Teachers’ engagement with published research: addressing the knowledge problem

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Despite the increased interest in research impact, there is very little empirical evidence that educational research can inform practice directly, and furthermore, a body of literature which suggests that this is, in principle, impossible. This paper reports on a study in which secondary school teachers were given research findings about teaching gifted and talented students, and were supported, over a 12-month period, to incorporate findings into action research projects of their own devising. A theoretical framework from the research literature was used to investigate the process by which knowledge generated from research, was transformed into teachers’ pedagogical knowledge, thereby influencing the curriculum, pedagogy and provision for these students. Evidence suggests that teachers transformed propositional knowledge into practical knowledge by developing their conceptual understandings; they transformed abstract, impersonal knowledge into context-specific, personal knowledge by using cases from their previous experiences, and they transformed narrowly focused knowledge into broadly focused knowledge by imaginatively diffusing it into areas beyond those in the original research. Implications for research and practice are discussed.

Keywords: knowledge; educational research; practitioner research; secondary schools; teacher learning

Introduction

There is renewed interest internationally, in the use of research evidence to improve public policy and practice, including in schools. In England, interest in this issue is intense. Among other initiatives, the educational arm of the publicly funded What Works Network (www.gov.uk/what-works-network) has been awarded £135 million over a 10-year period, to carry out educational interventions and test them with randomised controlled trials (RCTs). These trials currently involve 630,000 pupils in 4500 schools (Cabinet Office, 2014, p. 14). Furthermore, schoolteachers are
demonstrating enthusiasm for the idea that research could improve their practice. Meta-analyses of educational research (e.g. Hattie, 2008) are growing in sales and influence, whilst a teacher-led movement called ‘ResearchEd’, coordinated by the teacher and journalist Tom Bennett, is connecting teachers with research through conferences and online conversations. This enthusiasm is not restricted to a few: a large-scale survey of teachers in England found that 33% had undertaken research and enquiry to improve their practice, and 8% were studying for postgraduate qualifications which include engagement with research (Poet, Rudd, & Kelly, 2010).

At the same time, access to research is becoming easier. Open access policies ensure that more research papers appear on the internet and that these are accessed by more people than previously (Antelman, 2004). There is pressure on universities to pay attention to how their research is used; in England, university departments are required to submit accounts of the ‘impact’ of their research, defined as ‘an effect on, change or benefit to the economy, society, culture, public policy or services ... beyond academia’ (HEFCE, 2011, p. 48). The ‘impact’ agenda has led to more practitioner-friendly presentations of educational research. In England, these include British Educational Research Association’s (BERA) Insights and Briefings (www.bera.ac.uk/promoting-educational-research/insights-and-briefings), the EEF’s Toolkit (http://educationendowmentfoundation.org.uk/toolkit), the Institute of Education’s Evidence Library (http://eppi.ioe.ac.uk/cms) and York University’s Best Evidence in Brief (www.york.ac.uk/iee/news/beib).

Taken together, the policy commitment, the enthusiasm of teachers and the greater ease of access to research seem to promise an end to the oft-lamented gap between research and practice in education (e.g. Goldacre, 2013; Hargreaves, 1996). Enthusiasm for research also implies a view of teaching as an intellectual activity, rather than only a ‘craft’ (e.g. Winch, Oancea, & Orchard, 2014). However, there is very little empirical evidence that educational research can inform practice in any direct way, and furthermore, a body of literature which suggests that this is, in principle, impossible. This paper explores the arguments around this topic and presents findings from an empirical study into teachers’ use of research evidence in an English Secondary school. The overarching research question is, ‘How can educational research impact on teachers’ thinking and practice?’

The literature
A sizeable literature discusses what is sometimes called ‘Knowledge Mobilisation’. In some quarters, there is an almost evangelical zeal for research-informed practice:
No one would think of getting to the Moon or of wiping out a disease without research. Likewise, one cannot expect reform efforts in education to have significant effects without research-based knowledge to guide them. (Shavelson & Towne, 2002, p. 1)

By collecting better evidence about what works best, and establishing a culture where this evidence is used as a matter of routine, we can improve outcomes for children, and increase professional independence. (Goldacre, 2013, p. 7)

Academics, however, raise questions about whether research evidence can inform educational practice. These cohere around several themes:

(1) whether the ‘medical model’ of evidence-based practice – the one most often cited by enthusiasts – can be applied to education (Biesta, 2007; Hammersley, 1997; Slavin, 2002);
(2) whether the research methods that are most often cited by enthusiasts – chiefly RCTs – are appropriate or sufficient (Morrison, 2001; Slavin, 2002; 2008; Torgerson & Torgerson, 2001);
(3) what motivates educators to implement research – whether financial inducements, legislation, change agents or opinion leaders are necessary or sufficient (Bolam, 1994; Hemsley-Brown & Sharp, 2003; Nutley, Walter, & Davies, 2003; Wikeley, 1998);
(4) who is best placed to support the implementation of research findings – researchers, teachers, school leaders or local authorities (Hemsley-Brown & Sharp, 2003; Nutley et al., 2003);
(5) the roles of research producers, users and intermediary organisations (Levin, 2013; Sharples, 2013);
(6) what activities best lead to research-informed practice – CPD, action research or other interventions (Nutley et al., 2003);
(7) whether research-generated knowledge can, in principle, be implemented in practice (Biesta, 2007; 2010; Hammersley, 1997).

