NSW GOVERNMENT

Great Teaching, Inspired Learning
What does the evidence tell us about effective teaching?

Centre for Education Statistics and Evaluation

Letter to the Minister

Dear Minister

Thank you for your request that the Centre for Education Statistics and Evaluation prepare a paper outlining the research evidence on effective teaching.

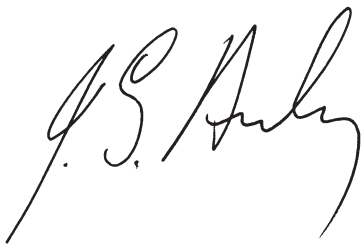
As Chair of the Centre for Education Statistics and Evaluation Advisory Council, I am pleased to provide the attached paper which has been prepared by the Centre.

It is well understood that the quality of teaching is a very important factor affecting student engagement and outcomes. This paper integrates the best research about effective teaching and the practices that support effective teachers.

It is important to make use of reliable evidence to inform decision-making, especially in efforts to improve the quality of teaching.

The Centre for Education Statistics and Evaluation looks forward to opportunities to support evidence-based planning and decisions in education and training.

Yours sincerely



Dr John Ainley
Chair
Centre for Education Statistics and Evaluation Advisory Council

Introduction

Significant research exists on the topic of teaching quality. In NSW, the *Great Teaching, Inspired Learning* discussion paper was released in 2012 to start a conversation about how NSW can best ensure all students have access to high-quality teaching.

High-quality teaching is the greatest in-school influence on student engagement and outcomes. Given current concerns about Australia's declining performance on international assessments, particularly when compared with high-performing Asian and other countries, there is significant interest in the contribution that high-quality teaching can make to improving educational results.

Some recent analysis has examined the education systems of high-performers, and described their teacher recruitment, training and development practices[1]. This type of analysis increases our understanding of other nations' education systems and different approaches. However, it does not provide evidence of a causal link between these countries' systemic practices and their strong education results[2].

This work is part of the Centre for Education Statistics and Evaluation's mandate: to be the central point of education evidence, to ensure decisions are information-based and investment is targeted to maximise the benefits to all students and citizens in NSW. Given the extensive research that has been undertaken on teacher quality, this paper does not set out to be exhaustive; nor does it make specific recommendations for policy or practice in NSW.

Wherever possible, this paper presents robust, quantitative research evidence on those areas of the teaching lifecycle that afford the greatest opportunity for action to improve the quality of teaching[3].

1. For example, B Jensen 2012, *Catching up: Learning from the best school systems in Asia*, Grattan Institute; OECD 2012, *Education at a glance: OECD indicators*; OCED 2012, *Education today 2013: The OECD perspective.*
2. Other factors may also be influencing student outcomes in some high-performing countries. For example, in Shanghai, Korea, Hong Kong and Chinese Taipei, it is estimated that up to 80 per cent of students attend out-of-school tutorials. See Pearson Foundation 2012, *Strong performers and successful reformers in education.* See also M Bray and C Lykins 2012, *Shadow education: Private supplementary tutoring and its implications for policy makers in Asia*, CERC Monograph Series in Comparative and International Education and Development, No 9, Asian Development Bank and Comparative Education Research Centre (CERC).
3. The nature and quality of the research available is discussed in section 3 of this document.

1. Quality teaching matters

Research consistently demonstrates that teaching quality is the greatest in-school influence on student engagement and outcomes[4]. Barber and Mourshed's 2007 report for McKinsey and Company noted that 'the quality of an education system cannot exceed the quality of its teachers'[5]. Ken Rowe's 2003 paper examines available research to assess the comparative influence of student achievement and background, and the teaching they receive, finding that:

The empirical evidence indicates that the proportion of variation in students' achievement progress due to differences in student background and ability (9-15 per cent) is considerably less important than variation associated with class/teacher membership (30-60 per cent)[6].

Hattie's 2003 analysis agreed that teacher quality accounts for 30 per cent of the variance in student performance[7].

Quality teaching benefits individual students. Modelling by the US economist Erik Hanushek estimates that if a student had a good teacher as opposed to an average teacher for five years in a row, the effect would be sufficient to close the average performance gap associated with low-socioeconomic status[8].

US researchers studying high schools found that being in a class with a strong teacher had an impact 14 times greater than being in a class with five fewer students[9].

Quality teaching also appears to have significant, broader economic benefits. A study by economists from Harvard and Columbia which followed 2.5 million people for over 20 years concluded that those who had good teachers in elementary and middle school earned more money as adults than peers who did not: 'replacing a poor teacher with an average one would raise a single classroom's lifetime earnings by about $266,000'[10]. Extending this line, Hanushek's 2011 'thought experiment' article uses existing research to show that improving the quality of teaching would add trillions to the US economy[11].

Australian estimates echo international research on teacher effectiveness. Conservative estimates suggest that a student with an effective teacher can achieve in three-quarters of a year what would take a full year with a less-effective teacher[12]. To extend the comparison, a student with a teacher in the top 10 per cent of teachers in the country could achieve in half a year what a student with a teacher in the bottom 10 per cent of effectiveness takes a full year to achieve[13].

4. See for instance, M Barber and M Mourshed 2007, *How the world's best-performing school systems come out on top*, McKinsey and Company: 12; OECD 2009, *Evaluating and rewarding the quality of teachers: International practices*: 13; B Jensen 2010, *Investing in our teachers, investing in our economy*, Grattan Institute: 10.
5. Barber and Mourshed 2007 (n 4 above): 16.
6. K Rowe 2003, 'The importance of teacher quality as a key determinant of student's experiences and outcomes of schooling'. Paper presented at the Australian Council for Educational Research Conference, 19-21 October.
7. J Hattie 2003, 'Teachers make a difference: What is the research evidence?' Paper presented at the Australian Council for Educational Research Conference, 19-21 October. The impact of various factors on student outcomes is complex. For a discussion of the influence of the home on student achievement, and in particular the influence of parental engagement on student outcomes, see L Emerson et al 2012, *Parental engagement in learning and schooling: Lessons from research*, Australian Research Alliance for the Family-School and Community Partnerships Bureau. Also note that Hattie's work has been particularly influential though his methodology has been criticised: see for example, I Snook et al 2009, 'Invisible learnings? A commentary on John Hattie's 'Visible learning: A synthesis of over 800 meta-analyses relating to achievement'', *New Zealand Journal of Educational Studies* 44(1).
8. E Hanushek 2004, *Some simple analytics of school quality*, Working Paper 10229, National Bureau of Economic Research. Hanushek uses the entitlement to a free or reduced school lunch as the proxy for 'low income'.
9. C Clotfelter, H Ladd and J Vigdor 2007, *Teacher credentials and student achievement in high school: A cross-subject analysis with student fixed effects*, Working Paper No. 13617, National Bureau of Economic Research; cited in Bill and Melinda Gates Foundation 2010, *Working with teachers to develop fair and reliable measures of effective teaching*, MET Project.
10. R Chetty, J Friedman and J Rockoff 2011, *The long-lerm impacts of teachers: Teacher value-added and student outcomes in adulthood*, Working Paper No. 17699, National Bureau of Economic Research.
11. E Hanushek 2011, 'Valuing teachers: How much is a good teacher worth?' *Education Next* 11(3).
12. 'Effective' here means a teacher in the 75th percentile of teacher effectiveness, while 'less effective' means a teacher in the 25th percentile. The 'effectiveness' scale has been determined by analysing changes in the distribution of student scores from one assessment to another, administered two years later. See A Leigh 2010, 'Estimating teacher effectiveness from two-year changes in students' test scores', *Economics of Education Review* 29(3).
13. Leigh 2010 (n 10 above).

