

Putting evidence to work: How can we help new teachers use research evidence to inform their teaching?



Contact Nick Rose (nrose@teachfirst.org.uk) or Susanna Eriksson-Lee (seriksson-lee@teachfirst.org.uk) for more information.

Acknowledgements

We'd like to express deep gratitude to the following who were consulted or interviewed as part of this research and suggested many of the resources highlighted within this report:

Becky Allen, Tom Bennett, Daisy Christodoulou, Rob Coe, Kevan Collins, Philippa Cordingley, Caroline Creaby, Becky Francis, Ben Goldacre, Jonathan Haslam, Jennifer van Heerde-Hudson, Gary Jones, Paul Kirschner, Julie Nelson, Ben Riley, Jonathan Sharples, Phil Stock, John Sweller, Alex Quigley, Yana Weinstein, David Weston, Dylan Wiliam, Dan Willingham

We'd also like to thank Harry Fletcher-Wood for providing valuable suggestions on an early draft of this report.

The conclusions and recommendations expressed in this report do not necessarily reflect the views of our contributors and any errors or omissions within this report are entirely the responsibility of the authors.

About Teach First

Founded in 2002, Teach First is a charity with a mission to end educational inequality:

**How much you achieve in life
should not be determined by
how much your parents earn**

This is an ambitious goal and we cannot achieve it alone. All of our work involves partnerships with schools, universities, charities, businesses and individuals who share our vision that no child's success should be limited by their background.

From September 2017, new teachers training with Teach First will undertake a two year qualification that fully integrates teacher training with leadership development. In partnership with universities our teachers complete a Post-Graduate Diploma in Education (PGDE). The redistribution of training in a more balanced way across the two year programme allows for smooth progression into further study or research; initially focusing on the practical skills new teachers need to quickly become effective classroom practitioners but, over the course of the programme, increasingly engaging with research evidence linked to practice, able to critically assess and reflect on their work, and make the best decisions for their pupils.

Purpose of this report

Preparation and design for any new programme is a challenging prospect, so the purpose of this study was to help inform and examine the components of the programme which will be delivered by Teach First, identify promising approaches and resources which might contribute, think out loud about how some of this might be sequenced across a two-year programme and identify a range of ways in which we might evaluate success in achieving the intended outcomes.

Table of Contents

Acknowledgements.....	2
About Teach First.....	2
Purpose of this report	2
Executive Summary	4
The research methodology.....	4
The research questions	4
Research findings and recommendations.....	4
The role of evidence in education	5
What is an intelligent consumer of research?	8
1. Developing professional scepticism	9
2. Knowledge of curriculum and learning	10
3. Knowledge of research methods and data analysis	11
4. Implementation into classroom practice.....	12
What content might support development?	13
1. Data analysis and assessment	14
2. Cognitive science and understanding misconceptions.....	14
3. Summaries of education research.....	15
4. Research methods and practitioner inquiry.....	16
How should we sequence development over the programme?	17
Does leadership development improve outcomes?	18
1. A lack of evidence-informed practice and robust evaluation	19
2. Extending professional scepticism to leadership	19
Myers-Briggs Type Indicator (MBTI)	19
Emotional Intelligence (EI).....	20
3. What might an evidence-informed approach to leadership involve?.....	21
4. How might we apply evidence related to effective professional development to leadership?	22
How might practitioner inquiry play a role in mobilising research evidence?	24
Asking well formulated questions.....	25
Accessing relevant and reliable research evidence	26
Appraising the usefulness and validity of research evidence	26
Applying evidence to practice.....	27
Assessing outcomes: Evaluating to improve not to prove	28
Evaluating success.....	29
References used in this report	31
Appendix 1: Suggested resources.....	36
Appendix 2: Interview questions.....	41

Executive Summary

The debate around what role evidence should play in education is not new. It has, however, recently become reinvigorated and something of a consensus is beginning to emerge. For Teach First, the question of how we can help our participants develop into practitioners who can critically engage with research evidence is an important one: we're a charity with an ambitious vision of ending educational inequality, and to achieve this we need to support our participants to become the best classroom teachers and leaders they can be. We believe the knowledge and skills underpinning a critical engagement with research evidence form an important part of how our teachers can help their pupils succeed, and of how they can develop as an effective leader. So, the question of how we can best support this within our training programme is a pertinent one.

The research methodology

The approach to the research was twofold: a short literature review and interviews with an expert sample including practising research leads in schools, educationalists, researchers/academics, psychologists and advocates of evidence-based approaches.

The research questions

- What does it mean to be an 'intelligent consumer of research'? - what knowledge or skills are required?
- What are the key sources trainee teachers should refer to support evidence-informed practice?
- How might this sequence look like across a two-year programme?
- What additional knowledge or expertise might a school leader need beyond that required for a classroom teacher?
- How might we evaluate whether Teach First is being successful in developing an 'expectation and enthusiasm for teaching as an evidence-based profession'?

Research findings and recommendations

Initial teacher education is a crowded curriculum but we should support the development of our teachers to critically assess and thoughtfully implement strategies and interventions arising from research evidence alongside other essential practice components. Our new training programme, which launched in 2017, is already designed to develop many of the areas identified as supporting this aim. It offers increased support across the two years for participants to: build on assessment knowledge to develop a broader knowledge related to research literacy and data analysis; adopt a professionally sceptical outlook of 'teacher as evaluator'; and emphasise the importance of going beyond reflection on practice and developing implementation and evaluation skills, so our trainee teachers can more accurately identify what helps their pupils learn and understand and address elements of pupil struggle¹.

As well as providing insight to inform our new programme our findings also offer recommendations on what broad sequence of content might be appropriate and when, and how we might evaluate success.

¹ Hassey, N (2016), *The Next Move*. Teach First. Retrieved on 03 July 2017 from https://www.teachfirst.org.uk/sites/default/files/TF_The_Next_Move_LDP.pdf

The role of evidence in education

The notion of taking an evidence-based approach to education isn't new - though David Hargreaves' lecture to the Teacher Training Agency² in 1996 is regarded by many as "sowing the seeds"³ for the emphasis on evidence-based research and how this evidence might be applied within the profession over recent years.

It should be recognised that not everyone agrees that an evidence-based approach to education is either necessary or possible. For example, Gert Biesta has argued that the role of evidence in education should be subordinate to the role of values, that various epistemological and ontological problems undermine the possible role that techniques like randomised controlled trials (RCTs) could ever play, and that there is an insurmountable gap between the knowledge we have and the situations in which we act. Classrooms are complex environments with multiple factors at play, and Biesta argues this means that: "evidence can at most provide us with information about possible connections between actions and consequences"⁴. For some these philosophical and practical concerns continue to represent fundamental limitations to evidence-based or evidence-informed approaches.

However, many of the debates about the use of research evidence relate to questions about the purpose of education and the values which should inform it⁵. Evidence in education acts more like a compass: Once we know where we want to go, it can help point us in the right direction for getting there - but it cannot tell us where we're trying to go in the first place. Teach First is a charity seeking to end the link between socioeconomic background and a young person's life chances - therefore, the evidence relating to how this outcome can be achieved is relevant for our teachers and to inform our wider work.

The case for taking an evidence-based approach was reinvigorated by Ben Goldacre's paper *Building Evidence into Education*⁶ arguing that, despite the resistance towards randomised controlled trials (RCTs), the potential benefits of using such trials to test educational claims meant an evidence-based approach was both viable and worth pursuing. Proponents of evidence-based practice also argue that there is an ethical duty⁷ as a professional to take approaches that are most likely to improve pupil outcomes and to make best use of resources. Kevan Collins, Chief Executive of the Education Endowment Foundation (EEF) has perhaps phrased this the most provocatively: "If you're not using evidence to inform your decisions, you must be using prejudice."⁸

Despite some resistance and scepticism, in recent years there appears to be a growing consensus within the profession in favour of using research evidence to inform professional learning⁹ and a rapid expansion in the numbers of randomised controlled trials (RCTs) being conducted within education.

However, even the most enthusiastic proponents of utilising research evidence to inform teaching and school leadership recognise a number of significant barriers. One issue is a lack of clarity

² Hargreaves, D. H. (1996). *Teaching as a Research-based Profession: possibilities and prospects*. Teacher Training Agency Annual Lecture 1996.

³ Nelson, J. and O'Beirne, C. (2014). *Using Evidence in the Classroom: What Works and Why?* Slough: NFER [online]. Available: <https://www.nfer.ac.uk/publications/IMPA01/IMPA01.pdf> retrieved 12 June 2017

⁴ Biesta, G. J. (2010). Why 'what works' still won't work: From evidence-based education to value-based education. *Studies in Philosophy and Education*, 29(5), 491-503. Page 500

⁵ However, it might be argued that many educators broadly agree on social mobility / social justice aims, but fundamentally disagree about the methods best used to achieve them. For examples of the dilemmas within the question, "what a socially just education system would look like" see: Francis, B., Mills, M., & Lupton, R. (2017). Towards social justice in education: contradictions and dilemmas. *Journal of Education Policy*, 1-18

⁶ Goldacre, B. (2013). *Building evidence into education*. DFE

⁷ e.g. Jones, G. (2016) *Evidence-based school leadership is an ethical requirement - it's as simple as that*. Retrieved 12 June 2017 from <http://evidencebasededucationalleadership.blogspot.co.uk/2016/09/evidence-based-school-leadership-is.html>

⁸ This quote was taken from <http://www.evidencebased.education/> retrieved 12 June 2017. A few variations of this quote exist on social media.

⁹ For example, Cordingley, P. (2015). The contribution of research to teachers' professional learning and development. *Oxford Review of Education*, 41(2), 234-252.

regarding what such an approach to teaching involves in practice. A plethora of terms, often possessing subtly different connotations, can potentially promote misunderstandings of evidence-based and evidence-informed approaches. For example, whilst sometimes used synonymously, in recent years the term ‘evidence-informed’ has sometimes been adopted in preference to ‘evidence-based’. One reason for this may be the perception that the term

evidence-based (or similar terms like research-based or evidence-led) implies that the outcomes of research should essentially over-ride professional judgement and dictate what teachers do from minute to minute in the classroom. Even if there were proponents for this way of using evidence (and it’s not clear that there really are), such an approach would be practically impossible¹⁰ and deeply unprofessional; and it is probably most accurate to categorise this view as a common misconception¹¹.