The final theme is of fundamental importance because, if research-generated knowledge cannot, in principle, be implemented in practice, the other themes are rendered irrelevant. It is also under-researched: Nelson and O’Beirne (2014) lament that ‘the research base on evidence use within the teaching profession is incredibly scant’ (p. viii), while Levin (2013) notes:

There are many works analyzing situations, decrying weaknesses or proposing actions, but not nearly as much careful evidence on how and why research evidence is actually used in practice . . . The irony has been noted more than once that the debate over the use of research is itself not well informed by research. (Levin, 2013, p. 4)
The knowledge problem

An important issue is that there is little overlap between the types of knowledge generated by research, and those which are needed in teaching. ‘Research’ is a broad term, embracing a huge variety of paradigms, methodologies and methods, all of which change over time; therefore, it is hard to make meaningful generalisations about it. However, inasmuch as meaningful generalisations are possible, research-generated knowledge is said to differ from practitioner knowledge in several respects.

From the research side of the divide, researchers seldom undertake studies specifically in order to inform practice, although, of course, there are exceptions including evaluation research, action research and RCTs of educational interventions. What researchers seek rather is deep understanding of matters which have theoretical value, such as the ways in which power is configured in educational transactions. To a large extent, research is about research; it is a form of enquiry which pursues knowledge in order to develop theory, and it is judged by the standards of the academic community (Hammersley, 2002). On the other side of the divide, research evidence is only one source of information for teachers; it must fight for attention with knowledge from students, parents, colleagues and line managers, local and national policy and inspection bodies, news and electronic media, knowledge that is embedded in teaching resources and texts, and the body of knowledge that comes from the considerable experience that most teachers have of teaching and being taught. Levin (2013) reminds us that teachers are not alone in this respect because ‘practitioners in every field give greater weight to the views of their colleagues and their interpretations of their own experience than they do to research evidence’ (Levin, 2013, p. 12). Furthermore, classroom teaching is fundamentally interpersonal, occurring within social contexts; it is a matter of personal values, not only scientifically proven techniques (McIntyre, 2005). Education, therefore, cannot be based on research; there is too little overlap between what education needs, and research provides. The question is, whether research can contribute to educational practice at all.

This question is not new. As Dewey (1929) recognised, educational means and ends are contingent on each other; therefore, teaching is not a matter of selecting the most effective means, however, well-researched, to achieve ‘given’ educational ends. He provided an example from learning to read: research might discover the most effective means for teaching reading ‘in its narrower sense of ability to recognise, pronounce and put together words’ but the most effective means might not develop a taste for reading which is ‘the more important issue’ (Dewey, 1929, pp. 61–62). No teacher, he implied, would use the most effective means if this led to children, disliking reading. (One of the ironies of the current political
enthusiasm for evidence-based practice is that teachers in England are required to use a particular, research-informed approach to teaching reading, regardless of how this affects their students’ attitudes to reading. Dewey (1929) remarked that teachers went to research, hoping to find ‘recipes’. He noted a tendency to convert research findings into ‘directions and rules’ for teaching, saying, ‘Results tend to be directly grabbed, as it were, and put into operation by teachers’ (Dewey, 1929, p. 18). He insisted that research findings should not be seen in this way because they acquire meaning only when they are linked to other findings and integrated into a coherent educational theory, and because education is always a more wide-ranging and complex endeavour than research, which is necessarily focused on relatively narrow questions.

Much contemporary writing on this matter echoes Dewey (1929). In an article entitled The Myth of Research-Based Practice, Hammersley (2005) argues that at best, research can provide only information to practitioners, who must also rely on their own experience and judgement, informed by their own values, to make decisions as teachers. He also argues that research findings are fallible and that what researchers consider to be well-founded knowledge (accumulated slowly and logically, with an attitude of principled scepticism) is quite different from practitioners’ views of well-founded knowledge (up to date and practical, capable of being implemented instantly). Echoing Dewey (1929), he says that research findings are often too complex to inform teachers’ actions because research deals with particular, isolated issues in depth:

[Research] often shows that the world is more complicated than practitioners think it is, that widely held stereotypes are false or only true in a very approximate way, that assumed causal relationships are more contingent than often supposed, and so on. (p. 324)

