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Enhancing achievement for vulnerable students: the role of research engagement and knowledge and capacity building in complex systems

Philippa Cordingley
Rebecca Mitchell

Centre for the Use of Research & Evidence in Education

curee

CUREE Ltd
4 Copthall House, Station Square, Coventry CV1 2FL
+44 (024) 7652 4036
philippa.cordingley@curee.co.uk
@PhilippaCcuree

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Introduction

This paper focuses on two aspects of the use of research and evidence in increasing educational effectiveness. It explores the contribution of use of research and evidence to meeting the needs of vulnerable students (Proposition 1) and the way in which it becomes increasingly important as the governance of education moves from central regulation to de-regulation, from a small number of high profile players to an increasingly diffuse, diverse and localised group of stakeholders. (Proposition 2), As remarked in OECD (Fazekas & Burns, 2012) knowledge and its use moves centre stage in the context of increasing complexity in education governance systems. Similarly, in the context of the complexity of the learning needs of the most vulnerable and the difficulties education systems have in responding effectively to them, research and evidence about high leverage approaches have a particularly important part to play. (Ibid).

The paper reflects on approaches to knowledge mediation that support effective and decentralised governance, by presenting three case studies of the use of research at scale to meet the needs of vulnerable students. The case studies are then analysed through the lens of what is known about research mediation, drawing on reviews of research into continuing professional development and learning (CPDL) (Timperley, Fung, Wilson, & Barrar, 2006; Cordingley, Bell, Thomason, & Firth, 2005) and the effective transfer of learning at scale in education systems (Cordingley & Bell, 2007).

Proposition one – research and evidence has a particular role to play in meeting the needs of the most vulnerable

The very welcome and long overdue sustained focus on meeting the needs of the most vulnerable students in the UK by successive governments of different stripes has enabled the accumulation of evidence and the development of systematic reviews that help to set the context for consideration of the use of research as a tool for meeting those needs. Key reviews carried out to inform developments in the UK, but drawing upon international evidence (Coghlan et al., 2009; Dyson, Gallannaugh, Humphrey, Lendrum, & Wigelsworth, 2010; Higgins, 2013; Sharples, Slavin, & Chambers, 2011), highlight a number of important issues.
First, there is the 'Matthew effect'; most strategies work for most students and so most interventions lead to the achievement gap between the vulnerable and others getting wider (Merton, 1995). Closing the gap therefore requires focussed interventions at class, teacher and leadership levels that maintain a particular focus on target students. Systematic reviews of interventions for closing the gap (IBID) have elicited a coherent, yet challenging picture of what is needed to close gaps. According to their findings;

- teaching strategies need to be:
    - selected so as to offer high leverage for vulnerable students, enacted within a strong pedagogic framework,
    - mediated through and modelled within the context of effective learning relationships by teachers; and
    - enacted by teachers whose own expertise develops alongside their vulnerable students' learning, with strong and sustained support for professional learning.
- student progress needs to be supported by sustained, fine grained, formative assessment and specific feedback that reinforces effort and skills (Black & Wiliam, 1998).
- teaching and learning needs to encompass extensive peer interaction and mutual support in an environment where high quality relationships that enable learning to progress are the norm.
- teaching and learning interactions and approaches need to include collaborative and co-operative activities, peer-tutoring and one-to-one and small group tutoring (ideally by teachers, if not, then well-trained volunteers).

- Learners themselves require help in order to become active agents in their own learning through the use of meta-cognitive approaches (planning, monitoring and reviewing one's own learning).

This summary of excellence in teaching and learning for vulnerable students reinforces the point about the Matthew effect: key to closing the gap is ensuring that our most able teachers and leaders are closely focused on meeting the needs of our most vulnerable students and committed to continuing to learn about it. Sadly, at least in England, the recognition of the need to support vulnerable learners has been accompanied by exponential growth in the use of teaching assistants to provide in-class and withdrawal support. This has meant that, in practice, it is often the least well-qualified staff in school and those who receive least support for continuing professional development who are focused on meeting the needs of the most vulnerable (Mortimore, Mortimore, & Thomas, 1994).

Proposition two - use of research and evidence has a particular role to play in the governance of increasingly complex education systems

A central tenet of the OECD project focussed upon governance in complex systems is that as data about education performance expands nationally and internationally, national governments try to increase local responsiveness and thus increase complexity in the way decisions about the resources, structures, content and process of education are made. In this context "knowledge is the driving force behind policy change and the key to continuous improvement of public services" (Davies, Nutley, & Smith, 2000). So identifying key interventions that are likely to deliver effective results and limit any negative side effects , "constitutes and should constitute the modus operandi of policy making and governance" (Campbell & Levin, 2009). There are also a growing number of targeted policies for supporting the use and generation of evidence in education some of which, such as those from Ontario, Canada (Campbell & Levin, 2009) are explored in this symposium.

Notwithstanding this, and ironically, research about the use of research and evidence is still in its infancy and evidenced accounts of failures in accurate take up of research findings are easier to find than accounts of successes. Papers from fellow symposium contributors suggest that this has a good deal to do with the organisational dynamics of use of research and evidence. For example, Levin et al highlight the need to pay more attention to interpersonal processes and structures in order to identify research based pathways to effective, evidence based improvement efforts (Levin, Sa, Cooper, & Mascarenhas, 2009).