Perhaps in an effort to avoid this misrepresentation of the use of evidence in teaching, some sources have dropped the term evidence-based entirely¹². Others have argued that the terms provide a useful distinction in the ways that evidence is being used, for example ‘evidence-based’ relating whole-school initiatives and ‘evidence-informed’ to teacher practice¹³. For the sake of clarity, within this report, we have adopted the following distinction between these terms:

Term	Definition
Evidence-based practice ¹⁴	<p>A claim about <i>outcomes</i>. Used in quite a narrow sense where an intervention or instructional strategy has been specifically tested using robust evaluation methods (e.g. randomised controlled trials, RCTs) and measurably demonstrated differential success in terms of pupil outcomes (e.g. reading or attainment at GCSE). Whilst there is still a need for careful implementation and robust evaluation of the intervention within a specific setting, it may be reasonable to expect that doing so will result in similar academic gains.</p> <p>For example: A headteacher deciding whether to buy in a specific reading intervention package based on an EEF summary of an RCT suggesting the programme’s effectiveness.</p>
Evidence-informed practice ¹⁵	<p>A claim about <i>the design</i>. Used in a fairly broad sense where a teacher’s professional judgement is guided by empirical research evidence identifying the potential benefits or costs of an instructional strategy or intervention. It implies a teacher or school leader is using empirical research in order to inform, challenge and refine their professional judgement.</p> <p>For example: A teacher implementing spaced retrieval practice within their regular classroom teaching based on findings from cognitive science; or a teacher trying to improve the quality of feedback given to pupils based on the general guidance from the EEF toolkit.</p> <p>However, unlike evidence-based practice, the implementation involves applying informed professional judgement rather than implementing a specific intervention package or programme.</p>

Recent changes in curriculum, assessment and accountability systems, and the pressures of teacher workload almost certainly impede teachers’ ability to engage with research evidence. For example,

¹⁰ Wiliam, D. (2015) *The research delusion*. TES 10 April 2015

¹¹ Jones, G. (2015) *Evidence-based practice - some common misconceptions*. The BERA Blog: Research Matters retrieved 07 July 2017 from <https://www.bera.ac.uk/blog/evidence-based-practice-some-common-misconceptions>

¹² For example: Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., Stoll, L, Willis, B., & Burns, H. (2017) *Evidence-informed teaching: an evaluation of progress in England*. Department for Education. Retrieved 07 July 2017 from <https://www.gov.uk/government/publications/evidence-informed-teaching-evaluation-of-progress-in-england>

¹³ Cain, T. (2015) *Dylan Wiliam and Kevan Collins: Can both be right?* Edge Hill University. Retrieved 07 July 2017 from <https://www.edgehill.ac.uk/scate/2015/04/22/dylan-wiliam-and-kevan-collins-can-both-be-right-2/>

¹⁴ This distinction broadly follows that proposed by Millar, R., Leach, J., Osborne, J., & Ratcliffe, M. (2006). *Improving subject teaching: Lessons from research in science education*. Routledge.

¹⁵ Ibid.

Helen Timperley argued that, “teachers need to have time and opportunity to engage with key ideas and integrate those ideas into a coherent theory of practice”¹⁶. At a school level, unless school leaders are proponents of teachers engaging with research evidence, individual teachers may not feel supported to develop in this area. Certain organisational conditions and supports appear to be a pre-requisite: for example, to be released from the timetable to be able to develop the necessary expertise and skills, to be able to challenge practice where there is evidence another approach may work better, and to be able to test and evaluate new approaches¹⁷.

A related issue is that the quality of research evidence is necessarily mixed and accessing and assessing research evidence requires time, expertise and access to resources. To be useable by a wide-range of teachers, available evidence needs to be “synthesised and presented with [...] clarity [and] accessibility”¹⁸ - and it often isn’t. This represents a gap between researchers and teachers; with teachers often unable to access research on the topics most relevant to them, or with research organisations not always making research evidence available in the most accessible way. The reception of suggestions and recommendations based upon research evidence can clearly be affected by this gap; there are frequently new ‘big ideas’ in education ostensibly based in research that teachers do not necessarily have access to or time to assess, and teachers may understandably be wary of these:

“Teachers ... are tired and wary of being sold the next ‘outstanding’ evidence-based answer to all their planning and marking, pains and stresses”¹⁹

There’s also some evidence that teachers may lack confidence to engage with research, sometimes due to a lack of pre-requisite supporting knowledge - for example not possessing the background in research methods or quantitative data analysis in order to assess the robustness of evidence²⁰. Even where high quality evidence is presented in an accessible form, the process of engaging with evidence can also be challenging: “Even those who are confident in their professional role can feel profoundly uncomfortable when what they hold to be true is challenged and they have to rethink their beliefs and practices”²¹. To achieve long-term change in practice, there needs to be time for informed debate around these challenging ideas and for teachers to be able to see the impact in practice²².

Together these might be referred to as the ‘knowledge mobility’ problem: The process by which the evidence produced by research organisations is transformed into accessible and usable knowledge for teachers, and the implementation of this knowledge in order to develop practice and improve pupil outcomes.

Evidence-based or -informed practice should change what teachers do in the classroom; and this is notoriously difficult to achieve. Estimates vary, but it has been suggested that it can take 17 years²³ for research evidence to become implemented in front-line practice within medicine. Putting

¹⁶ Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007) *Teacher Professional Learning and Development: Best Evidence Synthesis Iteration*. Wellington, New Zealand: Ministry of Education. Page 225

¹⁷ A more detailed discussion of these organisational barriers and suggestions for overcoming them was the topic of a recent report by CEBE: Creaby, C., Dann, R., Morris, A., Theobald, K., White, B., & Walker, M. (2017) *Leading research engagement in education: Guidance for organisational change*. Coalition for Evidence-Based Education. March 2017

¹⁸ Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007) *Teacher Professional Learning and Development: Best Evidence Synthesis Iteration*. Wellington, New Zealand: Ministry of Education. Page vii

¹⁹ Quigley, A. (2016) *Just don’t call it research!* Retrieved 03 July 2017 from <https://www.theconfidentteacher.com/2016/02/just-dont-call-it-research/>

²⁰ Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., Stoll, L, Willis, B., & Burns, H. (2017) *Evidence-informed teaching: an evaluation of progress in England*. Department for Education.

²¹ Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007) *Teacher Professional Learning and Development: Best Evidence Synthesis Iteration*. Wellington, New Zealand: Ministry of Education. Page viii

²² Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., Stoll, L, Willis, B., & Burns, H. (2017)

²³ For a critical discussion regarding this estimate see: Morris, Wooding & Grant (2011) The answer is 17 years, what is the question: Understanding time lags in translational research. *JRSocMed*, 104(12): 510-520

research evidence to genuine use in the classroom won't happen without a deliberate focus on developing capacity and networks, within schools and between teachers, researchers and other organisations acting as intermediaries²⁴. This also requires a culture fostered by school leaders where such processes are supported and prioritised²⁵.

Teacher training providers cannot address all of the barriers. We are in a position to address some of them, however, and have a responsibility to help prepare new teachers so that they are best able to capitalise on the opportunities which currently exist - as well as those which emerge across their careers. Our teachers work in challenging schools where pupils often have not achieved strong educational outcomes. Putting evidence to effective use offers a 'good bet' for how teachers can help pupils succeed in school.

We also believe that the knowledge and skills underpinning evidence-based and evidence-informed practice form an important part of developing as an effective leader²⁶ as well as an effective classroom practitioner and that it can motivate and give teachers agency in tackling the problems they face in their classrooms.²⁷ In addition, school leaders have an important role in establishing the climate and conditions within which support teachers in developing their engagement with and use of research evidence²⁸. It seems likely that the process a classroom teacher might use to identify and assess changes to classroom practice would also apply to a school leader seeking to implement, for example, a whole-school intervention.

As a social justice charity it is also an essential foundation for our work - with evidence-based and evidence-informed approaches providing a reasonable basis for how we can best tackle educational disadvantage where there is inevitably limited time and resources. Finally, we are in a position to promote the value of basing our decisions on evidence, incrementally experiment with implementation and evaluation models to identify effective examples, and share what we learn (successes and pitfalls) for the benefit of the wider sector.

What is an intelligent consumer of research?

One of the starting points for this research was the Carter review of initial teacher training²⁹ which suggested that providers needed to do more support an "expectation and enthusiasm for teaching as an evidence-based profession" and help new teachers become "intelligent consumers of research". Teach First works in partnership with universities to develop new teachers over a two-year programme. To support our contribution to this programme, a series of interviews was conducted with a range of research-engaged practitioners, educationalists, psychologists and others with expertise outside of education. This was combined with a short review of the literature to explore this question, and help identify some of the knowledge and skills involved.

Perhaps unsurprisingly, being an 'intelligent consumer of research' has different meanings to different people. In the interviews we conducted, there were a range of synonyms or alternatives

²⁴ Campbell, C & Levin B (2012) *Developing Knowledge Mobilisation to Challenge Educational Disadvantage and Inform Effective Practices in England*. Retrieved 07 July 2017 from http://tdtrust.org/wp-content/uploads/2015/11/Developing-Knowledge-Mobilisation-to-Challenge-Educational-Disadvantage-2012.pdf?utm_source=rss&utm_medium=rss

²⁵ For example, the [EEF evaluation of the Research Champion's initiative](#) argued that "one of the main barriers was a lack of time to fully engage in the programme, which was related to competing priorities in schools and varying levels of buy-in from senior leadership teams"

²⁶ Particularly within the context of professional development and instructional leadership: e.g. Robinson, V., Hohepa, M., & Lloyd, C. (2009). *School Leadership and Student Outcomes: identifying what works and why. Best evidence synthesis iteration (BES)*. Wellington: Ministry of Education.

²⁷ Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., Stoll, L, Willis, B., & Burns, H. (2017) *Evidence-informed teaching: an evaluation of progress in England*. Department for Education.

²⁸ e.g. Brown, C., & Zhang, D. (2017). How can school leaders establish evidence-informed Schools: An analysis of the effectiveness of potential school policy levers. *Educational Management Administration & Leadership*, 45(3), 382-401

²⁹ Carter, A. (2015). *Carter Review of Initial Teacher Training (ITT)*. London: DfE [online].

proposed to this phrase: ‘critical consumer of research’, ‘evidence-informed practitioner’ or being able to fully engage with an ‘evidence-based profession’. There were also questions about the definition of ‘evidence’, for example that the definition doesn’t just include evidence from academic research or EEF trials but includes wider evidence about pupils’ characteristics, and student attainment and progress data generated within schools.

Experts in the study of intelligence and related fields have endorsed the following definition of intelligence:

“Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather it reflects a broader and deeper capability for comprehending our surroundings—“catching on,” “making sense” of things, or “figuring out” what to do.”³⁰

In the context of using evidence to inform practice, we might apply this definition to mean new teachers need to be supported to be able to make sense of research that they encounter, to be able to reason about the complex ideas and abstract concepts involved in research methods and statistics, and to be able to use research evidence to help them solve the sorts of problems and challenges they will grapple with as classroom practitioners.

For some this process starts with understanding different research paradigms and epistemological approaches (e.g. ‘positivist’ versus ‘critical theory’ approach) or identifying and articulating the values underpinning evidence-informed practice (e.g. integrity or humility). However more frequently our respondents referred to developing a sceptical or critical stance, knowledge of the strengths and limitations of (specifically) empirical research methods, and a working knowledge of some key reference points and resources which form contemporary research into learning and instruction.

