

Combining the Best of Two Worlds

**Combining the Best of Two Worlds: A Conceptual Proposal for Evidence-Informed
School Improvement**

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Combining the Best of Two Worlds: Integrating Data-based Decision Making with Research Informed Teaching for Evidence-Informed School Improvement

Abstract

Background: Data-based decision making (DBDM) and research-informed teaching practice (RITP) are key to teacher and school improvement.

Currently, however, DBDM and RITP represent two distinct approaches to developing evidence-informed practice (EIP) and do not correspond to the all-encompassing notion of EIP envisaged by many academics and commentators.

Purpose: DBDM and RITP are usually employed independently of each other. Each is associated with its own theoretical perspectives and research base, and each has its own pitfalls and strengths. Yet the approaches employed appear to be complementary, suggesting that there might be value in combining DBDM and RITP into one overarching process for achieving EIP. This paper presents the conceptual analysis and arguments for this proposal.

Sources of evidence: Drawing from literature and previous research in the fields of DBDM, RITP and EIP, we describe both DBDM and RITP, before comparing and contrasting the integral aspects of each.

Main argument: Our analysis leads us to suggest that not only is there overlap between these two approaches, but the strengths of each appear to mirror and compensate for the weaknesses of the other. As such, we argue that it is important that decisions in education are based on a combination of personal judgement, research evidence and local school data. This is

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because such a combination is likely to lead to equitable, effective and efficient decisions that are informed by values and preferences, grounded in context and steeped in practices that have been shown to be effective elsewhere.

Conclusions: We suggest that an effective strategy for EIP might be to achieve ‘the best of two worlds’ by integrating DBDM and RITP. In line with evidence-informed practices in medicine and management, this means EIP in education can finally be engaged in as a holistic approach to educational decision-making that critically appraises different forms of evidence before key improvement decisions are made. Our proposed approach, *Evidence informed School and Teacher Improvement*, is thus designed with the aim of enhancing the quality of educational provision by employing these evidence types as part of a systematic cycle of inquiry, focused on continuously improving the quality of learning in schools.

Keywords: data-based decision making, research-informed teaching practice, evidence-informed practice, evidence-informed school and teacher improvement, professional learning community, knowledge mobilisation.

Introduction

In this conceptual paper, the authors draw on their experience of, and research into, approaches to facilitating evidence-informed practice (EIP). We do so with the aim of proposing a model for achieving EIP that represents a holistic means for improving teaching and learning, and , in turn, supporting school and school system improvement, through the use of school data, practitioner expertise and formal research knowledge. We begin by

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examining the current motivation for EIP, before exploring prevalent approaches to facilitating evidence-use by teachers, as well as outlining recent empirical research, including our own research into proven effective interventions. Suggesting that current models for evidence-use do not typically achieve the all-encompassing definitions of EIP put forward by many academics and commentators (e.g. Nutley *et al.*, 2002), we examine how such approaches could be combined in order that they might do so. We conclude the paper by proposing the *Evidence informed School and Teacher Improvement* model. This is an approach that attempts to achieve a unified vision for EIP through bringing together what we term ‘the best of two worlds’. We have based this model on literature in the field as well as on our own research into different forms of EIP.

Context

Across many countries, national and district level governments are increasingly pursuing approaches to school improvement that seek to achieve so-called ‘bottom-up’ change from the (i.e. starting from the level of the individual teacher). In particular, educational ‘self-improvement’ is now viewed by many as *the* preferred approach to enhancing provision at the school and system level (Greany 2014, 2015). At the same time, the economic imperative to reduce national debt levels following the 21st century global financial crisis means that many education systems, including those across Europe, are experiencing a decrease in financial support (Brown, Daly and Liou 2016; Greany 2015). As a result of the drive for self-improvement and the decline in funding for top-down mandates, teachers and schools are now required to develop the capacity to: 1) identify core problems in relation to teaching and learning; 2) discover the causes underpinning these problems; and 3) design and implement appropriate actions for improving student outcomes.

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An approach often turned to by schools facing such challenges is evidence-informed practice (EIP). This approach involves fostering situations in which teaching practice is consciously informed by knowledge such as: 1) formal research produced by researchers; 2) evidence derived from practitioner inquiry; and/or 3) evidence derived from routinely collected school or system-level data (for example, pupil assessment data) (e.g. Brown 2015a 2015b; Cain 2015; Galdin-O'Shea 2015; Nutley et al. 2002; Stoll et al. 2014). While EIP in education tends to be broadly defined (Stoll et al. 2014), typically teachers, schools and school systems attempt to achieve EIP via approaches that are narrower in focus. In particular, rather than attempt to employ myriad evidence types, schools tend to employ one of two models: either data-based decision-making processes (DBDM), or engagement in research-informed teaching practice (RITP) (Brown et al. 2016). DBDM refers to goal setting as well as the collection and use of quantitative and/or qualitative data, after which actions for improvement are designed and implemented (e.g., Schildkamp and Kuiper 2010). In contrast, RITP refers to the use of existing research evidence for designing and implementing actions to achieve change (e.g., Brown et al. 2016).

