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TEACHER QUALITY AND SCHOOL IMPROVEMENT: WHAT IS THE ROLE OF RESEARCH?

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> *The remarkable feature of the evidence is that the biggest effects on student learning occur when teachers become learners of their own teaching, and when students become their own teachers* (Hattie, 2009, p. 22).

ABSTRACT

In an era of major economic, technological and social change, high quality schooling is universally recognised as a key mechanism for the production of a skilled and adaptable workforce. In a rapidly changing and complex world, student success depends upon the capacity of schools to deal with the specific educational needs of each learner. The ability to deliver 'personalisation' of this kind is particularly important where the student body is composed of so-called 'low achievers' and/or others who are vulnerable for one reason or another.

The research evidence on improvement projects presented in this paper clearly demonstrates the links between teacher effectiveness and school improvement and the particular roles played by teacher education, school leadership and research knowledge. Teachers are the main actors in their classrooms and promote the learning processes engaged in therein; outcomes are always at their most pertinent for those pupils or students most at risk of low achievement. At the same time, teachers act collaboratively at school level and have the potential to greatly transform outcomes, by building bridges between classrooms and departments, and by engaging as (and with) leaders and researchers. The role played by research is to guarantee a horizon of expert knowledge and professional habits that might make a difference in the working contexts that the teachers inhabit.

Against this background, and drawing on a wide body of internationally sourced evidence and specific examples of school reform in Ontario and Alberta, this paper advances three arguments:

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1. That enhancing teacher quality is intrinsically linked to the quality of initial and continuing teacher education programs (OECD, 2012), and that such enhancement is vital if disadvantaged students are to succeed and disadvantaged schools are to progress;

2. That delivering school improvement depends on having the capacity to improve in place, creating an environment where teacher (and student) morale is high and where there are positive teacher incentives to engage in the change process;

3. That research - be this delivered or stimulated by external interventions or through on-site collaborative inquiry processes - is a vital component of a school's capacity for self-improvement, and that such research is likely to play a vital role in ensuring that effective teaching and learning processes are in place.

Initial and on-going teacher education, the determination of senior and middle leaders to create and sustain an organisational climate in which a culture of reflection, self-evaluation and professional development thrives, and a continued focus on the importance of research in informing, updating and reshaping practice are vital in securing sustainable improvements in school and teacher performance, improvements from which the most vulnerable students are likely to be the greatest beneficiaries.

INTRODUCTION

'Quality' and 'research' are problematic notions. Nevertheless, unwrapping quality and identifying the contribution of research to improvement is of critical importance. Moreover, the links between knowledge and innovation have long been established and investigated. Since "knowledge can come from multiple sources" (Seashore-Louis, 2010), only some of these sources have the potential of including a research-based input. The epistemological debate on different types of knowledge is a complex one (see Furlong, 2013).

However, it is possible to identify two major loci that contribute to the development of the teacher as a professional - the university and the school. Thus, in line with the idea of radial transformation, "combining inside-out and outside-in change" processes (Hargreaves, 2009), it is proposed that there are two ways in which research may both inform and emerge from practice and, therefore, contribute to school improvement:

1. Expert knowledge as an input from 'outside', for instance in the form of a higher education researcher or some other 'expert' provider: here, the locus of expert knowledge creation may, necessarily, be external in those cases in which there is no critical mass of quality teachers and, therefore, the possibility of stimulating transformational processes or new research knowledge internally is not available;

2. Expert knowledge emerging from "inside", in some cases limited to classrooms or departments or, in others, creating a wider professional learning community [PLC]: here, the locus of expert knowledge creation is internal, building on a critical mass of quality teachers and transformational processes. We see examples of this in the 'lesson study' approach in Japan or in collaborative planning in Finland (OECD, 2012), in subject-based teaching study groups in Shanghai (OECD, 2011), and in the creation of change-oriented and expert knowledge focused PLCs, for instance, through formative development meetings based on action plans (Wiliam, 2007).

Against this background, the argument advanced in this paper is twofold: on the one hand, the issue of teacher quality as a driver of school improvement is especially pertinent for those students who might be defined as 'low achieving' and in those schools that are viewed as 'underperforming'. In this context, the role of expert knowledge, whether it results from external intervention or internal generation, is vital.

