How can we improve teacher quality?

Andrew Leigh

Improving the quality of schooling is an effective way of boosting overall economic outcomes and helping the most disadvantaged. From both an efficiency and an equity perspective, policy makers should be concerned about the decline in the academic aptitude of the teaching workforce. They should also be aware that pay can make a difference. Overseas evidence suggests that introducing merit pay could potentially be a cost-effective way of raising teacher quality.

Unless you skipped a lot of school, you probably spent over ten thousand hours in the classroom. So what do you remember most about it? If you're like most of us, the answer rolls off the tongue: a great teacher.

Moreover, the consensus on this subject among policy makers is the same. Whereas past decades saw policy makers focusing on class sizes and curriculum development, many researchers now agree that improving

school outcomes means raising teacher quality.

In this article, I review what we know about trends in teacher quality over recent decades, and the responsiveness of teacher quality to changes in salary. I then conclude with a discussion of some of the evidence on teacher merit pay, the most controversial policy on the table.

But before looking at trends, it is necessary to ask the question: what is meant by 'teacher quality'? In an ideal world, we would need a broad metric, which captured the ability of teachers to raise student performance on tests, as well as on material regarded as important but difficult to test, such as social skills. A perfect teacher-quality metric might also encapsulate the ability of a good teacher to work well with other teachers and school administrators, and to raise their performance as well.

Unfortunately, we do not have such a measure for teachers today, let alone in the past. I therefore present evidence here that is based on two measures of teacher quality: the teacher's own academic aptitude, and her ability to raise her student's test scores. While such measures are imperfect, overseas studies have shown that they are correlated with one another, and with other measures, such as principal ratings.

Trends in teacher quality

To map the trends in teacher quality in Australia, Chris Ryan and I studied the career choices of six cohorts of young people, using a survey known as the Longitudinal Surveys of Australian Youth.[1] These surveys administered literacy and numeracy tests to students while they were at school and then followed them into their twenties. The tests allow us to observe how new teachers compare with the rest of their age cohort; those who became plumbers, doctors, bricklayers and lawyers.

In most of the cohorts, over 100 respondents entered teacher education courses, and many of these went on to become school teachers. But the academic make-up changed considerably. In 1983, the average person entering teacher education was at the 74th percentile of the aptitude distribution, and the average new teacher was at the 70th percentile of the distribution. By 2003, the average percentile rank of those entering teacher education had fallen to 61, while the average rank of new teachers had slipped to 62.

The decline in the academic aptitude of new teachers has occurred at both the top and bottom of the distribution. Focusing on women (who make up about three-quarters of new teachers), the probability of a woman in the top 20 per cent of the academic aptitude distribution entering teaching approximately halved from 1983 to 2003. Meanwhile, the probability of a woman in the bottom 50 per cent of the aptitude distribution entering teaching approximately doubled.

As a check on our results, we also looked at cut-off scores into teacher education courses. For example, we were able to track entry scores at one of Australia's most prestigious universities, the University of Sydney. In 1977, the cut-off for entry into a bachelor of education (365 out of 500) was nearly as high as law (390), and well above economics (284). But in 2005, the cut-off for entry into a bachelor of education (86.4) was below economics (91.1), and substantially below law (99.6).

The drop in Australian teacher quality is also consistent with the findings of US researchers Sean Corcoran, William Evans and Robert Schwab, who estimate that the typical new female teacher in

the United States was at the 65th percentile in the early 1970s, but at the 46th percentile in 2000. Given the many similarities between the US labour market and Australia's, this provides an additional check on the results.

teaching looked much less attractive in the 2000s than it did in the 1980s. Chris Ryan and I concluded that both these factors — lower average pay, and more pay dispersion in other occupations — had the effect of reducing teacher quality.

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What's pay got to do with it?

As well as charting the decline, we also attempted to understand its causes, focusing particularly on teacher pay. First, we looked at the average pay of a starting teacher. Compared to non-teachers with a degree, average teacher pay fell by more than 10 per cent from the early 1980s to the early 2000s. This appears to have been driven by two factors: a steady reduction in class sizes meant that state and territory governments had to spend significant sums on hiring new teachers; and state budget crises (particularly in the early 1990s) ratcheted teacher salaries down in relation to other occupations.

The other important pay change is earnings inequality in alternative (non-teaching) occupations. In the 1980s and 1990s, non-teacher earnings at the top of the distribution rose faster than earnings at the middle and bottom of the distribution. For someone with the potential to earn a wage at the 90th percentile of the distribution,

A different way to see how pay affects the aptitude of new teachers is to look at the relationship between starting teacher pay and the tertiary entrance rank of teacher education students. In unpacking the relationship between teacher pay and teacher quality, looking at teacher education students has the advantage that the researcher can be sure that any correlation reflects the impact of pay on quality, rather than the other way around. While it is conceivable that education authorities might set pay according to what they perceive as the quality of current teachers, it seems extremely unlikely that they would be reacting to the aptitude distribution of those who have only just entered university.

