

UN-RATIONAL BEHAVIOUR? WHAT CAUSES DISCREPANCIES BETWEEN TEACHERS' ATTITUDES TOWARDS EVIDENCE USE AND ACTUAL INSTANCES OF EVIDENCE USE IN SCHOOLS?

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1: OBJECTIVES

Whilst beneficial, the consistent and regular use of evidence to improve teaching and learning in schools is proving difficult to achieve in practice (Bryk *et al.*, 2011; Nelson *et al.*, 2015; Taylor, 2013). This paper attempts to shed new light on this issue by examining the applicability of a model of rational behaviour (outlined in Brown, 2014) as it relates to the notion of evidence-informed practice (EIP). Specifically, exploring the question: ‘if using evidence to inform teaching practice is rational behavior, why aren’t all teachers engaged in it?’, we examine whether the beliefs and perspectives of teachers in relation to EIP, align with their evidence-use behaviours. We then assess what factors (if any) prevent teachers/schools who wish to engage in EIP from doing so. To examine beliefs, instances of and barriers to evidence-use, we employ a *Gradient Boosted Tree* predictive model to analyse data from a survey of 696 practitioners in 79 schools. We conclude the paper by examining the policy levers available to school leaders should they wish to increase both support for evidence-informed change within schools, and boost instances of evidence-informed practice by teachers. We also explore the potential role that education accountability regimes have in ensuring that the *optimal rational* position of EIP can materialize in practice.

2: PERSPECTIVES

2.1: EVIDENCE-INFORMED PRACTICE

In framing the concept of evidence-informed practice (EIP), for the purposes of this paper we

adopt the definition provided by England's Department for Education, who suggest that EIP represents: "...a *combination* of practitioner expertise and knowledge of the best external research, and evaluation based evidence" (www.education.gov.uk, 2014: authors' emphasis)ⁱ. In other words, EIP is the use of evidence by teachers in order to enhance how they teach. Building on this idea and following Brown (2014) we specify our definition of evidence to include: 1) use of formal research produced by researchers; 2) evidence produced by practitioner enquiry such as action research; and 3) the interpretation of routinely collected data (and as with previous work, we use the terms 'research' and 'evidence' interchangeably and treat them as synonymous throughout).

This definition of EIP also serves to highlight both the distinctiveness of EIP and its similarity with other approaches to school improvement such as *data use*; which typically involves collaborative data teams analysing and using data to improve educational practice (Lai, *et al.*, 2009; Wohlstetter, Datnow & Park, 2008). Indeed, there is much overlap between these two approaches. For example, as Brown *et al.*, (2016) show, by seeking effective ways to identify, develop and share best practice, researchers focused on EIP and those involved in data use have reached a similar understanding of the need for: processes of collaborative learning; cycles of inquiry that involve the identification of need, the development, practical trial, iterative refinement and roll out of new approaches to teaching and learning; the use of knowledge creation activity to ensure tacit knowledge, data and research knowledge are effectively and meaningfully combined; and that effective conditions for data/research-informed improvement are characterized by the best Professional Learning Communities (e.g. see Brown, 2015a; Schildkamp and Ehren, 2012).

While the notion of teachers using evidence to improve their day to day classroom practice is not without its critics (Biesta, 2007; Maclure, 2005; Nutley *et al.*, 2007) EIP is, however, currently a ‘hot topic’ (Brown, 2015b). This is because, with many global school systems now engaging in serious structural changes, administrators, school leaders, and individual teachers are increasingly expected to use evidence when selecting, implementing and evaluating their teaching and learning strategies. As a result, the use of research and evidence is now positioned as something vital to providing validity to practice (Stoll, 2015).

There is merit in this focus: as Supovitz (2015) observes, a common characteristic of high performing school systems is that they facilitate the collaborative examination of research and data evidence in order to identify both likely problem areas (in relation to teaching and learning) and potential solutions to these problems. Likewise, growing correlational evidence shows that where research and evidence are used as part of high quality initial teacher education and ongoing professional development, they make a positive difference in terms of teacher, school and system performance (Cordingley, 2013; Godfrey, 2014a; 2014b; Greany, 2015; Mincu, 2013; Sebba *et al.*, 2012). Furthermore, the experience of ‘research-engaged’ schools that take a strategic and concerted approach in this area is generally positive, with studies suggesting that research engagement can shift a school from an instrumental ‘top tips’ model of improvement to a learning culture in which staff work together to understand what appears to work, when and why (Godfrey, 2014b; Greany, 2015; Handscomb and MacBeath, 2003; Sharp *et al.*, 2006).

For a number of reasons, however, many schools have found it difficult to become ‘research-engaged’: with teachers often lacking the skills, resource or the motivation to use evidence or to undertake meaningful and robust research activity (e.g. Cooper *et al.*, 2009; EEF, 2014;

Goldacre, 2013; Hargreaves, 1996;). This situation is nicely summarized by Nelson *et al.*, (2015: 10) who, after surveying 300 teachers in England and finding that only 16 per cent indicate that they use research to inform decision-making argue that: “externally-produced professional research tends not to be a major influence when schools are making decisions about whether or not to adopt a specific approach to supporting pupil progress”.

On one hand responsibility for this difficulty lies with educational academics, who can fail to make their research accessible to teachers; not only in terms of where it is published and the language typically employed, but also in terms of identifying how their research can make a difference (Brown, 2014). This is not universally the case, however, and bodies such as the What Works Clearinghouseⁱⁱ and the Education Endowment Foundation (EEF) have aimed to make ‘what seems to be effective’ accessible (one only has to look at the EEF’s *toolkit*,ⁱⁱⁱ for an example of such efforts). Correspondingly, part of the difficulty also lies with schools. Teachers, for instance, are often not allocated adequate time to explore and share what research exists regarding a particular issue. Or they can find themselves, as a result of the timetabling process, unable to work collaboratively with others to identify and trial ways to address issues of teaching and learning (Galdin-O’Shea, 2015; Godfrey, 2014a). Other activities are also often prioritized over research-informed professional development which, as a result, can find itself falling down the pecking order of things that need to be attended to (Galdin O’Shea, 2015; Roberts, 2015).

2.3: EIP AND EXTERNAL ACCOUNTABILITY

While, as we note above, there is increasing international emphasis on using evidence to improve teaching and learning outcomes, how people think about evidence, approach its use, and engage with it are deeply influenced by context (Earl, 2015: pp. 147-148). In many

countries, there are now two competing agendas at work: on the one hand, there is a move to hold teachers and schools more externally accountable for the education they provide, with engagement in EIP essentially acting as evidence of one aspect of teacher and school effectiveness. This approach is generally associated with top-down (government or district-driven) external accountability and high-stakes testing. On the other hand, there is a focus on using evidence as part of a process of practitioner enquiry, an approach generally associated with bottom-up (teacher-driven), internal (teacher or school) processes and a wide range of sources of evidence (Earl, 2015: pp. 148). This idea of competing agendas is exemplified in the education policy of the UK's current Conservative government, elected in 2015, which (following on from the previous coalition administration) is pursuing a 'self-improving school-led school system'.