Several respondents also identified the challenge inherent in supporting new teachers to develop the sorts of knowledge and skills within these areas. There was concern that this could be counter-productive where they inadvertently compete with the many other areas of development needed to become an effective teacher.

Indeed, the process of becoming an ‘intelligent consumer’ of research evidence likely takes *many years* - and experienced researchers in our sample suggested that we should expect fairly modest progress towards this goal over a two-year programme. The focus, therefore, should be to support new teachers to intelligently use high-quality research - which has been (at least initially) selected or sign-posted - to inform teaching, rather than with a view to developing them as academic researchers.

From the interviews, we identified four broad areas which appeared to support a teacher becoming an intelligent consumer of research:

1. Developing professional scepticism

Richard Feynman describes scepticism as ‘the exquisite balance’ between open-mindedness towards, and the rigorous scrutiny of, new ideas:

“It seems to me what is called for is an exquisite balance between two conflicting needs: the most skeptical scrutiny of all hypotheses that are served up to us and at the same time a great openness to new ideas ... If you

³⁰ Gottfredson, L. S. (1997a). Mainstream science on intelligence: An editorial with 52 signatories, history, and bibliography. *Intelligence*, 24, 13-23. Page 13

are only skeptical, then no new ideas make it through to you ... On the other hand, if you are open to the point of gullibility and have not an ounce of skeptical sense in you, then you cannot distinguish the useful ideas from the worthless ones.”³¹

An aim of a programme intending to promote an intelligent approach to research might be to cultivate an attitude of professional scepticism towards empirical claims about how pupils learn and what strategies or interventions may help them learn. Such critical thinking is not a generic skill³²; new teachers will need considerable background knowledge to inform and be able to apply critical thinking as a classroom teacher.

So what might support the development of professional scepticism? Our respondents highlighted a number of themes:

<i>Theme</i>	<i>Detail</i>
You need a questioning attitude and willingness to interrogate claims	Teachers need to be able to ask challenging questions about research evidence. They need the ability to think critically, interrogate the face value of a claim or intervention, ask challenging questions, and deconstruct an argument. They should look for red flags and warning signs in a claim rather than accepting it unquestioningly. They should apply this approach both to external claims - things they read, interventions that are proposed - and to themselves: to challenge their own preconceptions, intuitions and biases.
You need a certain degree of background knowledge to inform this critical stance	Common approaches to developing a critical approach to research sometimes suggest check-lists of questions one might ask. This is likely a helpful aide-memoir for those with some expertise, but assessing the validity of a conclusion or the quality of a research method requires a significant knowledge-base. Academic researchers spend many years developing and refining this research knowledge, however starting points might include critical exposure to common misconceptions within education, a frame-work related to the principles arising from the science of learning and a basic grasp of empirical research methods.
Teachers should apply these two things to their practice in order to be a ‘intelligent consumer of research’	The possession of this knowledge-base allows a teacher to apply their questioning attitude effectively when identifying problems they need to tackle in the classroom, making decisions related to developing classroom practice to meet those challenges and assessing the credibility of strategies identified from research literature to inform those decisions. However, many respondents explicitly argued that the focus of this development should not emphasise the context of training as an academic researcher, but rather directly link to the practice and the problems of classroom teaching. For example, critically examining the evidence base related to the sorts of interventions which might help overcome the barriers children face in their learning and evaluating their implementation into practice.

2. Knowledge of curriculum and learning

As identified above, a basic level of knowledge is an essential foundation for developing as an intelligent consumer of research. One aspect of this knowledge-base was related to possessing a good foundation in how to sequence learning within a curriculum and the practical aspects of assessment. In addition, many felt there was a benefit to tackling some common misconceptions related to

³¹ Shermer, M. (2002). Skeptical sayings: Wit and wisdom from skeptics past & present. *Skeptic*, 9(2), 24-33.

³² e.g. Bailin, S., Case, R., Coombs, J. R., & Daniels, L. B. (1999). Common misconceptions of critical thinking. *Journal of Curriculum Studies*, 31(3), 269-283.

learning and, in contrast to these, introducing some of the basic principles arising from cognitive science about how children learn.

<i>Theme</i>	<i>Detail</i>
You need a broad familiarity with the research domain related to teaching and learning	<p>In order to make sense of a piece of research or suggested intervention you need to have a broad familiarity with that domain - the subject background and the field of research around that topic. A framework of knowledge about learning and education provides the foundation needed to get a feel for the 'overall body of work' and develop a 'general understanding of the landscape'.</p> <p>There were different views of what should make up this broad knowledge-base: However areas often mentioned included: curriculum knowledge; knowledge of misconceptions; knowledge about the science of learning. Each of these is expanded on below:</p>
These include: Curriculum content and sequencing; practical aspects of assessment; extending to encompass more theory over time	<p>Some respondents thought that an early stage in developing the background knowledge required to engage with research should involve a distinctly practical focus on developing curriculum knowledge (for your subject or phase), the sequencing of learning through a curriculum and the practical use of assessment; arguing that the theory behind these ideas should be tackled later.</p> <p>It was noted that for some new teachers this element is a significant challenge and there was often too little support for developing an understanding of curriculum and that there was often more readily available guidance in some subjects (like maths and reading) than for others.</p>
Challenging common misconceptions related to teaching and learning	<p>There was broad consensus that it is important for early career teachers to be able to identify common misconceptions related to teaching and learning. For example, knowing that the idea of matching teaching activities to children's 'learning styles' is no longer considered an effective strategy. It was suggested that this is something which should be implemented quite early in initial teacher training; to help 'inoculate' new teachers against some of the intuitively appealing but un-evidenced and sometimes very unhelpful ideas which sometimes circulate within the profession.</p>
A practical introduction to the science of learning	<p>A number of respondents highlighted contemporary scientific ideas about how children learn and forget; arising from cognitive science or 'the science of learning'. Many suggested that new teachers should be introduced to some of the most reliable and practical principles, and that this could be a helpful foundation when they encounter various claims about how children learn across their career.</p> <p>There were, however, different views as to when more of the theory related to these principles should be introduced. Some argued that tackling psychological theory was too far removed from the important practice elements needed to become an effective teacher. However, others suggested that an element of theory (e.g. the basic structures of memory) might usefully contribute to a deeper understanding when assessing claims about how children learn.</p>

3. Knowledge of research methods and data analysis

In order to assess critical questions about a piece of research you need basic knowledge about research methods. This knowledge-base will need to be developed over the two-year programme and should have a practical focus: For example, bringing in key ideas from research methods as new teachers are attempting to implement, assess and evaluate teaching strategies and interventions in their classrooms.

<i>Theme</i>	<i>Detail</i>
--------------	---------------

Adopt a ‘classroom-facing’ approach to developing this knowledge	<p>Rather than teach research methods in the abstract, teachers should encounter the strengths and limitations of different approaches within the context of evaluating the strategies and interventions they might use in the classroom and the extent to which they can support the sorts of inferences they want to make about learning.</p> <p>Statistical concepts, along with an understanding of key ideas like validity and reliability, can also be made a bit less abstract and more ‘classroom facing’ in the context of understanding assessment - focusing on the sorts of inferences about learning or teacher evaluation we can and cannot make from data.</p>
Link research methods to developing evaluation	<p>Respondents variously mentioned a wide range of key ideas related to research methods which were required or at least helpful when making sense of research evidence.</p> <p>The strengths and limitations of basic study designs was a particularly common theme: For example, research summaries and syntheses (e.g. meta-analyses; systematic reviews; best evidence reviews, experimental and quasi-experimental designs (especially as they might relate to RCTs), the strengths and limitations of qualitative (e.g. interviews, open-response questions on surveys) and quantitative methods (student data, survey data).</p> <p>Initially the focus might be identifying the research methods used to answer particular kinds of questions (for example: contrasting questions around efficacy³³ and those around implementation or process³⁴). The broad aim being that new teachers are aware that certain methods are well suited to answering particular kinds of evaluation questions and are able to align their questions to an appropriate method or mix of methods.</p>
Link data analysis to developing assessment	<p>Respondents also identified a number of statistical concepts which they argued were needed to support their assessments of research evidence. Key concepts included statistical significance (‘p-values’), effect sizes (e.g. as it relates to the EEF’s ‘months progress’ measure), correlations, standard error and confidence intervals.</p> <p>These were recognised as difficult concepts especially for non-mathematicians, but a basic understanding would support teachers making valid inferences from the sorts of value-added data and effectiveness trial outcomes which they will likely encounter. It was also noted that teachers would likely need explicit warnings regarding common misconceptions related to statistics (e.g. distinguishing between statistical significance and educational importance; not inferring cause necessarily from a correlation).</p>

4. Implementation into classroom practice

Knowing about common misconceptions in teaching and learning, being familiar with research methods and being able to assess the quality of an empirical claim is likely of limited benefit to pupils unless teachers are equipped to translate what they learn into effective classroom practice:

The difficulty occurs when you then try and implement that in the real world; in the hurly-burly of a normal day. So you don’t only need to access the evidence and impact, you need [to mobilise] that knowledge: Implementation science if you like.”

Kevan Collins

³³ For example, the EEF divides its evaluations into pilot, efficacy and effectiveness trials, described here: https://v1.educationendowmentfoundation.org.uk/uploads/pdf/EEF_evaluation_approach_for_website.pdf retrieved 10 July 2017

³⁴ Similarly, an explanation of the EEF’s approach to implementation and process evaluations can be found here: https://educationendowmentfoundation.org.uk/public/files/Evaluation/Setting_up_an_Evaluation/IPE_Guidance_Final.pdf retrieved 10 July 2017

“Even when [strategies are] evidence informed, whatever that means, they are probably unhelpful because most things you can do well or you can do badly.”

Rob Coe

This is not necessarily easy to do well. For example, whilst ‘feedback’ is highlighted within the EEF toolkit as a highly effective strategy (in terms of the average effect size calculated across meta-analyses), many individual studies into feedback resulted in little, no or even negative outcomes³⁵. Respondents talked about two main aspects of this process: Effectively implementing a strategy or intervention within the classroom, and evaluating whether it is making the intended difference to pupils’ learning outcomes:

<i>Theme</i>	<i>Detail</i>
Linking implementation science to practitioner inquiry	It is a common part of many ITE programmes that new teachers undertake some kind of enquiry or research into their own practice. A number of respondents were sceptical of the value of this, suggesting that many of these take the form of reflective exercises which build in some of the biases which can mislead teachers as to the impact they are having. Some suggested that such research would be better to follow the model of an implementation cycle, rather than a reflective one. This is further discussed later in the report.
The difficulty in ‘knowing your impact’	<p>Within both classroom practice and school leadership, it is extremely difficult to demonstrate the efficacy or effectiveness of a classroom strategy or whole-school intervention - most commonly because of the lack of a counter-factual or robust comparison group to judge it against. A range of cognitive biases can lead teachers to think that their innovations are successful even when they may not be having any positive effects on student outcomes.</p> <p>Understanding some of the ways in which our judgements may be biased can be linked with the difficulties inherent in teacher assessments (compared to more standardised assessment techniques)³⁶. There is some evidence that teachers over-estimate the benefits of the interventions they are involved in³⁷, and this is likely due to a combination of confirmation bias, expectancy effects and the influence of sunk-costs.</p>

What content might support development?