Biesta (2007, 2010) concurs with Dewey’s (1929) view that the evidence-based argument is underpinned by an inadequate worldview that sees education as a technical matter of achieving given ends. This view, he claims, seriously underrates the importance of values, so research that shows only ‘what works’ is an inadequate basis for understanding educational practice, which is fundamentally moral, not merely technical. Biesta (2010) further argues that a transactional epistemology, through which we gain knowledge of the world by acting on it, can show only what has happened in the past, not what might happen in the future, which means that, ‘there is always – structurally, not pragmatically – a gap between the knowledge we have and the situations in which we have to act’ (p. 496). This view is amplified by McIntyre (2005) who sees research and practice involve ‘sharply contrasting kinds of knowledge’ (p. 359). Whereas research generates propositional knowledge, teachers need ‘knowledge of
how to do things . . . with primary concern being focused on the usability and usefulness of the knowledge’ (p. 359). Research knowledge is ‘abstract and theoretical or in some other way generalised’, whereas teaching occurs in highly specific contexts. This means:

While some kinds of research may pretend to offer recipes for teaching, even beginning teachers quickly learn that recipes do not generally work in teaching. What works for one teacher, or in one school, or with one class, or on one occasion, very likely will not work for another. (p. 359)

McIntyre (2005) also points out that the impersonal nature of research knowledge is quite different from the personal nature of teaching, where ‘it is overwhelmingly on themselves as people, with all their diverse personalities and ways of thinking, that teachers primarily have to depend’ (p. 360). He sees research-generated knowledge as generalised, propositional knowledge; abstract and theoretical; evaluated for its clarity, coherence and validity; it is narrowly focused and generated by rigorous and rational thinking. In contrast, pedagogical knowledge is ‘such as to enable [teachers] to address the context-specific and indeed unique characteristics of every class, pupil, lesson and situation with which they have to deal’ (p. 359). It is ‘knowledge of how to do things’; it is capable of being applied to complex, multidimensional and unpredictable situations.

To summarise: research-generated knowledge is propositional, generalised and impersonal; it is narrowly focused. Accumulated slowly with an attitude of principled scepticism, it is assessed by the academic community. Pedagogical knowledge is practical, specific and personal, with a broad focus. It is largely tacit and intimately bound up with values (see Figure 1). This means:

. . . research can never tell teachers what to do. Indeed, given the complexity of classrooms, it seems likely that the positivist dream of an effective theory of teacher action—which would spell out the ‘best’ course of action given certain conditions—is not just difficult and a long way off, but impossible in principle. (Wiliam, Lee, Harrison, & Black, 2004, p. 51)

The knowledge problem: some solutions

How might research impact on practice, indirectly? For some, this occurs through educational programmes, based on research (e.g. Fixsen, Blase, Metz, & Van Dyke, 2013). In this view, teachers teach research-informed programmes without necessarily knowing the details of the underpinning research. However, for most of the authors reviewed here, the influence of research on practice occurs through the ‘enlightenment’ of teachers. For Dewey (1929), research can provide intellectual tools or principles (Dewey called them ‘laws’) which, once embedded in the minds, hearts and hands
of educators, generate hypotheses that inform their ideas, planning, 
observations and judgements, so as to make the educational process ‘more enlightened, more humane, more truly educational than it was before’ (Dewey, 1929, p. 76). Biesta (2007) concurs, suggesting that research has a ‘cultural’ role by providing theoretical lenses that enable practitioners to understand problems and ‘to see problems where we did not see them before’ (Biesta, 2007, p. 19).

Hammersley (2002) distinguishes between a ‘strong enlightenment’ view, in which research provides ‘a comprehensive worldview that should govern practice’ (p. 40) and a ‘moderate enlightenment’ (or ‘cognitive resources’) view which recognises ‘the fallibilistic and qualified nature’ of research (p. 50). In this view, teachers select the research that they find relevant to their work, interpreting and employing it within their own context. Hammersley (2002) dismisses the ‘strong enlightenment’ view as having the same problems as the view that research influences practice directly, and argues that the latter view is preferable because it is more congruent with the actual relationship between research and teaching.

Winch et al. (2014) point out that teachers’ professional knowledge is not only practical; rather, it includes elements of, (1) craft knowledge which is situational and largely tacit, (2) technical know-how which is universal and precise, and (3) the knowledge that is gained through critical reflection and enables wise judgments. Research can contribute to each aspect of professional knowledge by providing, inter alia, (1) new, well-founded ideas which can challenge habitual ways of working; (2) ‘warrants for action, reference points for decisions and practical toolboxes’, and (3) concepts that deepen reflection, enriching ‘the ways in which practitioners discern the salient features, frame concrete problems, and challenge and authenticate their unfolding understanding’ (p. 6).

Figure 1. A summary of different types of knowledge (Biesta, 2007, 2010; Dewey, 1929; Hammersley, 2005; McIntyre, 2005).
McIntyre (2005) frames the matter differently; he argues that the knowledge generated by research, and teachers’ pedagogical knowledge, stand at the opposite ends of a continuum of types of knowledge about teaching and learning in the classroom:

1. craft knowledge for classroom teaching,
2. articulation of craft knowledge,
3. deliberative or reflective thinking for classroom teaching,
4. classroom action research,
5. knowledge generated by research schools and networks,
6. practical suggestions for teaching based on research,
7. reviews of research on particular themes, and
8. research findings and conclusions (McIntyre, 2005, p. 361).