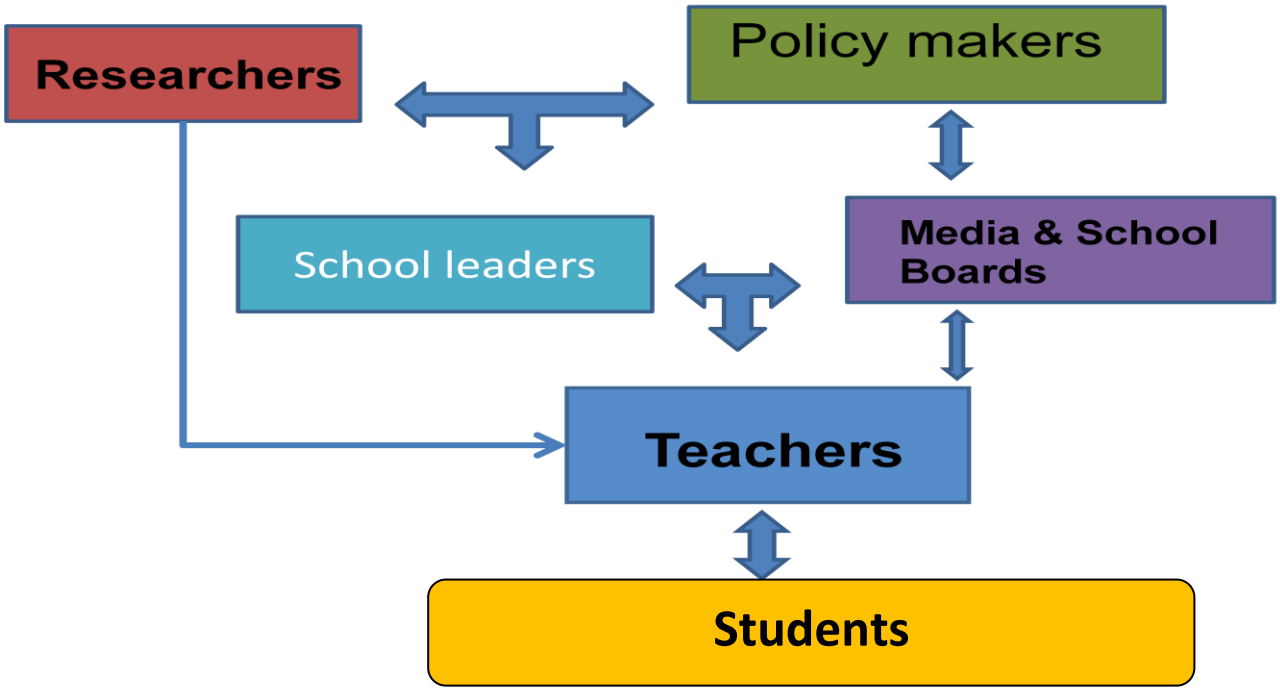
In any case the rational actor model of education of any other area of policy reform rarely provides a comprehensive account (Allison, 1971). As a review of the literature about the role ofresearch and knowledge in the governance of education in complex systems (Fazekas & Burns, 2012) suggests "The epistemological criticism stresses that evidence-based policy's ….excessive focus on scientific evidence in general, and randomised control trials in particular, neglects valuable and important types of knowledge which could contribute to better policies (Head, 2008)." (ibid)This paper attempts to fill this gap by presenting and analysing three case studies of policies about the use of research and evidence which approach policy making from bottom up, sideways on and top down governance perspectives.

Key stakeholders

Improving an education system through whatever means and at any level, including through use of research and evidence, self evidently involves identifying the key players and linkages. The approaches to reconfiguration of education systems accompanying decentralisation usually include the development of local capacity. This in turns involves changes in key personnel and an exponential expansion in the diversity of stakeholders in education improvement initiatives. Thus the task of identifying key players changes from the creation of a stable map and set of relationships between known key players to the development of networking capacity, good communications systems and data sharing.

Although the governance and knowledge networks in different countries take many forms, the high level components remain broadly constant. Policy makers contribute as instigators and framers of strategic direction and, to lesser and greater degrees, to operationalisation and implementation. Their connections with real world enactment of education, and therefore their aims and policies, are mediated through policy guidelines, regulatory, political and professional networks and frameworks, funding mechanisms and news and information delivered through a range of media. Connections with school boards and, less frequently, school leaders will also play a part in this. But connections between policy makers and teachers and policy makers and students are mostly indirect and mediated through school leaders and, in relation to school level policies and employment issues, through school boards. Researchers, as figure one suggests, make contributions more from the sidelines though interactions with policy makers and school leaders but more directly with teachers through their contributions to initial and continuing professional development and learning.

Figure 1



As the ultimate beneficiaries of education policy and governance, students and their learning are seen as the end to which other groups and stakeholders offer the means. In such a complex chain of linkages the risk is, and certainly has been, that networks thinking about students are located at the level of averages, and general trends and that sub groups of students, particularly vulnerable minorities or groups whose norms do not fit well with the norms of the education system will be overlooked. So the identification of student stakeholders is a particularly important and sensitive issue.

Although stakeholders in education knowledge systems are many and various, the actors who make the most difference to achievement within educations systems, whether simple, or complex, are teachers. "There is no more important empirical determinant of student outcomes than good teaching" (Barber & Mourshed, 2009) So a knowledge and capacity building system and engagement in and with research by practitioners within it as a means of improvement, needs to focus on them; on what teachers know and do and the ways they interpret, fashion and enact professional knowledge about teaching and learning. This is sometimes an uncomfortable truth because communicating and connecting with teachers is costly and takes time. Policy makers understandably prefer to focus on the effects that school leaders can have. What this evidence suggests is that school leaders themselves need to orchestrate support for teachers' engagement

in and with research as an improvement mechanism (Robinson, 2007). So policies need to focus on how leaders help teachers engage with knowledge in its different forms and work at multiple levels; individually, collaboratively (through joint development work/ R&D), organisationally at school level and or through school networks and collectively across the profession.

The nature of knowledge in education knowledge systems

A knowledge and capacity building system also depends upon clarity about what kind of knowledge is most useful for improving student learning and life chances and holds most sway in relation to both accountability and practice

The term 'knowledge' implies status or a warrant; in the context of policy making for school improvement it implies concepts, approaches, phenomena and skills that have been proven to work, usually in a range of contexts and for a significant number of people. In most education systems higher education institutions are seen as a key source and purveyor of warranted knowledge, drawing from their own and their colleague's education research. But teachers within higher education institutions, like their colleagues in schools also draw on other warrants, on the systems and policies that shape work in their institution, on the views of recognised thought leaders, on often tacit custom and practice and above all on their own internalised values, beliefs and assumptions and experiences. To use a metaphor, research based knowledge could be considered as a globe representing the earth spinning in space and practice based knowledge as the same globe being supported by a pair of hands. Research based knowledge, like the globe spinning in space, draws heavily on multiple cases and structures for reliability and validity to create something independent; something usable in multiple contexts and therefore context free. Practice based knowledge addresses the same phenomena but recognises their boundedness to context; it is a more human phenomenon dependent on the people who enact it; those whose very act of holding the globe hides some part of it from scrutiny.