It is unlikely that being an ‘intelligent consumer of research’ involves generic skills which can be easily transferred from an individual’s undergraduate or even post-graduate academic background, but instead represents an application of knowledge developed across a range of key content areas which should run ‘like the lettering through a stick of rock’ throughout our two-year programme. Our study identified five areas of knowledge which may act as a broad foundation for critical engagement with evidence-based and evidence-informed practice.

³⁵ For example: Wiliam, D. (2014) *Is the feedback you’re giving students helping or hindering?* Retrieved 10 July 2017 from <http://www.dylanwiliamcenter.com/is-the-feedback-you-are-giving-students-helping-or-hindering/>

³⁶ For example, Christodoulou, D. (2015) *Why is teacher assessment biased?* Retrieved 10 July 2017 from <https://thewingtoheaven.wordpress.com/2015/11/01/why-is-teacher-assessment-biased/>

³⁷ For example, in some EEF evaluations, teachers and students believed that the intervention they were involved in had observable benefits - however, this did not always match the more objective measures of impact when outcomes were assessed: e.g. In the EEF evaluation of Project-Based Learning pupils and teachers typically rated the intervention as having positive benefits (quotes on pages 45-47), which were not reflected in the final outcome assessments - which showed no clear (and some possibly negative) impact. <http://dro.dur.ac.uk/20513/1/20513.pdf> retrieved 10th July 2017

Respondents often suggested specific resources which might support these elements of content - and examples of these are listed within each section below (a full list of suggested resources can be found in Appendix 1).

1. Data analysis and assessment

Some of the key concepts related to research methods and data analysis might first be encountered by teachers in relationship to assessment. Basic principles might include different models of learning (e.g. difference between learning and performance; differences between assessing 'generic skills' vs 'deliberate practice' models) and identifying the strengths and limitations of different techniques (e.g. multiple choice versus short answer quizzes) linking to discussions related to qualitative and quantitative data.

Koretz, D. (2009) *Measuring up: What educational testing really tell us*. Harvard University Press

Wiliam, D. (2011). *Embedded formative assessment*. Solution Tree Press.

Christodoulou, D. (2017) *Making Good Progress?* Oxford: OUP

EEF Assessing and Monitoring Pupil Progress online course -

<https://educationendowmentfoundation.org.uk/resources/assessing-and-monitoring-pupil-progress/>
retrieved 28th April 2017

The purposes of assessment (summative, formative and assessing to boost retention) also have links to other areas of evidence-informed practice (e.g. validity relating to the inferences drawn from the result of an assessment; content sampling; understanding of the concept of reliability; sources of bias).

In addition, new teachers need support with the practical use and interpretation of statistics within teaching (e.g. in the context of making valid inferences from school assessment data or value added statistics). Key concepts also included a basic understanding of null-hypothesis testing, effect sizes, measurement error and confidence intervals with respect to understanding assessment and research, rather than application as researchers.

2. Cognitive science and understanding misconceptions

Contemporary cognitive science has identified a small number of reliable principles relating to memory and learning which could provide a useful framework for thinking about learning and could offer the basis of a 'common language' with which to anchor observations and reflections of classroom practice. Many respondents suggested this was a helpful and practical starting point for exploring this literature.

Centre for Education Statistics and Evaluation (2017) *Cognitive load theory: Research that teachers really need to understand*. NSW Department of Education. August 2017

Clark, R. E., Kirschner, P. A., & Sweller, J. (2012). Putting Pupils on the Path to Learning. *American Educator*, 36 (1). 6-11.

Deans for Impact (2015). *The Science of Learning*. Austin, TX: Deans for Impact.

Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). *Organizing Instruction and Study to Improve Pupil Learning*. IES Practice Guide. NCER 2007-2004. National Center for Education Research.

Pomerance, L., Greenberg, J., & Walsh, K. (2016). *Learning about Learning: What Every New Teacher Needs to Know*. National Council on Teacher Quality.

Smith, M. & Weinstein, Y. (2016) *Six Strategies for Effective Learning*.

<http://www.learningscientists.org/blog/2016/8/18-1> retrieved 28th April 2017.

It would be fair to say there were mixed feelings regarding the value of theory. Whilst the theories arising from historical approaches such as Piaget and Vygotsky were criticised by some respondents

for having few clear applications in the classroom, contemporary cognitive psychology was suggested by some to provide a good basis for developing teachers' understanding of the cognitive architecture which supports learning (e.g. working memory). A few respondents argued that, being mainly laboratory based, modern psychological theory may remain too far from the classroom to be practical.

Other respondents suggested that a deeper exploration of theory should come later in the sequence of teacher education than understanding some of the basic principles arising from them and opportunities to apply these to practice.

There were a large number of suggested resources to support this - ranging from academic journal articles, to American Educator articles and teacher-friendly books and websites.

Brown, P.C., Roediger, H.L. & McDaniel, M.A. (2014) *Make It Stick: The Science of Successful Learning*. Harvard University Press

Clark, R. E., Kirschner, P. A., & Sweller, J. (2012). Putting Pupils on the Path to Learning. *American Educator*, 36 (1). 6-11.

Didau, D. & Rose, N. (2016). *What every teacher needs to know about psychology*. John Catt.

Gathercole, S. E., Lamont, E., & Alloway, T. P. (2006). Working memory in the classroom. *Working memory and education*, 219-240.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational psychologist*, 41(2), 75-86.

Willingham, D. (2010) *Why Don't Students Like School?: A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom*. Jossey Bass

Many respondents also identified works relating to common misconceptions relating to how children learn, or to developing a professionally sceptical approach towards empirical claims about teaching.

Christodoulou, D. (2014). *Seven myths about education*. Routledge.

De Bruyckere, P., Kirschner, P. A., & Hulshof, C. D. (2015). *Urban myths about learning and education*. Academic Press.

Didau, D. (2015). *What if everything you knew about education was wrong?*. Crown House Publishing.

Goldacre, B. (2010). *Bad science: quacks, hacks, and big pharma flacks*. McClelland & Stewart

Hirsch Jr, E. D. (2000). You can always look it up—or can you. *American Educator*, 24(1), 4-9.

Hirsch Jr, E. D. (2002). Classroom research and cargo cults. *Policy Review*, (115), 51.

Kirschner, P. A., & van Merriënboer, J. J. (2013). Do learners really know best? Urban legends in education. *Educational psychologist*, 48(3), 169-183.

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles concepts and evidence. *Psychological science in the public interest*, 9(3), 105-119.

Willingham, D. (2012) *When Can You Trust the Experts?: How to Tell Good Science from Bad in Education*. Jossey Bass

Willingham, D. T. (2008). What is developmentally appropriate practice?. *American Educator*, 32(2), 34.

3. Summaries of education research

The EEF (and the 'What Works Clearinghouse' (WWC) in the US) provides a range of summaries which attempt to assess the quality of the evidence, the effectiveness and costs of a wide variety of educational strategies and interventions.

Coe, R., Aloisi, C., Higgins, S., & Major, L. E. (2014). *What makes great teaching? Review of the underpinning research*. Sutton Trust

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving pupils' learning with effective learning techniques promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4-58.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, 77(1), 81-112.

Hattie, J., & Yates, G. (2014). *Visible learning and the science of how we learn*. New York: Routledge

Rosenshine, B. (2012). Principles of Instruction: Research-Based Strategies That All Teachers Should Know. *American Educator*, 36(1), 12.

However, some suggested that engaging with this material required a degree of sophistication in understanding both the potential and some of the limitations of evidence-based approaches. It is important that teachers engaging with these resources understand that they do not represent that 'last word' on an educational approach and considerable professional judgement is required to apply findings to the classroom.

4. Research methods and practitioner inquiry

Understanding the strengths and limitations of different research methods (e.g. quantitative and qualitative approaches; case studies and randomised control trials; experimental vs correlational studies) and typical trade-offs in terms of validity (e.g. minimising bias vs generalisability) would help teachers to develop an ability to take an informed, critical view to research they might encounter over the course of their career.

Some respondents were highly sceptical of teachers undertaking research themselves: Operationalising research questions and conducting high-quality research is challenging, requiring extensive knowledge and often years of experience, and there was some feeling that a concentration on reaching the level required of an academic researcher would distract from the important task of becoming an effective teacher. Whilst a basic understanding of empirical research methods was considered a vital foundation of being able to assess research claims, there was an argument that the process of learning about methods should be focused on how a teacher might evaluate their practice (e.g. the effect of strategies or interventions they attempt to apply to the classroom) rather than with the aim of carrying out academic research.

However, small-scale research projects form part of many ITE programmes and others argued that this could provide a useful opportunity to apply the knowledge and skills required to critically engage with research. It was also noted that even highly-rated resources like 'The Science of Learning' or the EEF 'Toolkit' are not 'plug and play' - but require a thoughtful and disciplined approach to implementation and evaluation to use effectively.

Whilst a host of online resources exist to support various forms of reflective practice or enquiry projects, it was recommended that a high degree of scaffolding should be provided to help teachers identify reliable, high-quality research which might form the basis of a classroom strategy or intervention, and offering worked examples of effective models for implementing, monitoring and evaluating pupil learning. Over time, more sophisticated inquiry models might be introduced (e.g. using the EEF's DIY Evaluation guide to conduct a small-scale RCT).

EEF: Support for Strategic School Improvement Fund - guidance: https://educationendowmentfoundation.org.uk/public/files/Evaluation/Implementation/EEF_SSIF_guidance_May_2017.pdf retrieved 28th April 2017

EEF: The DIY Evaluation Guide - <https://educationendowmentfoundation.org.uk/resources/diy-guide/getting-started/> retrieved 28th April 2017

Some respondents related this to the idea of 'disciplined inquiry':

How should we sequence development over the programme?

Initial teacher education is extremely crowded and the need to help new teachers become confident in subject and pedagogical content knowledge and effective in practice elements like classroom management, planning and assessment should be the natural priority. However, within these practice elements there exist opportunities to potentially develop greater awareness and engagement with evidence-based research and evidence-informed practice which can provide a foundation for later professional development.