He suggests that dialogue between the extreme ends of the continuum is possible if there is movement along the continuum. Such dialogue would involve teachers reviewing their pedagogical knowledge in the light of research, the limitations of one being exposed by the merits of the other. It could occur mentally, as ‘armchair theorising’ or in actual conversation between teachers and researchers. Classroom action research is seen as creating an ideal space for such dialogue.

These are different, possibly competing, explanations of how research can influence practice, indirectly. None has been tested empirically and crucially, none explains how research knowledge is actually changed into knowledge that is usable in practice. Together, they formed a theoretical framework for investigating this issue.

**Empirical studies**

The empirical literature around knowledge mobilisation in schools is thin: a small corpus of work investigates how teachers understand research and a handful of studies examine how they implement research findings. In the first category, Zeuli (1994) investigated how 13 teachers read and understood educational research reports. Some held a ‘narrow’ view, understanding research as necessarily quantitative; others included qualitative, historical and philosophical work in their view of research, while others were not clear as to what constituted research. When reading research reports, some focused on the findings, expecting these to have a direct impact (or not) on practice, while those with a more sophisticated understanding of research, including some with a ‘narrow’ view of research, focused also on research concepts and processes, expecting research to have an indirect impact, in which, ‘the value of research is to help raise questions about their teaching and offer analytic frameworks with which they can better understand their work’ (p. 41). Teachers
tended to relate research to their own beliefs about teaching but most did not evaluate research findings by weighing up the evidence used to support them. More recently, Borg’s (2009) survey of 505 English language teachers in 13 countries found that the majority associated research with large-scale, quantitative studies. Only 15% claimed to read research regularly; reasons for not reading research included a belief that research is irrelevant to practice. Similarly, Hagger, Burn, Mutton, and Brindley (2008) interviewing 36 student teachers, found that less than 1% of their learning to teach could be attributed to reading research or professional literature, whilst the vast majority of their learning was attributed to personal experience.

In the second category, the most comprehensive account of teachers implementing research findings is probably Black, Harrison, Lee, and Marshall (2003) (also reported in Black & Wiliam, 2003; Wiliam et al., 2004). This describes a study in which the researchers led a Professional Development programme with 24 teachers in six schools in England. The teachers were presented with research findings relating to formative assessment (e.g. Black & Wiliam, 1998) and supported, individually and collectively, over 11.5 days, in planning and implementing their own interventions based on the research. In order to evaluate the teachers’ use of these findings, their students were tested and the test results were compared with at least one comparison group (typically either an equivalent class taught in the previous year by the same teacher, or a parallel class taught by another teacher). The mean effect size was 0.34 in favour of the intervention, although the authors urge caution in interpreting the results. Relevant to the present study, Black et al. (2003) noted that teachers had varying approaches to research findings: some appeared to focus on the presumed causal effects of individual variables, whilst others used many variables ‘to explain the complexities and nuances of a classroom environment’ (p. 49) – a finding that resonates with Zeuli (1994). A separate study into teachers’ use of formative assessment found that, although many teachers used the surface procedures described in the research, few did so in ways that enabled pupils to learn how to learn, i.e. to become more autonomous learners. Of the 27 lessons observed in the research, ‘Only about a fifth ... appeared to capture what might be called the ‘spirit’ of AfL’ (Marshall & Drummond, 2006, p. 137). These teachers understood the underlying principles to emerge from the research, rather than simply applying research-generated techniques.

Overall, the picture that emerges from this literature is complex. Despite the evidence that many teachers deny the influence of research on their practice (Borg, 2009; Hagger et al., 2008), some teachers have demonstrated research impact in their practice, albeit through substantial CPD (Black et al., 2003). There are suggestions that impact depends, at least in part, on how teachers understand research – narrowly or broadly – and
the type of impact they expect — direct or indirect (Zeuli, 1994). Given the difference between research knowledge and pedagogical knowledge, the question remains: how does the first contribute to the second; what is the process of transformation?

Methods

The study was set within the broad theoretical framework of social realism, which assumes that knowledge claims can be justified by the extent to which they accord with an external reality, are internally consistent and emerge from, and are located in, established traditions of codes and practices (e.g. Young, 2007). In this framework, what counts as knowledge is socially determined according to established processes, which implies that research knowledge is more robust than ‘common sense’. The research question (‘How can educational research impact on teachers and teaching?’) implied giving teachers research texts, inviting them to use these to inform projects of their own making and inquiring into how they used the texts. This approach meant that ‘research knowledge’ in the published reports could be compared with teachers’ pedagogical knowledge, expressed in the data, allowing the process of knowledge transformation to be examined.

The research took place in ‘Hilltown High’, a large secondary school on the edge of an industrial town in the North of England. Its head teacher perceived the need to improve provision for her most able students, many of whom were not achieving the expected academic standards. She intended to pursue this aim by means of teachers’ action research projects, coordinated internally by a member of the school’s senior leadership, with my support. She recruited eight volunteers to join the project — one teacher from each of the school’s faculties — with the expectation that they would read research articles that I provided for them and, bearing in mind what they had read, would design and carry out their own action research projects (Elliot, 1991; McNiff, 2013). The intervention accorded with approaches to research dissemination, thought worthwhile in the literature (e.g. Hemsley-Brown & Sharp, 2003; Nutley et al., 2003): dedicated time was set aside; there was dialogue between a researcher (myself) and practitioners; the teachers designed their own projects, within the agreed focus; they researched their own practice; the school’s coordinator acted as a ‘change agent’ and project teachers were positioned as ‘opinion leaders’ in their schools.