In the self-improving system, evidence-use is positioned as being front and centre, with Greany (2014) suggesting that core characteristics of 'self-improvement', include: 1) teachers and schools being responsible for their own improvement; and 2) teachers and schools required to learn from each other and from research so that effective practice spreads. Greany (2014) also notes in relation to the self-improving school system, the role of Teaching Schools; outstanding schools that are designated to co-ordinate initial and continuing professional development, school to school support and Research and Development across an alliance of partner schools (known as Teaching School alliances). By June 2014, 587 Teaching Schools had been designated (Matthews and Berwick, 2013).

At the same time, however, as the level of more centralized support for schools is rolled back to free up 'self-improvement', a number of challenges for EIP have begun to emerge. Perhaps the most significant is the emerging evidence that while many schools are seizing the

opportunities afforded by the new education policy framework, many others are not. For example, only around half of all schools were expected to be part of a Teaching School alliance by 2015 (Greany, 2015). There is thus a risk of a two-tier system emerging, with some schools thriving but others floundering because they do not have access to the knowledge and expertise they need to improve (*ibid*).

Another challenge is the limited capacity available within schools to take on these new roles. This seems to be particularly true in relation to Research and Development (R&D). The interim evaluation of Teaching Schools (Gu *et al* 2014), for instance, reflects considerable progress overall but also flags the unreasonable and unsustainable workload required to establish the alliances. It states that some alliances see the R&D role as underpinning everything they do and have developed rich relationships with their university partners, but that others have not prioritised R&D, find it daunting and/or feel that it is under-funded (Greany, 2015). Finally, hanging over Teaching Schools is the removal of their Teaching School designation if they lose their ‘outstanding’ OfSTED grade (OfSTED is England’s central school accountability regime). This can serve to hamper the extent to which those schools specifically tasked to engage in EIP, wish to take risks in experimenting with new practices that are informed by evidence. Similarly as Godfrey (2014: 4: our emphasis) argues, in England, the focus on accountability and the power afforded to OfSTED has led to a disproportionate pressure on school leaders to: “account for their pupil’s academic achievements and to find *quick fixes* where standards are lower than national benchmarks”. Related is the pressure on schools to adopt pre- or externally driven improvement strategies preferred by accountability bodies, as can be seen in educational policy in the US (Finnigan *et al.*, 2015). Combined, the difficulties associated with bringing EIP to fruition and the interplay between evidence-use and accountability, point to the need for effective school

leadership if EIP is to become a reality.

2.4 SCHOOL LEADERSHIP AND EIP

Finnegan *et al.*, (2015) note that school leaders can act either as a barrier or a gateway to school research-use. This position stems from the myriad of ways school leaders are able to influence the operation and performance of schools, including the teaching and learning that occurs within them. Such influence stems from school leaders ability to:

1. Provide vision
2. Develop, through consultation, a common purpose
3. Facilitate the achievement of organizational goals and foster high performance expectations
4. Link resource to outcomes
5. Work creatively and empower others
6. Have a future orientation
7. Respond to diverse needs and situations
8. Support the school as a lively educational place
9. Ensure that the curriculum and processes related to it are contemporary and relevant
10. Provide educational entrepreneurship

Day and Sammons (2013: 5)

In themselves these qualities can be divided into the ‘transformational’ aspects of school leadership and ‘pedagogic’ or instructional leadership (Day and Sammons, 2013). The former is described as a process based on increasing the commitment of those in a school to organizational goals, vision and direction (Bush and Glover, 2003) and has been shown to

have positive impact in relation to the introduction of new initiatives or the remodeling or restructuring of school activity (e.g. Leithwood, 1994). The latter is seen to relate to the efforts of principals in improving teaching in their school and their focus on the relationships between teachers, as well as the behaviour of teachers viz –a-viz their work with students (e.g. Timperley and Robertson, 2011).

True research-engagement within and across schools requires school leaders to address both the ‘transformational’ and ‘learning centred’ aspects of becoming research and evidence engaged, and Brown and Greany (forthcoming) argue that to do so requires school leaders to focus on and address four distinct but overlapping and interdependent factors. These are: 1) ensuring there is teacher capacity (i.e. ability) to engage in and with research and data (Bennett, 2015; Goldacre, 2013); 2) ensuring school cultures are attuned to evidence-use (i.e. school leaders attempt to make research-use a cultural norm within their school) (Galdin-O’Shea, 2015; Leithwood *et al.*, 2006; Roberts, 2015; Stoll and Fink, 1996); 3) school leaders promoting the use of research as part of an effective learning environment (Brown and Rogers, 2015; Datnow *et al.*, 2013); and 4) the existence of effective structures, system and resource that facilitate research-use and the sharing of best practice (Daly, 2010; Datnow *et al.*, 2013; Goldacre, 2013; Micklewright *et al.*, 2014). We return to these in Section 3.

2.5 EVIDENCE USE AS RATIONAL ENDEVOUR

Also important, however, is to recognize that the pursuit of EIP is also steeped in notions of rationality. That is, the *a priori* position of those who promote EIP appears broadly to be: 1) evidence-informed practice is beneficial – as noted above, evidence suggests EIP, when undertaken with a clear focus on addressing school improvement priorities, can make a positive difference in terms of teacher and pupil outcomes (Cordingley, 2013; Godfrey;

2014a; Mincu, 2013; Sebba *et al.*, 2012); 2) because the aim of teachers and schools is to improve student outcomes, engaging in EIP must represent a form of desirable behavior; 3) it is normal and so rational to pursue desirable outcomes (Tan, 2014); 4) *ergo*, all teachers should pursue EIP (the unstated argument being that if teachers' practice is not evidence-informed then such teachers by definition are acting irrationally: e.g. see Brown, 2014). EIP is thus intertwined or imbued with the notion of rationality: because EIP has beneficial outcomes, engaging in EIP 'makes sense'. This position is nicely encapsulated by Hammersley (2001: pp. 1-2), who notes that: "The central claim of the evidence-based [movement] is that research can make a very important contribution to improving the current state of [teaching] practice. [Correspondingly], who would argue that practice should not be based on evidence? So [the general conclusion is] that opposition to it can only be irrational".

But this leads to a fundamental question, namely that 'if the pursuit of EIP represents a rational decision on the part of schools, why aren't all teachers engaged in it?' We believe that the answer lies in the idea that EIP is indeed rational, but simultaneously can be explained by the idea that rationality is more multifaceted and complex than popular models of rational behaviour suggest. To begin to answer this question, therefore, we examine the mode of rationality currently underpinning EIP and explore whether the connecting research-to-practice movement might be better served by considering an alternative form of rational behavior; and one that, we argue, helps explain why a rather patchy realization of EIP, rather than its universal implementation, is currently a global phenomenon (e.g. see Bryk *et al.*, 2011; Gough *et al.*, 2011).