<i>Stage of ITE</i>	<i>Suggestions</i>
Simple starting points within pre-service training	Providing simple starting points for critical engagement with research. Suggested content included evidence summaries on how children learn (e.g. Science of Learning by Deans for Impact) and challenging some of the common misconceptions related to learning.
Initially focusing on practice elements, but expanding focus across the QTS year	<p>Over first term(s), the main focus should be the practice elements of teaching (e.g. developing classroom management, planning and assessment), however it is worth exploiting opportunities to develop the awareness of the importance of evidence and its role in day-to-day teaching. The focus, however, is being able to use evidence-informed strategies (e.g. spaced retrieval practice or effective feedback) and developing the ability to evaluate one's own teaching rather than necessarily focused on acquiring the knowledge and skills needed to assess academic research.</p> <p>Early development might also include: encouraging teachers to sign up to the EEF newsletter or The Institute of Effective Education's (IEE) Best Evidence in Brief; introducing a broad overview of the strengths and limitations of qualitative and quantitative methods as it might relate to assessment of learning (including the issues of bias in assessment); encouraging a critical and questioning approach, 'professional scepticism', regarding the effectiveness of strategies and innovations in the classroom; building knowledge of a range of evidence-informed strategies and opportunities to apply them to planning (e.g. alternating worked examples with problems to be solved or applying EEF guidance on feedback or mastery learning).</p> <p>Over the course of the year, the scope of opportunities might widen to help teachers develop a theoretical framework within which to accommodate research evidence relating to practice; e.g. exploring cognitive science theories (e.g. working memory, cognitive load, and the new theory of disuse). Selecting accessible summaries (e.g. American Educator articles) is likely a better starting point than primary references from research journals. There may also be opportunities to develop a basic understanding of research methods in the context of the broad strengths and limitations of different methods which might be used to evaluate impact.</p>
Retaining a practice focus, but widening the range of reading to support practitioner inquiry within the NQT year	<p>Over the course of the second year, a strong practice focus was still recommended, but opportunities should also exist to broaden and deepen knowledge and engagement with research evidence.</p> <p>The focus might widen to include more on research methods as they might apply to practitioner research. Given the difficulty of selecting appropriate research questions and operationalising them, it was suggested that providers encourage inquiry projects to examine one of a small range of options linked to evidence-informed practice. Rather than expecting teachers to design these inquiry projects from scratch, it was suggested that providing a framework for conducting them and past examples of high quality projects might act as the starting point.</p>

In addition, whilst some ‘curation’ of reading was still recommended (e.g. suggested book chapters and evidence summaries) the scaffolding provided in reading should start to be reduced, by extending the depth and breadth of reading lists - with more elements of theory focused on a critical understanding of the strategy or intervention under inquiry. Another suggestion was exploring something of the history of ideas about learning (e.g. behaviourism and social learning, constructivism and social constructivism, and contemporary cognitive science models of learning). This wider suggested reading would include more examples of selected primary sources as starting points for further independent research.

Does leadership development improve outcomes?³⁸

What additional knowledge or expertise might a school leader need to be an evidence informed practitioner, beyond that required for a classroom teacher? Several respondents highlighted the fact research evidence isn’t terribly robust on what makes effective leadership or how to develop it.

One of the greatest difficulties for any organisation seeking to create an effective leadership development programme is the sheer number of theories and approaches claiming to provide an effective framework for understanding leadership. White³⁹ suggests that part of the reason for this diversity within leadership theory has been the fact that it has served two - fairly distinct - markets: the academic market and the popular market. The academic market involves trained social scientists affiliated with academic programs in leadership or business management and is often concerned with championing that academic’s particular theory or approach to leadership. The popular market often involves successful businesspersons describing how their particular style of leadership contributed to success and are typically ‘light reading’ offering a short list of rules or steps toward improved leadership.

As Day et al⁴⁰ note in their review, whilst leadership research has expanded rapidly in the last quarter of a century, it remains a relatively immature field - rarely informed by robust empirical evidence. One reason for this is the essential difficulty in evaluating the efficacy of any leadership theory or development programme. Within leadership development research there are several levels to evaluation: starting with the affective level (e.g. did you enjoy the training?), the level of the learning that took place (e.g. assessing whether key skills were acquired), the level of transfer of the training (i.e. did the training alter behaviour in the workplace?), and finally the level of individual or organisational performance (i.e. did the training lead to improved / more effective performance?).

Arthur et al⁴¹ note that most training and development programmes are only evaluated at the most superficial level (the affective level) and that the rating of effectiveness (the ‘effect size’) of training tends to decline as the evaluation moves towards the deeper levels. In this meta-analysis, the stark conclusion was that training programmes “rarely produce long-term documented effects on behaviour”.

³⁸ Some of this section was reproduced from an internal review critically examining aspects of leadership development: Rose, N., Eriksson-Lee, S., Meenan, C. & Williams, B. (2016) *The Leadership Question*. Teach First

³⁹ White, R.F. (2011) Toward an integrated theory of leadership. *Politics and the Life Sciences*, 30(1), 116-121.

⁴⁰ Day, D. V., Fleenor, J. W., Atwater, L. E., Sturm, R. E., & McKee, R. A. (2014). Advances in leader and leadership development: A review of 25 years of research and theory. *The Leadership Quarterly*, 25(1), 63-82.

⁴¹ Arthur Jr, W., Bennett Jr, W., Edens, P. S., & Bell, S. T. (2003). Effectiveness of training in organizations: a meta-analysis of design and evaluation features. *Journal of Applied psychology*, 88(2), 234.

1. A lack of evidence-informed practice and robust evaluation

“Executives routinely dose their organizations with strategic snake-oil: discredited nostrums, partial remedies, or untested management miracle cures.” Pfeffer and Sutton (2006) p1⁴²

Kaiser and Curphy⁴³ reviewed some of the on-going issues within leadership development arguing that “There is scarcely any evidence that ... spending on development is producing better leaders”. For example, they examined evidence from an annual Harris Poll which asks people how confident they are in the leaders of major institutions such as Congress, the White House, the military, small and big businesses. Since 1996, they found that despite a doubling of the money invested in leadership training and development (based on reports from the American Society for Training and Development), the percentage of people reporting at least some confidence in the leadership of government, corporations, and Wall Street has plummeted from around 90% to 60%. However, the issue is not merely one of public perception, organisations are expressing grave concern about their supply of effective leaders:

“As just one recent example, a survey of more than 14,000 human resource (HR) professionals and line leaders found that only 26% of HR and 38% of leaders reported that the quality of leadership across their company was “excellent” or “very good.” Future prospects were even worse, with only 18% of HR and 32% of leaders reporting that their bench strength to meet future needs was “very strong” or “strong” (Boatman & Wellins, 2011).”⁴⁴

They argue that “A dirty secret about the leadership industry is that its offerings are rarely evaluated”, and that organisations need to be persuaded about the importance of formal evaluation within all leadership development programmes. This would include: systematic evaluation of the behavioural and organisational impact of leadership development; defining leadership and developing competency models in terms of building and leading teams; and making more informed decisions about leadership potential - avoiding rewarding roles which appeal to individuals merely seeking status and prestige.

2. Extending professional scepticism to leadership

Much as education has recently started to embrace empirical evidence in its approach to the questions of how children learn and how teachers can help them learn, the development of leadership should likewise adopt a much more evidence-informed approach. Part of this might, similarly, include tackling common misconceptions within leadership development resources and encouraging a comparable kind of ‘professional scepticism’ as proposed for teacher development. It is likely that there are as many of these misconceptions within leadership and historically there has been within teaching; two short, illustrative examples of popular but poorly evidenced approaches are described below:

Myers-Briggs Type Indicator (MBTI)

First developed in the 1940s, the MBTI is ‘the most popularly used measure in the consultancy and training world’⁴⁵. It was intended to encapsulate Jung’s theory of human personality and represents

⁴² Pfeffer, J., & Sutton, R. I. (2006). *Hard facts, dangerous half-truths, and total nonsense: Profiting from evidence-based management*. Harvard Business Press.

⁴³ Kaiser, R. B., & Curphy, G. (2013). Leadership development: The failure of an industry and the opportunity for consulting psychologists. *Consulting Psychology Journal: Practice and Research*, 65(4), 294.

⁴⁴ Ibid.

⁴⁵ Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy. Post-16 learning. A systematic and critical review*. Learning and Skills Research Centre. p 47

a theory-based instrument based on Jung's typology rather than an empirically derived trait instrument⁴⁶.

There have been serious questions about the construct validity of the measure. For example, respondents are categorised in one end of a dimension or another (e.g. either Sensing or Intuition) but none of the dimensions have been shown to have bimodality (i.e. a continuous distribution with two distinct modes). Along with the central theory appearing to fail to live up to scrutiny, another problem with the validity of the test is that it appears entirely ineffective at predicting people's behaviour or success in various jobs^{47, 48}. One of the likely reasons for this is that the test is highly unreliable. Retaking the test after a short time period of five weeks, there's a 50% chance (i.e. like tossing a coin) that the individual will end up with a different personality combination⁴⁹. If a measure is not reliable, we cannot draw valid inferences from its results; so the poor reliability of the MBTI is further support for the argument that it's not a valid measure of personality.

However, the question remains as to why the MBTI is so popular in the field of training and development despite these well-known flaws. One possibility is that the descriptions produced by personality tests are more focused on indulging our interest in talking about our 'selves' than providing any predictive or useful knowledge about that 'self'⁵⁰. In light of the profound problems identified with the MBTI, it is hard to imagine any role it might play in an evidence-informed approach to leadership development.

Emotional Intelligence (EI)

The concept of Emotional Intelligence (EI) and specific references to the work of Daniel Goleman are a fairly common feature of leadership development models. One of the difficulties in gauging the role of 'Emotional Intelligence' in the development of leadership is that there are many different versions of the theory; some positing EI as a trait, others as an ability, others combining these ideas (mixed-models).

The idea received little attention until the publication of Daniel Goleman's *Emotional Intelligence* in 1995 popularised the idea. Goleman redefined EI as the ability to 'develop competence' in four domains: self-awareness, self-management, social awareness and relationship management, and theorised that each of these four domains has multiple subskills⁵¹. The central claim of this approach to EI is that every person is a leader (in some form or another), and every leader's main role is to create 'resonance' (to "*prime good feelings in those they lead*") which in turn will generate the best performance in others. Goleman has also suggested that there were six basic leadership styles, each deriving from different emotional intelligence competencies⁵².

Goleman has been heavily criticised for making exaggerated claims regarding the importance of EI and the strength of the evidence supporting his theory⁵³. More generally, attempts to test the relationship between EI and leadership performance have been confounded by methodological issues. There are a number of issues which undermine much of the research apparently finding a correlation between leadership and EI; studies failing to control for competing variables (e.g. intelligence,

⁴⁶ Ibid. p46

⁴⁷ Pittenger, D. J. (1993). The utility of the Myers-Briggs type indicator. *Review of Educational Research*, 63(4), 467-488. and Gardner, W. L., & Martinko, M. J. (1996). Using the Myers-Briggs Type Indicator to study managers: A literature review and research agenda. *Journal of Management*, 22(1), 45-83.

⁴⁸ Martinko, M. J. (1996). Using the Myers-Briggs Type Indicator to study managers: A literature review and research agenda. *Journal of Management*, 22(1), 45-83.

⁴⁹ Stromberg, J. & Caswell, E (2014) *Why the Myers-Briggs test is totally meaningless*.

⁵⁰ Ibid.