Research around teaching gifted and talented (G&T) students was presented in the form of three journal articles, thought to be accessible to practitioners: Berlin (2009), Rogers (2007) and Tomlinson (2005). Between them, the texts present three types of knowledge identified by McIntyre (2005): Berlin (2009) is a report of an empirical study; Tomlinson (2005) is
a review of research, whilst Rogers (2007) is a literature review, expressly
designed to inform practice. Taken together, their content includes find-
ings about G&T children and their educational needs, the perceptions of
students who are labelled as G&T and the types of curriculum, pedagogy
and groupings that are appropriate for them.

The study followed BERA’s (2011) ethical guidelines; participants
were informed of my research aims and consented to participate. They
were informed of the likelihood of publication and were offered anonym-
ity and the opportunity to question, comment on and withdraw from the
research. G&T is not one of my research interests (although classroom
action research is) and I had no personal or professional interest in pro-
moting the research per se.

The teachers’ action research projects focused on improving their abil-
ity to challenge appropriately, their G&T students. Some set up extracur-
ricular clubs for G&T students and others incorporated additional
activities into classroom lessons. One teacher provided an online activity
that students could access from home and one arranged for his G&T stu-
dents to coach moderately able students. My role was to introduce them
to research around teaching G&T students and to support their enquiries
through monthly meeting at which I prompted discussion, chiefly by ask-
ing questions about their projects and their use of research evidence.

The teachers were interviewed individually twice during the project.
Interviews were audio-recorded and transcribed. At the conclusion of the
research, teachers wrote brief descriptions of their projects; these were
published internally by the school and also formed part of the research
data, along with my field notes of our monthly meetings and two of the
projects which I observed at first-hand. Themes were generated from the
data and traced back to the journal articles; applying the same coding
scheme to all the data enabled comparison of the research reports with
the empirical data (see Table 1 for an example.) In total, these included

- field notes from 8 selection interviews and 11 monthly meetings,
- 17 individual interview transcriptions (each c.30 minutes),
- teachers’ written reports of their projects,
- observations of pupils’ work in two projects.

Findings
Perhaps, the most significant finding is that every teacher in the study
claimed that the research papers had influenced their thinking and prac-
tice. The influence on practice was seen in three main areas: provision
(e.g. after school clubs for G&T students); curriculum (in the shape of a
broader or more demanding curriculum for these students) and pedagogy
(especially grouping G&T students together in the expectation that they
would challenge each other). Although some claims to use research could
be seen as ‘strategic’ (Cain, in press), others were corroborated with evidence of changed thinking and practice. These teachers transformed research knowledge into pedagogical knowledge largely by testing it against their own experiences of teaching, mentally considering the knowledge from research in the light of personal, previous experiences. Three particular types of thinking enabled this transformation, each of which is explored as follows.

Propositional, theoretical knowledge was transformed into procedural and practical knowledge through the development of concepts, common to both

The process of transforming propositional, theoretical knowledge into practical knowledge was not straightforward. For example, the finding that G&T students, ‘... need some opportunities, too, to work independently to fully develop their demonstrated talents’ (Rogers, 2007, p. 382) was not realised by simply designing independent activities for G&T students. Independent activities had to be perceived as sufficiently satisfying to capture the commitment of students, sufficiently challenging to generate new learning (but sufficiently easy to be completed independently) related to the curriculum and assessable. Once designed, such activities had to be resourced appropriately with adequate time and space, minimising disruption to the rest of the class. How G&T students were to work independently, where, for how long and how ‘independently’ was conceptualised, were decided by teachers, apparently on a case-by-case basis. Teachers also discussed balancing the general desirability for G&T

| Theme        | Research papers                                                                 | Interview data                                                                                                                                                                                                 |
|--------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Challenge    | Gifted and talented learners need daily challenge in their specific areas of talent ... consistent practice at progressively more difficult levels in skill, coupled with the talented learner’s natural ability to link new knowledge to prior knowledge and skill, accounts for what ultimately is perceived as expert performance ... [there is a] rise in psychological distress (existential depression), stress, and boredom when these individuals cannot ‘move forward’ — either individually or in socialized situations — in their area of talent. (Berlin, 2009, pp. 382–383) | When you’ve got 30 kids in the class, you have a tendency, with your gifted students, to just let them get on, and leave them to it, and offer your support to the students with different needs in the class. It’s become quite evident to me that they need quite a lot of instruction, to be challenged and to push them to the next level. (Head of Art & Technology) You can’t say, ‘go and do that’. You’ve still got to support. It’s gradual steps, but those steps will be bigger than the less able. If you give them too open-ended a challenge you’ve lost them and they’re just wandering around. (Mathematics teacher) |
students to work independently, with the anticipated social consequences of separating these students from the class. Unsurprisingly, two teachers tried incorporating such activities into timetabled lessons and ended up scheduling them in the lunch break or after school.