Currently, DBDM and RITP typically represent two distinct and separate fields of activity: approaches to DBDM tend not to employ formal research, and RITP privileges research use over the examination and analysis of school data. As a result, they usually do not result in the more all encompassing approaches to EIP envisaged by the authors listed above. In this paper, however, we argue that there is a natural overlap in the theoretical underpinnings of each. Moreover, as we will illustrate, the strengths of each approach appear to mirror and compensate for the weaknesses of the other. We will put forward the suggestion that a more effective way to approach teacher and school improvement might be to seek integrate DBDM and RITP into a more comprehensive means for realizing EIP. The purpose

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of this combined approach is to seek to enhance the quality of educational provision through a holistic conception and realization of EIP.

Data-based Decision Making

History and Theory of Action of DBDM

Schools are increasingly being held responsible for the quality of education they provide (Lai and Schildkamp 2013). Internationally, educational policies such as the No Child Left Behind Act (Wayman, Spikes, & Volonnino, 2013), have led to greater attention to DBDM in schools (Wayman, Jimerson, and Cho 2012). DBDM, or 'data use' for short, can be defined as the process of 'systematically analyzing existing data sources within the school, applying the outcomes of analyses in order to innovate teaching, curricula, and school performance, and, implementing (e.g., genuine improvement actions) and evaluating these innovations' (Schildkamp and Kuiper 2010, 482). These data can be both quantitative and qualitative, and need to be collected systematically: for example, through assessments, surveys or classroom observations (Lai and Schildkamp 2013; Wayman et al. 2012). Multiple sources of data are valued, including input data (e.g., about student characteristics), outcome data (e.g., about student achievements), process data (e.g., about classroom management) and context data (e.g., about school culture).

Initially, DBDM was predominantly focussed on the use of (standardized) assessment data. These data were used in a largely summative way to check whether predetermined goals and benchmarks had been achieved, and, if necessary, to adapt (for example) instruction in classrooms in response (Van der Kleij, Vermeulen, Schildkamp, and Eggen 2015). In current DBDM literature, however, a more formative approach is taken, where it is acknowledged that it is important both to use different data sources, and to adapt continuously (e.g.) instruction to facilitate effective learning. In so doing, it is recognised that it is also important

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to take into account students' learning needs and characteristics, as well as the context in which the learning is taking place (Coburn and Turner 2011; Schildkamp, Lai, and Earl 2013; Supovitz 2010).

Acknowledging that decisions cannot be completely driven by data, the term *data-driven* decision making is increasingly being replaced by *data-based* and *data-informed* decision making. For example, when data indicate that students lack certain calculation skills, educators also need their own knowledge and experience to decide how to act upon this information. Thus, the final decision is not driven by data, but based on, or informed by it.

Several theories of action exist with regard to data use (e.g., Coburn and Turner 2011; Lai and Schildkamp 2013; Mandinach, Honey, Light, and Brunner 2008; Marsh 2012; Schildkamp and Kuiper 2010; Schildkamp and Lai 2013; Schildkamp and Poortman 2015). These theories all comprise a number of similar factors:

1. **Goal setting:** to be able to use data, it is important that educators start with a goal they want to achieve. Goals are typically phrased in terms of improving student achievement.
2. **Data collection:** when certain goals are not achieved, it is important to think about possible explanations for this (e.g., why student achievement results are below a certain benchmark). After establishing potential causes, local school data can be collected to investigate those possible causes.
3. **Data analysis and interpretation:** after the data are collected, the quality of the data needs to be determined (e.g., its reliability and validity). Next, the data need to be analyzed and interpreted. Here, data becomes information. When this information is integrated with educators' existing understandings and expertise, it turns into knowledge: for example, with regard to the factors contributing to the student achievement problems.

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4. Improvement actions: the knowledge resulting from the use of data can be used to design and implement actions for improving the quality of education and to achieve desired goals (e.g., increased student achievement).
5. Evaluation: the actions for improvement should be evaluated to determine whether or not the desired goals, in terms of increased student learning and achievement, are reached.

Feedback plays an important role in the use of DBDM. Data can be seen as a form of feedback for both teacher and student learning. Moreover, DBDM is an iterative and cyclic process (Coburn and Turner 2011; Mandinach et al. 2008; Marsh 2012), and, as noted above, can also be seen as a formative assessment approach where data are continuously used to improve teaching and learning in the school (Van der Kleij et al. 2014). In such cases, a feedback loop is created from data to goal achievement (Mandinach et al. 2008; Marsh, 2012; Marsh, Pane, and Hamilton 2006).