On the other hand, school improvement is much more likely to emerge as a result of collective capacity building than through the application of a series of 'external' accountability measures. For such improvement to take place, there needs to be a focus on the development of teachers' knowledge, skills and commitment. It will be argued that a continuous infusion of new knowledge is key to ensuring both that there are effective learning processes in the classroom and that whole school improvement - inspired by distributed, instructional and inquiry-minded leadership – takes place.

TEACHERS MATTER AND SCHOOLS MAKE A DIFFERENCE

The effect of teachers and schools

During the 1960s and 1970s, influential studies claimed that individual characteristics and socio-economic backgrounds were the most influential factors accounting for pupils' achievement. At the same time, the effects of schooling processes were seen as weakly related to achievement. Subsequent studies have challenged this perspective and showed the existence of significant effects at classroom, departmental and school level. School effectiveness research explores the role of educational experiences, whilst at the same time acknowledging the relevancy of family background. It addresses the effects of education from pre-school to post-compulsory and higher education. Rather than seeking to measure the impact of schooling as a whole, it examines differences in the impact of one institution in comparison with another, taking account of pupil intake and differences in socio-economic status.

Although there are different findings concerning the balance between home and school effectives, when it

comes to the impact of school-level factors, research demonstrates that, on average, schools account for between 5 and 18% of achievement differences, after initial differences are controlled for (Sammons, 2007). It is widely accepted that there can be internal variations in effectiveness at departmental or class level, and that teacher effects tend to be substantially larger than school differences. These are especially strong in the primary phase (where pupils tend to spend most of the day with a single teacher) and in developing countries. Research studies suggest a range of between 20% and 40% (Ko and Sammons, 2012) or approximation around 30% (Hattie, 2003). In Australia, this 'classrooms effect' at primary level is in the region of 55% for Mathematics and 45% for English (Sammons, 2007).

Teacher quality appears to be the crucial variable at classroom level. Wiliam (2013) reports that:

1. The most effective teachers are at least five times as effective as the least effective;

2. Teacher quality may close the achievement gap in both primary and secondary schools;

3. Good teachers continue to benefit students for at least two years after they have stopped teaching them.

Effective for whom, effective about what and effective in which context?

This paper illustrates the impact of teacher effectiveness in terms of two definitions – a broader one that encompasses factors that reach beyond the classroom (for example, pre-existing teacher characteristics, teacher behaviour and expectations, teacher training, external and internal teaching contexts) and a more specific and differentiated one that focuses on the consistency of the effect of teachers in the classroom - in terms of time stability, subject consistency, differentiated roles and types of student. Both are helpful in order to:

1. Gain insights from different classroom, school and district levels;

2. Go beyond cognitive outcomes and consider the effects of non-cognitive factors such as motivation, expectations and beliefs;

3. Focus on the impact of teacher effectiveness on those defined as 'low achievers' and students from minority or disadvantaged backgrounds.

At classroom level, overall teaching quality and expectations are most relevant, while curriculum coverage, instructional approaches and the provision of good quality feedback to students are key components in addressing the educational needs of so-called lower achievers. Structured teaching is particularly efficient for the building of cognitive attainment in basic skills and in working with socio-economically disadvantaged groups. Constructivist approaches, as compared to traditional strategies, are less appropriate for younger, low-attaining and low SES children (Hattie, 2009; Rowe, 2006; Sammons, 2007). Both, however, are useful in specific circumstances and in the correct 'order' (Rowe, 2006): direct instruction, followed by constructivist approaches. However, for maximum impact, a wide repertoire of pedagogic approaches, personalised to meet the needs of individual students and particular cohorts, is required (in Dumont et al, OECD, 2012; Hopkins, 2013). In short, a combination of 'direct' (or instructional) and 'student-oriented' (or constructionist) methods are needed, while an over-reliance on either approach is not recommended (OECD, 2012). This kind of over-reliance on either constructionist (or 'progressive' or 'student-centred') approaches or instructional (or 'traditional' or 'direct') approaches has been a tendency in particular education systems at particular times. However the balance is struck, technology appears to be a significant cognitive resource that may reduce extraneous processing, manage essential processing and foster generative processing (Mayer, 2012).

There is also a need to provide continuous and comprehensive assessment in order to strengthen students' knowledge and meta-cognitive skills. The development of meta-cognition is particularly relevant for closing or narrowing the gap between low and high achievers. Meta-cognitive strategies enhance higher order skills and predict student achievement (effect size: 0.71; Hattie, 2009). Higgins and colleagues (2005) show that the greatest effects were generated by meta-cognitive strategies (d = 0.96), cognitive acceleration (d = 0.61), and instrumental enrichment (d = 0.58), with the greatest effects in mathematics (d = 0.89), science (d = 0.78) and reading (d = 0.48). As Hattie (2009) maintains, "they argued that the development of strategic and reflective thinking is a major goal of schooling" (p. 155).