Using a dataset containing the tertiary entrance scores of everyone admitted into an Australian university during the 1990s and early 2000s, I found a strong positive relationship between starting teacher wages and the decision to choose teaching.[2] The year after a state or territory raises its starting teacher wage, a larger share of high school graduates nominate teaching as their preferred course. Since the number of places remains constant, the net effect of this is to raise the academic aptitude of teacher education students. Boost teacher salaries by 10 per cent, and you raise the within-university rank of teacher education students by 6 per cent.

Like most professionals, teachers (and would-be teachers) are driven by the inherent enjoyment and challenges that come from their occupation as well as salary levels. Great teachers love the gleam of understanding in a child's eye when he or she finally grasps a difficult concept. But while intrinsic motivations matter, a good-sized pay packet will also make talented people more likely to choose teaching, and stay in the profession. Indeed, teachers' desire for better pay can also be seen in the fact that around two-thirds choose to join a union, whose central goal is to bargain for better wages for its members. There is no contradiction between being passionate about your job and wanting to be paid appropriately for doing it well.

With enough government money, it would be possible to raise the quality of the teaching profession simply by increasing average teacher pay. But would voters be willing to pay the extra taxes to make this happen? Some have argued that a more cost-effective approach might be to consider a system of teacher merit pay, in which the best-performing teachers are paid more.

Merit pay?

In considering the case for merit pay, a crucial issue is whether all teachers perform at a similar level. One way to answer this is to see whether teachers get similar test score gains. Using data from all primary school students in Queensland, I estimated the average test score 'value added' of each teacher in Queensland.[3] The results showed significant gaps between the best and the worst, with the top tenth of teachers twice as effective as the bottom tenth. Strikingly, experience explains only a little of that gap, and teachers with a Masters degree do not appear to obtain significantly higher test score gains. These patterns are probably similar to other occupations. From banking to management, medicine to the public service, the top 10 per cent most likely outperform the bottom 10 per cent by a large margin, with most of the gap being unexplained by experience and formal qualifications.

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One possible way of operating a merit pay plan would be to simply reward teachers whose students experience significant test score gains from year to year. Trials of a scheme of this kind in Israel by economist Victor Lavy found that it significantly increased educational outcomes.[4] Importantly, Lavy also found that the bonus scheme did not lead to adverse effects such as decreasing the performance of teachers who did not get the bonus, or causing teachers to manipulate test results.

Another alternative is to allow principals to decide which teachers receive the bonus. Work by Brian Jacob and Lars Lefgren indicates that principal ratings of teacher effectiveness at the beginning of the school year are highly predictive of the teacher's test score value-added.[5] Moreover, principal ratings may capture aspects of teacher performance that are missed by a narrow focus on test scores, such as their ability to raise performance in non-tested subjects, or to mentor new teachers.

Whether the bonuses are determined by test score gains (objective, but narrow), or principal ratings (subjective, but broader), they should be large enough to make a real financial difference. At present, the best-paid teachers in Australia earn $79,000 (less in most states). Like lawyers, doctors and politicians, shouldn't our best teachers make six-figure salaries?

Teacher Merit Pay in Denver, Colorado

Under the *ProComp* scheme, agreed upon by education authorities and union officials, teachers in Denver can receive four categories of salary bonuses.

Professional Evaluation

- Probationary teachers: an extra 1% when rated satisfactory
- Non-probationary: an extra 3% when rated satisfactory

Market Incentives

- Hard to Staff Position: an extra 3%
- Hard to Serve Schools: an extra 3%

Student Growth

- Student Growth Objectives: an extra 1% if objectives met
- Test Scores (Colorado Student Assessment Program): 3% more for exceeding expectations, 3% less for falling below expectations
- Distinguished Schools: an extra 2%

Knowledge and Skills

- Professional Development Units: an extra 2%
- Graduate Degree, National Licence and Certificates: an extra 9%
- Tuition Reimbursement: a $1,000 lifetime account

In the United States, columnist Matt Miller goes further, putting forward a plan to make teaching poor children the most exciting career in America.[6] The best teachers working in the most disadvantaged schools, he argues, should be able to earn up to US$150,000 (A$190,000); allowing them to retire as millionaires. While rewarding results, we should also make it more lucrative for experienced teachers to work in tough schools. Unfortunately, uniform salary schedules do just the opposite: by paying all teachers the same, the best teachers tend to gravitate to the most affluent schools.

Politically, the debate over merit pay in Australia has led to a deadlock between the Howard Government (which is keen to impose merit pay on schools), and the state and territory governments (which generally oppose merit pay). While Kevin Rudd's Labor opposition has trod carefully on the issue, it appears to be more closely aligned with the states and territories.