Research based knowledge

Practice based knowledge

Harnessing knowledge to practice

Harnessing research based knowledge to practice for the purpose of improving schooling and achievement at system level, means connecting these two worlds. Both are busy and oriented to their own very different power structures, imperatives, rhythms and realities. Simply telling teachers, school leaders or school boards that a particular intervention offers a high impact approach, that is superior to current practices, rarely has much impact. For example one of the approaches that has the strongest international research warrants, Assessment for Learning (AfL), whilst widely "known" is still relatively little understood by practitioners (Wiliam, 2008). Yet as Research for Teachers (Research for Teachers, 2007) and Wiliam himself (Wiliam, 2008)point out, only a small percentage of the full potential of AfL is actually being deployed by the teachers trying out AfL techniques because the techniques are used as an end in themselves; because

teachers don't feel able to use the windows into student learning offered by AfL techniques to refine their teaching and learning activities.

As the array of stakeholders and range of constructions of knowledge show, harnessing research based knowledge to practice requires focus and determination. So, inevitably, using research based knowledge to promote the use and effectiveness of high impact interventions for vulnerable students within increasingly complex and fragmented systems, clearly requires even greater clarity and determined efforts at multiple levels. To explore how this has worked and some of the obstacles to progress, this paper draws upon practical examples of research and evidence informed improvement initiatives, one that has worked from the chalk face up, one from a sideways on perspective of system improvement and one from government down. The subsequent cross case analysis draws both on the evidence base for transferring knowledge at scale in education contexts and on findings from systematic reviews to highlight key issues about effective approaches to developing professional learning and practice.

Case study one bottom up research and evidence informed approach

In 1997 the English Teacher Training Agency announced a programme of national research awards for teachers who were willing to carry out enquiries on behalf of the profession that would be rigorously quality assured and, if successful, published to engage other teachers with findings and to role model teacher engagement *with* the research of others and *in* their own enquiry oriented learning.

One of the successful teachers was Romey Tacon, head of an infant's school in a deprived town in coastal England who was deeply concerned about the lack of progress of a significant number of students in numeracy. Working with a colleague and the support of an HE mentor, Tony Wing from Brighton University, the two teachers explored the findings from Catherine Stern's research into the development of understanding of number relations. Stern's work focussed in particular on visual representation of number relations and the two teachers used this to construct and test apparatus that would support student learning and explored ways of introducing and working with this apparatus that were effective. They were delighted by a very positive and swift response from students and their colleagues began to take an interest, struck by the animated and detailed conversations about changes in the learning of all students and of known struggling learners in particular. The fruits of their first year's research were plain to see, reported carefully and summarised for professional colleagues (Tacon, 2004).

A second year grant enabled wider testing of the approach with other neighbouring schools, with other year groups in the host school and in the feeder destination junior schools. Again the results continued to be impressive particularly for struggling learners. The publication of the findings attracted a good deal of local and regional attention and Romey ran a number of very popular local conferences with support from the Local Authority. When her capacity to support the insatiable demand for conference places ran out she opened up her school on Tuesday afternoons so local teachers and head teachers could come and observe the approach at work and discuss what they had seen with the teachers afterwards. The impact of the approach was particularly striking for struggling learners, especially for those with short term memory challenges like students with Down's syndrome. The Teacher Training Agency put the teachers in touch with a Charitable Foundation able to fund further, larger scale research and they also contacted a leading charity supporting students with Down's syndrome. Further regional trials revealed similar striking patterns in improvement and, over time the resources and approach were developed for publication nationally and internationally. The resulting approach, known as Numicon mathematics, is now widely recognised as playing a significant role in advancing the numeracy skills of students with Downs syndrome in ways that have significantly advanced the level of progress they can attain and thus the extent to which they can function independently in society (Buckley & Bird, 2001; Nye, Buckley, & Bird, 2005).

This work progressed from micro to macro influence for a number of reasons. First it addressed a "wicked issue"; something of profound and continuing concern to significant numbers of primary school teachers and the education system as a whole; one that was driven by specific aspirations for vulnerable students and was able to harness strong moral purpose. Second there was powerful existing evidence on which to build. Third

there was sustained support over a period of three years enabling the research and development work to become self sustaining. Fourth there were compelling responses from students, teachers, and schools enabling the development of a critical mass of cases and the generation of significant data sets. Fifth the programme benefited from funding, recognition, critique and support from a high status teacher research scheme. This helped the teacher researchers and their HE mentor to commit to meeting the needs of students and teachers in other schools as well as their own. The programme grant requirements were also based on evidence about the use of others'research and , teacher learning.. Programme support included:

- commitment and support to meet the needs of other potential teachers from the outset
- a requirement to build their projects on existing evidence,
- coaching in research methods and in ways of making research accessible to peers
- attention to rigour and peer and expert review focussed on both the role of evidence (as distinct from opinion or description of practice) and outcomes.

Case study two sideways on research mediation by the third sector

Achievement for All (AFA) is a two year whole school development programme focussed on making substantial improvements in achievements for students with Special Education Needs and Disabilities (SEND) that also acts as a trojan horse forbuilding capacity for improvement more generally. It distilled key elements of the research evidence base into a programme focussed specifically on closing the gap for SEND students. The first pilot phase was government funded and, on conclusion of the pilot the design was bequeathed by government to a charity following a competitive tender, Achievement for All 3as, specifically established to take the project to scale. The programme involves four core components:

- focussing energy and attention on tracking progress in core subjects for a small and focussed target group of approximately 12 SEND students in two different year groups- in depth and in detail and on a sustained basis (Blandford & Knowles, 2013; Humphrey & Squires, 2011)
- developing a structured conversation with the parents of target students about their children's progress (Desforges & Abouchaar, 2003; Kreider, 2000)
- focussing on achieving wider outcomes for target SEND students (Blandford & Knowles, 2013; Humphrey & Squires, 2011)
- focussing on school leadership at all levels so that a sharp focus is maintained on the achievement, access and aspirations of the pupils with SEND.