Teacher effects on student achievement are cumulative, meaning they are not only the 'dominant factor affecting student academic gain' in the year they are directly responsible for students, but they continue to affect performance in subsequent years[14].

Chetty, Friedman and Rockoff find that achievement gains can be seen three years after exposure to an effective teacher. These gains are equivalent to one-third of the original performance gains achieved when the student was in the effective teacher's class[15].

Similarly, poor teachers put students at a significant, lasting educational disadvantage. Data obtained through the Tennessee Value-Added Assessment System (TVAAS) reveal that students performing similarly in grade two can take divergent paths, depending on the teaching they receive. Assuming one student has high-performing teachers, and another student has low-performing teachers in succession, the difference in performance three years later can be as much as 54 percentile points[16]. Disturbingly, subsequent effective teachers do not appear to offset the effects of ineffective ones[17].

There appears to be an association between high-quality teacher workforces, and high-performing students. In many high-performing education systems, teaching is a high-status occupation, teacher education students are recruited from the top school graduates each year, and there is ongoing investment in the professional development of teachers[18]. This apparent correlation has not been rigorously tested, however.

Quality teaching matters, but what is quality teaching and how can it best be measured?

Measuring teacher effectiveness

Reliable measurement of teaching quality presents conceptual and methodological challenges, and the research field is still in comparatively early stages of development. While some proxies have shown promise as indicators of quality teaching[19], others – such as teacher salary or education – are not generally reliable[20].

Measuring teacher effectiveness through student outcomes may seem obvious, but it remains complicated and is frequently contested, even when the focus is on student gain or 'value-add'[21] (as in the examples cited in the previous section). Teacher effectiveness is influenced by a variety of factors including

14. W Sanders and S Horn 1998, *Research findings from the Tennessee Value-Added Assessment System (TVAAS) database: Implications for educational evaluation and research*, University of Tennessee Value-Added Research Assessment Center. This research article has been positively reviewed by the US Department of Education, Institute of Education Sciences, What Works Clearinghouse 2012, *WWC review of the report: The long-term impacts of teachers: Teacher value-added and student outcomes in adulthood*.
15. Chetty, Friedman and Rockoff 2011 (n 10 above).
16. Sanders and Horn 1998 (n 14 above).
17. Sanders and Horn 1998 (n 14 above).
18. Jensen 2012 (n 1 above).
19. Such as certification. J Hattie 2009, *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*, Oxon, UK: 117. See also Bill and Melinda Gates Foundation 2010, *Learning about teaching: Initial findings from the measures of effective teaching project*, Research Paper; J Steele, L Hamilton and B Stecher 2010, *Incorporating student performance measures into teacher evaluation systems*, RAND Education.
20. E Hanushek and S Rivkin, 'Teacher quality', in E Hanushek and F Welch 2006 (eds), *Handbook of the economics of education*, Volume 2: 1061; H Andrews, 'Supporting quality teaching with recognition', *Australian Journal of Teacher Education* 36(2); Leigh 2010 (n 12 above).
21. Ingvarson notes that value-added approaches are attractive given the increased access to student results, but 'face increasing concern about their reliability and validity and rarely last': L Invgvarson 2011, 'Professional certification: Promoting, recognising and rewarding accomplished teaching', Paper presented at the International Seminar on Innovation and Quality in Initial Teacher Training, 7-8 November: 16.

training, school and system resources, teaching methodology and others – only some of which are within a teacher's ability to change. In addition, measures of these influencing factors are not well understood[22].

The Measures of Effective Teaching (MET) project carried out by the Bill and Melinda Gates Foundation is a high-profile addition to the developing research base on measuring teacher effectiveness. Published reports attest that the MET project confirmed the validity of using a composite measure of teacher effectiveness, including classroom observation (ideally by more than one observer), student survey data and student gain data (controlling for measurable student characteristics, such as prior test scores and socioeconomic status)[23]. The project set out to verify the reliability of the measure through a second stage, which randomly assigned students to teachers.

Despite its attempts to achieve methodological robustness however, the MET project has been criticised by some commentators, on the grounds of methodological non-compliance within schools[24], flawed project logic, and limitations seen by some to be inherent to value-added measures[25].

In 2008, Ingvarson and Rowe reported that available measurements of teacher quality do not adequately capture subject knowledge and pedagogical skill[26]. As a corollary of this, a key foundation of teacher evaluation is to ensure that teachers have access to clear, detailed and accurate performance standards[27]. This was first achieved in New South Wales in 2005 through the introduction of the New South Wales Professional Teaching Standards, now in transition to the closely aligned Australian Professional Standards for Teachers, which describe what teachers should know and be able to do at four career stages: Graduate, Proficient, Highly Accomplished, and Lead. Following from this, another research approach is to look at the practices and other attributes of effective teachers.

Practices and attributes of excellent teachers

There is general agreement about effective teaching practices, as identified by major studies both in Australia and internationally. The following teacher practices and attributes have been consistently highlighted:

- Monitoring and feedback
- Strong subject knowledge
- Explicit teaching techniques[28].

Many of these effective teaching practices are associated with the 'direct teaching' approach, summarised by Hattie as follows:

The teacher decides the learning intentions and success criteria, makes them transparent to the students, demonstrates them by modelling, evaluates if they understand what they have been

22. J Stone 1999, 'Value-added assessment: An accountability revolution'; cited in M Kanstoroom and C Finn, Jr (eds) 1999, *Better teachers, better schools*, Thomas B Fordham Foundation, Washington DC.
23. Bill and Melinda Gates Foundation 2013, *Ensuring fair and reliable measures of effective teaching: Culminating findings from the MET project's three-year study*, Policy and Practitioner Brief. For further methodological commentary, see also previous project reports, especially T Kane et al 2013, *Have we identified effective teachers? Validating measures of effective teaching using random assignment*, Research Paper, Bill and Melinda Gates Foundation. On the desirability of composite measures of teacher effectiveness, see J Strong 2010, *Evaluating what good teachers do: Eight research-based standards for assessing teacher excellence*, Eye on Education; E Villegas-Reimers 2003, *Teacher professional development: An international review of the literature*, UNESCO International Institute for Educational Planning.
24. S Sawchuk 2013, 'Combined measures better at gauging teacher effectiveness, study finds', *Education Week* 8 January.
25. See for instance, the initial response and forthcoming article of B Baker 2013, *Gates still doesn't get it! Trapped in a world of circular reasoning and flawed frameworks*, National Education Policy Centre, January.
26. L Ingvarson and K Rowe 2008, 'Conceptualising and evaluating teacher quality: Substantive and methodological issues', *Australian Journal of Education* 52(1): 5.
27. Strong 2010 (n 23 above).
28. For example, N Rowe, A Wilkin and R Wilson 2012, *Mapping of seminal reports on good teaching*, National Foundation for Educational Research: 5; H Walberg 1984, 'Improving the productivity of America's schools', *Educational Leadership* 41(8); Productivity Commission 2012, *Schools workforce*, Research report, Australian Government: 10; G Masters 2009, *A shared challenge: Improving literacy, numeracy and science learning in Queensland primary schools*, Australian Council for Educational Research: 4-5; Hattie 2009 (n 19 above).
29. Hattie 2009 (n 19 above): 206.

told by checking for understanding, and retelling them what they have told by tying it all together with closure[29].

