500 rural government-run primary schools running from first grade through fifth

grade. The schools, which each had on average 80 students, were split into five equally-sized groups. In the first group, teachers were told they would receive a bonus based on the improvement in performance on assessment tests by their students (“individual incentive”). In the second group, teachers were told they would receive a bonus based on the improvement in performance of all students in the school (“group incentive”). The incentive payments were about 3 percent of a teacher’s annual salary. Two other groups of schools received grants for supplies or for an extra teacher. The control group received no payments of any kind. The study covered two school years, beginning in June, 2005 and ending in May 2007.

The schools were randomly sampled from a representative population and then randomly assigned to one of the five groups. Household surveys were conducted to obtain household demographic data for the 50,000 children in the study. The school year in Andhra Pradesh starts in the middle of June, and independently-admin-

#### Did You Know...

On any given day 25 percent of teachers in government-run schools in India are absent

At any given time less than 50 percent of teachers are teaching

Over 90 percent of spending on primary education, excluding capital expenditures, goes to teacher salaries and benefits



istered baseline assessment tests were conducted in late June and early July, 2005. In August, study coordinators visited the schools, providing them with the performance reports and explaining verbally and in writing into which group the school was placed. During the school year, coordinators made unannounced visits to collect data on

student and teacher attendance, teaching activity and to observe in-classroom teaching. Based on the results of the assessment tests at the end of the 2005–2006 school year, qualifying teachers received bonus checks at the start of the next school year. The same process was repeated in the 2006–2007 school year.

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## The Findings\*

### **Paying teachers extra if their students do well on tests is highly effective...**

Students in schools where teachers received either individual-based or school-based incentive pay did better than students in control group schools in all five grades, all districts, and at all levels of test question difficulty. There was very limited evidence that the program had different effects based on school characteristics such as the size of the school or the quality of its infrastructure. There was no difference in results based on student demographics, including gender, household literacy, household caste and baseline score. Affluence, however, did play a role: students from more affluent families showed a better response to the teacher incentive program.

### **...and students also do better in subjects for which teachers do not receive incentive pay.**

The study found that students in the incentive schools performed better in social studies and science, two subjects that were not included in the calculation of the bonus payments. The improvements may indicate that in the context of primary school education in a developing country, where there are very low levels of learning, there is a “positive spillover” effect from increased teacher efforts in two specific study areas. Students with stronger math skills, for example, are probably better able to handle science; better

language skills could help students understand material in other classes. The boost in the other subjects also could reflect an improvement in test-taking skills.

### **Teachers who were eligible for bonuses assigned more homework, class work and practice tests.**

Teacher behavior was studied through individual interviews and direct observation. Teachers who were eligible for incentive pay did not come to work more

The average rural primary school in Andhra Pradesh has a total of about 80 students. The schools cover grades one through five and have an average of three teachers. Teachers typically will teach more than one grade at a time, and they usually teach all subjects for the grade. Teachers are state employees and their salaries are based on experience, rank and sometimes assignment location. There is no compensation based on performance. The average teacher salary at the time of the project was Rs. 8,000 per month, or Rs. 10,000 with benefits, compared with a per capita income in Andhra Pradesh of about Rs. 2,000 per month. (U.S. \$1 = 46 rupees)

than teachers in the control group. Based on classroom visits by study observers, there also was no difference in use of the blackboard, asking students questions, assigning homework or helping individual students. But interviews with the teachers did highlight differences.

This bulletin summarizes the results of the research paper “Teacher Performance Pay: Experimental Evidence from India” by Karthik Muralidharan and Venkatesh Sundararaman. The paper is based on a project known as the Andhra Pradesh Randomized Evaluation Study (AP RESt), a partnership between the Government of Andhra Pradesh, the Azim Premji Foundation, and the World Bank, with support from DFID. Full study can be found at: <http://www.nber.org/papers/w15323>

\*All differences reported are statistically significant unless otherwise stated.