2.6 RATIONAL CHOICE THEORY

We argue that the current ‘EIP is beneficial so it should be pursued’ argument is typically grounded within a model of rational behaviour known as Rational Choice Theory (RCT), an approach developed by economist Gary Becker in order to understand and so predict human behavior. The underlying premise of RCT is that people establish the most effective way to reach a given goal in any particular situation (Tan, 2014). More specifically, RCT argues that individuals will attempt to maximize their benefits (utility) and minimize their costs, subject to any constraints on this maximization (Green, 2002); a process that will involve both information seeking and problem solving. It is noted by Tan (2014) that RCT is widely employed to explain social behaviour because: 1) it is considered to be fairly or approximately accurate, in that it works in many cases to explain examples of behavior; 2) importantly, RCT, with its simplicity and easy to understand underlying premise (and so its applicability) is hard to replace. As Sen notes: “there is little hope of finding an alternative assumption structure that will be as simple and usable as the traditional assumptions of self-interest maximization” (1990, p. 206).

In theory, approaches to improving teaching activity are suitable for analysis via the lens of RCT. School leaders and teachers are faced daily with problems which can broadly be summarised as “how do I ensure all children under my care learn to the best of their ability?” Or to put it another way, “how can I teach as effectively as possible?” (Daly, 2010; Roberts, 2015). There are also resource constraints that may impact on this effectiveness (including time and budget: Roberts, 2015). Correspondingly, teachers are presented with the impetus to continually maximise their effectiveness whilst facing the necessity of doing so in ways that achieve large impacts given the input available (Daly, 2010). At the same time, as the EEF note, “it is clear that different ways of spending school budgets can have very different impacts on pupil attainment...” (website reference)^{iv}

As such, the axioms of RCT would seem to suggest that EIP represents a preferred approach because engaging in EIP is an effective way to improving teaching at a relatively low cost. For example, the benefits of engaging in EIP are set out in section 2.1 above but, are summarised by Oxman *et al.* (2009), who suggest EIP increases the chance that teaching and learning activity will be more effective, equitable and efficient in terms of its value for money. The EEF's toolkit (mentioned above) also provides detailed information on the cost of implementing specific evidence-informed interventions, based on a class of 25 pupils (and outlines costs of both resource and/or training). From examining the toolkit it can be seen that effective evidence informed approaches are not necessarily expensive: for example 'feedback' which, if implemented effectively, can lead to pupils gaining eight months progress over the course of a year (compared a similar performing group), at a cost of some £80 (\$121) per pupil. This cost effectiveness is also the same for approaches such 'meta-cognition' and 'self regulation'.^v More generally, the EEF also promote, on their website, the message that "educational research can help schools get the maximum 'educational bang for their buck'" (website reference)^{vi}

But for RCT to operate meaningfully, as well as there being benefits to EIP that might occur in actuality, also important is that teachers have knowledge of such benefits. We suggest that such knowledge does exist: an interim report by Nelson *et al.*, (2015) for instance suggests that of 300 teachers (in England) surveyed, 69 percent agreed or strongly agreed with the normative statement that "information from research plays an important role in informing teaching practice". Likewise 81 percent agreed or strongly disagreed with the statement "I do not believe that using information from research will help to improve pupil outcomes". Similarly in case studies of 15 schools in England, developed by Caldwell *et al.*, (2015) all

school leaders appeared aware of the benefits of engaging in EIP. In terms of EIP being an efficient approach to school improvement, England's National Audit Office indicate that 64 percent of school leaders in England have seen the EEF's toolkit (NAO, 2015), with an implied assumption that they therefore had an understanding of the effectiveness and the cost of using particular evidence informed approaches.

But, while popular, RCT is also subject to substantive critique – in particular, from empirical studies which suggest that individuals do not behave in ways that regularly and consistently maximize their utility. For instance, people often make do with 'good enough' solutions as opposed to optimal ones; they use short cuts and rules of thumb rather than seek out all information required to achieve maximal utility from any given decision; and people can rely on intuition or perception rather than analyse the data relating to their decisions (Kahneman, 2003; Tan, 2014). Also vital is the suggestion that individuals often only possess bounded will power: individuals may engage in ways that are totally inconsistent with what will serve them best in the long term (Jolls *et al.*, 1998). Similarly people act with bounded self-interest: that is, they act and care about others, so sacrifice or limit the maximization of their personal own interests (Jolls *et al.*, 1998; Tan, 2014). Given the problem we pose earlier: that EIP may be regarded as beneficial, that teachers and school leaders would seem to know it is beneficial and yet EIP is not universally adopted, we ask whether there is an alternative approach to considering the rationality of evidence-use, that might help explain this situation as well as provide guidance on how a rational (and so 'most effective') situation might be reached.

2.7 OPTIMAL RATIONALITY

One alternative to RCT is that of *optimal rationality* (Brown, 2014) a conception of rationality grounded in philosophy rather than economics, and which originates from a rejection of the Kantian universal moral imperative, combined with a repositioning of Aristotelian reasoning. Specifically, optimal rationality (OR) suggests that our analysis of what rationality is or comprises should focus two things: 1) what individuals actually do in order to achieve goals (their *practical rational* acts); and 2) people's understanding of the broader ramifications of their actions (in the *cultural rational* environment).

There are three key aspects of OR that spotlight its relevance to EIP and these are now explored in detail. First is that OR examines people's behaviour, both in terms of the timescales involved and with regards to who might be affected by particular actions. In other words, OR argues that we should conceptualise and judge whether an act is rational according to both *when* the implications of actions are likely to materialise and in terms of *who* they might effect. According to OR, the effects of actions are therefore likely to range, on one hand, from being fully *universal* to being fully *individual*, and on another from focusing on the *short-term* to centering on the *long term*. This is important because with (as noted above) accountability regimes encouraging short term 'wins', this may focus teachers' attention towards particularly narrow rational acts and away from pursuing actions that could bear fruit and be of benefit to many for much longer in the future (in many ways this is akin to a consumption vs. investment analogy).

Second, and building on from this point, OR argues that, whether in terms of when or who, in all cases practical behavior is rational when it is concerned with maximizing 'wellbeing'. This does mean however the type of welfare maximization postulated by RCT; instead OR suggests that *practical rational* acts represent those things that individuals 'know' are

‘needed’ at a given point in time. Third, relates to the need to incorporate concepts designed to explain society’s role in instilling values or norms into individuals, in order to provide a wider *context* within which actions play out and are contextualized. Within OR, these serve to guide the *cultural rational* position; i.e. these represent the things that producers, society, groups within society, or perhaps even more localized cultures such as schools or government departments, deem as vital to the wider wellbeing and so seek to embed and enforce. Again points two and three serve to highlight a potential tension between teachers being incentivized to achieve short term benefits and the benefits from approaches favoured by central educational policy-makers (e.g. EIP) which may not be instantly achieved).

Within OR, consideration is also required of how the two modes of cultural and practical rationality interrelate or affect behavior. It is clear, for example, that an individual may consider and act in accordance with either one or both at a given point in time. It is not unreasonable, for instance, that social actors will seek to pursue an entirely practical path (which will likely amount to individuals focusing on the welfare of the short term self: for example knee jerk responses to the demands of accountability). An approach that is not only rational but also optimal however (and which gives OR its name) is that, on aggregate, there is balance or alignment between the *cultural* and the *practical*. This is because at a point of balance, when an individual or sub-group pursues their desires, they do so in ways congruent with approaches that also benefit either society or themselves in the long-term. This notion of balance and so *optimality* thus requires individuals or groups to act as often as possible in ways sympathetic the cultural rational position, but simultaneously, it requires society to provide incentives to do so. For example by setting in place disincentives to dissuade people from pursuing their whims too often (or to excessive levels) and/or to the detriment of others; or by educating so that individuals seek balance themselves.