Moreover, "[such] meta-cognitive skills are especially beneficial for less able students who might otherwise have difficulty monitoring and self-regulating their own learning" (Leithwood et al, 2010, p. 612), while usually teachers narrowly focus on basic skills and knowledge. The crucial role of meta-cognition in closing the gap for students from minority backgrounds emerges from a research review in New Zeeland (Alton-Lee, 2003). In this sense, a "rich curriculum for deep understanding" is required (Leithwood et al, 2010, p. 612). In addition, meta-cognition is beneficial for teachers and students alike: teaching with meta-cognition (reflection on goals, student characteristics, content) and teaching for meta-cognition (Hartman, 2001 in McCormick, 2003).

Appropriate preparation is likely to enhance the ability of the teacher to support the development of students' meta-cognitive processes (Zohar, 1999 and Matanzo and Harris, 1999 in McCormick, 2003). Hence, it can be inferred that possessing a wide repertoire of teaching strategies, extending students' knowledge and promoting meta-cognitive skills, requires research-based teacher education and reflection on professional practice.

Teaching teams and subject-based departments, as the immediate working contexts of teachers in many schools - especially in secondary or high schools where teaching is more likely to be subject-based - often contribute more to differential teacher effectiveness than the schools themselves. Subject inconsistency varies within and between schools and it is larger in secondary schools than primary (Ko and Sammons, 2012). Another critical issue is that differential teacher effectiveness outweighs the effects of differences in class size and heterogeneity (Darling-Hammond, 2000). Quite different positions are noticeable when it comes to the effects of schools. Some researchers indicate a residual effect of structures, organisational patterns or processes (Rowe, 2006). However, while schools have a significant impact on achievement and behaviour, their influence on the social and affective domain at the individual level is less noticeable, although correlations remain significant and positive. In other words, improving students' attainment can improve self-esteem, engagement and attitudes to school and vice-versa.

Analysis of how different school levels (immediate teaching group, classroom, department, whole school) contribute to pupils' achievement reveals a deep interdependence between the cognitive and non-cognitive domains. As Hattie (2009) has showed, a highly predictable variable of student achievement (effect size: 0.72) is the individual teacher's skill in developing interpersonal relationships with students.

The relevance of pedagogical content knowledge is supported by a major meta-analysis (Seidel and Shavelson, 2007), which draws on a cognitive model of teaching and learning (Bolhuis, 2003). The premise is that the execution of 'learning activities' - consisting of teaching acts supporting social interactions, basic processing and domain-specific processing - is most proximal to knowledge building, thus implying a larger effect than other variables. Teaching, as most proximal to the executive processes of learning, is of critical importance, most notably its domain-specific components, that is, pedagogical content knowledge. In fact, "[providing] opportunities for students to engage in domain-specific learning activities was shown to be the component with the highest effect sizes, regardless of domain (reading, mathematics, science), stage of schooling (elementary, secondary), or type of learning outcome (learning processes, motivational–affective, cognitive)" (p. 483).

Finally, researchers have raised the question of whether schools and teachers are equally effective for different groups of students. Thus, major research supports the view that "schools matters most for underprivileged and/or initially low achieving students. Effective or ineffective schools are especially effective or ineffective for these students" (Scheerens and Bosker, 1997 in Sammons, 2007, p. 13). The possibility to add value for the most vulnerable students calls into question the capacity of teachers to act and make a difference with these pupils. This hints not only at the generic effectiveness of teachers, but also at their specific differentiated effectiveness.

Teacher effects are much larger in schools that draw their students from more challenging socio-economic backgrounds. This suggests that the distribution of teacher effectiveness is much more uneven in these schools than in those that draw their students from more advantaged socio-economic backgrounds, or as one group of authors commented, "in low-SES schools, it matters more which teacher a child receives than it does in high-SES schools" (Nye et al., 2004, p. 254 in Hattie, 2009, p. 109). In many countries, in urban and poor rural areas, as well as in minority schools, less qualified teachers are likely to concentrate (Darling-Hammond, 2010).