Goals, Implementation and Effectiveness of DBDM

Goals of DBDM

Data are typically used for three purposes: accountability, school development, and instruction. Data use for accountability entails data being used to explain or defend certain actions or decisions. For example, teachers can use assessment results in their conversations with parents. When data are used for school development, they can serve, for example, as a tool to determine effective teaching methods, professional development needs, and to provide direction for policy development. Data can also be used to improve teachers' instruction. For instance, teachers can use data to determine whether the content is addressed at an appropriate pace, and then make adjustments accordingly (Breiter and Light 2006; Coburn

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and Talbert 2006; Schildkamp and Kuiper 2010; Schildkamp, Lai, and Earl 2013; Wohlstetter, Datnow, and Park, 2009).

Implementation of DBDM

The implementation of DBDM has proven to be difficult. Every school has, within it, a variety of data sources, making it difficult to determine where to start. Moreover, it is well documented that teachers and school leaders often lack the knowledge and skills to use data effectively (Earl and Katz 2006; Marsh et al. 2006; Park and Datnow 2009; Schildkamp and Poortman 2015). As a result, several professional development programmes have been developed and implemented to support schools in their use of data (e.g., Boudett, City, and Murnane 2005; Carlson, Borman, and Robinson 2011; Lai, McNaughton, Amituanai-Toala, Turner, and Hsiao 2009; Schildkamp and Poortman 2015; Slavin, Cheung, Holmes, Madden, and Chamberlain 2011). It is also important to invest in teacher training: it has been recommended that data use becomes part of the initial teacher education curriculum as well as form a key aspect of schools' professional development provision (Mandinach and Gummer 2013; Mandinach and Gummer in press). Moreover, it is important to establish ways of connecting data use with practitioners' own experiences: in keeping with the notion of expertise (e.g., see Flyvbjerg 2001) high quality decisions are invariably those based on a combination of data and practitioners' tacit knowledge.

One approach to achieving DBDM is through using a data team intervention. This intervention can be described as a professional development programme delivered to individual schools. The focus is on a problem that the school wants to solve (e.g., grade repetition, low mathematics achievement, low English achievement). Supported by an external coach, a team of teachers and school leaders (six to eight people) work on solving this specific problem, using a structured and cyclic eight-step approach: (1) problem

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definition, (2) developing hypotheses with regard to possible causes of this problem, (3) data collection, (4) checking the quality of the collected data, (5) analysis and interpretation of the data, (6) conclusions, (7) taking action, (8) evaluation.

This type of intervention has been implemented and studied in over 80 schools in the Netherlands and Sweden (e.g., Hubers et al. 2016; Poortman and Schildkamp 2016; Schildkamp and Poortman 2015; Schildkamp, Smit, Blossing 2016; Schildkamp, Poortman, and Handelzalts 2016).

Effectiveness of DBDM

Some studies of DBDM have found only mixed, small or even no effects of data use on achievement (e.g., Slavin, Cheung, Holmes, Madden, and Chamberlain 2012; Tyler 2013). However, several others suggest that, under the right conditions (i.e., a professional development intervention), data use can lead to school improvement in terms of higher student achievement (e.g., Carlson, Borman, and Robinson, 2011; Lai, Wilson, McNaughton, and Hsiao 2014; Van Geel et al. in press). These studies found evidence that DBDM can lead to improved educational outcomes in terms of both pedagogy and student attainment.

Several of these studies, using different research designs, including randomized controlled trials, have found that the use of data can lead to increased student achievement in different subjects, such as literacy and mathematics (Carlson et al. 2011; Faber and Visscher 2014; Lai, Wilson, McNaughton and Hsiao 2014; Poortman and Schildkamp 2016; Slavin et al. 2011; Van Geel et al. 2016).

Studies suggest that the specific data team intervention approach outlined above can lead to the professional development of teachers (Ebbeler et al. in press; Ebbeler et al. 2016) and increased student achievement (Poortman and Schildkamp 2016). However, some teachers indicated that they were not able to use data in their classrooms without support

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(Ebbeler et al. 2016; Poortman et al. 2014; Schildkamp et al. 2012), and the impact on achievement was also mixed (Poortman and Schildkamp 2016; Schildkamp, Handelzalts, and Poortman, 2015).

Strengths and Weaknesses of DBDM

A strength of most DBDM approaches is that school-specific vision and goals are used to identify a context-specific problem, thereby addressing a real need in the field. For example, the data team intervention starts with a problem that the school chooses. This creates a sense of ownership, because educators are working on an everyday problem experienced in school. Based on their knowledge, experience, and expertise, educators hypothesize what the possible causes of their problem are. As a result, the ideas, experiences and intuition of practitioners are taken seriously, and are used as a starting point for a systematic cycle of inquiry.

Furthermore, educators can use data to design a context-specific solution targeting the problem that they are working on, taking into account the values and needs of the teachers and students in their school. Based on these data, they can make decisions to improve teaching and learning in specific settings, leading to context-appropriate actions informed by data.

At the same time, there are also pitfalls associated with DBDM. First, while data can inform educators about problems in their school, educators need substantive expertise if they are to identify meaningfully the potential causes of this problem. It is also the case that one problem might have several different causes (e.g., relating to the curriculum, instruction, assessment), which all need to be investigated.