2.8 EVIDENCE-INFORMED PRACTICE AS OPTIMAL RATIONAL ACT

Returning to the act of EIP as rational act, and revising it in line with the notion of optimal rational behaviour provides an alternative analysis of how we might conceive of rational evidence-use behavior. Specifically, that:

- The discourse of cultural rationality seems to be currently in favour of EIP: this is evident in the direction of travel of recent educational policy in England and elsewhere (which focuses strongly on promoting/requiring teachers to better engage with evidence: Brown and Greany forthcoming; Stoll, 2015). It is also evident and in recent announcements by organizations such as the EEF, who themselves recently launched a £1.5m (\$2.3m) fund to improve use of research in schools (EEF 2014). In addition it can be considered apparent from the rise of bottom up/teacher led initiatives, such as the emerging network of ‘Teachmeets’^{vii} and ‘ResearchED’^{viii} conferences (Galdin O’Shea, 2015) designed to help teachers connect more effectively with research. Finally we suggest that the cultural rational position is also reflected in a recent content analysis of the websites and school policy documents of 100 Teaching Schools (Caldwell *et al.*, 2015), which shows how the majority claim to be both promoting evidence-use as well as having mechanisms in place to ensure the engagement by teachers in and with evidence. To be entirely sure of the cultural rational position however, we also have to examine the beliefs and perspectives of those working in schools in relation to evidence-use.
- As well as examining beliefs, we need to also assess actual behaviours – the practical rational position of teachers in relation to evidence-use: i.e. irrespective of what teachers say they believe or would like, what are teachers actually doing?

- Optimal rationality can only exist when there is parity between cultural and practical rationalities. In other words, we assume engagement in EIP and the benefits that accrue as a result are maximized when cultural and practical rationalities align. To judge whether we are at this position or ascertain how we might become so means then that we have to ascertain whether there is a gap between beliefs and behaviours. If such a gap exists we must then assess what is causing it and make suggestions or recommendations for how this gap (might be closed and the policy levers that might result in an optimal rational EIP outcome.

3: DATA SOURCES

To test the model of optimal rationality as relates to evidence-use, the authors of this paper set out to explore: 1) the beliefs of teachers in relation to using evidence to enhance practice; 2) their self-reported behaviours in relation to EIP; and 3) contextual factors that might influence 1) and 2), including an examination of the level of accountability ‘scrutiny’ schools and teachers may be under. In addition, recalling the importance and role of school leaders in facilitating EIP (see section 2.4), we also sought to examine where school leaders should be focusing their efforts in order to facilitate evidence-use within their schools (i.e. how might they align points 1) and 2) in order to achieve a cultural rational position).

To do so we analysed the findings of a survey focused on practitioners’ beliefs and behaviours in relation to EIP, as well as the four factors outlined above and regarded as being vital to facilitate evidence-use (to recall, these were: 1) teacher capacity to engage in and with research; 2) school cultures being attuned to evidence-use; 3) school leaders promoting research-use within an effective learning environment; 4) and the existence of effective structures, system and resource that facilitate research-use). We also asked additional

questions to examine key overarching factors such as trust and the strength of interpersonal relationships within schools, which have been shown to effect evidence-use (e.g. see Bryk and Schneider, 2002). In all cases questions were designed to provide an indication of the base state of individual schools.

The design of the survey was undertaken in conjunction with Professor Alan Daly, University of California, San Diego, who is experienced in examining the movement of evidence within and between schools in Californian school districts (e.g. see Daly, 2010; Finnegan and Daly, 2012a; 2012b). We also ensured that questions were taken from existing tried and tested scales including: measures of trust, which were taken from Tschannan-Moran's (2004); measures of research use and organizational learning, taken from Brown *et al.*, (2016).

Before it was distributed, the survey was also piloted with teachers from the primary sector (not involved in the project) in order to test 'face' and 'construct' validity. Feedback from the pilot was then incorporated into the final questionnaire. The final survey questions for this aspect of the survey are set out in table 1, below:

Table 1: Baseline survey questionnaire employed

[insert Table 1 about here]

Each question in table 1 employed a five point Likert scale which ranged from 'Strongly Agree' to 'Strongly Disagree'.

The survey itself was developed using *survey monkey* and distributed electronically to 79 primary schools via their principal/headteacher. The survey period lasted from 2 October to

19 October 2014. In total we achieved 797 responses to the survey from 79 schools, representing a response rate of some 65%. Of these, 696 were analysed, with these 696 representing those who had joined the school before September 2014, since it was reasoned that three to five weeks into a school term wouldn't provide sufficient time for teachers new to a school to reflect on its longer term research-use activity. Table 2 provides the overall demographics of the participating teachers from the 79 schools. As can be seen, of all the 696 teachers, 84% are female; approximately 42% serve as a subject leader (e.g., math lead or coordinator); and about 19% hold a formal and senior leadership position (e.g., headteacher). On average, the teachers have less than four years of experience working in their current position. In terms of school level data, on average schools had 18 teachers and 320 pupils.

Table 2: Sample demographics

[insert Table 2 about here]

4: METHODS

As well as looking at behaviours and beliefs, our aim in analyzing the data was to ascertain the effectiveness of potential school policy levers for the enactment of EIP (i.e. how might school leaders be able to achieve the optimal rational position within their schools). To begin with the variables represented by the survey questions were divided into *cause* and *effect* type variables; the latter representing teacher's own experiences in relation to evidence informed practice, while former refer to the external factors that potentially influence these experiences. Which variables were deemed as cause and effect are set out in the last column in Table 1, above. Overall, four survey questions were determined as representing *effect* variables: i.e. they represent actions or beliefs likely to result from (i.e. be caused by) the

presence of other factors. For example, the presence of teachers discussing research findings is assumed to indicate that research-related discussion is encouraged and/or time is made available for it to take place, and so on. In summary, the four *effect* variables are regarded as:

- Q1: Information from research plays an important role in informing my teaching practice (*R-practice*)
- Q2: I have found information from research-useful in applying new approaches in the classroom (*R-approaches*)
- Q4: I do not support implementing a school-wide change without research to support it (*R-support*)
- Q12: In the last year, I have discussed relevant research findings with my colleagues (*R-discussion*)

From the above, it can also be seen that of these four questions, Q1, 2 and 12 represent practical rational acts: i.e. they indicate that teachers are using evidence or are engaging with it. Q4 meanwhile represents the existence of cultural rationality within a school. That is, it represents whether teachers believe in EIP and the use of evidence to drive school improvement. The remaining 16 variables were thus deemed as influencing (causing) changes in these four effect variables.