Direct instruction[30] was first evaluated during the 1960s in 'Project Follow Through', a ten-year study involving over 72,000 students (including control groups). Project Follow Through aimed to compare the performance of disadvantaged students experiencing different educational practices[31]. It found that direct instruction improved student outcomes in basic skills, cognitive-conceptual skills and affective skills to a greater extent than any other approach. This research demonstrates that 'when dealing with novel information, learners should be explicitly shown what to do and how to do it'[32].

Subsequent studies have confirmed the original findings about the benefits of direct instruction, which has been found to be particularly effective for disadvantaged children. One review of meta-analyses in this area concluded that 'citing an individual study to prove that Direct Instruction [sic] doesn't work is like citing a rainstorm in Tucson to prove that southern Arizona isn't a desert. The preponderance of evidence shows otherwise'[33]. Another review of evidence found that the empirical research was overwhelming and unambiguous[34].

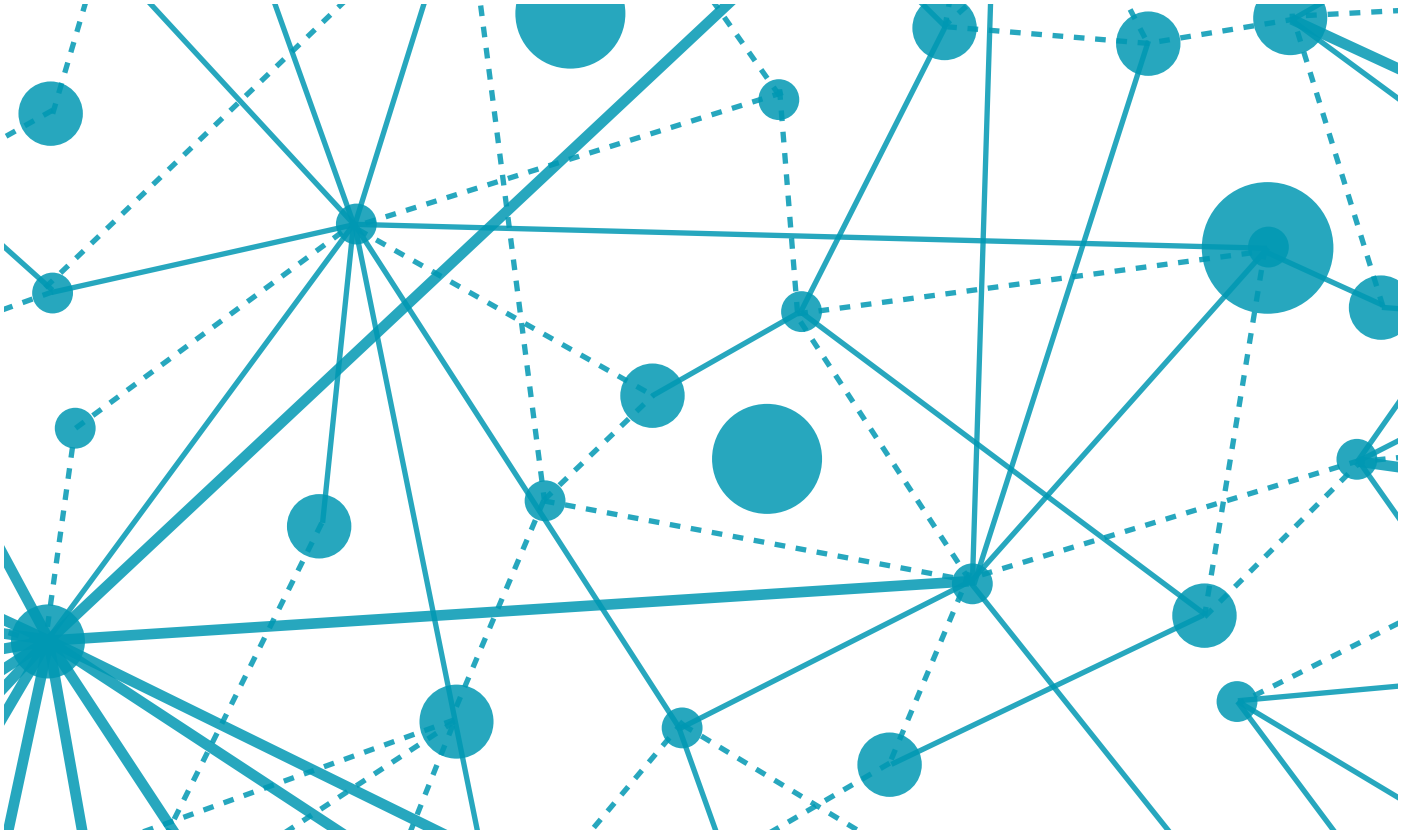
A research project undertaken between 2004–2007 in NSW, investigated the relationship between (among other things) quality teaching and student achievement. The 'Systemic Implications of Pedagogy and Achievement in NSW Public Schools' (SIPA) study was a collaboration between researchers at the University of Newcastle and the NSW Education Department[35].

This research offered an analysis of the efficacy of the NSW Quality Teaching model, which had been developed by Gore and Ladwig, also from the University of Newcastle. Although elements of the Quality Teaching Model were derived from a constructivist pedagogy, (influenced by Newman's 'Authentic Pedagogy'), the research again pointed to the effectiveness of explicit teaching. It found, for example, that there were differences in the effect of different dimensions of the Quality Teaching model on certain students: 'the strongest positive results for Aboriginal students came from tasks where students were given clear criteria for the quality of the work required, when expectations were high and when they had some choice in their work'[36].

Fewer research projects have been conducted on the emotional or relational characteristics of excellent teachers, though the findings are generally consistent. In 2007, Cornelius-White examined over 100 studies of student-centred teaching and identified the attributes of effective relationships between teachers and their students[37]. In effective relationships, the study finds teachers are passionate about each student engaging and succeeding; the teacher is aware of each student's progress; and the relationships are characterised by warmth (affection, respect, positive regard), trust (high expectations and encouragement), and empathy (personalisation).

30. The term 'direct instruction' relates to the explicit teaching practices as descibed by Hattie. Note that there is a product named 'Direct Instruction' which packages a suite of teaching resources. References in this document are to the practices, not the product.
31. F Wyatt and C Campbell 1981, 'Ten years of Follow Through – What have we learned?' Paper presented at the Annual Meeting of the International Reading Association, 27 April-1 May.
32. P Kirschner, J Sweller and R Clark 2006, 'Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching', *Educational Psychologist* 41(2): 79.
33. Education Consumers Foundation 2011, *Direct instruction: What the research says.*
34. Kirschner, Sweller and Clark 2006 (n 32 above): 76.
35. T Griffiths et al 2007, 'Equity and pedagogy: Familiar patterns and QT based possibilities'; J Gore et al 2007, 'Data-driven guidelines for high quality teacher education'; J Ladwig et al 2007, 'Quality Pedagogy and student achievement: Multi-level replication of authentic pedagogy'; W Amosa et al 2007, 'Equity effects of quality teaching: Closing the gap'. All papers presented at the Australian Association for Research in Education Conference: 25-29 November.
36. J Ladwig et al 2009, 'Quality teaching matters: A study investigating the links between quality teaching and improved student outcomes shows promising results for teaching and learning in NSW public schools' *Side by Side* 27.
37. J Cornelius-White 2007, 'Learner-centred teacher-student relationships are effective: A meta-analysis', *Review of Educational Research* 77(1): 43.