In brief, research may contribute to a precise diagnosis of effective approaches in various contexts and with diverse students, helping to ensure that teachers acquire a sound pedagogical content knowledge, promoting and extending meta-cognitive skills for all and for lower achieving students in particular. The contribution of professional learning and activity at various school levels, of non-cognitive and of interpersonal variables are key research findings whose endorsement may in turn produce improvement.

Teacher education as a source of expert knowledge

From a broader effectiveness perspective, teachers' pre-existing characteristics, and especially their education, need to be taken into consideration. Darling-Hammond (2000) reports that several aspects of teachers' qualifications are related to student achievement:

1. General academic and verbal ability;
2. Subject matter knowledge;
3. Knowledge about teaching and learning as reflected in teacher education courses or preparation experiences;
4. Teaching experience;
5. The combined set of qualifications measured by teacher certification, which includes most of the preceding factors.

Thus, courses that develop a teacher's subject knowledge and his or her pedagogic understanding and capability (for instance, initial and continuing teacher education programs) provide one source of expert knowledge that is more often gained beyond the school's boundaries, and substantially before qualification. Reflection on practice and the sharing of experience with other professionals, once the teacher is a member of a school community, provide a second source.

Although the role of teacher education as a predictable variable of students' achievement requires further investigation (Hattie, 2007), the research evidence is encouraging. A number of studies (Greenwald, Hedges, and Laine, 1996; Raudenbush, Fotiu, and Cheong, 1999 and Greenberg, Rhodes, Ye, and Stancavage, 2004 in Ingersoll, 2007) report significant relationships between teacher education, certification and student performance at the levels of the individual teacher, the school, the district and the state (Darling-Hammond, 2002). Research reported by Marzano (2003) suggests that "teacher subject-matter knowledge was related to student achievement only up to a certain point" (p. 64), while the relationship between pedagogical knowledge and student achievement appears to be empirically more strongly sustained. In addition, more experienced and traditionally trained teachers performed better than a sub-sample of new teachers possessing content background but little educational training (Darling-Hammond et al, 2001 in Darling-Hammond et al, 2005). This has implications for current debates, in the UK and elsewhere, as to whether teachers need to be formally qualified, and would imply that they do. Recent studies that comparatively and comprehensively investigate teacher qualifications and certification, their attitudes, and their instructional preferences and practices are less conclusive. For instance, a study in Flanders (Boonen, Van Damme and Onghena, 2009) reports that teachers' background has no impact on student achievement in reading and spelling, whereas a significant effect is detected in Mathematics. Conversely, Palardy and Rumberger (2008, in Boonen et al, 2009) found that teacher background in the United States has no effect on Mathematics achievement but that it does have a significant effect on achievement in reading.

However, Hattie's synthesis of over 800 studies suggests that teacher education produces relevant effects on teachers, which in turn may have beneficial consequences for students and school improvement. For instance, Colosimo (1984 in Hattie, 2009) found a quite substantial increase (d = 0.30) in positive attitudes and self-concept amongst new teachers who had been through a teacher education program. In pre-service programs which included interpersonal skills training, Joslin (1980) found that in-service programs were effective in changing teacher achievement, skills and attitudes. Professional development was an effective way in which to improve job performance and satisfaction through increased professional knowledge (d = 1.11), affective feelings and satisfaction (d = 0.85); it has also been found to have a lower but still positive impact on student outcomes (d = 0.47) (Harrison, 1980, in Hattie, 2009). Another study, conducted in New York City, found that teachers who were prepared in formal teacher education programs felt significantly better prepared for virtually all teaching tasks by comparison with those who lacked preparation or who entered teaching through alternative programs (Darling-Hammond, Chung, and Frelow, 2002). For the UK, such findings question the recent opening-up of multiple routes into teaching, a number of which have a much-reduced 'teacher training' input and involve learning 'on the job'.

In this context, a convincing argument about the positive effects of teacher preparation on teachers' professional development and their day-to-day professional practice in schools has been developed by Hattie (2009). Understanding, expectations and disposition to collaborate and challenge traditional points of view, which are also key ingredients leading to capacity building for school improvement, are thus formed:

> *Teacher education programs can do much to build lenses and conceptions that can lead to teachers being prepared for the rigors of the classroom, with classes of 25 or more students and detailed and busy curricula, and being prepared to question their own expectations, appreciating the need to talk with other teachers about teaching, and, most importantly, seeing learning through students' eyes* (p. 111).