There are several processes wrapped around the core elements that are also consistent with the wider evidence base and that also emerged from the pilot evaluation (Humphrey & Squires, 2011) as being linked with the greatest success in pilot schools. These are:

- the provision of support and challenge is provided to schools on a fortnightly basis by colleagues with skills in and experience of school improvement and meeting the needs of vulnerable students (Cordingley, Bell, Isham, Evans, & Firth, 2007; Timperley et al., 2006);
- an emphasis on identifying and building on the best of existing school practice for SEND students thus creating rich opportunities for collaborative learning (Robinson, 2007; Moss et al., 2007);
- a requirement that the programme is led within the school by an AFA Champion who must be the head teacher or an established member of the school leadership team (Robinson, 2007);
- the requirement that Champions provide ongoing support and critical friendship to the teachers involved with the target groups of the most vulnerable SEND students in two selected year groups (Timperley et al., 2006; Cordingley et al., 2005; Cordingley, Bell, Evans, & Firth, 2005; Cordingley, Bell, Rundell, & Evans, 2003; Cordingley et al., 2007).

An independent evaluation of the programme identified impressive outcomes including the fact that, on average, pupils with SEND in pilot schools progressed significantly faster than pupils with SEND in other schools nationally and in several cases, faster than pupils without SEND nationally (Humphrey & Squires, 2011).The Achievement for All 3 s charity has subsequently successfully launched the process of taking AFA to scale. The programme is now in over 1500 schools across England and the charity is providing expertise to educational leaders in other countries such as the US and Norway to support its development there.

AFA has continued to develop and strengthen the mediation of research through Achievement for All in partnership with CUREE by, for example, introducing Response to Intervention (RTI) (Fuchs & Fuchs, 2006) to the AFA process initially for a specific sub cohort funded by the Education Endowment Foundation (EEF). The integration of RTI into AFA is being piloted with a focus on supporting vulnerable students whose literacy levels on transfer to secondary school will not enable them to access the secondary curriculum. This follows on from a review of effective approaches to help Year 6 students catch-up in literacy which highlighted the positive impact of RtI (EEF, 2012).

RTI is centred around close case analysis for individual students and the matching of research-based interventions in three successive layers of intensity to the emerging student needs . The emphasis on close case analysis fits with AFA's own use of sustained tracking at class teacher and senior leadership levels. CUREE has developed a series of research based tools to introduce and scaffold the use of research-based literacy interventions and to support schools in identifying the research and in-school evidence about existing in-school interventions that they wish to build on. CUREE has also introduced a series of research-based tools and protocols in to the critical friendship coaching process provided by both external AFA personnel and by in-school Champions in the context of RTI.

The initial pilot of RTI starts after standardised final primary school assessments at the end of April and finishes with the assessment by secondary school colleagues of the progress of target students in highly engaging and demanding summer holiday tasks introduced through the structured parental conversations. A randomised control trial of this intervention is being undertaken on behalf of EEF from May until the end of the primary school year in late July and secondary colleagues will be involved in programme based follow up evaluation using the research based tools designed into the programme.

Case study three top down research mediation through policy

Australia's federal government system is a good example of an established and complex governance system. Roughly two thirds (6,697) of Australia's schools are managed and run by the government, with the rest being a roughly equal mix of independent (1,017) and catholic /church (1,713) schools.
Education policy and its implementation is supported and determined almost entirely by individual jurisdictions with very different histories and orientations towards teacher quality**.** But in the view of the Australian government: "Internationally and locally, education systems are developing professional standards for teachers as a mechanism to attract, develop, recognise and retain teachers. 'High performing school systems, though strikingly different in construct and context, [maintain] a strong focus on improving instruction because of its direct impact upon student achievement' (Barber & Mourshed, 2007).

So, following an intense period of consultation and consensus building across a very broad group of stakeholders starting in 2009, the Australian federal government introduced for the first time in 2013, national standards for the teaching profession. This required national legislation since professional standards in general had hitherto rested at the level of individual jurisdictions and although the standards are specified nationally, their implementation remains a State level responsibility.

Work on developing the Standards commenced in January 2009. This was a rigorous national process drawing on existing standards and external research as well as expert knowledge from key educationalists across Australia.

The consultation phase which followed the drafting of the Standards was similarly extensive and involved all key education stakeholders, including but not limited to teachers, teachers associations, professional subject associations and teacher educators. Between March and May 2010 stakeholder consultations were conducted within jurisdictions using the arrangements determined by jurisdictional authorities, major employing authorities and teacher regulatory authorities. The Australian Government conducted consultations with national stakeholders.

In addition to the feedback provided at consultation workshops across the country, more than 120 written submissions were received from the Australian Government, state and territory governments and their regulatory authorities, education unions, professional peak bodies and individual schools and teachers. All feedback submitted was considered in redrafting the Standards.

The refined draft of the Standards was then subjected to a rigorous psychometric validation process conducted through the University of New England. It incorporated two online national surveys and focus group workshops held in every state and territory and involved thousands of teachers and hundreds of schools across the nation.

There are four aspects of this regulatory approach to governance that relate to this symposium;

- First there is the extent to which the content of the standards attempt to embed teacher engagement in and with research and evidence of various kinds as a core element in what can be expected of Australian teachers.
- Second is the attempt to embed giving priority to meeting the needs of the most vulnerable students in teacher expectations.
- Third is the way in which the national body facilitating and enabling implementation by jurisdictions, AITSL, is attempting to model engagement in and with research in the implementation process.
- Fourth is the way in which the implementation of the standards and their evaluation attempts to reinforce and model a research and evidence based approach to education development.