We began our analysis with a simple exploration of the data; analyzing distributions of total individual teacher responses to the four effect questions. These are set out in Table 3, below:

Table 3: Responses to the effect variable questions (n=696)

[insert Table 3 about here]

To examine the relationships between the *cause* and *effect* variables we also employed a data mining approach. Here, we began by transforming all of the Likert scale points into numerical integers, with values ranging from -2 ('strongly disagree') to +2 ('strongly agree') with the neutral response represented as zero. Because Likert scale values are ordinal in nature, we then employed nonparametric statistical methods for data analysis and modelling (rather than standard parametric techniques such as Student t-test which assumes a normal distribution of data) (Agresti, 2010; Field and Hole, 2003). For the effect variables, we measured their pairwise associations using a nonparametric method: Kendall's τ rank correlation coefficient. As shown in Figure 1, the correlation between the normative variable *R-support*, which reflects teachers' (cultural rational) beliefs about the general use of evidence within school, and the three other (practical rational) behavioural effect variables (*R-practice*, *R-approaches*, *R-discussion*) is quite low (< 0.30); with the discrepancy between *R-support* and *R-practice* significant according to the nonparametric Wilcoxon signed-rank test (p-value $1^{-25} \lll 0.01$). This suggests that there is a gap between supporting the idea of evidence informed practice and its enactment; and so correspondingly, low levels of optimal rational behavior.

Figure 1: Correlation between the effect variables

[insert Figure 1 about here]

What is interesting, however, is that basic analysis of the survey data (in Table 3) highlights that 50 percent of respondents 'agreed' or 'strongly agreed' with *R-support* (survey question

4): ‘I do not support implementing a school-wide change without research to support it’ (with 38 percent neither agreeing/disagreeing and 12 percent disagreeing and strongly disagreeing). A higher percentage (76 percent) ‘agreed’ or ‘strongly agreed’ with *R-practice* (survey question 1): ‘information from research plays an important role in informing my teaching practice’. This finding adds interesting additional insight to that provided by the literature engaged with earlier (Caldwell *et al.*, 2015; Nelson *et al.*, 2015). This is because it suggests that the discrepancy between beliefs and practice detailed in Figure 1 is not caused because practitioners believe in using evidence but encounter difficulties in implementing it (e.g. such as those described in 2.1); rather it results because research-use does not exist as a school-level cultural norm. Correspondingly, research-use, when it does occur, potentially materializes primarily as an individual endeavor undertaken by some teachers within their classrooms.

In itself, the data may also therefore be indicative of one the major issues for knowledge mobilisation in a self-improving system: school accountability (e.g. Greany, 2015; Godfrey, 2014a;). That is, as noted above, the argument that England’s accountability regime is flattening the very freedom and autonomy that the self-improving school system is designed to encourage: these figures perhaps highlighting that schools are looking to second guess what they think (England’s school inspectorate) OfSTED wants to see rather than wholesale engagement with the evidence base (Finnegan *et al.*, 2015). To test this argument we also examined the relationship (as a correlation) between individual, whole school-level ‘average’ responses to the *R-support*, *R-practice*, *R-approach* and *R-discussion* questions, and the OfSTED grade for individual schools. This is set out in Figure 2, where it can be seen that there is a negative correlation, suggesting that the most poorly rated schools (those at OfSTED grade 3 – *requires improvement* and grade 4 - *inadequate*) are also those most likely

to disagree or strongly disagree with the cultural rational *R-support* statement and least likely to engage in forms of practical rational acts (i.e. EIP).

Figure 2: Correlation between the effect variables and school OfSTED grade

[insert Figure 2 about here]

Corresponding distribution data is provided in Tables 4 and 5. Here, Table 4 provides the range of OfTSED grades of the schools surveyed. Table 5 provides the average scores for each question for each school: the responses in Table 5 thus provide the percentage of schools whose average fits within the range in question.

Table 4: Distribution of Ofsted grades (n=79).

[insert Table 5 about here]

Table 5: Distribution of average whole school responses to the *R-support*, *R-practice*, *R-approach* and *R-discussion* questions (n=79).

[insert Table 5 about here]

In order to help ascertain how the optimal rational position might be realised, we next examined how best support for EIP can be increased. Specifically, we sought to ascertain which of the *cause* variables outlined in table 1, school leaders could focus on in order to positively influence *R-support*. To do so (and because our Likert data was ordinal in nature)

we employed the Decision Tree learning algorithm, CART (Brieman *et al.*, 1984) to analyse our data; we were also able to enhance the prediction accuracy of our model by using the *Gradient Boosted Tree* (GBT) approach. This meant we were able to employ an ensemble of Decision Trees rather than just one (Hastie, 2009; Seni and Elder, 2010). It is also clear, from an optimal rational position, that the most desirable position for schools to be in is when practitioners both fundamentally believe in and engage in evidence informed practice. To examine potential policy levers in this area, we repeated the approach used above, to build a predictive model for respondents who ‘agreed’ or ‘strongly agreed’) with the *R-support* question in order to examine how their subsequent responses to the *R-practice* question were contingent on their perceptions of the influencing external environment (as represented by their responses to the cause factor questions). The results for both models are discussed in section 5, below.

5: RESULTS

Data for each of the two predictive models is set out in tables 6 and 7. For each cause variable the *Gradient Boosted Tree* (GBT) predictive model indicates an importance score. This score indicates how useful a *cause* variable is within the model for the purpose of making predictions about the *effect* variable. Specifically, the relative rank of a variable employed as a decision node in a tree can be used to assess the relative importance of that variable with respect to the predictability of the *effect* variable. Looking first at Table 6, it can be seen that while a number of factors do influence support, they are concentrated in three groups. The cause variables with by far the highest levels of importance when predicting a positive response to *R-support* are: *Encouragement (0.221)* (‘My school encourages me to use research findings to improve my practice’), *R-conversations (0.149)* (‘Staff at my school use research and evidence to stimulate conversation/dialogue around an issue’) and *R-strategies*

(0.113) ('Research and evidence is used to inform staff here about potential improvement strategies'). Following these variables, it is apparent that the level of trust teachers have in senior and middle leaders (teacher leaders) within their school as well as the overall trust within their school also matters, but the importance of these variables within the model is much less. Finally, comes school leaders making time for training around evidence-use ('In this school time is made available for education/training activities for school staff') and the receptiveness of teaching staff to new ideas ('In this school, people value new ideas'), again however the importance of these variables is relatively low.

As can be seen in Table 7, for those schools where there is already agreement or strong agreement with the *R-support* question ('I do not support implementing a school-wide change without research to support it'), the three most important features, or *cause* variables, for then improving *R-practice* are once again: *R-strategies* (0.318), *R-conversations* (0.270) and *Encouragement* (0.164); although the order of the importance and their relative values changes, with *Encouragement* and *R-strategies* swapping places. In other words, for schools where leaders have engendered support for evidence-informed change more generally, our model suggests that approaches for then increasing practice should comprise a continuation of:

- School leaders engaging in 'learning-centred' leadership activity, such as showcasing or demonstrating how research and evidence can form key aspects of school improvement strategies;
- School leaders ensuring staff engage with research as part of their ongoing learning communities activity, such as when engaging in discussion in relation to teaching and learning; and

- The continued active encouragement by school leaders for teachers to engage in evidence-use.