Second, data can be used to pinpoint problems and the possible causes of these problems, but it cannot make clear the best available course for school improvement. In the

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case of the data team intervention, teachers struggled with developing improvement measures based on data (Poortman and Schildkamp 2016; Schildkamp and Poortman 2015).

Finally, educators need to be data literate. This comprises practitioners being able to identify problems and frame questions; collect data; appraise the quality of the data; analyze and interpret data; transform data into information, and into decisions; implement actions; and evaluate the outcomes of these action. Moreover, it also requires foundational knowledge (e.g., pedagogical content knowledge, curriculum knowledge, knowledge of the learners) (Mandinach and Gummer, in press). It is clear, however, that not all practitioners currently possess all such attributes (Mandinach and Gummer in press).

Research-Informed Teaching Practice

History and Theory of Action of RITP

In line with EIP generally, there is a now a global impetus for teachers to engage in research activity and with research evidence in order to enhance their practice (Cain 2015; Greany 2015; Hammersley-Fletcher and Lewin 2015). Typically, the engagement of teachers in and with research can take two forms. The first may be thought of as ‘action research’ or ‘practitioner research’: in other words, an investigative research project undertaken by an individual teacher as a means through which to instigate change in their classroom (Bubb 2014; Roberts 2015). The second can be described as teachers engaging in ‘research informed teaching practice’ (RITP). Here, teachers employ existing research with the aim of improving or innovating current pedagogic practices. Of these, it is the latter that is currently dominating the discourses of both policy and practice and, as such, provides the focus for this paper¹.

¹ Although we acknowledge that action research, and the practice of teachers and schools engaging *in* as well as *with* research is a widespread practice in many countries, it is not within the scope of our paper to include action research.

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The specific definition of RITP we use is that provided by England's Department for Education, who suggest RITP is most effectively conceived as: 'A combination of practitioner expertise and knowledge of the best external research, and evaluation-based evidence' (see: www.education.gov.uk, 2015). More specifically in relation to this definition, we consider the notion of external research to refer to that which has been peer reviewed and published by academic researchers. Meanwhile, the phrase 'evaluation-based evidence' is considered to comprise meta-analyses or syntheses such as those produced by Hattie (2011) or the Sutton Trust-EEF's *Teaching and Learning toolkit* (Sutton Trust-EEF 2013). In other words, this latter category represents broader, overarching assessments of specific approaches to teaching and learning. Typically, these assessments will include effect sizes showing the average improvements in student outcomes that these approaches have achieved.

The use of the term 'combination' within England's DfE's definition also highlights an evolution in thinking about research informed teaching practice. It represents a move, as with DBDM, from the idea that teaching can be *based* on research evidence (e.g. see Biesta 2007; Saunders 2015), to the realization that it is perhaps more realistic, relevant, and effective to consider a situation where teaching practice is *informed* by research evidence. In other words, the phrase *research-informed practice* represents a change of emphasis, to consider how teachers can employ research alongside other forms of evidence such as their tacit expertise, in order to make effective pedagogic decisions in specific contexts (Brown and Rogers 2015; Hammersley-Fletcher, and Lewin 2015; Nelson and O'Beirne 2014; Saunders 2015; Stoll 2015).

Teachers' use of research has a long and rich history (Fenwick and Farrell 2012; Saunders 2014, 2015; Greany 2015). Internationally, it has been supported by numerous policy and practice initiatives (Brown 2013; Gough, Tripney, Kenny, and Buk-Berge 2011; Greany 2015). Furthermore, there has been a renewed emphasis and vigour in this area, in

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recent times. It is noted, for instance, by both Cain (2015) and Hammersley-Fletcher and Lewin (2015) that, in England, current support for RITP can be traced to the 2013 report by Goldacre, who called for a ‘revolution’ in education. More specifically, Goldacre suggests there is a need for:

...a change in culture [... with] whole new systems... to identify questions that matter to practitioners, to gather [research] on what works best, and then, crucially, to get it read, understood, and put into practice (2013, 7).

Despite the policy focus on RITP, the evidence base on effective research-use is scant (Cain 2015; Nelson and O’Beirne 2014) and, as a result, there is no one single preferred process for engaging in RITP. Nonetheless, we suggest that a theory of action which links research-use to school improvement is likely to comprise the following:

1. There is an assumption that research exists that has actual or potential use value. That is, there is research that can (or can potentially) be used to signpost to teachers improvements in their pedagogy and/or content knowledge
2. If teachers are able to engage with such research in a way that enhances their ability to respond in certain situations, then their teaching quality will be improved. More specifically, this stage requires teachers to be able to: 1) access research; 2) make sense of research findings and relate these to their specific context or problem area; 3) develop an approach based on these findings; 4) implement the approach and gauge its effectiveness; and 5) decide whether to continue with the approach, to try to employ it more widely or to discontinue it (e.g. see Cain 2015).