2. Systemic practices that support quality teaching



A literature review conducted by the UK-based National Foundation for Educational Research (NFER) identified a repertoire of effective teacher characteristics, which included being calm and caring, using humour as a tool, being sensitive, giving praise, engendering trust and being flexible[38]. Research by Hattie adds respect for students and a passion for teaching to this list[39]. The NFER review warns however, that any repertoire must be 'adapted and refined to suit the particular needs, context and experience of the school'[40].

Similarly, the Effective Provision of Pre-School, Primary and Secondary Education (EPPSE 3-16) project, a large-scale, longitudinal research study conducted in England, concludes that teachers must establish a positive classroom climate, with like and respect characterising the relationships between children and adults, in order to make a difference to children's development and progress[41].

If we know that quality teaching matters, and we know what quality teaching looks like and something about the characteristics quality teachers have, what does research say about systemic practices that embed and support quality teaching? What is the evidence for the most effective practices in initial teacher education, recruitment, professional development, performance management, and pay and rewards?

Initial Teacher Education

Studies that have collected data on the effectiveness of teacher education tend to be small-scale, disconnected and often evaluate unique program structures[42]. The 2012 Productivity Commission examination of the teacher workforce reported that relevant data collections are qualitative and focus on student teacher, teacher and lecturer perceptions, rather than student outcomes[43]. This report echoed 2007 findings by the House of Representatives Standing Committee on Education and Vocational Training, which recommended a comprehensive study into the effectiveness of different teacher education programs[44].

Despite the paucity of rigorous or broad research, there is some evidence about specific components of initial teacher education that are effective. In 2006, Arthur Levine reported on a four-year study of 28 diverse schools and departments of teacher education in the United States. He concluded that the best programs have the following characteristics:

Each is committed to prepare excellent teachers and has clearly defined what an excellent teacher needs to know and be able to do. The field component of the curriculum is sustained, begins early, and provides immediate application of theory to real classroom situations. There is a close connection between the teacher education program and the schools in which the students teach, including ongoing collaboration between academic and clinical faculties. All have high graduation standards[45].

Entrants to teacher training should be high academic performers

The McKinsey Report notes that high-performing school systems tend to recruit high-performing students into the teaching profession[46]. But this apparent correlation between the academic performance of teacher recruits and high achievement of students does not appear to have been tested for evidence of causality.

38. Rowe, Wilkin and Wilson 2012 (n 28 above).
39. Hattie 2003 (n 7 above); Rowe, Wilkin and Wilson 2012 (n 26 above).
40. Rowe, Wilkin and Wilson 2012 (n 28 above): 16.
41. I Siraj-Blatchford et al 2011, *Effective primary pedagogical strategies in english and mathematics in key stage 2: A study of year 5 classroom practice drawn from the EPPSE 3-16 longitudinal study*, Research Brief.
42. See for example, J Ryan et al 2009, 'Rural and regional preservice teacher education: Effective and cost effective?' Paper presented at the Australian Association for Research in Education Conference, 29 November-3 December; C Ure and J Lysk 2008, 'Professional learning in pre-service teacher education: Placement experience in graduate teacher education programs', Paper presented at the Australian Association for Research in Education Conference, 30 November-4 December; L Watson et al 2008, 'Beyond the practicum: Integrating content, pedagogy and practice in teacher education', Paper presented at the Australian Association for Research in Education Conference, 30 November-4 December; J Harris et al 2007, 'Improving pre-graduate teachers' professional knowledge, practice and commitment: Evaluating a school–university collaboration', Paper presented at the Australian Association for Research in Education Conference, 26-29 November.
43. Productivity Commission 2012 (n 28 above).
44. House of Representatives Standing Committee on Education and Vocational Training 2007, *Top of the class: Report on the inquiry into teacher education*: Recommendation 1.
45. A Levine 2006, *Educating school teachers*, The Education Schools Project, Washington DC: 81.
46. Barber and Mourshed 2007 (n 4 above).

The evidence for the importance of teachers' verbal and cognitive ability is the most persuasive in the research literature[47] and numerous studies have found that teachers' verbal and cognitive abilities account for the greatest variance in student achievement when compared with other measurable characteristics of teachers[48].

For instance, a review of the research literature conducted by the National Council on Teacher Quality[49] cites a number of studies that find positive statistical relationships between student learning gains and teachers' scores on the American College Tests[50], tests of teachers' verbal skills[51], and tests of teachers' general academic ability[52].

Similarly, teacher literacy has been shown to correlate with student achievement. Hanushek found that highly literate teachers improved student achievement 0.2 to 0.4 grade levels more than teachers who were among the least literate[53].

While the evidence linking teachers' verbal ability with student outcomes is strong, isolating its impact is not straightforward: 'verbal ability is a correlate of many important attributes … such as flexibility, empathy and content knowledge'[54]. In one Swedish study, higher GPAs were not, on average found to result in better student performance, and teachers with strong cognitive abilities who lacked social skills could in fact negatively impact upon student achievement[55].

Teacher trainees need strong subject matter preparation

Ingvarson and Rowe found that teaching quality can only be attained by ensuring that teachers are equipped with subject matter knowledge and an evidence- and standards-based repertoire of pedagogical skills that are demonstrably effective in meeting the developmental and learning needs of all students for whom they have responsibility[56].

The international research shows that teachers tend to be more effective if their pre-service and in-service training focuses more on the content they will be delivering and the curriculum they will be teaching[57].

Research conducted in 2004 by the Australian Council of Education Research found that making teacher education programs highly 'practical' and 'school-based' will not compensate for a lack of content knowledge[58].

47. G Whitehurst 2002, 'Research on teacher preparation and professional development', Paper presented at the White House Conference on Preparing Tomorrow's Teachers, March 5.
48. See for example, R Ferguson and H Ladd 1996, 'How and why money matters: An analysis of Alabama schools' in H Ladd (ed) *Holding Schools Accountable*, Brookings Institution, Washington DC; R Ehrenberg and D Brewer 1994, 'Do school and teacher characteristics matter? Evidence from high school and beyond', *Economics of Education Review* 14; R Greenwald, L Hedges and R Lane 1996, 'The effect of school resources on student achievement', *Review of Educational Research* 66; J Kain and K Singleton 1996, 'Equality of educational opportunity revisited', *New England Economic Review,* May/June; all cited in Whitehurst 2002 (n 47 above).
49. National Council on Teacher Quality 2004, *Increasing the odds: How good policies can yield better teachers.*
50. Ferguson and Ladd 1996 (n 48 above).
51. Ehrenberg and Brewer 1994 (n 48 above); see also R Ferguson 1991, 'Paying for public education: New evidence on how and why money matters', *Harvard Journal on Legislation* 28; E Hanushek 1971, 'Teacher characteristics and gains in student achievement: Estimation using micro-data', *The American Economic Review* 61(2).
52. Greenwald, Hedges and Lane 1996 (n 48 above).
53. Hanushek 1971 (n 51 above); cited in National Council on Teacher Quality 2004 (n 49 above).
54. Hattie 2009 (n 19 above): 114.
55. E Grönqvist and J Vlachos 2008, *One size fits all? The effects of teacher cognitive and non-cognitive abilities on student achievement*, Working Paper, Institute for Labour Market Policy Evaluation: 20, 22.
56. Ingvarson and Rowe 2008 (n 24 above).
57. D Boyd et al 2009, 'Teacher preparation and student achievement', *Educational Evaluation and Policy Analysis* 31(4); cited in Productivity Commission 2012 (n 28 above).
58. ACER 2006, 'Training great teachers', *Professionally Speaking* June.