Although much lower in terms of their importance (with scores in the range of 0.05), it is clear that teachers having trust in their school leadership too will continue to influence whether teachers engage in the (potentially risky) activity of experimenting with evidence informed practice.

Table 6: The importance of cause variables for ‘R-practice’

[insert Table 6 about here]

Table 7: The importance of cause variables for ‘R-practice’

[insert Table 7 about here]

It should be noted that the results outlined above do come with a number of caveats in relation to how they should be interpreted. First, the 79 schools surveyed are all primary schools, so no inference can be made between this analysis and England’s 3,200+ secondary schools. Second, it is likely that the schools involved are more predisposed to research engagement than the majority of England’s primary schools: of the schools involved in the survey, 20 were in a formal Teaching School Alliance and a further 20 in a similar relationship (but had not applied or were in the process of applying to be Teaching School Alliance). Finally, the distribution of OfSTED grades within the sample is positively skewed: of those schools surveyed, 90 percent are outstanding or good, this corresponds to 82 percent

of primary schools nationally (OfSTED, 2014). Conversely, while only four percent of the sample were rated ‘requires improvement’, this compares to 16 percent of all primary schools (with two percent ‘inadequate’) (*ibid*). Nonetheless, despite these caveats, our analysis does provide useful insights as to how the optimal rational position of EIP might be achieved, and these are discussed below.

6: SIGNIFICANCE

The aim of this paper was to examine the applicability of a model of rational behaviour (proposed in Brown, 2014) as it relates to the notion of evidence-informed practice (EIP). In particular, we sought to explore whether the beliefs and perspectives of teachers in relation to EIP align with their evidence-use behaviours, an outcome that we argue, represents a situation of optimal rationality: one in which there are higher levels of evidence-use and so more benefits accruing from evidence-use. Our initial assumption was that beliefs and perspectives would be stronger than actual behaviours. In other words, from our analysis of the literature in section 2.1, we assumed that the realization of EIP represented a hard to achieve aspirational goal. Based on this initial hypothesis, we also assumed that a further aim would be to then assess what factors (if any) were working to prevent teachers/schools who wish to engage in EIP from doing so. In analysing the discrepancies between beliefs and behaviour, however, a far more interesting picture emerged, namely that more practitioners engaged in EIP than supported it as a whole-school policy. To us this indicated that the discrepancy between beliefs and practice detailed in Figure 1 is not caused because practitioners believe in using evidence but struggle to implement it; rather it results because research-use does not exist as a school-level cultural norm.

Although we are unable to state this definitely from our data, based on extant literature which

examines the effects of high stakes accountability on teacher and school leader behaviour, we argue that this lack of ‘gung-ho’ buy-in may be caused by the dominance of England’s accountability regime in an education system where other forms of school improvement support have been reduced or removed. This position would therefore seem to coheres with, for instance, empirical work by Daly and Finnegan (2012b) where it is noted that, as a result of the US No Child Left Behind legislation, which introduced the Adequate Yearly Progress (AYP) benchmark, that as a consequence of being designated ‘In Need of Improvement’ (INI) - which occurs when schools fail to meet AYP - schools and districts face progressive sanctions until schools achieve their AYP. At the same time, increasing numbers of schools are entering this category, with large numbers remaining INI for many years. This leads Daly and Finnegan (2012) to argue that INI often results in schools focusing on less effective approaches to school improvement, such technical compliance to improvement programs, rather than more effective approaches like engaging in innovative or research driven behaviour. Correspondingly we argue that the correlations set out in Figure 2 seem to indicate that schools are perhaps expressing a wish to retain the freedom to second guess what they think (England’s school inspectorate) OfSTED wants to see rather than wholesale engagement with the evidence base (Greany, 2015; Supovitz, 2015).

This position has a number of implications for the model of rationality set out in section 2.7 and that we sought to test in more detail. In particular it highlights that EIP, as a cultural rational position, cannot be achieved without the direct support and buy-in of school leaders (the importance of whom was noted in section 2.4). Since this apparently not the case (as evidenced by the low numbers of respondents agreeing/strongly agreeing with *R-support*) it seems to imply (in relation to EIP in education) that schools and practitioners are happy to engage in optimal behaviour but not to fully subscribe to the cultural rational position

underpinning it. Potentially this is because, in education, other aspects of the cultural rational position are determined to a significant extent by a rapidly changing external discourse (e.g. by changes in education policy or OfSTED requirements for what counts as an ‘outstanding school’) and because they often account for ‘higher stakes’ (i.e. they lead to greater reward or punishment), these other aspects of cultural rationality tend to be given a higher weight or priority by school leaders. This potentially therefore requires teachers and, in particular, school leaders, to have a certain level of rational pragmatism: to engage in short term practical rational behaviour, but to not get too bound up or aligned with (this specific) aspect of cultural rationality, as doing so will make it difficult to shift behaviours as the policy paradigm itself moves. As a result, our analysis also highlights that the optimal rational position, as relates to evidence-use, can often be fragile: it might be achieved in the short term, but without full buy-in from school leaders (which provides an indication of security – i.e. it ‘tells’ teachers that it is OK to buy into the optimal position whole heartedly) EIP will never be fully grounded as an integral ‘way of life’ for schools and teachers. This analysis thus points to OfSTED buying into and making evidence-use part of its inspection criteria if EIP is to be realized in any meaningful way as an optimal rational outcome for schools, along with the attendant benefits evidence use by schools can have.

Should OfSTED decide to take up this mantle, however, our analysis does provide useful indicators as to where school leaders should be concentrating their efforts in order to effectively embed EIP within their schools. Specifically, that school leaders should be: 1) promoting the vision for evidence-use (i.e. encouraging its use); 2) engaging in actions strategies that illustrate how research and evidence can be effectively employed to enhance aspects of teaching and learning. For example by engaging in acts such as ‘modeling’, ‘monitoring’ and ‘mentoring and coaching’ (Southworth, 2009); and 3) establishing effective

learning environments in which learning conversations around the use of evidence can flourish (*R-conversation*). Considering *R-Support* and *R-Practice* together, in terms of the aspects of leadership above, it can be seen that to begin the process of making evidence-use a cultural norm within schools, leaders are required to engage primarily in ‘transformational’ modes of leadership. To embed it however, they must switch focus and in engage in more ‘pedagogic’ or learning-centred leadership aspects. This also flags the importance, more generally, of school leaders having the capacity to engage in both modes of leadership.

REFERENCES

Agresti, A. (2010) *Analysis of Ordinal Categorical Data*, (2nd edition), Wiley-Blackwell: Hoboken, NJ.

Argyris, C and Schön, D. (1974) *Theory in Practice: Increasing Professional Effectiveness*, Jossey-Bass: San Francisco.

Aristotle (with Introduction and notes by Lesley Brown) (2009) *The Nicomachean Ethics* Oxford University Press: Oxford.

Bennett, T. (2015) “Evidence and Quality”, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 30-39.

Biesta, G. (2007) “Why ‘What Works’ Won’t Work: Evidence-based Practice and the Democratic Deficit in Educational Research”, *Educational Theory*, Vol. 57, No. 1, pp. 1-22.

