

## **Deep questions of evidence and agency: How might we find ways to resolve tensions between teacher agency and the use of research evidence in mathematics education professional development?**

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We reviewed the literature around evidence-informed practice, teacher agency, and professional development for mathematics teachers, using a conceptual saturation approach to identify tensions around the contested nature of evidence and possible rights and responsibilities of ‘evidence-informed’ professional development. We found that narrow definitions of evidence and its ‘implementation’ may be used to create a powerful orthodoxy around research in practice, reducing teacher agency and resisting alternative discourse. We propose accepting a wide definition of ‘evidence-informed practice’ in order to reduce tensions between research use and devaluing other types of knowledge, and conclude with the need for good quality mathematics education professional development to provide teachers with metaevidential insulation and critical resistance by attending to the nature of evidence as well as merely interpreting it.

**Keywords: evidence into practice; teacher agency; professional development**

### **Introduction**

This is a work-in-progress narrative review, synthesised using conceptual saturation as we discovered an emergent overlap between our literature reviewing while investigating identity, power and agency in the use of research in professional development for mathematics teachers. We separately reviewed research around the broad question “how is research translated into classroom practice in mathematics education?”, but both quickly arrived at a remarkably similar entanglement of powerful tensions between educational beliefs, teacher agency, professional development, and the perceived and in-practice value of research itself.

There is consensus that educational research evidence has great, yet largely unfulfilled potential to positively impact practice (Gorard et al., 2020). Mathematics education research is suggested by some as “not very influential [or] useful” (Burkhardt & Schoenfeld, 2003, p.3) and yet by others as powerful and emancipatory: “research discourses [are] consequential not just to the mathematics classroom, but also to society at large” (Sfard, 2005, p.410). Educational research, for teachers, is often inaccessible, irrelevant, or impenetrable, and may require translation to become useful (Malin & Brown, 2020), but this process, as well as research production itself, is not neutral, apolitical or value-free (Collins, 2004).

Equally, while some views of evidence-into-practice in mathematics education suggest that research results can - and should - be straightforwardly implemented through scaled-up professional development (e.g. Roesken-Winter et al., 2021), others have criticised linear, unidirectional models of research use with teachers (e.g. Farley-Ripple et al., 2018), in particular noting that beyond instrumental use of research, teachers may have the right to alternative forms of use (Dagenais et al., 2012). This is

likely because the very concept of ‘educational practice that is informed by research’ is often understood very differently by researchers, practitioners and policymakers. The contribution of different kinds of evidence - from the ‘gold standard’ of randomised-controlled trials to teacher professional knowledge and everything in between – is contested, and these different kinds of evidence often contrasted as part of value judgements rather than brought together in complementary ways (Thomas & Pring, 2010). Below, and as former maths teachers as well as maths education researchers, we explore some of these different push and pull factors in more detail, and how they might begin to be resolved, using fondly remembered ‘force diagrams’.

## Definitions

For the purpose of exploring these issues, we use the following working definitions of three key concepts: teacher agency, evidence-informed practice, and professional development. The concept of *teacher agency* is a useful lens through which to view the ways that teachers engage with policy and enact the practice of teaching; however, descriptions of teacher agency are often inexact (Priestley et al., 2015). Tao and Gao (2017) report three main ways of viewing agency: agency as an innate variable; agency as doing; and agency as capacity to act. In this paper we consider agency as capacity to act, with teacher agency operating within a system of constraints that include teacher beliefs, knowledge and skills, available resources, culture, and external drivers of change (Imants & Wall, 2020).

Attempts to define *evidence-informed practice* in education, even while the phrase has gathered momentum in terms of use, have often uncovered more questions than answers (Nelson & Campbell, 2017). A strong argument has been made by Slavin (2002) that true ‘evidence-based practice’ in education should replicate the model which revolutionized medicine, only including certain types of evidence – robust, valid, trustworthy, scientific, nomothetic research with clear implications for practice, and rejecting other more qualitative, observational, anecdotal ‘evidences’ as unethical (Gorard et al., 2017). It is likely that, as teachers of mathematics and/or statisticians, we may place more value on forms of knowledge that are quantitative and so this definition may have immediate ‘kerb appeal’ for mathematicians in particular. We begin with this definition and develop our argument towards something more nuanced.

*Professional development* or CPD can be characterized by a broad range of activity, often described as “planned opportunities for teacher learning” or similar (Kelly, 2006, p.505). Kelly describes professional development that is geared only towards acquiring skills, knowledge and understandings in one setting to apply it in another as a *cognitivist model*, suggesting this is inadequate and arguing that professional development should take account of *knowledge-in-practice* as well as *knowledge-of-practice*. Professional development (although Kelly prefers the term teacher learning) then, is not instrumental; it is instead “the process by which teachers move towards expertise” (Kelly, 2006, p.514), and we would tend to agree.