For instance, one study found that strong preparation in the discipline of mathematics makes high school math teachers more effective. Similar results have been found for high school science teachers who are well-prepared in their field[59].

Teachers need to learn good classroom management skills

There is a significant body of research regarding the importance of classroom management in creating an environment that makes effective teaching and learning possible. Research points to the effect of classroom management on:

- student achievement
- attrition rates of new teachers
- stress levels of teachers
- behaviour of disadvantaged students[60].

Managing a classroom is where the theory of teaching and the practical implications of day-to-day teaching come together. The greatest impact on successful classroom management is effective teaching where students are engaged in learning.

However, there is some evidence that new teachers receive inadequate training in establishing positive classroom environments[61]. An Australian study of student teachers, conducted after their first practicum, reveals that respondents considered classroom issues to be 'the most difficult thing, and that student teachers wanted to be better equipped with management strategies before leaving universities and commencing the placement[62]. The 2010 Staff in Australia's Schools survey found that managing student behaviour was one of the top five areas in which school teachers indicated they needed more professional learning[63].

The absence of effective instruction in classroom organisation and management reduces the effectiveness of new teachers. Effective instruction includes providing teachers with instructional approaches for classroom management through coursework and guided practice with feedback[64].

Teachers need to be taught how to use assessment data

The advantages of teachers using data from assessment for formative purposes are well documented[65]. Helen Timperley's research into the effect on student outcomes of teachers using high-quality assessment data found that student achievement gains accelerated at twice the expected rate, with greater gains for the lowest-performing students[66].

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59. B Chaney 1995, *Student outcomes and the professional preparation of eighth-grade teachers in science and mathematics*, Report prepared for the National Science Foundation.
60. See for instance, A Brouwers and W Tomic 2000, 'A longitudinal study of teacher burnout and perceived self-efficacy in classroom management', *Teaching and Teacher Education* 16; S Kellam et al 1998, 'The effect of the level of aggression in the first grade classroom on the course and malleability of aggressive behavior into middle school', *Development and Psychopathology* 10(2); R Ingersoll and T Smith 2003, 'The wrong solution to the teacher shortage: Loss of new teachers plays a major role in the teacher shortage, but pouring more teachers into the system will not solve the retention problem', *Keeping Good Teachers* 60(8); R Oliver and D Reschley 2007, *Effective classroom management: teacher preparation and professional development*, National Comprehensive Center for Teacher Quality, Washington, DC.
61. The review of teacher education and school induction for the Queensland Government concluded that universities don't teach essential skills of behaviour and classroom management. B Caldwell and D Sutton 2010, *Review of teacher education and school induction for the Queensland Government*, Second report – Full report: esp. 8-15.
62. Ure and Lysk 2008 (n 42 above).
63. P McKenzie et al 2010, *Staff in Australia's schools: Main report on the survey*: Table 6.4.
64. Oliver and Reschly (n 60 above): 3.
65. See for example, P Black and D Wiliam 1998, 'Inside the black box: Raising standards through classroom assessment', *Phi Delta Kappan* 80(2); J Hattie and H Timperley 2007, 'The power of feedback', *Review of Educational Research* 77(1).
66. H Timperley 2009, 'Using assessment data for improving teaching practice', Paper presented at the Australian Council for Educational Research Conference, 16-18 August.

Despite the evidence of its importance, numerous studies also show that teachers often don't understand the use of assessment data for formative purposes[67], or they may not use it at all. For instance, an admittedly very small Australian pilot study into teacher intentions to use NAPLAN data found that only 27 per cent of teachers reported directly accessing this data[68]. Recent research by the US National Council on Teacher Quality into what teacher education students are learning about assessment found that of the 180 elementary and secondary undergraduate and graduate programs examined, only three per cent provided sufficient coverage of assessment and less than two per cent adequately addressed using assessment data to drive instructional decision-making[69].

Timperley points out that many teachers have been trained to use data to label and categorise students, and that a shift is required in order for teachers to use data to guide and direct students, and to reflect upon the effectiveness of their teaching[70]. There is some evidence that this shift is occurring in NSW, where some teachers have received training on the effective use of data as part of the National Partnership on Literacy and Numeracy[71].

These teachers report a greater understanding of data analysis tools and techniques, leading to changes in their classroom practice. For instance, 81 per cent of survey respondents said that this training had led, to a great extent, to more effective classroom teaching of literacy and numeracy. It is, as yet, too early to measure improvements in NAPLAN results.

Good teacher preparation requires quality practicum experience

The NCATE report of the Blue Ribbon Panel appointed to develop a national strategy to prepare effective teachers is emphatic about the importance of 'clinical practice' in teacher training. It cites findings from the US National Research Council identifying clinical preparation as 'one of the three aspects of teacher preparation that are likely to have the highest potential for effects on outcomes of students', along with content knowledge and quality of candidate teachers[72].

A 2007 report by the Australian Parliamentary Standing Committee on Education and Vocational Training reported that the practicum is 'critically important' to teacher education, and is highly valued by education students. However, the report also listed a number of problems with practicum placements, including weak links to theory; supervision quality; funding; and access for students outside of major cities[73].

The research literature generally agrees that practicum experience is important for effective teacher preparation, but is relatively quiet on what constitutes quality practicum experience. Darling-Hammond finds that the best programs require

67. M Heritage et al 2009, 'From evidence to action: A seamless process in formative assessment?' *Educational Measurement: Issues and Practice* 28(3). See also M Heritage, B Jones and E White 2010, 'Knowing what to do next: The hard part of formative assessment?' Paper presented at the annual meeting of the American Educational Research Association, May 2; M Gearhart and E Osmundson 2008, *Assessment portfolios as opportunities for teacher learning*, CRESST Report 736, University of California, National Center for Research on Evaluation, Standards, and Student Testing; B Boyle and M Charles 2010, 'Defining ongoing assessment: The effective method for supporting teaching and learning in early years and primary education', *School Leadership and Management Journal* 30(2); M Gearhart et al 2006, 'Developing expertise with classroom assessment in K-12 science: Learning to interpret student work', *Educational Assessment* 1; E Osmundson, Y Dai and J Herman 2011, *Year 3 ASK/FOSS efficacy study*, CRESST Report 782, University of California, National Center for Research on Evaluation, Standards, and Student Testing; all cited in M Heritage and S Change 2012, *Teacher use of formative assessment data for English language learners*, CRESST Report, University of California, National Center for Research on Evaluation, Standards, and Student Testing.

68. R Pierce and H Chick 2011, 'Teachers' intentions to use national literacy and numeracy assessment data: A pilot study', *Australian Education Research* 38: 447. This study consisted of 49 secondary mathematics and 35 secondary English teachers in 16 schools.