Goals, Implementation and Effectiveness of RITP

Goals of RITP

The explicit aim of RITP is to improve teaching quality and, in turn, pupil attainment. For instance, Goldacre (2013) links both the collection of research evidence about effective practice, and the establishment of cultures in which this research is used, with enhanced teacher independence, improved teacher decision making and, as a result, better teaching. Further emphasis on how RITP operates is provided by Rousseau and Gunia (2016) who illustrate that RITP represents a process through which best practices are continuously and widely identified and adopted.

Implementation of RITP

Despite an abundance of definitions, surprisingly little has been written about how teachers could become research-informed in order to achieve the goals detailed above (Brown 2015a; Godfrey 2014, 2016; Nelson and O'Beirne 2014; Saunders 2014). One approach to achieving RITP is represented by the Research Learning Communities (RLCs) model. RLCs were designed to enable the use of research-informed practice at scale by activating the theory of action described above (Brown 2015c). Underpinning the RLC approach is a cycle of inquiry process that enables participants to go through the stages of engaging with research and developing new practices, building their expertise in how, when and why such approaches should be used and then implementing them more widely within school. In particular, the RLC model involves participants attending four workshops over the course of an academic year (October to June), with the content of these workshops focussed on developing a research-informed approach to improving practice.

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Effectiveness of RITP

Although not comprehensively or systematically established, there are numerous reported benefits to practitioners engaging in RITP. Supovitz (2015), for example, observes that high performing school systems are also those that facilitate the collaborative examination of research evidence in order to identify both likely problem areas and potential solutions to these problems. Likewise, Mincu (2014) and Cordingley (2013) both report correlational evidence suggesting that, where research is used as part of high quality initial teacher education and ongoing professional development, it is associated with higher teacher, school and system performance (similar relationships are reported in Godfrey 2014, 2016; Greany 2015; Sebba, Tregenza, and Kent 2012). More specifically, CUREE (2010) list a range of positive teacher outcomes that emerge from RITP, including improvements in pedagogical knowledge and skills and greater teacher confidence. 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 a superficial ‘hints and tips’ model of improvement to a learning culture in which staff work together to understand what appears to work, when and why (Handscorn and MacBeath 2003; Godfrey 2016; Greany 2015; Sharp, Eames, Saunders, and Tomlinson 2006).

In terms of the RLC approach set out above, work by Brown (in press) suggests that RLCs are successful in facilitating participating teachers to engage with research in relation to specific areas of teaching and learning; and in enabling participants to marry research to their own practical knowledge in order to develop research-informed interventions. Furthermore, the RLC model has also proven successful in terms of providing participants with the capacity to embed the wider use of the research-informed practices they have developed amongst their colleagues/across their schools.

Strengths and Weaknesses of RITP

There are several strengths associated with RITP. First, it is possible that educators may not know about or have experienced the best available course for school improvement. RITP-type approaches thus enable schools to draw upon a variety of effective approaches to improving teaching and learning activity, as well as an existing understanding of why such approaches work and what is needed to support them (e.g. see Goldacre 2013; Moss 2013).

Second, approaches to RITP often employ tools and protocols and facilitative expertise to help practitioners connect existing research to their context and allow them to consider how existing research informed approaches might be used to address a given problem area (see Stoll and Brown 2015).

Additionally, many approaches to RITP (e.g. see Stoll and Brown 2015) explicitly introduce a wide range of research and practical joint practice development activities to help schools engage with the process of trialling and refining specific approaches. Similarly, approaches to RITP also engage teachers in activity that helps them consider how they might implement new initiatives on a school-wide basis.

However, there are also pitfalls. First, it can often feel that a specific area has been selected for RITP related school improvement activity because it is a ‘hot topic’ rather than because it represents a real area of need. A more effective approach might be for teachers to spend time establishing a vision that considers what schools really need to concentrate on in order to improve. Second, teachers can be in danger of moving from baseline to vision (goals) via a research-informed approach, without ascertaining whether this approach is tackling the real reasons. As a result, any new practice implemented may not target the causes of a problem and/or fail to fit with the context, values, and needs of the stakeholders.

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Third, mirroring the first weakness, if the vision for school improvement is not grounded in an understanding of the needs of the school, then any analysis of impact is likely to miss some of the true drivers or inhibitors of that impact. Finally comes issues with teachers' research literacy: it can often be difficult for teachers to engage with the most recent and relevant research if it is written for an academic journal audience.

Comparing DBDM and RITP

We have outlined two currently popular approaches to school improvement: DBDM and RITP. A summary of each approach is set out in Table 1, below. We now describe the similarities and differences between these two approaches, drawing on literature and the results of our own studies. Furthermore, we illustrate how the weaknesses of each approach seemingly mirror and are compensated for by the strengths of their counterpart. We conclude by suggesting how both approaches might be combined into a comprehensive overarching model for school self-improvement and the benefits of doing so. For comparative purposes, we have described the two approaches as two very distinct models. In reality, of course, there are some examples where the approaches overlap and intertwine (e.g., in schools using the cycle of inquiry developed by Halbert and Kaser 2013). We believe, however, that it is important, both in EIP and school improvement literature, as well as in practice, that the two approaches are systematically combined and used on a larger scale.