Significantly, enhancing the quality of teacher education has proved to be a critical ingredient in the school improvement efforts of the highest-achieving countries across the world. These countries prepare their teachers extensively, pay them well in relation to competing occupations and provide them with lots of time for professional learning. In Finland, Sweden, Norway and the Netherlands, every teacher receives between two and three years of graduate-level preparation before they enter the profession, completely at government expense, including a living stipend. Typically, programs include at least a full year of training in a school connected to the university (Darling-Hammond, 2010).
A research component lies at the heart of some of the best teacher education systems and is directly linked to supporting lower achievers. In Shanghai and in Finland, for instance, "teachers are trained to be action researchers in practice, with the ability to work out ways of ensuring that any student starting to fall behind is helped effectively" (OECD, 2012, p. 14).

This action research may take the form of researching teaching, whether one's own or someone else's, may

be part of in-service teacher education (Ponte, 2002), continuing professional development (Elliot, 2004) or, as in the Finnish case, it may take various forms and be constitutive part of pre-service education:

> *In Finland, research-based teacher education has four characteristics. First, the study programme is structured according to the systematic analysis of education. Second, all teaching is based on research. Third, activities are organised in such a way that students can practise argumentation, decision-making and justification while investigating and solving pedagogical problems. Fourth, students learn academic research skills* (Toom el al, 2010, p. 333).

On the collaborative professional development side, the reported changes in teacher behaviour are significant and include:

1. Greater confidence;

2. An enhanced belief in their power to make a difference to pupils' learning;

3. Greater enthusiasm for collaborative working, despite initial anxieties about classroom observation;

4. A commitment to change practice, coupled with a greater willingness to try new things.

The positive impact on students included enhanced motivation and improvements in performance (Cordingley et al, 2003). Evidence that these 'teacher scholars' gain confidence in their own professional judgement and became more knowledgeable and informed in their discussion of classroom practices due to their greater use of reading and the systematic collection of evidence has been provided by The Best Practice Research Scholarships (Furlong, Salisbury, and Combes, 2003).

In the same vein, Ko and Sammons (2012) argue that effective schools need to:

- Disseminate and study relevant research and inspection evidence on effective teaching practices;
- Encourage evidence-informed teacher collaboration and self-reflection as strategies to enhance effectiveness and achieve consistency across all aspects of learning;
- Encourage monitoring and observation, using appropriate research protocols to support professional learning among teachers, and across subject departments.

In summary, the importance of correctly diagnosing student need and the ability to apply a wide repertoire of appropriate solutions has become part of initial teacher education around the world. To this end, the design of teacher education must be context-specific (Musset, 2010, in OECD, 2012) and should prepare competent teachers for practice in disadvantaged schools. The skills for reflective practice and on-the-job research have come centre stage (OECD, 2011) and, significantly, these are essentially research derived.

TEACHERS AND LEADERS AT THE HEART OF SCHOOL IMPROVEMENT

The need for "a balance shift towards capacity building" (Fullan, 2007)

Those directly engaged in improvement projects in recent decades agree with Fullan that what matters most is strengthening the capacity of teachers, rather than tightening the controls over education; public policy has, in some settings, pulled in the other direction. In other places, new initiatives invest more in well-prepared and well-supported teachers rather than in regulations to direct what they do (see Darling-Hammond, 2010; Hargreaves, 2010).

In any context, school improvement requires teacher learning and development. The wider perspective of the institution in its environment is relevant at the classroom or the departmental level, though teaching itself remains a clear focus. Researchers in this field recognise the overwhelming importance of teacher motivation and commitment to implement reform, while suggesting that accountability measures by themselves are less effective (Leithwood et al, 2002, in Thompson, 2010).

A new vision of change as a top-down, bottom-up and outside-inside dynamic has informed recent large-scale school improvement projects in Alberta, as well as emphasising the centrality of the school context as it exists. This model of change, improvement and transformation draws on the premise that actors from inside can greatly benefit from resources, input and actors from outside. Collaboration, networking and partnership with external institutions and experts helps to drive school improvement, such that the infusion of, and the internal professional stimulation provided by, externally sourced expert knowledge empowers a hitherto disempowered teaching community.