69. National Council on Teacher Quality 2012, *What teacher preparation programs teach about K-12 assessment: A review*, revised, May. This is consistent with a study of professional attitudes to the use of pupil performance data in English secondary schools, which discovered that newly qualified teachers and teachers with 1-5 years' experience have the lowest levels of understanding of pupil performance data, 'which when taken together with other findings suggests poor "data analysis" content in teacher training courses'. See A Kelly and C Downey 2011, 'Professional attitudes to the use of pupil performance data in English secondary schools', *School Effectiveness and School Improvement* 22(4): 423.

70. Timperley 2009 (n 66 above).

71. T Wyatt and R Carbines 2011, *Evaluation of the take-up and sustainability of new literacy and numeracy practices in NSW schools: Final report of phase 1*, Erebus International: Table 12.

72. National Council for Accreditation of Teacher Education 2010, *Transforming teacher education through clinical practice: A national strategy to prepare effective teachers*.

73. House of Representatives Standing Committee on Education and Vocational Training 2007 (n 44 above): xxv.

significant time to be spent in schools, including 'at least a full academic year of student teaching under the direct supervision of one or more teachers who model expert practice with students who have a wide range of learning needs'[74].

Writing for the International Academy of Education and the International Institute for Educational Planning Education Policy series, Cooper and Alvarado agree that the practicum must be tightly aligned with coursework and should be carefully supervised by effective teachers[75].

Beginning Teaching

Effective recruitment and placement processes

Research into effective practices for recruitment and retention of teachers is limited and sometimes contradictory. In particular, there is little evidence linking recruitment and retention practices to student outcomes.

One finding that emerges consistently is the need to consider the academic ability of the prospective teacher, especially their literacy ability. This aligns with the research highlighting the importance of teachers' verbal and cognitive ability discussed above.

Robert Strauss's analysis of hiring practices in the US shows that there is a relationship between recruitment practices and student achievement. However, he found that generally, schools do not consider the content knowledge of applicants as stringently as they should[76]. Strauss's analysis of a 1997 study of hiring practices in Pennsylvania shows that schools generally 'consider test scores no more heavily than an applicant's willingness to engage in extra-curricular activities', community involvement and non-teaching work experience[77]. Strauss's statistical analysis showed that districts that used more professional personnel practices tended to be districts with students whose achievement and post-school outcomes were higher[78].

Johnson and others note that, while empirical evidence is slender, there is some relevant research showing that positive hiring experiences provide a 'realistic job preview' and allow teachers time to prepare for the commencement of classes. Conversely, hiring processes that do not involve an adequate exchange of information between teacher and school, or that take place too late in the year, increase the risk of a poor match and promote stress and poor performance[79].

Ingersoll notes that new teachers are more likely to be placed in disadvantaged schools, and to be teaching 'out-of-field'[80]. This is detrimental to student achievement and contributes to attrition rates of new teachers[81].

74. L Darling-Hammond 2006, 'Constructing 21st century teacher education', *Journal of Teacher Education* 57(3): 8.
75. J Cooper and A Alvarado 2006, 'Preparation, recruitment, and retention of teachers', Education Policy Series, International Academy of Education and International Institute for Educational Planning.
76. Strauss 1999; cited in Kanstoroom and Finn (eds) 1999 (n 22 above).
77. Strauss 1999; cited in Kanstoroom and Finn (eds) 1999 (n 22 above): 119.
78. Strauss 1999; cited in Kanstoroom and Finn (eds) 1999 (n 22 above).
79. E Liu 2004, *New teachers' experiences of hiring in four states*, Harvard University; see also M McCarthy and E Guiney 2004, 'Building a professional teaching corps in Boston: Baseline study of new teachers in Boston's public schools', Boston Plan for Excellence, Boston, Massachusetts; all cited in S Johnson, J Berg and M Donaldson 2005, *Who stays in teaching and why?* Harvard School of Education.
80. R Ingersoll 2002, *Out-of-field teaching, educational inequality, and the organization of schools: An exploratory analysis*, Center for the Study of Teaching and Policy; cited in Johnson, Berg and Donaldson 2005 (n 79 above): 56.
81. See E Hanushek et al 2004, 'Why public schools lose teachers', *Journal of Human Resources* 39(2); R Murnane and B Phillips 1981, 'Learning by doing, vintage and selection: Three pieces of the puzzle relating teaching experience and teaching performance', *Economics of Education Review* 1; J Rockoff 2003, *The impact of individual teachers on student achievement: Evidence from panel data*, National Bureau of Economic Research, Cambridge, Massachusetts; all cited in Johnson, Berg and Donaldson 2005 (n 79 above): 11.

Effective Induction and Mentoring

Compared with other countries, Australia provides very high levels of induction and mentoring[82]. Yet despite the widespread nature of these practices, and their intuitive sense, supporting evidence of their efficacy is scarce[83]. Research tends to be program specific and methodologically weak, making it difficult to draw broad conclusions[84].

Research has not found mentoring to have a significant effect upon mentee performance outcomes[85], although the effects of mentoring are greater in relation to attitudes, motivation[86] and teacher wellbeing[87]. Consequently, mentoring programs can increase retention rates and reduce the overall cost of new-teacher attrition rates[88]. Darling-Hammond cautions that mentoring and induction programs must be well-designed and supported, and cites programs using expert mentors (who have received training, and receive coaching time) as among the most effective[89].

Some research finds that mentoring programs are associated with certain positive outcomes for mentors, including improved pedagogical and leadership skills, and better professional exchanges with colleagues[90].

Teaching Careers

No matter how good initial teacher education is, it cannot prepare teachers for the ongoing and often rapid changes and challenges throughout their career. What does research tell us about effective ways of supporting teachers in their ongoing development as members of a profession?

Effective professional development

The professional development of teachers is a career-long process which begins with initial teacher education and continues until retirement. Professional development is generally agreed to be a good investment of education dollars, and professional development is 'virtually universal' in Australia[91]. However, as is the case for induction and mentoring, while the impact of teacher professional development upon teachers is often measured, there is comparatively little research examining its impact on student learning[92].

82. A Schleicher 2011, *Building a high-quality teaching profession: Lessons from around the world,* Background report for the international summit on the teaching professions: Figure 2.1.
83. H Timperley et al 2007, *Teacher professional learning and development: Best evidence synthesis iteration*, New Zealand Ministry of Education: 228-229. This report identified a 'major gap' in the knowledge base in this area.
84. T Smith and R Ingersoll 2004, 'What are the effects of induction and mentoring on beginning teacher turnover?' *American Educational Research Journal* 41(3).
85. Hattie 2009 (n 19 above): 188.
86. Hattie 2009 (n 19 above): 188.
87. M Totterdell et al 2004, *The impact of NQT induction programmes on the enhancement of teacher expertise, professional development, job satisfaction or retention rates: a systematic review of research on induction,* Research Evidence in Education Library, EPPI-Centre, Social Science Research Unit, Institute of Education.
88. L Darling-Hammond 2003, 'Keeping good teachers: Why it matters, What leaders can do', *Educational Leadership* 60(8).
89. L Darling Hammond 2003 (n 88 above): 4-5. Data from the OECD's Teaching and Learning International Study (TALIS) suggests that induction and mentoring programs are not always very useful, with new teachers in schools with these programs not substantially more likely to receive more frequent appraisal or feedback than other new teachers. See OECD 2012, *The experience of new teachers: results from TALIS 2008.*
90. A Hobson et al 2009, 'Mentoring beginning teachers: What we know and what we don't', *Teaching and Teacher Education* 25(1); see also L Huling and V Resta 2001, *Teacher mentoring as professional development*, ERIC Clearinghouse on Teaching and Teacher Education, Washington DC; all cited in I Menter et al 2010, *Literature review on teacher education in the 21st century*, Scottish Government Social Research.
91. OECD 2009, *Creating effective teaching and learning environments: First results from TALIS*, 52. However, TALIS data also shows that Australian teachers participate in fewer days of professional learning than many of their international peers.
92. J Gore et al 2012, *Response to* Great Teaching, Inspired Learning, School of Education, The University of Melbourne.