In transforming research knowledge into practical actions, the teachers used a variety of concepts from the papers to develop their own understanding of G&T students, both as individuals and as an identifiable group. For example, from seeing these students as essentially privileged (with ‘gifts’ or ‘talents’), they moved to a position of seeing some of these students as also not necessarily adapting well to school, sometimes bored, insufficiently challenged and, although probably having a passion for their particular area of expertise, unwilling to present themselves as able, for fear of peer pressure. In discussion, they explored how research findings were applicable to their school: how students find it generally acceptable to be seen as G&T in some (mainly practical) subjects but not others; how girls can feel comfortable to be seen as G&T in some subjects where boys cannot; how students do not necessarily like their achievements to be publicly recognised (e.g. in school assemblies). Developments in their conceptual knowledge occurred through questioning their own practice in the light of research findings:

In classes where G&T students aren’t really showing their true colours, I’ve been trying to think about, ‘why is that? Is that because they’re finding it too easy? Is it boring? Do they think, ‘well, I can do this in five minutes so why am I bothering to do it now?’ (History teacher)

Some of the G&T students identified, do in some ways want to be under the radar because of the negative social stigma ... I think I was aware of the possibilities before the research, it was just an awareness and kind of, “Oh, I wonder if it is the case?” Doing this [the project] and speaking to the other members of the project, and reading these articles, it has become more apparent. What has been researched, I have been able to see. (RS teacher)

Similarly, the teachers developed their conceptions of challenge for G&T students. At first, challenge was seen in terms of providing what the teachers called ‘extension tasks’ for the G&T students — additional tasks, dealing with the same curricular content as in the lessons. Engagement with the research helped them to see challenge in terms of providing different types of tasks:

We’ve all been guilty in the past of saying, “you can have harder questions, you can do this” or, “why don’t you just partner up with them and help them with questions you’ve already answered?” That’s not effective but sometimes, I think people aren’t really aware that that’s not effective. (Head of Media)
The nature of challenge varied from subject to subject. The Mathematics teacher linked challenge to questions from higher level examinations, whereas, for the Media teacher, prompted by Tomlinson (2005), challenge meant moving beyond examination requirements. The Arts teacher interpreted challenge in terms of providing G&T students with a broader understanding of the cultural aspects of art and the Science teacher interpreted challenge in terms of philosophical thinking:

What I’ve been interested in recently is the link between that and higher order questioning, and levels of demand not being, “this question is harder than that one” but more deep learning into areas of philosophy so they are beginning to generate their own deeper thinking ... rather than being given tasks to do. (Head of Science)

For some teachers, their conceptual development was prompted mainly by their own reflection, their action research projects and discussion with their colleagues. Others cited the influence of research findings:

You tend to get stuck in the same routine, thinking the same things. Even stuff [research] that, you read it and you go, “I know that”, it refreshes your memory and makes you think, “I do know it but do I apply anything of it? Maybe not”. (History teacher)

I think you can’t always quote what’s in the research but subconsciously, you start executing it. (Mathematics teacher)

These conceptual developments included changes of awareness, attitudes and intentions. Teachers’ awareness was changed as the research prompted them to examine aspects of school life that they had not previously considered (e.g. peer pressure not to show ability; the nature of ‘extension tasks’). Their attitudes towards G&T students changed as they came to know them better, and their intentions changed as they decided on appropriate ways to group or to challenge their students. As far as I can tell, changes of awareness, attitudes and intentions contributed to conceptual changes, and vice versa and together, these influenced pedagogical knowledge which, in turn, influenced practical actions such as:

I’m less keen to put high and low ability together in a lesson now. Because of what people have said, and what I’ve seen ... let’s make sure that they are getting challenged as well, physically, to become better. (PE teacher)

*Generalised, abstract, impersonal knowledge was transformed into context-specific and personal knowledge through the use of cases*

The teachers transformed generalised, abstract and impersonal knowledge into context-specific and personal knowledge by relating generalised knowledge to specific cases from their own experience. These cases gave
them a means to explore and understand the general in the light of the specific and vice versa, and enabled impersonal and abstract knowledge, generated in unfamiliar contexts beyond the institution, to become useful within a familiar institutional context. Cases usually consisted of individual students or classes. For example, Tomlinson (2005) has an extended passage, explaining why gifted students are ‘anything but formulaic’ in terms of the spectrum of ability they display, their sociocultural backgrounds, biological characteristics and the presence or lack of additional needs (p. 160). The English teacher related this passage to the group he was working with:

The group I had were the most able, the top end of the spectrum. That was in the research which I found quite interesting. You don’t just have most able, you have the most able and highly able. There were a few people in the group who weren’t as strong, but it gave them confidence to be in a group with people who could lead, and to put forward ideas as well. (English teacher)