Breiman, L. Friedman, J. Stone, C. and Olshen, R. (1984) *Classification and Regression Trees*, CRC Press: Belmont, CA.

Brown, C. (2014) *Evidence informed policy and practice: a sociological grounding*, Bloomsbury: London.

Brown, C. (2015a), "Conclusions", in C. Brown, C. (Ed.) *Leading the Use of Research & Evidence in Schools*, IOE Press: London, pp. 154-161.

Brown, C. (2015b), "Introduction", in C. Brown, C. (Ed.) *Leading the Use of Research & Evidence in Schools*, IOE Press: London, pp. 1-10.

Brown, C., Daly, A. and Liou, Y-H. (2016) "Improving Trust, Improving Schools: Findings from a Social Network Analysis of 43 Primary Schools in England:", *Journal of Professional Capital & Community*, Vol 1, No. 1, pp. 69-91.

Brown, C. and Greany, T. (in press), "The 'self-improving' school-led system in England: are schools engaging in evidence informed practice and is there room for improvement?", *Leadership Policy in Schools*.

Brown, C. and Rogers, S. (2015), "Knowledge creation as an approach to facilitating evidence informed practice: examining ways to measure the success of using this method with early years practitioners in Camden (London)", *Journal of Educational Change*, Vol. 16 No. 1, pp. 79-99.

Bryk, A., Gomez, L. and Grunow, A. (2011) “Getting ideas into action: Building Networked Improvement Communities in Education”, in M. Hallinan (Ed) *Frontiers in Sociology of Education, Frontiers in Sociology and Social Research*, Springer: Dordrecht, NL, pp. 127-162.

Bryk, T and Schneider, B. (2002) “Trust in schools: A Core Resource for School Reform”, available at: <http://www.ascd.org/publications/educational-leadership/mar03/vol60/num06/Trust-in-Schools@-A-Core-Resource-for-School-Reform.aspx> (accessed 2 March, 2015).

Bush, T. and Glover, D. (2003) *School Leadership: Concepts and Evidence*, National College for School Leadership: Nottingham.

Caldwell, M., Greany, T., Higgins, S., Maxwell, B. Stiell, B., Stoll, L. and Willis, B. (2015) *Evaluation of progress towards an evidence based teaching system, including DfE’s role in facilitating progress: interim report*, Department for Education: London.

Cartwright, N. (2013) ‘Knowing what we are talking about: why evidence doesn’t always travel’, *Evidence & Policy*, Vol. 9, No. 1, pp. 97-112.

Chomsky, N. and Foucault, M. (1974) “Human Nature: Justice versus Power”, in F. Elders (Ed) *Reflexive Water: The Basic Concerns of Mankind*, Souvenir Press: London.

Cooper, A., Levin, B., and Campbell, C. (2009) The growing (but still limited) importance of evidence in education policy and practice, *Journal of Educational Change*, Vol. 10, No. 2–3, pp. 159–171.

Cordingley, P. (2013) “The contribution of research to teachers’ professional learning and development”, available at: <https://www.bera.ac.uk/wp-content/uploads/2013/12/BERA-Paper-5-Continuing-professional-development-and-learning.pdf> (accessed 22 November, 2014).

Daly, A. (2010) “Mapping the terrain: social network theory and educational change”, in A. Daly (Ed) *Social Network Theory and Educational Change*, Harvard Education Press: Cambridge, MA.

Datnow, A., Park, V. and Lewis, B. (2013) “Affordances and constraints in the context of teacher collaboration for the purpose of data use”, *Journal of Educational Administration*, Vo. 51, No. 3, pp. 341-362.

Day, C. and Sammons, P. (2013) *Successful leadership: a review of the international literature*, CfBT Education Trust: Reading.

Earl, L. (2015) “Reflections on the challenges of Leading Research and Evidence Use in Schools”, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 147-153.

EEF (2014) “EEF launches £1.5 million fund to improve use of research in schools”,

available at: <https://educationendowmentfoundation.org.uk/news/eef-launches-15-million-fund-to-improve-use-of-research-in-schools/> (accessed 27 September, 2015).

Field, A. and Hole, G. (2003) *How to Design and Report Experiments*, Sage: London.

Finnegan, K and Daly, A. (2012) “Mind the gap: Organizational learning and improvement in an underperforming urban system”, *American Journal of Education*, Vo. 119, No. 1, pp. 41-71.

Finnegan, K and Daly, A. (2012) “Exploring the space between social networks, trust and urban school district leaders”, *Journal of school leadership*, Vol. 22, pp. 493-530.

Finnegan, K., Daly, A., Hylton, N. and Che, J. (2015) “Leveraging social networks for educational improvement”, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 138-146.

Galdin-O'Shea, H. (2015) “Leading ‘disciplined enquiries’ in schools”, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 91-106.

Godfrey, D. (2014a) “Creating a research culture – lessons from other schools”, available at: <http://www.sec-ed.co.uk/best-practice/creating-a-research-culture-lessons-from-other-schools> (accessed 22 November, 2014).

Godfrey, D. (2014b) “Leadership of schools as research-led organizations in the English educational environment: cultivating a research engaged school culture”, *Educational Management Administration & Leadership*, early online publication.

Goldacre, B. (2013) “Building evidence into education”, available at: <https://www.gov.uk/government/news/building-evidence-into-education> (accessed 27 January 2014).

Gough, D., Tripney, J., Kenny, C., Buk-Berge, E. (2011) “Evidence informed policymaking in education in Europe: EIPPEE final project report summary”, available at: www.eippee.eu/LinkClick.aspx?fileticket=W6vkqDjbiI%3d&tabid=2510&language=en-GB (accessed 11 February 2015).

Greany, T. (2014) *Are we nearly there yet?: progress, issues and possible next steps for a self-improving school system*, IOE Press: London.

Greany, T. (2015) “How can evidence inform teaching and decision making across 21,000 autonomous schools?: learning from the journey in England”, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 11-29.

Green, S. (2002) *Rational Choice Theory: An overview*, Baylor University: Waco, TX.

Gu, Q., Rea, S., Hill, R., Smethem, L. and Dunford, J. (2014) *Teaching Schools Evaluation: Emerging Issues from the Early Development of Case Study Teaching School Alliances – DfE Research report*, DfE: London.

Hammersley, M. (2001) “Some Questions about Evidence-based Practice in Education”, paper presented at the Annual Conference of the British Educational Research Association, University of Leeds, England, September 13-15, 2001.

Handscomb G and MacBeath J (2003) *The research engaged school*. Essex County Council: Chelmsford.

Hargreaves, D. (1996) “The Teaching Training Agency Annual Lecture 1996: Teaching as a research based profession: possibilities and prospects”, available at: <http://eppi.ioe.ac.uk/cms/Portals/0/PDF%20reviews%20and%20summaries/TTA%20Hargreaves%20lecture.pdf> (accessed 29 September 2015).

Hastie, T, Tibshirani, R. and Friedman, J. (2009) *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd edition), Springer: Dordrecht, NL.