[Insert Table 1 here]

Similarities and Differences

History and goals

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DBDM and RITP both find their origin in the international drive to enhance teaching quality, and in turn, to increase students' outcomes. Both approaches began with a narrower focus of *data-driven* or *research-driven* school improvement processes. However, over time, it has been acknowledged that educational practices should be *based* on, or *informed* by such resources: in other words, educators' experience is also required..

Theory of Action

The theory of action for DBDM is strongly linked to its cycle of inquiry. In reality, however, the situation is more complex, since the DBDM approach requires the necessary data to be available, and it requires practitioners to possess certain dispositions, knowledge and skills if they are to collect, analyze, interpret and use these data (Hoogland et al. 2016, Mandinach and Gummer, in press). Similarly, for RITP, difficulties exist in terms of whether appropriate research is available, and whether it can be accessed, transformed and used by teachers. It is also assumed that RITP is most effective when it is undertaken in a way that results in teachers' tacit knowledge being fused with the research evidence in question.

Effectiveness

Overall, we suggest that the effectiveness of DBDM is currently better established than it is for RITP. Evidence on the former illustrates that when data are used to improve teacher quality, this can lead to increased student learning and achievement (Carlson et al. 2011; Faber and Visscher 2014; Lai et al. 2014; Poortman and Schildkamp 2016; Slavin et al. 2011; Van Geel et al. 2016). Reports on RITP illustrate that the use of research is associated with teacher, school and system performance (Cordingley 2013, Mincu 2014; Supovitz 2015) More research is needed, however, to investigate the impact of RITP on student achievement.

Strengths and Weaknesses

In comparing the strengths and weaknesses of DBDM and RITP, it appears that the strengths of each approach counterbalance the weaknesses of the other. For example, a common critique for RITP is that it often does not start with the vision and goals of a school, that it is not based on a real need in the field, and that the specific area for school improvement has been selected because it is a ‘hot topic’ rather than a real area of need (e.g. see Brown 2015b). DBDM, on the contrary, starts with the vision and goals of a specific school, and a focus on a contextually specific problem. Through DBDM-type approaches, educators collect data about their specific issue and brainstorm the possible causes of this problem. An issue associated with DBDM, however, is that while data can inform educators about problems in their school, educators will typically require substantial expertise if they are to identify, effectively, possible causes of this problem. With RITP, educators can draw upon a variety of effective approaches to school improvement. Furthermore, while these approaches are typically used to identify solutions to particular issues, they may also provide stimulus in terms of identifying the issues underlying the particular problem area.

Another critique often associated with RITP is that ‘one size does not fit all’: although a lot of evidence may exist for certain school improvement interventions, it cannot automatically be assumed that such interventions will be effective more generally. With a DBDM approach, on the other hand, schools develop a context-specific solution that targets the problem that they are working on and that takes into account the needs of the teachers and students in the school. However, an issue with DBDM is that data can be used to pinpoint problems and possible causes of these problems, but educators may still not know what the best available course for school improvement might entail. As with hypothesizing potential causes of a problem, RITP is helpful here in selecting the most promising solutions based on an existing evidence base, as well as using an existing understanding of why approaches

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‘work’ and what is needed to support them (e.g. see Goldacre 2013; Moss 2013). In addition, approaches to RITP can then often employ tools and protocols and facilitative expertise to help practitioners connect existing research to their context, and allow them to consider how existing research informed approaches might be used to address a given problem area in their setting.

Evidence Informed School and Teacher Improvement

We therefore propose that DBDM and RITP-type methods should be integrated in order to support schools in improving the quality of their education. In such an approach, both types of evidence - context specific school data *and* research findings - would be employed within a systematic cycle of inquiry. Furthermore, alongside data and research practitioners’ tacit knowledge, stakeholders’ values and concerns would also form an integral part of attempts to improve teaching and learning. Our approach would comprise the following eight steps, in which we propose a merger of the basic ideas of (1) DBDM in general, and the data team intervention specifically, with (2) basic ideas of RITP in general, and the Research Learning Communities approach specifically:

- 1 Goal setting: The data team intervention starts with identifying the current situation (i.e., a problem) in a school-based on the school’s own context specific data, along with the desired situation (i.e., the goal). This goal can refer to a student achievement goal, but also to other goals, such as student well-being or safety.
- 2 Identifying possible causes of problems: Next, in a data team, possible causes of this problem are considered. To do so, teachers use both local expertise (e.g., the experience and knowledge of practitioners in the field) as well as research evidence (e.g., what is already known about this problem and its possible causes). Although, in the current data team intervention, the use of research evidence is encouraged, this can

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be made more explicit using the lessons learned from the Research Learning Communities approach: i.e. the need to engage with research in a way that facilitates learning and knowledge creation.