The History teacher associated the same idea with her own tendency to view G&T students as a single, indeterminate group:

G&T pupils are different levels, just like SEN [Special Educational Needs]. It’s not a one size fits all approach for G&T. It’s obvious but then you don’t really think about it. I think that’s the problems with groups, and groups having names [i.e. labels]. Sometimes you almost wash over them and think, ‘well this works for these students’, rather than thinking of them as individuals. (History teacher)

In both these instances, the teachers used ‘you’ to mean ‘I’ and probably, ‘we’ (‘We almost wash over them . . .’); the abstract, ‘research’ knowledge, whilst being related to personal experience, was still somewhat depersonalised. In the process of transforming generalised, decontextualised knowledge into context-specific and personal knowledge, some matters were lost and others were gained. For example, Tomlinson’s (2005) distinctions of social and economic backgrounds, race, culture and gender, and so on, seen as ‘confounding variables’ in research terms, were lost in both teachers’ accounts. Instead, the teachers related general statements to themselves, their students and their educational practices. What was gained included reflections about, for instance, less able children who acquired confidence because they were grouped with G&T leaders, in the English teacher’s account. Interestingly, the teachers used cases to describe both the general and the specific, and thus, to refer to both. Teachers referred to named individual students in statements such as, ‘You’ve got your Amy Smiths’, using students’ names to refer both to actual individuals and to types: cases that exemplified other individuals with shared characteristics. Thus, the teachers’ shared knowledge of the
students enabled them to share information about types (‘exceptionally gifted girls’) using institutionally specific shorthand (‘Amy Smiths’). In this way, general statements from research were transformed into specific ones without losing their generality.

**Knowledge that is narrowly focused on single, isolated issues was integrated into broadly focused knowledge through imaginative diffusion**

Initial analysis of the data suggested that this was the least problematic form of knowledge transformation: teachers appeared to have no difficulty integrating specific knowledge of G&T students into their broad knowledge of teaching. The breadth of the teachers’ pedagogical knowledge emerged in the monthly discussions, which included issues of motivation, relationships between G&T students and teachers, behaviour management, gender, rewarding achievement, consulting students, school policy, school inspection, exam results and the influence of parents on G&T children. These were not loose conversations; there was almost no deviation from professional matters, but one issue (G&T children) often merged into another (e.g. motivation). This occurred also during the interviews:

> The boys are kind of like, ‘well, we’ve done it’. Girls seem to take much longer. (History teacher: gender differences)
> We had gone through all the characteristics of a classical tragedy in A View from the Bridge, and that challenged them to think about ancient Greek theatre. (English teacher: curriculum)
> We had OFSTED [inspectors] in school and some of the staff were showing me their lesson plans and the section for gifted and talented was like, “students can move on to the next stage”. And I said, “how beneficial is that for the student? Think about maybe broadening and deepening”. And that member of staff went away and changed her lesson plan. (Head of Art and Technology: leadership)

These instances demonstrate what happened when the teachers integrated narrowly focused knowledge from research: they extended this knowledge imaginatively, diffusing it into areas beyond the original research. As an ink blot spreads on fabric, new knowledge from research was diffused into their thinking about many topics. This occurred because, although teachers’ knowledge is necessarily widely focused, each aspect of their pedagogical knowledge inter-relates with others. The teachers discussed interrelated issues including curriculum, pedagogy, teaching techniques, students, learning, resources, assessment, behaviour management, leadership, management, policy, accountability and values.

In contrast, researchers focus on very specific topics, separating these from related matters; it is unusual for researchers to embrace more than
two or three of the above issues, for instance. This difference can lead to two possible problems. First, it is possible that the necessary breadth of teachers’ understanding militates against depth. Confirmation of this can be seen in the findings that the teachers ignored. For example, Tomlinson (2005) provides a detailed description of advanced challenge and expert working (pp. 163-164). The teachers ignored this passage, possibly because it is highly abstract but possibly because, to incorporate it might mean wider ramifications than they could easily accommodate. This suggests that research findings which require a deep understanding of a narrowly defined topic might be difficult to incorporate into practice. Second, the imaginative diffusion process might go too far. For instance, the Mathematics teacher discussed using the research to inform her differentiation with ‘lower ability’ groups. This might have been unproblematic — we did not discuss it in detail — but it is possible that the practical implementation of research findings (about G&T students) could be diffused beyond what is appropriate (into lower ability groups).

The literature posits two further types of knowledge transformation: (1) knowledge, accumulated slowly and logically, is transformed into intuitive, tacit, swift and fluent thinking; and (2) knowledge, valued for its significance, originality and rigour, is transformed into knowledge valued for its practicality and fitness for purpose. There is no evidence of either transformation in the data and testing them would require further research. Those aspects of knowledge transformation, which were studied, are summarised in Figure 2.