The standards as a framework to encourage research and evidence use by teachers

The Standards are grouped into three domains of teaching; Professional Knowledge, Professional Practice and Professional Engagement whilst recognising that in practice, teaching draws on aspects of all three domains. The professional engagement standards encompass professional learning -thus at headline level, teachers model effective learning. They identify their own learning needs and analyse, evaluate and expand their professional learning, both collegially and individually." Within this overarching rubric teachers are required to engage with evidence and research in increasingly sophisticated ways. At the lower levels of the professional standards, teachers are required to identify and understand sources of professional learning leading to engagement with learning to update knowledge and practice. Engaging with colleagues initially involves seeking and applying constructive feedback to improve teaching which moves towards teachers using feedback to improve professional knowledge. There is a progression from a general understanding of the rationale behind continued professional learning to undertaking targeted professional learning programs to address student needs. Whilst at the lower levels the onus is on recognition and initial engagement with professional learning and knowledge, at the more sophisticated and advanced levels the standards become very specific about engagement in and with research and evidence including:

- for highly accomplished teachers there are requirements to:
    - "Plan for professional learning by accessing and critiquing relevant research, engage in high quality targeted opportunities to improve practice"
    - "Initiate and engage in professional discussions with colleagues in a range of forums to evaluate practice directed at improving professional knowledge and practice, and the educational outcomes of students"; and

    - Engage with colleagues to evaluate the effectiveness of teacher professional learning activities to address student learning needs;
- For lead teachers there are requirements to:
    - Initiate collaborative relationships to expand professional learning opportunities, engage in research, and provide quality opportunities and placements for pre-service teachers,
    - Implement professional dialogue within the school or professional learning network(s) that is informed by feedback, analysis of current research and practice to improve the educational outcomes of students; and
    - Advocate, participate in and lead strategies to support high-quality professional learning opportunities for colleagues that focus on improved student learning.

Similarly the Standards make specific requirements on teachers in relation to meeting the needs of vulnerable students. For example, there are sections in the standards about addressing the needs of Aborigine and Torres Straight islanders which require teachers to engage increasingly proactively and deeply with the community in designing and supporting learning experiences.

There are also sections in the standards at all levels about knowledge and understanding of specific learning needs for students with disabilities and differentiation that meets those needs across the full range of abilities. The standards also require teachers at the third and fourth, more advanced levels to evaluate the effectiveness of learning programmes for students with disabilities and ultimately lead other colleagues to do the same.

Practising what is preached – embedding engagement in and with research and evidence in the implementation process

The use of research and evidence as a key driver within the standards is also reflected in the way that the implementation of the Standards is being supported and implemented. The Evaluation policy and the specification for the commissioning of the evaluation recognises that "evaluation in real world settings will impact on the subjects of the evaluation, whether intended or otherwise." They therefore require that the evaluation design should harness that impact positively and deliver benefits to the evaluation's participants as well as its commissioners. For example the Evaluation policy and specification require that data collection tools/instruments are designed to be useful at the point of application (e.g. student surveys should report analysed results to the school as well as the researchers) in order to add value to the participants and increase the amount of participation and the quality of the data. There is also recognition that "in a semi-autonomous policy environment, the 'beneficiaries' of evaluation designed in this way might be co-constructors of the evaluation, undertaking studies serving local purposes as well as feeding relevant data at more aggregate levels (e.g. from State to Commonwealth).

Key issues in use of research and for closing the gap within complex governance systems.

As the case studies exemplify, the use of research and evidence both promotes and requires in-depth professional learning. It is difficult to isolate the professional learning processes of teachers involved in system level reforms and very hard for those designing such reforms to specify such learning processes, not least because the processes involved are often internalised and because agency lies so strongly in the hands of individuals. It is not a surprise therefore that efforts to back the use of research are often located at the level of the contribution of school leaders and school performance management and development systems. Furthermore teachers themselves contribute to an over-focus on behaviours and performance and an underestimation of the importance of in-depth knowledge and an understanding of the underpinning research rationale or theory of teaching and learning, emphasising as they do, what they see as "common sense" approaches. In reality, for effective teachers, common sense approaches are really internalised,

complex and layered ways of responding to diverse needs, based on accumulated professional expertise, analysis and critique. Because they are aware of and focused on how much more can be achieved they significantly underestimate their established, tacit knowledge and expertise. But for less effective teachers "common sense" approaches often involve unthinking adherence to established routines and resources – and become a defence against questioning and risk taking. At its worst this can result in a "tyranny of common sense", an intransigent resistance to learning from practices developed and tested elsewhere through research.

However, as the case studies illustrate, the greater our understanding of the importance of research evidence, its use in practice and the contribution of professional development and learning is, the greater the prospect for success in overcoming these difficulties such as the internalised nature of practice based knowledge. Research and evidence can and should be brought to bear on practice even in the most complex educational systems. The grant requirements and the learning support built in to the TTA research grant programme (See Numicon case study) were explicitly targeted at both challenging and supporting teachers as they developed their evidence-and-practice-based research projects. Its success led to the creation of a number of other funded research programmes for teachers in England such as the Post Graduate Professional Development Programme funded by the Teacher Training Agency (CUREE, 2008), the Best Practice Research Scholarships (Street & Temperley, 2005)funded directly by the Department for Education and skills(DfES), the General Teaching Council's Teacher Learning Academy, the Networked Learning Communities programme (Katz & Earl, 2006) and the Research Associate programmes both funded by the National College for Teaching & Leadership (https://www.nationalcollege.org.uk/signin?indexidol=no&url=http%3A//www.nationalcollege.org.uk/index. Each scheme addressed a particular sub set of issues and was nested within the standard operating processes and organisational values of the host organisation. Despite these contextual differences, the different schemes combined to generate an increasingly shared understanding of the key ingredients for professional learning from research. Across the numerous UK agencies support gradually improved. Between 1997 and 2009 this focus on professional learning via influential national agencies encouraged large numbers of teachers (by 2010 the annual GTC survey was recording 33% of teachers as being actively engaged in or with research) and school leaders to think hard about the way they approached teacher professional development, often putting research and inquiry at the heart of their learning. During these years, one of the effects of this growing national trend was to create significant inroads into the prevailing status quo around teaching, learning and CPD – or the "tyranny of common sense" described above (Cordingley, 2010).