These 'outside' inputs might take the form of accountability measures, such as the introduction of a school inspection regime, and/or a range of more overtly supportive measures, for instance peer-to-peer based partnerships with other schools, advisory support from a local authority or input from a university department of education. On the one hand, inspections have a useful role to play in identifying weaker or failing schools and their need for support (see Sammons, 2007), and a 'poor' inspection can be a catalyst internally and externally in leveraging this support, but critics contend that inspection itself is a crude tool and

that its usefulness is fairly limited to certain situations. On the other hand, a wide range of public and private actors can provide external support. This may take the form of peer-to-peer interaction between district leaders, school leaders, departmental heads or recently qualified teachers or it may involve interaction between departmental leaders, school leaders and district leaders or advisers on a more hierarchical or consultative basis. Typically, such work might take the form of school-based teams of teachers working to drive up effectiveness (one output of which ought to be enhanced student outcomes in terms of examination grades) and external design teams helping with school redesign, ensuring that what is offered is what is required internally (Thomson, 2010).

Empirical and theoretical research clearly links teachers' willingness to embrace change, and to work positively for its implementation, with teacher morale in the setting in which the change is required. This is, of course, difficult; the identification of the need for change, especially if identified through an external and public inspection or through consistently poor examination outcomes for students, can itself sap morale. Conversely, a pre-existing culture of strong research-based teacher preparation and evidence-based practice is more likely to generate innovative visions of teaching and schooling, and better performance across whatever suite of accountability measures exists. Evidence for this relationship is to be found in whole school improvement designs (Hill and Crevola, 1997 in Collins et al, 2012) that highlight the dimension of beliefs and understanding:

> *Unless teachers believe they can make a difference and have a commitment to do so, the impact of the other elements is seriously diminished* (p. 7).

Fullan (2011) strongly argues for the right mix between accountability and capacity building, with the latter in a dominant position in order to foster intrinsic motivation. He draws on the findings in a McKinsey study of 20 strongly improving systems (Mourshed et al, 2010). Improving systems in developing countries tended to have an equal proportion of accountability and capacity-building activities, while in the good and best performing systems in developed countries the percentages accorded to professional learning and accountability were 78% and 22% respectively. He concludes that, even in the worst cases, accountability was a co-equal driver, not a dominant one. In the case of Ontario, the government abolished the paper-and-pencil testing of new teachers, which the profession had seen as punitive, and replaced this with more supportive policies, such as induction programs for new teachers and changes to the performance appraisal framework. As a result, staffing levels have increased, teacher workload has been reduced and preparation time has increased (Levin, 2010).

More broadly, and building on the kind of accountability-support balance argued for here, schools that have overcome obstacles and improved are able to contribute their own knowledge and practice of school improvement (MacBeath et al, 2005 in OECD, 2012) to a wider community of schools. Sometimes, disadvantaged schools embed expertise and practices that are exemplary and from which the whole system can benefit (OECD, 2012).

This kind of analysis has the potential to produce a paradigm shift. It draws on theories of human motivation and decades of experience with school change, and brings to new life the idea of teacher professionalism. This is in line with ideas of democratic and collaborative professionalism (Whitty, 2002, 2006). Increased teacher professionalism based on self-initiated changes, a culture of teacher-inquiry, decentralised relationships with districts and networks with various institutions including universities strongly characterise the Alberta Initiative (Hargreaves et al, 2009):

> *Teachers have acquired new skills as researchers and micro-level policy makers who identify problems in children's learning, collaborate with colleagues to formulate potential solutions and then acquire funding, skills and support to put their professional knowledge to work* (p. 58).

In fact, the AISI project is a case in point of improvement externally stimulated by research and internally balanced through reflection. There is a striking awareness of tight links with university-based researchers:

> *Several districts have collaborated with university faculty at various points in their project cycles and received assistance in designing surveys, studying student achievement data, and modifying assessment practices The requirement to infuse current research into AISI-related projects has sparked considerable connectivity, as each district developed strategies and structures to gather and infuse new thinking into its system* (Sumara and Davies, 2009, p. 49).

This new vision of change, best exemplified by the Alberta and Ontario cases, is effectively captured in the words of one teacher: "We are not a chain of command, but a chain of trust" (Sumara and Davies, 2009, p. 44).

The role of school leaders

It is well established that leaders play a critical role in both pupils' achievement and school improvement more broadly (Day et al, 2000). Effective leadership is distributed, and shared, instruction-focused and supportive of teachers' morale. Leaders set directions (shared visions, high performance expectations), develop

people (individual support, intellectual and emotional stimulation, modelling) and redesign the organization (collaborative cultures and structures, building productive relations with parents and the community) (Leithwood et al, 2004, in Fullan, 2007).