- 3 Data collection: Step 3 in a data team is the collection of local data, such as student voice data, assessment data, and classroom observation data, on the most likely of these possible causes (in the context of the school).
- 4 Quality analysis: following this, in a data team teachers check the quality of the collected data and analyze it.
- 5 Drawing conclusions: the causes of the problem are considered.
- 6 Seeking solutions: these should target the causes of the problem and be based on local expertise, as well as research evidence. Again, in a data team, the use of research evidence is encouraged, but needs to become a more explicit part of the cycle, as described in the Research Learning Communities approach, where pertinent research is engaged with using exercises and protocols to foster evidence-literacy and ensure teachers are apply to translate research findings to their settings.
- 7 Develop an action plan: the action plan should be based on local data, local expertise, and informed by the research base.
- 8 Evaluation: Finally, teachers should engage in a cycle of trialing, refining, and evaluating the action plan, which eventually includes a process of wider implementation (e.g., from one or two classrooms to the entire school) and an analysis of the impact of the action plan (i.e., is the problem identified in step 1 solved?).

This suggested approach integrates DBDM and RITP and benefits from the strengths of each approach, meeting the more holistic definitions of EIP detailed above (e.g. Nutley *et al.*, 2002). As such, we define it as *Evidence informed School and Teacher Improvement*

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(ESTI). There are two components of the ESTI approach which we believe are vital to its successful enactment. First, the systematic aspect is important, to guard against quick decisions based on personal judgements, which, in themselves, are often not reliable as well as being susceptible to biases (Katz and Dack 2013; Barends, Rousseau, and Briner 2014). Secondly, the term ‘informed’ is significant here, as good quality decisions are developed through a combination of research and data evidence, critical thinking, and sense making. As stated by Barends et al (2014, 14) “Evidence is not an answer. It does not speak for itself. To make sense of evidence, we need an understanding of the context and a critical mindset”. Thus at the core of ESTI is the notion of taking informed action that will promote student learning.

Finally, although the main goal of ESTI is to improve student learning, we argue that the focus should be on school and teacher improvement, as this is key to increasing the achievement of pupils (Hattie 2011). We also note that, when beginning processes of school improvement, practitioners often possess deep seated beliefs about the role of ‘others’, typically phrased in ways such as ‘the cause of the problem is that they do not...’. In order to move towards teacher and school improvement, these assumptions should not be dismissed but respected, taken seriously, and investigated (Timperley, Kaser and Halbert, 2014), for example by turning them into measurable hypotheses (Schildkamp and Poortman 2015; Schildkamp, Poortman, and Handelzalts 2015). The invariable result of doing so is a shift from ‘others should’ to ‘what can *we* do to promote learning in our school (Schildkamp and Poortman 2015; Schildkamp et al. 2015; Timperley et al. 2014).

Conclusion

Data Based Decision Making and Research Informed Teaching Practice are two approaches currently used by schools, and their university partners, in the pursuit of

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evidence-informed self-improvement. As we have shown, both DBDM and RITP both have strengths and weaknesses. We have also argued that it is important that decisions in education are based on a combination of personal judgement, scientific research evidence, as well as local school data. This is because such a combination is likely to lead to decisions that are informed by values and preferences, that are grounded in context and that are steeped in practices that have been shown to be effective elsewhere (a situation, argued by Oxman et al. 2009, to be effective, efficient and equitable). Correspondingly, our argument in this paper is that systematically combined, DBDB and RITP bring together the ‘best of both worlds’: providing an approach that gets to the heart of what is preventing outstanding performance as well as identifying interventions that might lead schools to their desired goals.

Such a combined approach would anticipate education moving forward in a way that is analogous to other fields such as management and health care (Dawes et al. 2005). Evidence from these areas suggests that a conjoined approach is conducive (see Barends *et al* (2014)).

However, combining these two approaches will not necessarily be easy, nor will it provide a ‘quick win’. In particular, there are a number of factors that need to be considered when seeking to operationalize the conjoin we envisage above. For example, ESTI potentially requires schools and teachers to develop a broader set of skills than those required for the adoption of DBDM or RITP alone. This is because, as well as understanding how to source, interrogate and assess the quality of data, schools will also need to engage in a similar way with a given research base (and vice versa for those schools currently ‘research engaged’). This requirement for a combination of both data literacy (Mandinach and Gummer, in press) as well as research literacy implies that both pre-service training as well

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as in-service professional development provision should pay more attention to these areas.

The eight steps proposed in this paper could, thus, also be used as a starting point for a curriculum framework to address ESTI.

At the same time, a process that involves sense-making collaboration is crucial to the successful enactment of ESTI. This is because, invariably, individuals may have too many ‘blind spots’ to engage in challenging reflective practice (Schon, 1984; Pollard, 2008) by themselves. We argue therefore that ESTI is most effectively achieved through the auspices of professional learning communities (PLCs). PLCs hold a particular importance because of the conditions that effective learning communities foster (Stoll et al. 2006, 226-227). Finally, we argue that ESTI is not an approach to school improvement that can or should be achieved via any kind of ‘technical compliance’ model (Daly 2010; Supovitz 2015). Rather, we suggest that our approach should be used as within collaborative learning environments to galvanize the energy and knowledge of school staff and their university partners. As such, the ESTI approach provides schools with an opportunity to improve their educational provision, both within a given set of values, and through an ethos that serves the needs of their pupils and community.