Underpinning this growing coherence lay the emergence of a mature and increasingly coherent evidence base about what makes a difference to students as well as to teachers in Continuing Professional Development (CPD) that emerged in England as a result of Government investment in developing a methodology for systematic and technical reviewing of research findings through the Evidence for policy and practice Information(EPPI) centre, the work of the linked impact of CPD review group (Cordingley et al., 2005; Cordingley et al., 2005; Cordingley et al., 2003; Cordingley et al., 2007) and, a little later the parallel work of the Best Evidence Synthesis groups in New Zealand (Timperley, Parr, & Bertanees, 2009). Subsequently a number of English national organisations (the General Teaching Council, the Department for Education, the National Teacher Research Panel, CUREE and the Learning and Skills Improvement Service came together to fund a systematic and technical review of the evidence about teacher engagement in their own research and with the research of others and the ways in which this compares with the experiences of health and social care professionals.

In the next section of this paper, the key features of the three case studies which are explored above provide a context for extending our understanding of the different ways in which, in the context of increasingly devolved and complex governance arrangements in both policy and practice approach the systemic use of

research and evidence, mediated through professional learning, as a means of improving outcomes for vulnerable students.

Key features of these case studies through the lens of evidence and transferring learning at scale in education and the particular role of CPD

Closing the gap: Effective transfer and scaling up (TSU)

Closing the gap is a common focus within all three examples and all three involve the use of research and evidence albeit variously as an input, process or goal. Although they illustrate efforts to close gaps and promote the use of research at different levels of governance (top down, sideways on and bottom up) they also all involved changes to, or the development of, teachers' professional practice, at scale, in complex educational environments. In all three cases it is possible, as this paper attempts to demonstrate, to draw on the evidence bases for (a) effective transfer and scaling up of educational innovations, including research-based interventions, and (b) effective teacher CPD to identify and describe some of the key processes and conditions underpinning the transfer of research evidence into educational practice. To this end and to try to make sense of what the examples tell us, the paper uses the five key issues that have been identified as being key to the effective transfer of learning at scale in education systems as an analytic approach. The five key issues comprise:

- goal and purpose – how much change is involved, of what kind?
- depth - or transfer of practice, knowledge, beliefs and understanding of the principles and values
- spread - numbers - or volume and extent of embededness
- extent of ownership
- degree of sustainability.

Closing the gap: Continuing Professional Development and Learning (CPDL)

CPDL is central to all five of these Transfer and Scaling up categories. Similarly, sustained, in-depth changes in practice, which target the needs of vulnerable children, require effective CPDL, particularly if they are to be owned by practitioners and have the capacity to be taken to scale. (Coghlan et al., 2009; Dyson et al., 2010; Higgins, 2013; Sharples et al., 2011; Cordingley & Bell, 2007) Systematic reviews of research about CPDL that makes a difference for students as well as teachers offer a mature evidence base about effective learning processes and forms of support . These have been well rehearsed at previous AERA conferences(Cordingley, 2011; Cordingley, 2010) and are consistent also with findings about effective teacher engagement with the research of others and in their own research. Reading across these reviewsit is possible to identify a number of core characteristics of effective professional learning that it is therefore important to bring to bear on support for closing the gaps for vulnerable students. Key factors here are:

- linking student and teacher learning,
- the provision of sustained specialist support that highlights and models high leverage approaches
- the enabling of sustained peer support and reciprocal vulnerability which increases ownership, commitment and a willingness to take risks and to unlearn established assumptions and habits *and* to develop new understandings and practices,
- learning how to learn from close observation of learning and teaching exchanges,
- structured dialogue rooted in evidence from trying out strategies that disturb the status quo with students,
- ambitious goals – which *can* be externally mandated providing there is a strong element of peer support; and
- modeling of this kind of deep and sustained, enquiry oriented learning by school leaders who provide time for collaborative analysis and evidence based reflection and who specifically encourage risk taking.

The case studies illustrate many aspects of these findings especially the importance of ownership, depth and evidence within the professional learning process and the role of collaboration and enquiry orientated activities in achieving this. They also illustrate to the contribution of strategies such as coaching, co-construction, the mobilisation of teachers' aspirations for their students and the presence of specialist in the CPD that is offered in support of reforms.

Purpose

All three case studies include a focus on meeting the needs of the most vulnerable. They also all call for high levels of achievement for pupils and teachers and involve considerable professional development journeys because of the degree of change that they require; they are focussed on goals of substance that matter to participants and have externally recognisable success measures to bring clarity of purpose and accountability to bear.

A key distinction in relation to purpose between AFA and Numicon is the degree of specificity and its focus. In the Numicon example it is the tightness of the focus on the development of an understanding of number relations that drives the work. This contrasts with the breadth of the focus on both core achievement and wider learning goals for a small number of the most vulnerable students in a year group in Achievement for All. Here teachers may be called upon to focus on any aspect of learning. In AfA it is the selection of a small number of students at the core of the learning intervention that brings focus to purpose. In the Numicon project the initial incentive was to find ways of meeting the numeracy needs of a whole cohort of very vulnerable learners -and the power and specificity of the intervention that enabled that purpose to be sustained.

The Australian Standards are slightly different in that they are externally triggered. They matter to teachers and schools because of the force of regulation – but also because they have been developed in a way that connects the standards with pride in professional identity and efficacy.

Depth

Coburn defines depth, in the context of transferring learning at scale as "going beyond the surface structures or procedures (such as the introduction of a lesson plan) to alter teachers' beliefs, norms of social interaction and pedagogical principles" (Coburn, 2003); features around which there was a strong existing evidence base about effectiveness on which to build.

The systematic reviews about effective professional development and learning and research use, for example, highlight the importance of enabling teachers to develop theory and practice side by side so that teachers have the depth of understanding needed to adapt approaches for different needs and contexts (Timperley et al., 2006; Bell et al., 2010).

At one level the Australian standards address depth instrumentally in specifying the role of evidence and research in shaping and informing the beliefs and norms of more advanced teachers. However they also recognise the learning implications of the use of research and evidence by accompanying the standards with an entitlement to professional review and development. As importantly, they stipulate some of the forms of such development directly in line with the CPD evidence base cited above, for example, Standards include requirements that teachers:

- "Initiate and engage in professional discussions with colleagues in a range of forums ……..
- Engage with colleagues to evaluate the effectiveness of teacher professional learning activities to address student learning needs…….
- Implement professional dialogue within the school or professional learning network(s) that is informed by feedback, analysis of current research and practice to improve the educational outcomes of students…; and Initiate collaborative relationships to expand professional learning opportunities……."