## A network under tension

As maths teachers, we felt under pressure to ‘use’ robust, valid research to improve our practice, and guilt for not doing so. Gorard et al (2017, p.5) suggest a term for much contemporary practice in education might be “evidence-resistant”, perhaps implying blame for this rests with teachers. The refrain seems to be “if evidence-informed practice is rational behaviour, why aren’t all teachers engaged in it?” (Brown

& Zhang, 2016). In truth, for most teachers, research is hard to get hold of, hard to read, hard to interpret, and hard to justify spending time on (Malin & Brown, 2020).

A further tension exists in the way teachers experience research-based evidence, often as a justification for the implementation of policy from on high. Often, there may be a lack of transparency around the source of evidence, or the bounds of validity. When evidence is imposed in this way, one could see the gap between research and practice as a feature of the system and not a bug; the controller of ‘evidence’ retains power within the system. In this context, it has been suggested that the reason for this evidence-resistance is related to teacher agency. We are not the first to identify this tension:

There is an ongoing tension within educational policy worldwide between countries that seek to reduce the opportunities for teachers to exert judgement and control over their own work, and those who seek to promote it. Some see teacher agency as a weakness within the operation of schools and seek to replace it with evidence-based and data-driven approaches, whereas others argue that because of the complexities of situated educational practices, teacher agency is an indispensable element of good and meaningful education. (Biesta, et al., 2015, p.26).

As former teachers, we found the tangled ecosystem of tensions in our professional lives confusing and frustrating (see Figure 1), and often wondered if the education system could not be somehow rationalized, so that research evidence formed a foundational base in which forces acting on teachers could be consolidated into one direction, creating a type of ‘gravitational pull’ model (see Figure 2 below).

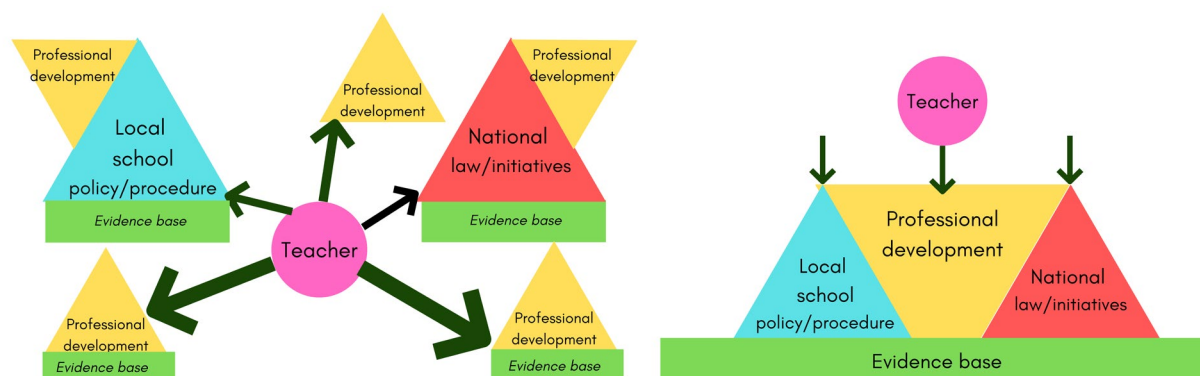


Figure 1: an ‘ecosystem in chaotic tension’ model

Figure 2: a ‘gravitational pull’ model

This sounds utopian, but was alas naïve of us. Not only is educational research-into-practice “a multifaceted, multidimensional construct comprising not only direct, but also alternative forms of use, as well as non-use, misuse and abuse” (Dagenais et al., 2012, p.287), but the nature of (what constitutes) evidence itself in education is complex, contested, politicised, corrupted and colonised (Thomas & Pring, 2010). Forms of evidence and forms of professional development are situated within multiple social contexts; in many education systems including the UK, much of this discourse is situated within a neoliberal framework of hyperaccountability and ubermeasurement (De Lissovoy, 2013), backed by a ‘what works’ oversimplification of research implementation in education, which not only affects teachers using research but researchers producing it. In this context there is little space for alternative approaches to enter the discourse and disrupt the orthodoxy, even though some have

argued that this is the very purpose of research in education, in particular mathematics education (Sfard, 2005).

In fact, neoliberal practices enforce a kind of capitalist realism: the idea that “it is easier to imagine the end of the world than the end of capitalism” (Fisher, 2009, p.2). In education, this is reimagined as the idea that *this is what works* and *there is no other way*, analogous in some sense to a ‘grounding’ in evidence by adding artificial ‘weight’ to the system as shown in Figure 3. It is worth noting the distinct difference between this kind of political value-based weight and the idea of a weight of accumulated evidence which describes sufficiency in scientific truth-seeking (Thomas & Pring, 2010, p.6).