In this analysis, school leaders are crucial for shaping 'trust in schools', which has a dramatic influence, both direct and indirect, on the effectiveness of the school (Bryk and Schneider, 2002). In addition, McLaughlin and Talbert (2006, in Fullan, 2007) find that the quality of leadership at the departmental and/or school level accounts for a significant part of the differences between schools, and between departments within schools. They show that leaders are in a strategic position to promote or inhibit the development of the kind teacher learning communities in which improvement initiatives thrive. A recent OECD (2012) report states that, "school leadership is the starting point for the transformation of low-performing (and) disadvantaged schools" (p. 146).

Taking this a step further, leaders are key to both closing the gap and enhancing a culture of research. Three inter-connected modes of enquiry-minded leadership for school improvement have been distinguished (Stoll, Bolam and Collarbone, 2002 in Stoll et al, 2006):

1. Promoting research and evaluation across the school, in departments and by individual classroom teachers;

2. Adopting a more systematic approach to collecting, analysing and using data and evidence in the course of on-going work, for example, students' examination results, value-added data and external school inspection reports;

3. Seeking out and using relevant and practical research, generated and produced by external researchers.

The prominence now given to data in publicly funded education systems has further underlined the significance of the leader's role. Recent work has focused on the role of school leaders in helping to determine what information is considered worth talking about in the first place (Seashore-Louis, 2010). In synthesis, school leadership is crucial to school improvement and particularly relevant for the transformation of low performing disadvantaged schools (OECD, 2012).

RESEARCH AS A PILLAR OF SCHOOL IMPROVEMENT

During the 1990s, the idea of the school as a research institution, in itself, gained considerable currency. This notion of the school as research-hub (and students and teachers as researchers) was closely aligned with concurrently emerging ideas about schools as self-improving institutions. School improvement was closely tied to teachers' professional development and against this backdrop teachers' (and, in some settings, students') research was actively promoted as facilitating school improvement. The emergence of a community of Professional Development Schools in the USA provided one expression of this approach. These schools combined the use of academic research with the creation of 'data-rich' environments in which self-evaluation thrived and teachers acted as action researchers and research leaders, involving students and other members of the school community in the investigative and analytical processes.

A necessary teacher and school inquiry element is essential for both teachers' professional learning and for school improvement, one feeding the other in a virtuous feedback loop, while providing a series of outcomes or incidences that spur teacher reflection. The empirical evidence is clear; the argument put forward in the 1970s by Stenhouse still holds: school and teacher practice can only be improved if teachers are actively and collectively engaged in the investigation of problems and produce local and specific solutions (Collins et al, 2012; Hargreaves and Fullan, 2012; Hopkins, 2013).

What kind of research is most likely to impact on teaching practice? In a significant study, Cousins and Leithwood (1993) conclude that genuine and whole school improvement takes place when practitioners share useful information. They also argue that teachers should be involved in the design, delivery and follow-up activities associated with the school improvement project. Why? Because the source of information is a key factor in the use of research findings. Following their analysis, a particular role is now assigned to evidence-based and tested practice as one of the main sources of improvement interventions. The capacity for learning at local level is linked to changes at system level through collaboration, networking and systemic improvement (Mourshed et al, 2010; Fullan, 2007, 2011). Of course, in reality, the ability of teachers to enquire in this way, and to build their commitment to proposed changes as a result, is linked to the availability of the necessary time to explore options, to plan, trial and reflect. The provision of teacher time may require additional funding and organisational provisions. Organisational measures are in place in Boston, Japan and Finland, where teachers are given time for joint planning and analysis of teaching practices (Mourshed et al, 2010), but this is not the case in many settings, including the UK.

With regard to the use of data and research, Ontario is a case in point (Levin, 2010). The Ontario Plan emphasizes policies and practices that are supported by research evidence while encouraging schools and districts to use their own data and action research as well as the broader research literature to inform their

work. In this context, a provincial education research strategy was developed, one which involved:

1. Contracting universities to write short 'what works' papers for schools;

2. Commissioning external evaluations of the strategies adopted;

3. Supporting schools and districts in improving their grasp and use of data, so as to guide their own improvement plans, through a specific data-use sub-strategy.

The Student Success Strategy, initiated in 2005, has had a substantial impact on teaching practices and on students' results. Students' test scores have improved markedly and a range of indicators relating to high school improvement also reveal positive read-outs (Levin, 2010).