⁵¹ e.g. Goleman, D., Boyatzis, R. E., & McKee, A. (2001). Primal leadership: The hidden driver of great performance. *Harvard business review*, 79(11), 42-53.

⁵² Goleman, D. (2000). Leadership that gets results. *Harvard business review*. Mar-Apr 2000

⁵³ Paul, A. M. (1999). *Promotional intelligence*. Salon. Retrieved from <http://www.salon.com/1999/06/28/emotional/> 02 June 2016

personality), studies using measures which were designed for traits like ‘empathy’ rather than EI directly, and the use of student populations which may not generalise to ‘leadership’ populations⁵⁴.

A number of studies and reviews have cast further doubt upon EI as a valid concept: For example, “no relationship between the EI of leaders and the job performance of their followers has been found”⁵⁵; criticism that a good deal of evidence apparently supporting EI has been based on anecdotal observations and self-report surveys⁵⁶; and arguments that EI may be defined too broadly to ever be adequately tested⁵⁷.

In the eyes of some psychologists, Goleman’s work does not represent an academic approach to the topic, but a work of ‘popular psychology’⁵⁸. However, the strong academic criticism directed towards the approach Goleman has taken to EI appears not to have prevented the ideas becoming popular within leadership development. Leadership development organisations may not be aware of lack of empirical evidence supporting EI theory or concerns that claims about the importance of EI are highly-exaggerated. It might be argued that ideas about ‘leadership styles’ based on emotional intelligence should be treated with a similar caution as the concept of ‘learning styles’.

3. What might an evidence-informed approach to leadership involve?

A number of respondents noted that school leaders need additional domain-specific expertise beyond that of a classroom teacher. For example, respondents suggested specific training in human resources, finance, budgets, and administration. They also need to acquire expertise beyond the subject they teach (or taught) to be able to look across and make decisions across a range of subjects areas within a school for which they may have a management responsibility.

Some suggested that the development of building evidence into practice as a classroom practitioner was essentially in microcosm the sort of process an effective school leader needed to apply. Therefore, many of the suggestions for developing the sort of evidence-informed and based classroom practice discussed above would be appropriate also for developing leaders. There were a range of ideas regarding how evidence-informed practice might look at a leadership level, building on experience as a classroom practitioner.

<i>Theme</i>	<i>Detail</i>
Leaders need a broader & deeper engagement with research evidence	<p>Middle or senior leaders in schools might be expected to have a similar but deeper knowledge and skill set around evidence-informed practice, in comparison to classroom teachers. Leaders should have more sophisticated data analysis skills for example, in order to take a school-wide approach to assessment. They should have a deeper understanding of the research and evidence behind school improvement and RCTs, in order to make school-wide strategic decisions.</p> <p>They need to keep up to date with the latest research in order to be able to make strategic decisions. They also need to be familiar with research about a broader selection of issues, for example being familiar with the evidence base behind leadership, organisational behaviour as well as education research.</p>

⁵⁴ Antonakis, J. (2003). Why “emotional intelligence” does not predict leadership effectiveness: A comment on Prati, Douglas, Ferris, Ammeter, and Buckley (2003). *The International Journal of Organizational Analysis*, 11(4), 355-361.

⁵⁵ Wong, C. S., & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *Leadership Quarterly*, 13, 243-275.

⁵⁶ Zeidner, M., Matthews, G., & Roberts, R. D. (2004). Emotional intelligence in the workplace: A critical review. *Applied Psychology*, 53(3), 371-399.

⁵⁷ Locke, E. A. (2005). Why emotional intelligence is an invalid concept. *Journal of Organizational Behavior*, 26, 425-432

⁵⁸ Mayer, J. D., Salovey, P., & Caruso, D. R. (2008). Emotional intelligence: new ability or eclectic traits? *American psychologist*, 63(6), 503.

Leaders apply their knowledge & skills around evidence-informed practice to different things

Leaders are using a similar (but deeper and broader) skill set and knowledge base but applying it to different things - for example making evidence-informed decisions about procurement, setting, curriculum. They apply their evidence-informed practice to a much wider canvas - a whole department or faculty, if you're a middle leader, and a whole school if you're a senior leader. Leaders might also look across and between schools for a birds' eye view. Leaders might apply their deeper knowledge and skills to encouraging the school to be evidence-led and creating the environment for teachers to be evidence informed practitioners.

Leaders need to be able to implement and evaluate change

Leaders need to be able to evaluate the impact of the decisions and changes they make, understanding that simply introducing something that is evidence informed isn't enough to understand whether it's had an impact. They also need to engage the right people in change - teachers and parents, for example. Whilst the focus of this would often be broader in scope, the practitioner inquiry model presented later in this report is suggested as a common process for teachers and school leaders seeking to implement changes in school practices based on research evidence.

Leaders shape the culture which supports using research evidence in practice

A few respondents noted the possible difficulties for a teacher who is aware, for example, of the limitations and possible risk associated with labelling children with 'learning styles' as part of an approach to differentiation, where school leaders expected to see this practice as part of routine lesson planning. Crucially, leaders need to create a culture in their schools to encourage professional debate regarding the research evidence underpinning such strategies and support the development of their teachers in developing professional scepticism and challenging ineffective practice.

4. How might we apply evidence related to effective professional development to leadership?

Many of the approaches to leadership development place an over-reliance on 'reflection' as a mechanism for changing leadership behaviour. However, whilst few would argue that reflection isn't a necessary component, it is likely insufficient to bring about the development of effective leadership practice⁵⁹. Some level of challenge to that reflection would seem required to bring about changes of behaviour, and the challenge provided needs to have a valid and outcomes focused basis. If effective leadership might be characterised as solving the often complex problems which organisations face⁶⁰, then it is unlikely that this is a 'generic skill' but likely involves a combination of practical experience of leading and domain knowledge related to the wider context and needs of an organisation, the people and resources available, the role of that organisation and the development of credible strategic plans for accomplishing its goals. It seems likely that the process a classroom teacher might use to identify and assess changes to classroom practice, described in the next section, would also apply to a school leader seeking to implement, for example, a whole-school intervention.

⁵⁹ e.g. Day, C. (1993). Reflection: a necessary but not sufficient condition for professional development. *British educational research journal*, 19(1), 83-93

⁶⁰ Feser, C., Mayol, F., & Srinivasan, R. (2015). Decoding leadership: What really matters? *McKinsey Quarterly*. January 2015.

From reviews of effective professional development as it relates to teaching, and some of the wider more outcomes focused work on leadership^{61,62,63}, we posit a number of ‘good bets’ which might underpin effective leadership development:

<i>Recommendation</i>	<i>Explanation</i>
Avoid ‘generic’ approaches	Professional development which focuses on generic approaches and strategies are unlikely to lead to longer term changes in practice and improved performance. Where theory is presented it should be related explicitly and linked to opportunities to practice. To develop the so-called ‘soft skills’ needed in leadership (e.g. being supportive), focus on practical experience and providing high quality feedback (e.g. from experienced leaders) over theoretical approaches or approaches relying on the pseudo-psychometric assessment of traits or capabilities.
Develop professionally informed leaders	Develop knowledge of the organisation domain and help the leader become ‘professionally informed’ (e.g. keep up to date with research and policy, in schools this might include changes to accountability measures, pedagogical developments and academic research in their field). Many of the elements involved in developing teachers who can use research evidence to inform practice are also relevant to developing leaders. In the context of school leadership, this likely also involves knowledge of instructional leadership practices (based on the relevant pedagogical and curriculum content) so that they are better able to detect and correct mismatches between those understandings and the administrative systems intended to support them.
Reflection and collaboration are necessary but not sufficient	Reflection has long been considered a principle method for professional development (whether as teachers or leaders). However, reflection alone is unlikely to lead to significant changes in practice unless it accompanied by a valid element of challenge. Collaboration is also generally considered integral to professional development, however creating an environment where that collaboration is genuinely contributing to improvements in practice and outcomes remains elusive. A likely factor underpinning the effectiveness of reflection and collaboration is whether it genuinely challenges current practice and leads to changes in behaviour.
Professional development should have a sustained focus over time	Sustained professional development appears to be more effective than shorter interventions. Multiple, iterative and supported opportunities for application should follow on from any initial input from training. It is important to note that ineffective programmes also feature extended time and frequent contact. The crucial factor is not simply more time, but what the time is used for.
Programmes must explicitly focus on outcomes	The professional development of leaders needs to have a strong focus on improved outcomes for the organisation. In schools, for example, there needs to be an explicit focus upon improved outcomes for pupils and impact on student achievement.
Rigorous evaluation should be applied to leadership development	Leadership courses and development programmes are frequently only evaluated at a fairly superficial, affective level (e.g. ‘did you enjoy it?’). This does not provide a robust basis for evaluating leadership training. At the very least, organisations involved in leadership development should examine whether their

⁶¹ Cordingley, P., Higgins, S., Greany, T., Buckler, N., Coles-Jordan, D., Crisp, B., Saunders, L., Coe, R. (2015) *Developing Great Teaching: Lessons from the international reviews into effective professional development*. Teacher Development Trust.

⁶² Barrs, S., Parameshwaran, M., Menzies, L., & Chiong, C. (2016) *Firing on all cylinders: What makes an effective middle leader?* lkm^{co} report for Teaching Leaders.

⁶³ Robinson, V. M. J. (2010). From instructional leadership to leadership capabilities: Empirical findings and methodological challenges. *Leadership and Policy in Schools*, 9(1), 1-26.

training leads to changes in behaviour and whether those behaviours are sustained over time⁶⁴.

For genuine progress to be made in improving leadership the evaluation processes used to monitor and assess outcomes needs to move towards increasing the rigour applied. This is vital because even established programmes run by credible providers can fail to have impact⁶⁵. Establishing plausible and causal links to improved outcomes is challenging (e.g. involving RCTs or well-matched comparisons), so leadership training providers should be expected to have established links to external evaluation providers.

How might practitioner inquiry play a role in mobilising research evidence?

The extent to which teachers, especially early career teachers, should be engaged in conducting research (e.g. in the form of ‘action research’) is a matter of considerable debate.

“Similarly, projects such as action research and lesson study, while possibly tangentially worthwhile post-ITT, should be de-emphasised in initial teacher training, as the danger of encouraging pseudo-scientific approaches to research and analysis outweighs any potential reflective benefits.”⁶⁶

The development of the knowledge and skills required to effectively sift and evaluate primary research articles is a huge expectation and it is nigh impossible to ‘prove’ adaptations of teaching are responsible for any learning gains within the content of classroom research. Whilst many teachers may go on to more formal research (e.g. completing a master’s degree), after initial training, there is a question as to what sort of ‘research’, if any, teachers should engage in within the context of developing their classroom practice.