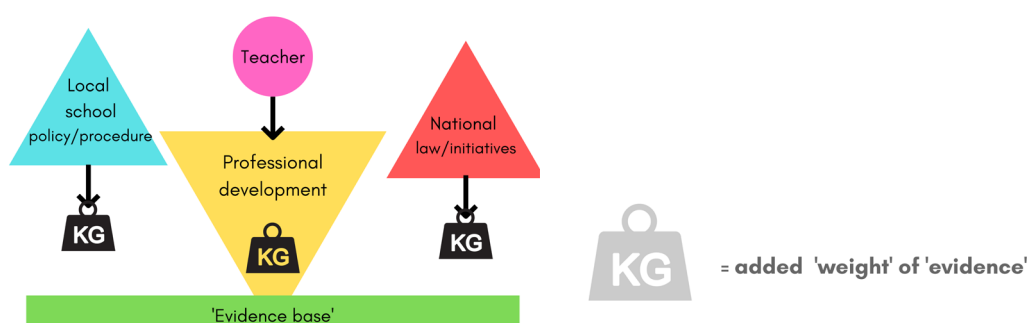


Figure 3: adding artificial weight to ‘ground’ policy and practices in (particular) ‘evidence’

This has the effect of implying that the need for evidence to support the prevailing discourse is unnecessary, and the burden of proof on any ‘alternative’ becomes impossibly high by comparison. It is easy, in education, to dismiss ideas by setting them in contrast to *evidence-informed* - as “confused, poorly understood, distorted, unbalanced and unwarranted” (Gorard et al., 2017, p.4). Of course, such ideas do exist, but using Slavin’s strict definition of the ‘gold standard’ of evidence is not a prophylactic against them; anyone can use research ‘evidence’ to claim almost any position, whether by blunder or by plunder.

Thus, we propose a paradox is formed - in order to reject orthodoxy, a high standard of evidence is required, but both *access to* and definitions of *what is allowed to constitute* this evidence is mediated by the gatekeepers of this orthodoxy. In order to sidestep this, teachers need direct and unmediated access to evidence to be armed against a system which is supposed to use evidence to support them. This paradox is partly created by adopting a very narrow definition of ‘evidence-informed’, as we did at the beginning, that supports an oversimplified ‘what works’ agenda: and thus we argue for the rejection of this definition in favour of one that reflects the complex and messy reality of teacher practice on the ground and values different kinds of evidence thoughtfully: a *realist synthesist* approach which also takes into account social contexts, inexactnesses and ambiguities of evidence in education (Thomas & Pring, 2010).

### Moving forward: a critical perspective

What then might be the role of evidence-informed professional development in this system? Mediation of research to form weighty ‘evidence’ by a third party, however well-meaning, may be viewed as an act of agency reduction – a removal of the opportunity to critically evaluate from a teacher perspective. When judged through this lens, teacher agency and professional development are in conflict. In context of

this tension between subjective and objective types of knowledge in professional development, Adey suggests that “teacher education should steer a middle way between these two ‘flawed truths’ and rely rather on critical discourse which continually questions underlying value judgements” (Adey, 2004, p.144). This leads us to conjecture that teachers at every stage do not only need professional development that *uses* evidence from research, but that also *examines the nature of* evidence from research: that which we have termed the ‘metaevidential’. While it may appear desirable in the long-term that teachers have unmediated access to research evidence - and are able to navigate this comfortably- in the shorter term this implies a need for professional development to work towards the provision of two elements for teachers: a layer of ‘metaevidential insulation’, and a related kind of normal reaction force which acts on all ‘evidence grounding’ claims which we term ‘critical resistance’. These may serve to protect the teacher from the slings and arrows of outrageous evidence claims, whether by individuals or through policy or program. They give on the one hand a layer of powerful insulation which reduces penetration of new or faddish ideas that smell wrong, however ‘evidence-based’; and on the other, the knowledge of what ‘evidence’ can mean, so that the pull of a particular kind of ‘evidence-informed’ does not automatically outweigh everything else. Importantly, the centre of gravity remains with the teacher themselves unless they choose otherwise.

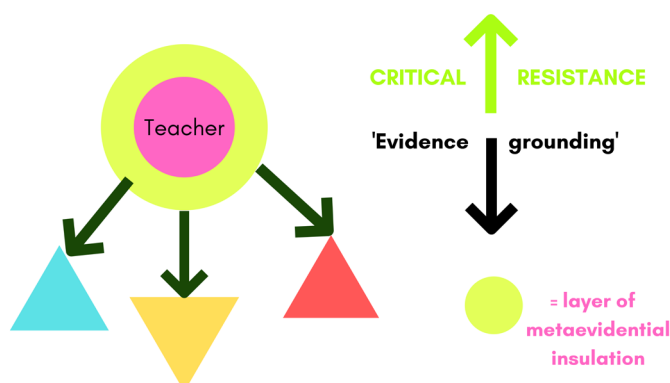


Figure 4: development of critical resistance and metaevidential insulation

This review is intended to stimulate further discussion of the need for better articulations of the tensions around the practice of evidence use in mathematics education and how these impact professional development; in particular attending to factors of teacher agency when developing or critiquing models of engagement with evidence. We conclude that evidence-based professional development should take teacher agency into account in order to not simply be “an empty exercise of compliance...that rarely improves professional practice” (Calvert, 2016, p.53).

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