When asked unprompted questions about what they did differently—and before being told the test results of their students—teachers in the incentive groups listed a number of activities that they undertook to prepare their students for the assessment tests. They were significantly more likely to have assigned more homework and class work, conducted extra classes after regular hours, given practice tests and paid special attention to weaker students.

The disconnect between classroom observation and teacher interviews can be explained, according to the researchers. Observers, who sat in only during school hours, might be unaware of after-hours classes, for example. The observers also were active only from September through February, which means they would have missed practice tests or extra homework given closer to the end of the school year, such as in March. Finally, it is hard to capture increased intensity of teaching effort by observation alone.

### **However, not all teachers respond equally to incentive pay.**

Teachers with higher base pay respond less well to the individual or group-based incentives. More experienced teachers—who are often those with higher base pay—also do not respond as well to incentives. The researchers suggested this could be because the bonus represents a higher percentage of base pay for younger (and usually less experienced) teachers. But they also note that young teachers may respond better to any new policy initiative, including

pay for performance, so it is difficult to distinguish between the impact of the size of the bonus and other teacher characteristics that influence base pay.

### **It turns out that individual incentives are more effective than group-based incentives...**

Individual incentives and group incentives worked equally well in the first year of the program. By the second year, students in the individual incentive schools significantly outperformed the group incentive schools.

### **...while incentive bonuses in general work better than giving schools money for extra inputs that are unconditional on outcomes.**

Cash incentives to teachers not only boosted student performance more than providing inputs, they were also more cost-effective. Students in these schools performed better than those in schools that received cash grants for supplies or an extra teacher. At the same time, paying teachers based on the performance of their students was more cost-effective. It cost an average of Rs. 10,000 a year for an extra teacher or to give a school a cash grant, the same amount spent on bonuses for teachers in schools in the individual incentive group. But students in these schools showed test score gains that were three times larger than students in schools that received a grant or an extra teacher. Students in the group incentive schools did not score as well as students in the individual incentive schools, but payments also were lower, making the group incentive program as cost-effective as the individual incentive program. The individual incentive program, however, would be more cost-effective after adding in the fixed costs of administering the programs.

“The work the World Bank is doing on the effect of incentives on education in India is some of the best and most promising work in development today. Education is critical to the growth of the developing world and what we learn from these studies can be quickly scaled to reach millions.” Alex Tabarrok, *Bartley J. Madden Chair in Economics at the Mercatus Center, George Mason University and blogger at Marginal Revolution*

## Teachers in general like the incentive program...

Close to 75 percent of teachers in the cash-bonus program reported that they were more motivated (25 percent reported no change) and 95 percent of teachers had a favorable opinion about the program. A majority of teachers—more than two-thirds—said that the government should consider implementing a performance-based bonus system.

## ...and it could in turn lead to better teachers entering the profession.

The authors of the study suggest that paying bonuses based on performance could attract better teachers. By rewarding teachers, those who feel they can or do excel in the profession are more likely to be attracted to working in school systems that offer such an incentive program.

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## Conclusion Making policy from evidence

Efforts to improve education in both the developed and developing world typically focus on providing schools with more money for additional supplies and teachers. But there is substantial evidence that increased funding is not sufficient to ensure better learning outcomes. Increasingly, policymakers are looking at pay-for-performance programs to improve student learning in schools. This study shows that even modest bonus payments to teachers can boost education outcomes. While some issues

were not resolved in this study, such as the optimal ratio of bonus pay to base pay, the results show that performance pay for teachers did lead to significant improvements in student test scores, with no apparent negative consequences. Policymakers, educators and development experts considering programs to increase student learning may want to take a closer look at using financial resources to give teachers bonus payments based on how well their students do in school.

The Human Development Network, part of the World Bank Group, supports and disseminates research evaluating the impact of development projects to help alleviate poverty. **The goal is to collect and build empirical evidence that can help governments and development organizations design and implement the most appropriate and effective policies for better educational, health and job opportunities for people in developing countries.** For more information about who we are and what we do, go to: <http://www.worldbank.org/hdchiefeconomist>



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