Jolls, C., Sunstein, S. and Thaler, R. (1998) “A behavioural approach to law and economics”, *Stanford Law Review*, Vol. 50, No. 5, pp. 1471-1550.

Kahneman, D. (2003) “Maps of bounded rationality: Psychology for behavioural economics”, *American Economic Review*, Vol. 93, pp. 1449-1475.

Lai, M. K., McNaughton, S., Timperley, H., & Hsiao, S. (2009). “Sustaining continued acceleration in reading comprehension achievement following an intervention”, *Educational Assessment, Evaluation and Accountability*, Vol. 21, No. 1, pp. 81–100.

Leithwood, K. (1994) “Leadership for school restructuring”, *Educational Administration Quarterly*, Vo. 30, No. 4, pp. 498–518.

Leithwood, K., Day, C., Sammons, P., Harris, A. and Hopkins, D (2006) *Successful school leadership: what it is and how it influences student learning. Research report 800*, DfES: London.

Louis, K.S. (2010) “Better schools through better knowledge? New understanding, new uncertainty”, in A. Hargreaves., D. Hopkins., M. Fullan. and A. Lieberman, A. (Eds) *International handbook of educational change*, (2nd edition), Springer: New York, NY.

Micklewright, J. Jerrim, J. Vignoles, A. Allen, R. Ilie, S. Jenkins, E. Bellarbre, F. and Hein, C. (2014) *Teachers in England’s Secondary Schools: Evidence from TALIS 2013 Research report*, Institute of Education: London.

Mincu, M. (2013) “Inquiry paper 6: teacher quality and school improvement – what is the role of research?” in British Educational Research Association/ The Royal Society for the encouragement of Arts, Manufactures and Commerce (Eds) *The Role Of Research In Teacher Education: Reviewing The Evidence*, available at: <https://www.bera.ac.uk/wp-content/uploads/2014/02/BERA-RSA-Interim-Report.pdf> (accessed 29 September 2015).

Matthews, P. and Berwick, G. (2013) “Teaching Schools: First Among Equals”, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/329742/teaching-schools-first-among-equals.pdf (accessed 19 January 2015).

National Audit Office (2015) “Funding for Disadvantaged Pupils”, available via:
<http://www.nao.org.uk/wp-content/uploads/2015/06/Funding-for-disadvantaged-pupils-summary.pdf> (accessed 29 September 2015).

Nutley, S.M., Walter, I. and Davies, H.T.O. (2007) *Using evidence: How research can inform public services*, The Policy Press: Bristol.

Nelson, J., Mehta, P., Sharples, J. and Davey, C. (2015) *Measuring Teachers’ Research Engagement: Findings from a pilot study*, Education Endowment Foundation & National Foundation for Educational Research: London.

Oakley, A. (2000) *Experiments in knowing: gender and method in the social sciences*, Polity Press: Cambridge.

Oxman, A., Lavis, J., Lewin, S., and Fretheim, A. (2009) “SUPPORT Tools for evidence-informed health Policymaking (STP) 1: What is evidence-informed policymaking?”, available at: www.health-policy-systems.com/content/7/S1/S1 (accessed 14 November 2015).

OfSTED (2014) “The report of Her Majesty’s Chief Inspector of Education, Children’s Services and Skills 2013/14: Schools”, available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/384707/Ofsted_Annual_Report_201314_Schools.pdf (accessed 2 March, 2015).

Roberts, C. (2015) Impractical research: overcoming the obstacles to becoming an evidence-informed school, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 107-116.

Schildkamp, K. and Ehren, M. (2012) “From ‘intuition’ to ‘data’ driven decision making in Dutch secondary schools?”, in: K. Schildkamp., M. Lai. and L. Earl. (Eds) *Data-based Decision Making in Education: Challenges and Opportunities*, Springer: Dordrecht, pp. 49-67.

Sebba, J., Tregenza, J. and Kent, P. (2012) *Powerful professional learning: a school leader’s guide to joint practice development*, National College for School Leadership: Nottingham.

Sen, A. (1990) “Rational Behaviour”, in J. Eatwell., M. Milgate. and P. Newman, P. (Eds) *Utility and probability*, W. W. Norton: New York, NY, pp. 198-216.

Seni, G. and Elder, J. (2010) *Ensemble Methods in Data Mining: Improving Accuracy Through Combining Predictions*, Morgan & Claypool Publishers: Chicago, Il.

Sharp, C., Eames, A., Saunders, D. and Tomlinson, K. (2006) *Leading a Research Engaged School*, NCSL: Nottingham.

Southworth, G. (2009) “Learning centred leadership”, in B. Davies. (ed), *The essentials of school leadership* (2nd Edition), Sage: London, pp. 91-112.

Stoll, L. and Fink, D. (1996) *Changing Our Schools*, Open University Press: Buckingham.

Stoll, L. (2015) “Three greats for a self-improving school system: pedagogy, professional development and leadership: executive summary”, available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/406279/Three_greats_for_a_self_improving_system_pedagogy_professional_development_and_leadership_executive_summary.pdf (accessed 27 February, 2015).

Stoll, L., Bolam, R., McMahon, A., Wallace, M. and Thomas, S. (2006) “Professional learning communities: a review of the literature”, *Journal of Educational Change*, Vol. 7, No. 4, pp. 221-258.

Supovitz, J. (2015) Teacher data use for improving teaching and learning, in C. Brown (Ed) *Leading the use of Research & Evidence in schools*, IOE Press: London, pp. 117-125.

Tan, E. (2014) “Human Capital Theory: A Holistic Criticism, Review of Educational Research”, Vol. 84, No. 3, pp. 411-445.

Taylor, M. (2013) “Social science teachers’ utilisation of best evidence synthesis research”, *New Zealand Journal of Educational Studies*, Vol. 48, NO. 2, pp. 35 – 49.

Timperley, H. and Robertson, J. (2011) “Establishing platforms for leadership and learning”, in J. Robertson, J. and H. Timperley. (Eds) *Leadership and Learning*, Sage Publications: London.

Tschannen-Moran, M. (2004) *Trust matters: Leadership for successful schools*, Jossey-Bass:

San Francisco, CA.

Wohlstetter, P., Datnow, A. and Park, V. (2008) “Creating a system for data-driven decision –making: applying the principal-agent framework”, *School Effectiveness and School Improvement*, Vol. 19, No. 3, pp. 239-259.

ⁱ See: <http://www.education.gov.uk/childrenandyoungpeople/families/b00203759/evidence-based-practice>, accessed 10 January 2014.

ⁱⁱ See: <http://ies.ed.gov/ncee/wwc/>

ⁱⁱⁱ See: <http://educationendowmentfoundation.org.uk/toolkit/>

^{iv} See: <https://educationendowmentfoundation.org.uk/toolkit/toolkit-a-z/about-the-toolkit/>

^v See: <https://educationendowmentfoundation.org.uk/toolkit/toolkit-a-z/>

^{vi} See: <https://educationendowmentfoundation.org.uk/toolkit/toolkit-a-z/about-the-toolkit/>

^{vii} See: <http://www.teachmeethants.co.uk/sample-page/>

^{viii} See: <http://www.workingoutwhatworks.com>