In Alberta, the AISI project revealed that the value of knowledge for innovation was highly contextual. Moreover, teachers and school leaders acted as coordinators at different levels, collecting and disseminating research-based practices. Ongoing efforts to collaborate with universities and other external partners were revealed as being essential to gathering knowledge about teaching, learning, and instructional improvement. AISI coordinators shared information and planned meetings or workshops for teachers, schools and their partners to build dialogue, share experience and collaborate on future activity (Foster, Wright and McRae, 2008).

Improvement stimulated by outside interventions - for instance, through a specific research-input or partnership - can have a vital impact on school improvement, but it requires (1) that a range of organisational provisions are made and (2) that forms of social capital - such as collaboration, networking and knowledge sharing – are in place. Finally, the intervention needs to be specifically designed and targeted and those involved, including policy-makers who might be observing the process, need to be aware that any outcomes are always contextual in nature.

CONCLUSIONS

As an OECD (2012) study notes, highly competent teachers can have strongly positive effects on student performance, closing the achievement gap between disadvantaged and advantaged students. Moreover, some countries - for instance, Finland and South Korea – are successful in this respect, managing to combine equity and high performance for all.

The research evidence on improvement projects presented here clearly demonstrates the links between teacher effectiveness and school improvement and the particular roles played by teacher education and research knowledge. Teachers are the main actors in their classrooms and promote the learning processes engaged in therein; outcomes are always at their most pertinent for those pupils or students most at risk of low achievement. At the same time, teachers act collaboratively at school level and have the potential to greatly transform outcomes, by building bridges between classrooms and departments, and by engaging as (and with) leaders and researchers. The role played by research is to guarantee a horizon of expert knowledge and professional habits that might make a difference in the working contexts that the teachers inhabit.
Three themes have permeated this paper:

A. The importance of teacher education and teaching quality - especially to those young people who are defined as low achievers or who are from disadvantaged or minority communities or who attend 'struggling' schools;

B. The physical capacity and other pre-conditions that need to be in place if school improvement is to take place;

C. The role of internally generated and externally sourced research in informing the objectives and processes of school improvement.

From the assessment of the literature offered here, we can conclude that:

1. *Teacher quality is vital if disadvantaged students are to succeed and disadvantaged schools are to progress and this is intrinsically linked to the quality of initial and continuing teacher education programs* (OECD, 2012). Teacher education in all its forms is a major component in the creation of a high-quality teaching force, with relevant research reviews underlining its effects, both on students and on teachers. Teachers' gains are cognitive, attitudinal, self-conceptual and interpersonal in their relationships with their students. Content knowledge and pedagogical preparation needs to be integrated with strong research competencies and focused on preparation for those deemed to be lower achievers in disadvantaged schools;

2. *Delivering school improvement depends on having the capacity to improve in place, creating an environment where teacher (and student) morale is high and where there are positive teacher incentives to engage in the change process.* School leaders are key actors in all of this. They provide instruction and set out vision, stimulate a positive school culture and act as mediators and stimulators in the process of research production. Low performing and

disadvantaged schools improve by getting their staff to improve, training them according to school-specific needs and applying the lessons from school-pertinent research. Schools that emerge positively from such challenges are likely to hold exemplary expertise from which the whole system might benefit.

3. *Research, be this delivered or stimulated by external interventions or through on-site collaborative inquiry processes, can make a vital contribution to ensuring effective teaching and learning processes are in place and in building capacity for whole school improvement.* The greatest beneficiaries of this kind of 'research-rich' approach are likely to be those who are defined as lower achievers and those in marginalised communities. Engagement in the research process is indispensable for securing teachers' morale and in building their professionalism. Finally, such research fuels the wider school improvement process, one that is heavily dependent on the human and social capital in all its forms.

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This paper has been commissioned as part of a major Inquiry undertaken by BERA and the RSA on the role of research and teacher education. The Inquiry aims to shape debate, inform policy and influence practice by investigating the contribution of research in teacher education and examining the potential benefits of research-based skills and knowledge for improving school performance and student outcomes.

To investigate the contribution that research can make to teacher education, seven academic papers have been commissioned from experts in the relevant fields: international and UK policy and practice on teacher education; philosophical reflections on the nature of teachers' professional learning; innovative programmes of initial teacher education based on the model of research-informed 'clinical practice'; the role of research in effective continuing professional development (CPD); the impact of research-based teaching on school improvement and student outcomes; and research engagement from the teacher's perspective.

Further information on the Inquiry and its other outputs can be found via the BERA website: www.bera.ac.uk