The standards explicitly recognise that reviewing, developing and even changing beliefs is likely to be a long and challenging professional journey, involving substantial iterative exchange between practices, assumptions, evidence and understanding as teachers wrestle with teaching and learning challenges together.

The Numicon project focussed on depth indifferent ways. Originally it involved an ever increasing circle of collaborating teachers and schools working together to understand and develop new and very different ways of helping young and vulnerable learners develop understanding. They developed theri understanding and practice through observing learning intently and using tools and protocols to discipline developments and ensure consistency in interpretation and assessment. Later cohorts of teachers were introduced to Numicon through enquiry oriented CPD activities, which were being externally evaluated. But in each phase depth was secured by sustained collaborative learning rooted in exploration of evidence about how students were responding to new ways of engaging with number. The tools and protocols, the sustained rhythm of learning, the exploration of a single approach in multiple contexts and the growing coherence in the results and the excitement about them all helped to secure depth.

For Achievement for All depth has been secured more organisationally, through the joint contributions of the external critical friends and the school champions. The latter are firmly embedded in the leadership team, which has focused efforts across the school as a whole in meeting the needs of the most vulnerable learners. Critical here to depth, as participants unanimously agree, has been the way the programme requires teachers to engage imaginatively, determinedly and in-depth with the target students' parents and to link them into the ongoing monitoring and celebration of progress. Consistent with the CPD evidence base, teacher learning (both through the Champions and the critical friends) and student learning are closely linked as teachers implement the research-based interventions. More recently a series of research-based tools and protocols have been introduced by CUREE adn AFA working in partnership to embed greater depth into the critical friendship coaching process offered to schools by both external AFA personnel and by in-school Champions.

The strategies for securing depth vary between all of these case studies although all are embedded in and supported through careful attention to CPD and to securing high quality teaching. Variations reflect both the contexts and the differences in the groups of colleagues for whom depth is being sought – the whole profession, the leaders of classes and mathematics teaching and school leadership teams. However all three are focussed on expanding the knowledge base by bringing research and evidence to bear on practice. In particular, the monitoring and tracking built into AFA and the Australian standards offer examples of evidence based mechanisms designed to secure the persistence needed to effect changes in belief. The development of Numicon was also enquiry based for a considerable period of time, ensuring that changes in teacher practice were firmly rooted in the evidence of the learning benefits for vulnerable students secured by the intervention.

The spread/ embeddedness of transfer

Spread in the context of transfer and scaling up is understood as both number and scale and the extent to which reform norms and principles influence identifiable operational structures such as whole school, regional policies and procedures and professional development processes and priorities. In Australia, the introduction of the standards is self evidently a policy focused on scale in all these senses, especially as the standards are linked to a professional development and review entitlement. By contrast Numicon started with a focus solely on within-school development by two teachers, but orientated towards illustrating and informing professional practice more widely over time. It grew to scale organically and slowly and is rooted more in a specific pedagogy than in the operational structures involved in the other two examples. The Numicon focus on was on enquiry questions, tools and evidence-rich CPD to secure shared understanding of underpinning principles, rather than a specific focus on leadership or structure. Numicon's spread from one small school and two teachers to hundreds of schools and SEN organisations was characterised by well-

evidenced principles of effective CPD. Teacher learning was strongly focused on student learning, leaders modelled research and enquiry, observations were followed by collaborative teacher inquiry and the original Numicon researcher/ architects took on the role of specialists, supporting the learning of teachers within and beyond their own school.
AFA, occupies a third position, using protocols, tracking and strong senior leadership involvement to secure spread in exactly the sense highlighted by the transfer and scaling up research. And the introduction of CPD tools and protocols more recently reflects accurately the second element in securing "spread" described above.

The sustainability of the approach

It is important to note at the outset that in relation to sustainability both AFA and the Australian NPST make extensive use of monitoring. Within AFA, monitoring takes place in the context of fortnightly coaching visits and so is tightly linked with the kind of sustained specialist support identified in the CPD research. Even though the close tracking of student progress is represented as part of the intervention, it is absolutely clear that external monitoring is also taking place; that plans that have been made have been enacted, and that the target groups of vulnerable students are making good progress.

Numicon does not use monitoring or accountability as part of its approach to sustainability. Its approach to sustainability evolved as the organic growth of the use of the strategy expanded. There was no deliberate attempt at the outset to grow something at scale; rather scale arose in response to interest and demand. This is a pull through rather than a push down example. Interestingly however, the vehicle for expansion in the early stages was practitioner action research; colleagues were encouraged to try out for their own students the experiments that the original teacher researchers used and to discover for themselves how effective this was for their particular students. And it was the dramatic nature of the responses of the most vulnerable students that sustained such interest. Also the intervention itself made learning about number relations very visible and so was readily assessable. Later on, support from charitable foundations and research teams enabled larger scale assessment and exploration of consistency to take place and the results were used to refine the design of the tool and the CPD. Ultimately, the purchase of the NUMICON approach by Oxford University Press, a commercial education publisher, secured longer term sustainability of a rather different kind.

For AFA, there is no doubt that government sponsorship and significant funding subsidy has played a very important part in making the intervention sustainable at scale beyond the pilot. It isn't just that such funding helped resolve a number of practical problems , it also acted as a powerful symbol of worth. So too was the clarity of the key building blocks (the involvement of school leaders, the specification of the structured learning conversation with parents, the focus on tracking progress, on wider achievement and on building upon existing strengths within the school) in the design and the fact that coaches trained in AFA are available to make fortnightly visits to all participating schools. But here too the evidence of the very positive impact of the intervention on the most vulnerable students, which has been evaluated quantitatively at school and whole programme level, has been an important factor in sustaining effort and interest and taking the approach to scale.