**Conclusions**
This study suggests a possible solution to a previously unresolved theoretical problem, namely how research knowledge can be transformed into...
pedagogical knowledge by teachers. It confirms suggestions in the literature that research knowledge can impact on pedagogical knowledge through ‘enlightenment’, and it describes three types of thinking that enable this to happen: conceptual development, reflection on cases drawn from personal experience and the imaginative diffusion of research knowledge into areas beyond those originally researched. The findings provide empirical evidence that published research can impact on how teachers think and act, and they explain how the problems identified in the philosophical literature, relating to incompatible types of knowledge, can be overcome by types of teacher thinking.

This is not to suggest that engagement with research leads only to these types of thinking. On the contrary, there is evidence to support claims in the philosophical literature, reviewed above. Engagement with research prompted teachers to pose questions, sometimes in the form of hypotheses (Dewey, 1929) such as ‘research discovered $x$; I wonder if that applies here?’ Published research enriched teachers’ professional knowledge (Winch et al., 2014) by providing theoretical lenses that enable practitioners to see some problems in a new light and sometimes, to see new problems (Biesta, 2007). McIntyre’s (2005) suggestion of knowledge passing through a continuum was not supported: there was no evidence of teachers comparing the limitations of research knowledge with the strengths of pedagogical knowledge or vice versa; neither was it possible to distinguish, within the data, between the first three types of knowledge on his continuum. However, Hammersley’s (2002) account of teachers selecting, interpreting and using research as ‘cognitive resources’ was corroborated. There were also instances in the data of teachers questioning or denying particular research findings; these will be reported in a future article.

These findings might encourage people who wish research to impact on educational practice. They indicate the sort of work which might be necessary if teaching is to become more research-informed: professional development which invites teachers to compare research findings with their own practice, focusing on the development of concepts, the use of cases and the diffusion of narrowly focused knowledge, is likely to be more successful in this regard than that which does none of these things, especially when set within individual action research projects around a single topic, with regular opportunities for discussion. Such an approach might contribute to master-level work, particularly where the aim focuses on the informed development of professional practice.

For those who see research as providing educational panaceas, the findings might be considered less encouraging because the process of knowledge transformation is unlikely to occur instantly. The processes of conceptual development, relating research findings to specific cases and imaginative diffusion, involved many thoughtful discussions. Although this study was shorter than Black et al. (2003), it was no quick fix.
This is a small-scale study; it has limitations, not least that I had the
dual role of providing information for teachers, and investigating how
they understood that information. As a case study, its claims are necessar-
ily limited to particular teachers in a particular context, although it is pos-
sible that similar findings would be found in similar schools. Given the
paucity of empirical research on knowledge mobilisation in education,
more research works are needed. Such research works might involve dif-
ferent teachers (not only volunteers, not only in secondary schools) using
different research texts (not only qualitative and about G&T students)
with different types of support (not unintrusive, not involving action
research and not over 12 months). Longitudinal research, investigating
the long-term effects of engaging with published research, might show
whether teachers continue to think and act in research-informed ways,
after projects end. A recurring issue for research is how to scale up small-
scale studies such as this, to the institutional and systemic levels. It would
also be interesting to know how teachers select, interpret and use research
into the disciplines they teach. Further studies might investigate what
types of research engagement are most useful for teachers in different
roles or at different stages of their careers; they might investigate forms of
dissemination and how research influences organisational change and
students’ learning. The aims of such research would include generating
better understandings of the ways in which research interacts with practi-
cice, and could lead to benefits for both.

In the meantime, there is a problem. As we have seen, what people
expect research to contribute to teaching depends on their view of both
research and teaching. A narrow view of research, coupled with a techni-
cal view of teaching, can logically lead people to expect research to have
direct and simple impact on practice, even though the evidence and argu-
ment reviewed here suggest a more complex relationship, involving
knowledge transformation, not merely ‘mobilisation’. In England, policy-
makers appear to share this narrow technical view (witness their enthusi-
asm for RCTs); therefore, although the current enthusiasm for educa-
tional research is welcome, it could be misplaced and is likely to be
disappointed. This implies that, when engaging with policy-makers,
researchers stress that practical advantages can flow from research but
not without sustained engagement by practitioners. If this argument can-
not prevail, policy-makers might lose hope for research and look else-
where for solutions to educational problems. Such a loss of hope could be
deeply unhelpful for, although some research has suggested that teachers
do not value research, when research is engaged with in a sustained way,
over time, the consequences can be profound. As one teacher reported:

This stretch and challenge thing is quite obvious to a lot of people I’m sure
but it’s changed the way that I teach and that doesn’t happen very often
because I like the way that I teach and I think I teach well, so I like it when I come across something that bowls me over. And I’ve seen the results of it in the classroom and I’ve realised I’ve been getting it wrong all these years. (Head of Science)

Note
1. Carlile (2004) distinguishes three types of knowledge mobilisation: transfer, translation and transformation. 'Transformation is necessary when the actors (e.g. researchers and teachers) have different purposes and interests; it seems the most appropriate term for the changes, described here.

Acknowledgements
The research reported here could not have been undertaken without the enthusiastic and committed participation of the teachers in the study and in particular the project’s coordinator. Ethical conventions prohibit my naming the teachers but I am grateful to them.

Disclosure statement
No potential conflict of interest was reported by the author.

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