There are two ways that this deadlock might be broken. One is to learn more about merit pay, by running some randomised merit pay trials. These should test the claims of merit pay advocates: that merit pay will encourage teachers to work harder, that it will attract high-performers to join the profession, and that it will ensure fewer great teachers leave for other occupations. Merit pay trials should also test the claims of the detractors: that merit pay will be regarded as unfair, that it will break down the camaraderie of the staffroom, that it will tempt teachers to adjust their students' scores, or that it will lead teachers to spend too little time on non-tested parts of the syllabus. With systematic evidence on how merit pay works, Australian policy makers will be in a better position to decide whether it should be implemented more broadly.

Using data from all primary school students in Queensland, I estimated the average test score 'value added' of each teacher in Queensland. The results showed significant gaps between the best and the worst, with the top tenth of teachers twice as effective as the bottom tenth.

If, after conducting these merit pay trials, policy makers decide that merit pay looks promising, we might consider making it optional, rather than compulsory. Such an implementation strategy is what policy wonks have called a 'grand bargain' over teacher merit pay; teachers who wish to stick with their current contract are free to do so, while those who wish to choose a merit pay contract can do so instead.

Such a grand bargain over teacher pay recognises that many of Australia's 264,000 teachers entered the profession in the expectation that they would have security of tenure and certainty of earnings. Preserving uniform salary structures for those who want them honours that bargain. At the same time, it opens up the possibility of writing a salary contract that carries the potential rewards of higher pay in exchange for accepting more risk. Unlike the current teacher salary contract, which carries virtually no risk of dismissal (e.g. Victoria fired 3 of its 39,434 government school teachers in 2006), removal for poor performance would be a real possibility under the new contract.[7] Every occupation faces the problem of the 1–2 per cent of workers who are just badly suited for the job. Teaching is no different. And allowing for the possibility of dismissal might also make it more feasible to recruit mid-career professionals into the teaching profession. Not everyone who wants to try will make the transition from the office to the classroom but we should open the door to those who wish to give it a shot.

Schools as social policy

The quantity of schooling that a person receives is a key determinant of their economic outcomes. Across individuals, every extra year of schooling leads to a 10 per cent increase in earnings. Higher test score performance also boosts wages.

The same pattern holds for nations: more education, higher literacy, and higher numeracy all lead to faster economic growth rates.

But quality schooling isn't just an effective way of improving overall economic outcomes: it's also critically important for helping the most disadvantaged. Looking at those who were bound by their state's compulsory schooling laws to complete an additional year of school, Chris Ryan and I found that students who were forced to stay in school for another year enjoyed the same 10 per cent gain in earnings.[8] A child who drops out before year 12 will almost certainly have worse life chances than if he or she had finished school. The same cannot be said for most government programs targeted towards the poor. Rossi's Law, named after American sociologist Peter Rossi, states that 'the expected value for any measured effect of a social program is zero'.[9] Against this disappointing backdrop, quality schooling may well be the best social policy Australia has to offer.

From both an efficiency and an equity perspective, policy makers should be concerned about the decline in the academic aptitude of the teaching workforce. They should also be aware that pay can make a difference. One of the key reasons why teacher quality has fallen over time is that teacher salaries have declined, relative to other occupations. For new entrants to the profession, higher starting pay buys smarter teacher education students.

The controversial question is over teacher merit pay. Evidence from Israel and the United States suggests that introducing merit pay might be a cost-effective way of raising teacher quality, but it would be valuable to have robust evidence of our own. A natural way to do this would be to run a series of randomised merit pay trials, putting the claims of the advocates and detractors to the test. Then, if we decide that merit pay works, we should consider putting another contract on the table; providing teachers with a choice, not an ultimatum.

Getting teacher pay right is no easy task, but the goal is simple: let's try to ensure that our most talented regard teaching poor children as the most exciting job in Australia. ■

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ENDNOTES

1 Andrew Leigh and Chris Ryan 2006, 'How and Why has Teacher Quality Changed in Australia?', ANU CEPR Discussion Paper 534. This section also draws upon Andrew Leigh and Chris Ryan 2006, 'A failure to make the grade', *The Australian*, 28 August, p. 8.

2 Andrew Leigh 2006 'Teacher Pay and Teacher Aptitude', unpublished paper, Australian National University.

3 Andrew Leigh 2007, 'Estimating Teacher Effectiveness from Two-Year Changes in Students' Test Scores', unpublished paper, Australian National University, 2007. This section also draws upon Andrew Leigh, 'Breaking the Pay Deadlock', *Australian Financial Review*, 8 March, p. 62.

4 Victor Lavy 2004, 'Performance Pay and Teachers' Effort, Productivity and Grading Ethics', NBER Working Paper 10622, National Bureau of Economic Research, Cambridge, MA.

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9 Peter H. Rossi 1978, 'Issues in the Evaluation of Human Services Delivery', *Evaluation Review*, vol. 2, no. 4, pp. 573–599.

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