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Summary of Data-based Decision Making (DBDM) and Research-Informed Teaching Practice (RITP).

	DBDM	RITP
History	<ul style="list-style-type: none"> - International drive: teachers and school leaders use data to enhance their practice. - From a narrow focus on (standardized) assessment data and accountability, to a broader focus on multiple data sources and a focus on instructional and school development. It is acknowledged that decisions cannot be completely driven by data, but they can be based on or informed by data. 	<ul style="list-style-type: none"> - International drive: teachers and school leaders use research results to enhance their practice. - Research-use has evolved from the idea that teaching can be <i>based</i> on research evidence to the realisation that it is, perhaps, more realistic, relevant and effective to consider a situation where teaching practice is <i>informed</i> by such evidence.
Goals	<ul style="list-style-type: none"> - To improve teaching quality and therefore pupil outcomes. 	<ul style="list-style-type: none"> - To improve teaching quality and therefore pupil outcomes.
Implementation	<ul style="list-style-type: none"> - Difficult. Data use should be connected with practitioner expertise, which involves learning about data use and embedding those approaches in practice. 	<ul style="list-style-type: none"> - Difficult. Research use should be connected with practitioner expertise, which involves learning about research use and embedding those approaches in practice.
Theory of action	<ul style="list-style-type: none"> - Several theories of actions have been developed, but generally include the following steps: <ol style="list-style-type: none"> 1. Goal setting: practitioners need to define a purpose or goal they reach. 2. Data collection: hypotheses on possible causes are formulated and data are collected to check whether the hypotheses can be accepted. 3. Data analysis and interpretation: the quality of the data need to be determined (e.g., reliability, validity). Next, data need to be analyzed and interpreted. 4. Actions for improvement: the results can be used to determine actions for improvement. 	<ul style="list-style-type: none"> - There is no one single preferred process for engaging in RITP. Nonetheless, a theory of action is likely to comprise the following steps: <ol style="list-style-type: none"> 1. Research exists that has actual or potential use value. That is, it can (or can potentially) be used to signpost, to teachers, improvements in the way they can teach and/or their content knowledge (or both); 2. If teachers are able to use research to enhance their ability to respond in certain situations (both in terms of pedagogic and subject knowledge); then their teaching quality will be improved; 3. Improved teaching quality will lead to enhanced pupil outcomes;

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| <p>5. Evaluation: the actions for improvement need to be evaluated to determine whether or not the goals of increased student learning and achievement are reached.</p> <ul style="list-style-type: none"> - Several feedback loops exist (e.g., data can be used to determine whether or not the desired goals are reached: if not, practitioners go back to a previous step). | <p>4. Likewise, research can (or can potentially) signpost to school leaders how they might improve the ways in which lead and manage their schools;</p> <p>5. If school leaders are able to use research to enhance their ability to respond in certain situations, then aspects of their leadership will be improved;</p> <p>6. Improved school leadership will improve a variety of aspects of the school through a variety of mechanisms including cultural, operational and pedagogical. Correspondingly, it will result in enhanced pupils' outcomes.</p> <ul style="list-style-type: none"> - A sub-theory of action is required between steps 1 and 2, and between steps 4 and 5, which specifically focuses on how formal and practitioner-held knowledge can be combined in order for teachers and school leaders develop expertise in relation to a given piece of research. |
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Effectiveness	<ul style="list-style-type: none"> - When data are used to improve teacher quality, this can lead to increased student learning and achievement. 	<ul style="list-style-type: none"> - There are numerous reported benefits to practitioners engaging in RITP (e.g., increased teacher, school and system performance).
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Strengths and weaknesses	<p><i>Strengths</i></p> <ul style="list-style-type: none"> - It starts with a real need in the field. - Practitioners hypothesize what the possible causes of their problem are. - Schools develop a context-specific solution. <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> - Practitioners need a lot of expertise in brainstorming possible causes of their educational problem. - Practitioners may still not know what the best available course for school improvement entails and how to prioritise choosing between different courses of action. 	<p><i>Strengths</i></p> <ul style="list-style-type: none"> - Schools can draw upon a variety of effective approaches to school improvement as well as an existing understanding of why approaches work and what is needed to support them. - Tools, protocols and facilitative expertise are employed to help practitioners connect existing research to their context. <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> - A specific area for school improvement might be selected because it is a 'hot topic' rather than a real area for need. - There is a risk of moving from baseline to goals, without ascertaining whether the real causes are being tackled. - If the vision has not been truly grounded in an understanding of the needs of the school, then any analysis of impact is likely to miss some of the true drivers or inhibitors of that impact. - Issues with access, understanding and translating research.
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