On the other hand, for research evidence to be of value, teachers need to be able to assess and implement this knowledge, develop and refine practice and improve outcomes for their pupils. Whether arising from psychological experiments or guidance based on the meta-analysis of well-controlled classroom-based trials, research evidence isn’t ‘plug and play’: it would be unreasonable to expect strategies and interventions to work perfectly when first used without adaptation or adjustment by the teacher. There is also some evidence to suggest that teachers undertaking research are more likely to engage with external evidence than those who are not⁶⁷, suggesting it can be a useful strategy for knowledge mobilisation.

In addition, whilst accepting that school leaders will have a broader scope than a new teacher, the process outlined below represents the same process, in microcosm, that an effective school leader might need to apply when instigating changes intended to bring about school improvement. A process of formulating questions, finding and assessing relevant and robust evidence, implementing interventions or changes effectively and evaluating outcomes as rigorously as possible is something which underpins evidence-based and informed practice across both teacher and leadership development.

⁶⁴ e.g. Guskey, T. R. (2002). Does it make a difference? *Educational leadership*, 59(6), 45-51.

⁶⁵ For example, <https://educationendowmentfoundation.org.uk/our-work/projects/achieve-together>

⁶⁶ Bennett, T. (2016) *Moving towards an evidence informed teaching profession. A proposal for an Initial Teacher Training evidence and research curriculum*. researchED

⁶⁷ Nelson, J., & O’Beirne, C. (2014). *Using evidence in the classroom: What works and why?* Slough: National Foundation for Educational Research. Retrieved July, 9, 2014.

Drawing on a broad definition of evidence-based practice⁶⁸, we present a sketch of how practitioner inquiry might help play a role in the mobilisation of research evidence. A guiding principle might be the extent to which the inquiry models used by new teachers incorporates the implementation cycle^{69,70} recommended for making effective use of research evidence.



Asking well formulated questions

One of the challenges in any kind of practitioner inquiry is formulating an operationalised question related to practice. One method for approaching this arises from evidence-based medicine and divides the process into two: formulating a background and a foreground question⁷¹.

Background questions tend to be fairly broad - a general 'what', 'who', or 'how' related to an issue of importance to practice: e.g. "How can homework help improve student achievement?"

Foreground questions are much more specific and measurable - and a helpful heuristic is the PICO format:

P – Pupils. Who are the relevant pupils?

I – Intervention. What are you planning to change or introduce with these pupils?

C – Comparison. What will you use as a comparison to see changes? (This might be a control group, or comparison with a baseline measure)

O – Outcomes. What are the anticipated effects of the intervention or change?

So an example of a foreground question might be: "For my Year 7s studying forces, do practice homework questions focused on specific common misconceptions reduce the incidence of these misconceptions in an end of term assessment compared with the assessment of their prior knowledge?"

Creating well-formulated but also educationally relevant questions is not always easy. Providing new teachers with a bank of examples - or allowing them to select or adapt a formulated question they feel most relevant to their practice - would provide a potentially useful scaffold to this process.

⁶⁸ Broadly synthesised from some of the variations of evidence-based practice that exist, e.g.: De Groot, M., van der Wouden, J. M., van Hell, E. A., & Nieweg, M. B. (2013). Evidence-based practice for individuals or groups: let's make a difference. *Perspectives on medical education*, 2(4), 216-221.; Barends, E., Rousseau, D. M., & Briner, R. B. (2014). *Evidence-based management: The basic principles*. Also: Jones, G. & CEBMa (2016) *Evidence-Based Practice: A Handbook for Teachers and School Leaders*. Retrieved 26 July 2017 from <https://drive.google.com/file/d/0B3LUp9PxnSZlZUVUSDJnUUE4M00/view>

⁶⁹ Kime, S. (2016) *Five steps to EEF Toolkit success*. Retrieved 21 July 2017 from <http://www.evidencebased.education/toolkit-success/>

⁷⁰ Sharples, J. (2015). Developing an evidence-informed support service for schools-reflections on a UK model. *Evidence & Policy: A Journal of Research, Debate and Practice*, 11(4), 577-587.

⁷¹ Jones, G. (2015) *The school research lead and asking better questions - part one*. Retrieved 27 July 2017 from <http://evidencebasededucationalleadership.blogspot.co.uk/2015/01/the-school-research-lead-and-asking.html>



Accessing relevant and reliable research evidence

Inquiry should be “relevant to the many short- and long-term challenges that teachers have to address, the knotty problem that keeps them awake at night”⁷². For new teachers, these are likely to be closely related to practice elements like assessment, planning and classroom management.

However, one problem is that research doesn’t always address these sorts of challenges and locating rigorous, empirical studies or summaries which are relevant to these classroom challenges can be a time-consuming and often fruitless challenge. Add to this the issue that a great deal of academic research is not publicly accessible, and the difficulties quickly become high insurmountable.

For new teachers, this step of the process can be facilitated by initially pointing towards a fairly curated set of suggested resources (for example, university reading lists, summaries of research by the EEF or IEE; selected summary articles (e.g. American Educator), books or blogs (which have been selected for rigour).

Where we wish to scaffold this process even more, linking high-quality articles and resources connected to a well formulated research question would allow new teachers to fairly quickly overcome these barriers - whilst avoiding the risks associated with expecting student teachers to find resources for themselves⁷³. Our interview respondents suggested as range of such resources which might contribute to such a resource bank and matched to the forms of questions which frequently form the basis of projects conducted by new teachers.



Appraising the usefulness and validity of research evidence

As discussed above, the expertise required to assess the valid inferences which can be drawn from a piece of research may require many years to develop. Whilst common approaches to assessing research frequently offer a checklist of how to approach the task and questions to ask⁷⁴, which can help structure an approach and act as an aide-memoir, it would be a mistake to treat this process as something which can be effectively achieved in the absence of considerable knowledge and experience.

To a great extent, new teachers can be supported in developing their approach to critically assessing evidence using resources where something of that assessment has already been undertaken. For example, introducing the resources available on the EEF toolkit and providing support to help teachers critically examine how the strength and trustworthiness of the findings have been

⁷² Saunders, L. (2017) *Just what is ‘evidence-based’ teaching? Or ‘research-informed’ teaching? Or ‘inquiry-led’ teaching?* IOE London Blog. Retrieved 25 July from <https://ioelondonblog.wordpress.com/2017/03/23/just-what-is-evidence-based-teaching-or-research-informed-teaching-or-inquiry-led-teaching/>

⁷³ See quote above from Bennett, T. (2016) *Moving towards an evidence informed teaching profession. A proposal for an Initial Teacher Training evidence and research curriculum.* researchED

⁷⁴ For example: <http://blogs.lse.ac.uk/impactofsocialsciences/2016/05/09/how-to-read-and-understand-a-scientific-paper-a-guide-for-non-scientists/> retrieved 10 July 2017

assessed⁷⁵. This may help to scaffold an approach to appraisal, as well as offering opportunities to critically engage with evidence-based research.

In addition, providing new teachers with some explicit training in the methods and statistics frequently used in educational or psychological research would act as a useful foundation for assessing the validity of the research evidence they encounter across their career. A reasonable grounding in the major theoretical approaches which often underpin research into learning or teaching methods may also provide a basis for being able to assess the validity and potential usefulness of such research.



Applying evidence to practice

Applying research evidence to practice is not a straightforward proposition. Whilst the evidence summarised in the EEF toolkit, for example, provides an important insight into whether, on average, interventions lead to improved outcomes for students, the issue of generalising such findings to a different context represents a challenging barrier related to the familiar trade-off between internal and external validity⁷⁶.

Even where meta-analysis identifies potentially important components of an effective strategy, the process of implementation is neither necessarily straightforward nor guaranteed. For example, Dylan Wiliam makes the point that even a very effective strategy like ‘feedback’ can potentially have negative influence on outcomes.

“In their review of feedback studies conducted between 1905 and 1995, Kluger and DeNisi (1996) found that in 38% of well-designed studies, feedback actually made performance worse—one of the most counterintuitive results in all of psychology.”⁷⁷

It may also be the case that Kurt Lewin’s maxim “There’s nothing so practical as a good theory” hold true in this context. Strategies like spacing and retrieval practice^{78,79} are well-evidenced from both laboratory and classroom studies, but even here the retrieval intervals or which forms of retrieval practice might be most effective is still a matter of active research⁸⁰ and likely to be sensitive to the phase and subject being taught. However, some of the issues of external invalidity - which potentially undermine a strictly evidence-based approach - may be less problematic when seeking to apply a robustly tested theory, because good theory can then be usefully applied⁸¹ in an evidence-informed way.

⁷⁵ Gorard, S. (2015) *A proposal for judging the trustworthiness of research findings*, ResearchED January 2015, http://www.workingoutwhatworks.com/en-GB/Magazine/2015/1/Trustworthiness_of_research retrieved 10th July 2017

⁷⁶ Cartwright, N. (2007). Are RCTs the gold standard?. *BioSocieties*, 2(1), 11-20.

⁷⁷ Wiliam, D. (2014) *Is the Feedback You’re Giving Students Helping or Hindering?* Retrieved 21 July 2017 from <http://www.dylanwiliamcenter.com/is-the-feedback-you-are-giving-students-helping-or-hindering/>

⁷⁸ Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). *Organizing Instruction and Study to Improve Student Learning. IES Practice Guide*. NCER 2007-2004. National Center for Education Research.

⁷⁹ Adesope, O. O., Trevisan, D. A., & Sundararajan, N. (2017). Rethinking the Use of Tests: A Meta-Analysis of Practice Testing. *Review of Educational Research*, 87(3), 659-701.

⁸⁰ e.g. <http://www.learningscientists.org/blog/2017/7/20-1>;
<http://www.learningscientists.org/blog/2017/5/11-1> retrieved 21st July 2017

⁸¹ Mook, D. G. (1983). In defense of external invalidity. *American psychologist*, 38(4), 379.

Whether seeking to apply psychological or educational research evidence, application to practice involves informed professional judgement rather than following a recipe⁸². However, whilst developing the experience and knowledge required to navigate the subtleties of research findings, new teachers would likely benefit from the ability to reference and critique a range of models and examples of how research findings might be applied to practice.



Assessing outcomes: Evaluating to improve not to prove

One of the issues in teachers conducting classroom research is the extreme difficulty in robustly evaluating whether the strategies or interventions used are responsible for any learning gains. Even where good questions are asked of practice, robust research consulted and intelligently applied, the ability to cumulatively build improved practice won't happen if evaluations lack rigour.

“Teachers. If a non-randomised study of 30 kids in one class counts as significant evidence, your sector is broken.”⁸³

There are a range of well-established biases which could reasonably influence outcome evaluations of practitioner inquiry: Expectancy effects may act to create the equivalent of a placebo effect, where the teacher (explicitly or implicitly) communicates their expectations of the outcomes, or mere novelty brings about changes in behaviour which would not necessarily be sustained or transfer to a different context; confirmation bias may lead a teacher to focus on sources of evidence which support their belief in the effectiveness of a strategy, whilst discounting evidence which contradicts it. The influence of the investment of time and effort creates a sunk-cost, which may also lead teachers to persist with strategies even where they appear unsuccessful (for example, interpreting poor results as a need for more consistent application, rather than potentially a flaw in the strategy).