One review of the few studies to examine the impact of the professional development of science and mathematics teachers on student performance found:

- When comparing programs focused on subject matter, or how students learn the subject, with programs which focus on pedagogy, the former had the greatest impact on students' learning.
- When school-wide programs were compared with teacher-specific programs, the former had the least effect on students' learning.
- The total contact time with teachers [time spent in professional development programs] was not an important predictor of the effect on students' achievements.
- The effect of concentrated or distributed time for professional-development experience varied according to subject matter. In most studies, concentrated time was more effective for mathematics, while distributed time was more beneficial to science teachers[93].

Similarly, Alton-Lee's synthesis of 72 studies, which analyses the links between professional development and its impact on student outcomes, found that the greatest benefits to student learning were from professional development programs 'that deepen teachers' foundation of curricula-specific pedagogical content and assessment knowledge' because they 'provided teachers with new theoretical understandings that helped them make informed decisions about their practice'[94].

Baker and Smith have identified the following characteristics of professional development as being the most effective in sustaining change in teachers:

- a heavy emphasis on providing concrete, realistic and challenging goals;
- activities that include both technical and conceptual aspects of instruction;
- support from colleagues;
- frequent opportunities for teachers to witness the effects that their efforts have on students' learning[95].

While there are difficulties in attributing impact, research reviews suggest that continuing professional development is most effective when it is site-based, fits with school culture and ethos, addresses particular needs of teachers, is peer-led, collaborative and sustained[96].

Bolam and Weindling analysed 20 projects to conclude that professional development is more effective when it is collaborative and owned by the teachers themselves (often referred to in literature as professional learning communities)[97].

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93. M Kennedy; cited in S Baker and S Smith 1999, 'Starting off on the right foot: The influence of four principles of professional development in improving literacy instruction in two kindergarten programs', *Learning Disabilities Research and Practice* 14(4).
94. Alton-Lee 2011, '(Using) evidence for educational improvement', *Cambridge Journal of Education* 41(3): 311-312.
95. Baker and Smith 1999 (n 93 above).
96. Site-based professional development activities include mentoring, modelling, peer coaching and the provision of feedback. See Menter et al 2010 (n 90 above); Timperley et al 2007 (n 93 above).
97. R Bolam and D Weindling 2006, 'Synthesis of research and evaluation projects concerned with capacity-building through teachers' professional development', General Teaching Council for England (now abolished); see C Mitchell and L Sackney 2000, *Profound improvement: Building capacity for a learning community*, Swets and Zeitlinger, Lisse; L Stoll et al 2006, 'Professional learning communities: A review of the literature', *Journal of Educational Change* 7.

Generally, professional learning communities include a focus on student learning, collective responsibility, reflective professional inquiry, collaboration and group and individual learning[98]. An OECD report states that professional learning communities are based on two assumptions:

1. *that knowledge and learning are embedded in social contexts and teachers' experience can be promoted through reflection and social interactions*

2. *that participation in a professional learning community leads to changes in teaching practices and subsequently enhances student learning*[99].

In Australia, Gore and colleagues have been developing Quality Teaching Rounds (QTR), a form of professional development which involves guided reading, discussion and observation by teachers who are members of a 'professional learning community'.

The work is informed by Richard Elmore and others who have written about 'instructional rounds' in the United States, a model built on the teaching hospitals' medical rounds. These instructional rounds encourage observation and reflection, and help teachers and school leaders to identify effective teaching practices[100].

Thus far, Gore's study shows the QTR are correlated with improvements in teaching, teacher satisfaction and student outcomes (effect sizes have been high for teaching quality and teacher satisfaction). The work is promising but incomplete and the research needs to be tested to establish that the initiative improves learning to a degree commensurate with the effort and resourcing expended.

Another branch of research suggests teacher participation in professional development has positive effects on teachers' motivation and commitment to change[101]. A review by Cordingley and others identified effective professional development as that which tailored professional development to address particular needs, for example, by initially interviewing teachers to establish individual starting points[102].

Rewarding effectiveness

Where research has looked for empirical evidence that higher pay provides better teachers, it has generally failed to find a link[103]. No research has concluded that simply raising teacher pay, without changing teaching practices and perhaps also the composition of the teaching workforce, will have much to do with raising student performance. If the higher pay has not necessarily been associated with any measure of teacher skill, development or effectiveness, then there is no evidence it will deliver better quality teaching or better outcomes for students.

In a recent examination of the variation in teachers' pay across OECD countries, Dolton and Marcenaro-Gutierrez claimed that higher pay led to improved pupil performance. They found that a '10 per cent increase in teachers' pay would give rise to a 5-10 per cent increase in pupil performance and likewise, a 5 per cent increase in the relative position of teachers in the income distribution would increase pupil performance by around 5-10 per cent'[104].

Their analysis is not rigorous enough however, to show more than a correlation and is not adequate to show causation. It would require an experimental design (randomly assigning one

98. Stoll 2006 (n 97 above).

99. OECD 2010, *Teachers' professional development: Europe in international comparison.*

100. Gore et al 2012 (n 92 above); E City et al 2009, *Instructional round in education: A network approach to improving teaching and learning.*

101. See for example, K Jongmans et al 2004, 'Teachers' participation in school policy: Nature, extent and orientation', *The Journal of Agricultural Education and Extension* 10(1); see also F Geijsel et al 2001, 'Conditions fostering the implementation of large-scale innovations in schools: Teachers' perspectives', *Educational Administration Quarterly*, 37; M Smylie, V Lazarus and J Brownlee-Conyers 1996, 'Instructional outcomes of school-based participative decision making', *Educational Evaluation and Policy Analysis* 18.

102. P Cordingley 2007, *What do specialists do in CPD programmes for which there is evidence of positive outcomes for pupils and teachers?* Technical Report, Research Evidence in Education Library, EPPI-Centre, Social Science Research Unit, Institute of Education.

103. See for example, E Hanushek et al 1999, 'Do higher salaries buy better teachers?' Working paper no. 7082, National Bureau of Economic Research.

104. P Dolton and O Marcenaro-Gutierrez 2011, 'If you pay peanuts, do you get monkeys? Paying teachers 10 per cent more results in 5-10 per cent higher pupil performance', London School of Economics and Political Science, December.

group of teachers in the same country to receive pay raises while another group does not, with before-and-after comparisons of pupil performance) to show that paying teachers more results in higher pupil performance.