For the Australian National Standards it is too soon to know about whether steps taken to secure sustainability are resulting in sustainable change on the ground. Certainly at federal and legislative level, the extensive consultation, the careful development of consensus, the evidence-based approach to collaborative CPD, the use of research and evidence and the detailed level of specification are designed to help secure the architectural sustainability of what is essentially a regulatory framework. There is also an impressive array of web based illustrative tools and resources to support implementation by individual jurisdictions and, in the case of Initial Teacher Education, universities on hand to support sustainability through specialist input and consistency in relation to process. The considerable investment in evaluation and the appointment of a very prestigious evaluation team is also an effort to use monitoring both formatively and summatively to secure sustainability.

The approach to ownership

The development of ownership in relation to the transfer of knowledge at scale tends to centre around recognising , respecting and building upon existing practices, knowledge strengths and understandings often through a mix of co-construction and peer support together with coaching (Cordingley & Bell, 2007). Numicon's early stages of development were rooted in collaborative enquiry. Its use now is entirely voluntary and schools have to purchase the tools and the training to support their use. In this context ownership is in the hands of users and flows from self direction.

Coaching support and building on existing strengths, two of the core characteristics of sustainability, are also two of the central design features of AFA. Those involved in the National Pilot also reported a sense of pride and ownership flowing from working on behalf of the system. For participants in the roll out phase ownership seems to be connected with two key factors:

- First there is the active involvement of a member of the school leadership team in understanding and meeting the very challenging needs of a specific, target group of students; in this way meeting these needs becomes a focus for moral purpose and coherence which act as a springboard for ownership.
- Second, the use by those leaders of learning from this work to support developments in other year groups and contexts then secures ownership amongst a wider group.

For ownership as for other key issues, benefits for students are powerful drivers.

Although the Australian National Professional Standards are a fixed framework for all to use there was a strong degree of co-construction between the many different stakeholder groups in their development and a quick scan of the internet suggests that these different groups are all actively engaged in encouraging and promoting ownership as implementation starts to take place. The Evl;aaution will tell us more in due course.

Another strategy highlighted as being helpful in generating ownership is the use of competition but there are few instances of the use of competition in our three case study interventions. Perhaps an exception is the development of a national awards scheme for particularly outstanding teachers at different levels within NPST.

Conclusion

This paper set out to explore the contribution of use of research and evidence to meeting the needs of vulnerable students and the way in which it becomes increasingly important as the governance of education moves from central regulation to de-regulation, from a small number of high profile players to an increasingly diffuse, diverse and localised group of stakeholders. In doing so it illustrates the complexity and scale of the task. But the three case studies also illustrate a range of government interventions of very different scales, types and levels making, or designed to make, significant inroads into the challenges.

The case studies are provided to map the terrain rather than as a basis for evaluating different approaches. However all three achieved (or in the case of NPST were explicitly designed to achieve) evidence based changes in practice at scale. They illustrate the potential of government interventions of different kinds and scales and orientations to contribute to teacher engagement with research and evidence informed practices for closing the gap in ways which help to build capacity or informed local decision making. But there is a remaining unexplored question which is crucial in times of austerity – that of funding. What then are the pros and cons of the different funding models underpinning each of the approaches?

- Funding for the TDA teacher research Grants was relatively modest. Teachers were given £2,00 which had to include the purchase of HE or Local Authority support. Teacher salso receive eth

equivalent of £500 in direct support and funded release from teaching to take this up.TTA funding and support for small scale teacher research carried out to relatively demanding national standards and the subsequent publication of peer and academically reviewed summaries acted as a powerful symbol of the value of teacher learning of the kind illustrated in the Numicon case rather than as a direct driver of this at scale. But the symbolic funding also acted as a catalyst for promoting teacher use of research more broadly. The successes of early participants, like the teachers in this case study, led other national organisations in the UK to use funding for exemplar teacher R&D as a vehicle for taking forwards a range of different and specific policy aims. Although it inevitably had little to add to the knowledge base it did a good deal to illustrate it, and to draw the work of other researchers' to teachers' attention. Teachers' enquiries (like laughter rather than flu) are infectious to other teachers in a way that academic research reports are not. We moved from a position in 1996 when teacher engagement with research was a closet activity in England to one in 2010 where almost 150,000 (33%) of teachers were actively engaging in and with research activity and a further 16% were less actively involved in and/ or with research. So the small scale funding's contribution was to a change in culture and mindset.

- The central funding of Achievement for All operates on an altogether more substantial scale. All pilot activity was generously funded and even now there is a 50% subsidy for schools becoming involved in this substantial, two year whole school improvement programme. It demands more extensive commitment from schools in relation to a very specific target cohort of students, provides substantive support and achieves significant improvements. Its bespoke design which is disciplined by a number of research informed principles, aligns with many of the characteristics highlighted as effective by research about closing the gap *and* about effective CPD and use of research. Its mix and layering of close tracking and analysis of the progress of target students through partnerships between key stakeholders, including parents, creates both a strong approach to ownership building and a naturally occurring monitoring device. More recent developments like the integration of RTI strengthen the links with use of research and evidence very explicitly and these too have been centrally funded, in this case by the Education Endowment Fund. In this instance the programme uses research and evidence to design instruments to close gaps and, at the same time, builds capacity for doing so. If funding allows, if there are mechanisms and capacity for the provision of external coaches and where the goal is the closing of gaps for students with SEND at scale then this case study suggests that much can be achieved through a careful, research-informed programme of highly focussed support. The questions this raises are ones about sustainability. Are schools, for example, able to maintain their successes when external coaches and programme support withdraws? Will schools commit the necessary resources for working in sufficient depth and with external critique when central resources are withdrawn? Certainly a number of schools from the pilot appear to be sustaining theri commitment through, for example, acting as ambassadors fro AFA.
- The costs of developing national professional standards and or revising existing ones depends substantially on the approach taken to consulting about their content to build consensus, the level of investment in supporting their use, and in illustrating them and providing CPDL to ensure they are met and in evaluating their effectiveness. The Australian model is a resource intensive one whose outcomes we do not yet know. It too is focussed on achieving a culture change, on recognising the intellectual efforts involved in informed teaching and learning and

ending the tyranny of common sense. The standards promote the use of research and evidence and the closing of gaps for vulnerable learners as specific goals and, given the efforts made to secure ownership, the weight of regulatory force behind them and the commitment to evaluation, we should know more in the foreseeable future.

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