What research does show is that relative salaries, especially after 10 to 15 years of experience, are an important – some researchers argue the most important – factor in attracting the best graduates to teaching rather than other professions[105]. A 2006 Australian Government report noted that while altruism was a strong motivator for becoming a teacher, extrinsic factors such as remuneration and employment conditions were among the most significant factors in people *not* choosing teaching as a career, or leaving the profession[106].

Research also shows that strategies designed to improve career paths and rewards for good teaching may improve teaching quality if rewards are linked to evidence of knowledge and skill developed through professional development[107]. In a complementary finding, Australian researcher Steven Dinham has identified a spike in resignations once teachers reach the top of the salary scale[108].

In 2006, Ingvarson and Kleinhenz explained that, unlike most other professions, the teaching profession has found it difficult to create a strong market for highly accomplished practitioners: 'A major reason for this is that the profession has yet to develop a voluntary system for providing certification to teachers who attain high standards of performance'[109]. This is no longer true for Australia. In 2004, the legislation creating the NSW Institute of Teachers required implementation of professional teaching standards. Between 2010-2013, national professional teaching standards were also developed and agreed. Processes for certification at high levels of achievement are in place in most states and territories. There is now a profession-wide system by which highly accomplished teachers can gain certification of their accomplishments. However, systems have been slow to respond by providing incentives for teachers to attain higher levels of certification. There is still no systematic inclusion of certification at higher levels included in career paths for teachers. Teacher pay arrangements typically remain annual incremental increases, based on little more than time served[110].

Ingvarson and Rowe claim that, if salary scales are to promote professional development and high performance, they must be 'linked to evidence of enhanced teacher knowledge and skill'[111]. Addressing the same issue from a different angle, TALIS data indicates that internationally, almost three-quarters of teachers report that they receive no recognition or reward for more effective teaching. In Australia, this proportion rises to 90 per cent[112].

US qualitative evidence shows that the public understands the importance of teacher quality and supports reforms that lead to significant increases in teacher salaries, if those reforms also provide better guarantees that these increases reward evidence of professional development and quality teaching[113].

105. P Dolton, A Chevalier and S McIntosh 2001, *Recruiting and retaining teachers in the UK: An analysis of graduate occupation choice from the 1960s to the 1990s*, Department of Education and Science, London, UK.

106. Department of Education Science and Training 2005, 'Attitudes to teaching as a career: A synthesis of attitudinal research', *Journal of the Home Economics Institute of Australia* 14(2).

107. Ingvarson and Rowe 2008 (n 26 above): 8-9.

108. S Dinham, L Ingvarson and E Kleinhenz 2008, 'Investing in teacher quality: Doing what matters most', in *Teaching talent: The best teachers for Australia's classrooms*, Business Council of Australia, Melbourne.

109. L Ingvarson and E Kleinhenz 2006, 'Advanced teaching standards and certification: A review of national and international developments', Report to Teaching Australia (Australian Institute for Teaching and School Leadership), Australian Council for Educational Research; L Ingvarson and E Kleinhenz 2006, *A standards-guided professional learning system*, Incorporated Association of Registered Teachers of Victoria, Jolimont, Victoria.

110. The ACER review on performance-based pay (Ingvarson and Kleinhenz 2006, n 109 above) found evidence that there is a stronger demand – in the sense of a greater capacity to offer over-award payments – for highly accomplished teachers in independent schools. The NSW Association of Independent Schools has introduced a system of remuneration based on increasing levels of professional standards.

111. Ingvarson and Rowe 2008 (n 26 above).

112. OECD 2009 (n 91 above): 161.

113. See for example, P Hart and M Teeter 2002, *A national priority: Americans speak on teacher quality*, Educational Testing Service, Princeton, New Jersey.

3. The importance of evidence

Society increasingly expects that important decisions of policy and practice should be 'evidence-based,' thereby offering the best chance of delivering the identified desirable outcomes. This expectation is right and proper in a context of finite resources and strong competition for the public purse.

It is important to recognise, however, that research in the social sciences often differs significantly from research in the hard sciences, and that the evidence base in areas of social policy such as education is frequently less definitive than we have become accustomed to in areas such as medicine.

This document has attempted to outline the evidence base for systemic options that deliver effective teachers and teaching. Frequently, however, it has been observed that the research or evidence for a particular point is inconsistent, inadequate, or non-existent. This is not surprising. Historically, education research has depended heavily on qualitative rather than quantitative methodologies. Often, descriptive or anecdotal accounts of practice have been accorded the same status as more rigorous methodologies, meaning that the important distinction between correlation and causation is lost.

Education presents particular challenges as a research field. The comparative lack of 'gold-standard' methodologies such as randomised trials and controls can be attributed partly, at least, to the difficulty in initiating studies that allocate promising interventions to some students while withholding them from others (the 'control group'), although developments in behavioural economics may suggest some new approaches in this area. The complex interplay of factors that influence student outcomes also presents researchers with difficulties, making it very hard to quantify the unique contribution of individual variables. In addition, the impact of different factors on student outcomes plays out over the course of a student's life. Rigorous longitudinal analysis can provide valuable insights, but it is very expensive and its timeframe exceeds the policy-making cycle.

Education research has a tendency to be unhelpfully polarised, especially within public debate – the phonics/whole language divide is a classic example. In such an ideologically influenced field[114], even research that appears to be rigorous, data-based, and comprehensive, can be subject to criticism and contention[115], not always in ways that clarify the topic. As a result, the base that does exist has not always made a significant impact on classroom context. Conversely, spurious theories have sometimes attained faddish status with the result that the research literature includes 'recurrent findings of inadvertent harm' – evidence that 'it is possible for teachers – well-intentioned, caring and experienced – to unknowingly have impacts on students that are the direct reverse of what they intend'[116].

In this context it is as important to understand impartially what the research cannot yet determine, as it is to understand what it can and does. The research literature is clear that teacher quality contributes significantly to student outcomes, but so too do many other things. While teaching quality is an obvious policy lever in the objective of improving students' educational experiences and outcomes, we should not expect it to achieve transformative change alone, or at the expense of activity in other areas.

Within the research literature on teacher quality and effectiveness, the findings are strongest on the efficacy of certain teaching practices and weaker on the robust measurement of teaching quality and the mechanisms for rewarding effective teaching. This does not mean, however, that policy reform should not be undertaken in these areas. It is important to recognise the opportunity presented by policy-making to contribute to the ongoing development of a robust evidence base. Initiatives and interventions undertaken on the basis of the best available evidence (especially where this evidence is inconclusive or contradictory) can produce valuable insights if subject to well-designed evaluations.

114. Rowe has claimed that ideology rather than evidence driven teaching practice is 'endemic in Australian schools and higher education providers' and elsewhere in the world: K Rowe 2007, 'Educational effectiveness: The importance of evidence-based teaching practices for the provision of quality teaching and learning standards', in D McInerney, S Van Etten and M Dowson (eds) *Standards in Education, Information Age Publishing*, Charlotte North Carolina: 59-60.

115. See Snook et al 2009 (n 7 above); C Watkins 1995, 'Follow Through: Why didn't we?' *Effective School Practices* 15(1).

116. Alton-Lee 2011 (n 94 above): 321.

Centre for Education Statistics and Evaluation
Office of Education
GPO Box 33
Sydney 2001
Australia

T 9561 1200
E cese@det.nsw.edu.au
www.dec.nsw.gov.au

NSW Department of Education and Communities

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