Whilst educating new teachers about these biases (particularly where they apply to teacher assessment⁸⁴) is likely a helpful start, simply knowing that there is a high risk of bias related to particular approach to assessment doesn't appear to moderate the belief in the objectivity of judgements formed using them⁸⁵. In an effort to improve the rigour of evaluation, the EEF created a 'DIY Guide'⁸⁶ intended to support schools and teachers assess the impact of their interventions. New teachers should be given training and support to utilise frameworks of this sort to evaluate inquiry projects.

The prevalence of analysis manipulation or even fraud in practitioner research does not appear to have been the focus of much exploration, but given the concerns regarding the extent of fraud and misconduct in clinical research⁸⁷, it seems reasonable to consider to what degree evaluation assessments are potentially distorted (especially where there are accountability pressures of 'demonstrating impact', the external scrutiny is low, or the outcomes being assessed involve a degree

⁸² e.g. <http://educationmediacentre.org/blog/evidence-informed-judgments-not-research-based-instructions-thats-professional-teaching/> retrieved 21st July 2017

⁸³ Goldacre, B. (2014) Comment on social media: <https://twitter.com/bengoldacre/status/479194509495259137>

⁸⁴ e.g. Campbell, T. (2015). Stereotyped at seven? Biases in teacher judgement of pupils' ability and attainment. *Journal of Social Policy*, 44(3), 517-547.

⁸⁵ Hansen, K., Gerbasi, M., Todorov, A., Kruse, E., & Pronin, E. (2014). People claim objectivity after knowingly using biased strategies. *Personality and Social Psychology Bulletin*, 40(6), 691-699.

⁸⁶ Coe, R., Kime, S., Nevill, C. and Coleman, R. (2013) *The DIY Evaluation Toolkit*, London: Education Endowment Foundation. Retrieved 23 June 2017 from http://educationendowmentfoundation.org.uk/uploads/pdf/EEF_DIY_Evaluation_Guide_2013.pdf

⁸⁷ Gupta, A. (2013). Fraud and misconduct in clinical research: A concern. *Perspectives in clinical research*, 4(2), 144.

of subjectivity). Beyond creating a culture where such practices are discouraged, other methods for reducing the influence of bias and possibility of manipulation should be explored: For example, some form of independent arrangement, like a colleague ‘blind’ marking an assessment which is being used to evaluate a strategy.

Finally, underlining the focus of inquiry as a way of identifying ways in which practice might be incrementally improved, rather than to demonstrate ‘success’ may help to remove some of the motivation to manipulate analysis. This may also increase the possibility that the evaluation is genuinely used to inform and make changes to future practice.

Evaluating success

How best might Teach First evaluate whether we are successfully supporting participants in becoming ‘intelligent consumers of research’? Respondents discussed some of the difficulties in isolating specific elements of training, but suggested some methods by which we might evaluate specific aspects of knowledge and application within the context of a wider evaluation of the programme’s impact on pupil outcomes.

<i>Theme</i>	<i>Detail</i>	<i>Possible method</i>
Define the goal	We should first define what we are trying to achieve and the objectives for our participants, and articulate these explicitly (e.g. setting out our thinking in a theory of change). Defining our outcomes and linking them to the interventions (e.g. training content) will give us the framework for what we should evaluate.	This would factor into any theory of change & plans for interventions. Many of the evaluation measures currently in place (e.g. examining the impact that participants are having in the classroom) will help to evaluate the effectiveness of the changes made to the programme.
Evaluate the process & output measures	Based on the activity in our theory of change we might want to measure certain outputs, and measure the process of delivering the activity.	<p>This will depend on the activity, but for example might comprise the number of people attending training, number of people accessing resources etc.</p> <p>A process evaluation of how the implementation of the suite of activity went might include looking at the fidelity of the training (i.e. was the programme delivered as intended?) and participant experience of the programme (e.g. did they find the training relevant and useful?) with some follow up (e.g. a term later - had they used the training?).</p> <p>This would also attempt to assess potential barriers - for example, whether their school culture and professional environment was supportive of using evidence to inform teaching.</p>
Evaluate the outcomes	<p>Individual outcomes - e.g. participants’ acquisition of certain knowledge and a change in knowledge / attitudes towards evidence informed practice and engaging with research evidence.</p> <p>Application of that knowledge in the classroom</p>	We could, for example, test participants’ knowledge of key concepts/ misconceptions / terms relating to (for example) assessment theory pre- and post-programme. However, we would also want to examine whether participants are able apply that knowledge. For example, examining the way participants are using assessment in practice. This could be done through observation of classroom practice or through mentors’ observation - are they applying knowledge of evidence-informed practice, e.g. interleaving? Are they introducing evidence-

	<p>informed cycles? We could ask participants the last change they made in their teaching and what difference it made. We could follow up with individuals and ask them about the extent to which they were able to apply what they learnt.</p>
<p>Pupil outcomes - does participants' acquisition and application of knowledge result in improved outcomes for pupils?</p>	<p>Respondents highlighted the importance of going beyond evaluating just what participants had learnt, but also admitted the difficulty of doing this. As noted above, we may be able to evaluate the success of the programme (e.g. by capturing pupil data), however specifically isolating the impact of the evidence informed practice will be challenging.</p>
<p>Wider, collective, longer-term outcomes - e.g. what contribution to the research field are our participants making? Are they producing and sharing research which is having a knock-on effect on other people's practice? This might evidence a sustained adoption of evidence informed practice beyond the acquisition of certain knowledge, as well as the impact beyond an individual level.</p>	<p>Measure the extent to which our participants are sharing or disseminating evidence informed projects / interventions / resources / models (assuming we have facilitated a platform for them to do so).</p>

References used in this report

- Adesope, O. O., Trevisan, D. A., & Sundararajan, N. (2017). Rethinking the Use of Tests: A Meta-Analysis of Practice Testing. *Review of Educational Research*, 87(3), 659-701.
- Antonakis, J. (2003). Why “emotional intelligence” does not predict leadership effectiveness: A comment on Prati, Douglas, Ferris, Ammeter, and Buckley (2003). *The International Journal of Organizational Analysis*, 11(4), 355-361.
- Arthur Jr, W., Bennett Jr, W., Edens, P. S., & Bell, S. T. (2003). Effectiveness of training in organizations: a meta-analysis of design and evaluation features. *Journal of Applied psychology*, 88(2), 234.
- Bailin, S., Case, R., Coombs, J. R., & Daniels, L. B. (1999). Common misconceptions of critical thinking. *Journal of Curriculum Studies*, 31(3), 269-283.
- Barends, E., Rousseau, D. M., & Briner, R. B. (2014). *Evidence-based management: The basic principles*.
- Barrs, S., Parameshwaran, M., Menzies, L., & Chiong, C. (2016) *Firing on all cylinders: What makes an effective middle leader?* lkmco report for Teaching Leaders. Retrieved from <https://www.lkmco.org/wp-content/uploads/2016/07/Firing-on-all-cylinders-What-makes-an-effective-leader.pdf> 29 July 2016
- Bennett, T. (2016) *Moving towards an evidence informed teaching profession. A proposal for an Initial Teacher Training evidence and research curriculum*. researchED
- Biesta, G. J. (2010). Why ‘what works’ still won’t work: From evidence-based education to value-based education. *Studies in Philosophy and Education*, 29(5), 491-503. Page 500
- Brown, C., & Zhang, D. (2017). How can school leaders establish evidence-informed Schools?: An analysis of the effectiveness of potential school policy levers. *Educational Management Administration & Leadership*, 45(3), 382-401
- Cain, T. (2015) *Dylan Wiliam and Kevan Collins: Can both be right?* Edge Hill University. Retrieved 07 July 2017 from <https://www.edgehill.ac.uk/scate/2015/04/22/dylan-wiliam-and-kevan-collins-can-both-be-right-2/>
- Campbell, C & Levin B (2012) *Developing Knowledge Mobilisation to Challenge Educational Disadvantage and Inform Effective Practices in England*. Retrieved 07 July 2017 from http://tdtrust.org/wp-content/uploads/2015/11/Developing-Knowledge-Mobilisation-to-Challenge-Educational-Disadvantage-2012.pdf?utm_source=rss&utm_medium=rss
- Campbell, T. (2015). Stereotyped at seven? Biases in teacher judgement of pupils’ ability and attainment. *Journal of Social Policy*, 44(3), 517-547.
- Carter, A. (2015). *Carter Review of Initial Teacher Training (ITT)*. London: DfE [online]
- Cartwright, N. (2007). Are RCTs the gold standard?. *BioSocieties*, 2(1), 11-20.
- Christodoulou, D. (2015) *Why is teacher assessment biased?* Retrieved 10 July 2017 from <https://thewingtoheaven.wordpress.com/2015/11/01/why-is-teacher-assessment-biased/>
- Coe, R., Kime, S., Nevill, C. and Coleman, R. (2013) *The DIY Evaluation Toolkit*. London: Education Endowment Foundation. Retrieved 23 June 2017 from http://educationendowmentfoundation.org.uk/uploads/pdf/EEF_DIY_Evaluation_Guide_2013.pdf

- Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy. Post-16 learning. A systematic and critical review*. Learning and Skills Research Centre. p 47 Retrieved from: <http://skills.nl/lerenlerenu/bronnen/Learning%20styles%20by%20Coffield%20e.a..pdf> 21 July 2016
- Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., Stoll, L, Willis, B., & Burns, H. (2017) *Evidence-informed teaching: an evaluation of progress in England*. Department for Education. Retrieved 07 July 2017 from <https://www.gov.uk/government/publications/evidence-informed-teaching-evaluation-of-progress-in-england>
- Cordingley, P. (2015). The contribution of research to teachers' professional learning and development. *Oxford Review of Education*, 41(2), 234-252.
- Cordingley, P., Higgins, S., Greany, T., Buckler, N., Coles-Jordan, D., Crisp, B., Saunders, L., Coe, R. (2015) *Developing Great Teaching: Lessons from the international reviews into effective professional development*. Teacher Development Trust. Retrieved from <http://tdtrust.org/wp-content/uploads/2015/10/DGT-Full-report.pdf> 22 July 2016
- Creaby, C., Dann, R., Morris, A., Theobald, K., White, B., & Walker, M. (2017) *Leading research engagement in education: Guidance for organisational change*. Coalition for Evidence-Based Education. <http://www.cebenetwork.org/sites/cebenetwork.org/files/CEBE%20-%20Leading%20Research%20Engagement%20in%20Education%20-%20Apr%202017.pdf> Retrieved March 2017
- Day, C. (1993). Reflection: a necessary but not sufficient condition for professional development. *British educational research journal*, 19(1), 83-93
- Day, D. V., Fleenor, J. W., Atwater, L. E., Sturm, R. E., & McKee, R. A. (2014). Advances in leader and leadership development: A review of 25 years of research and theory. *The Leadership Quarterly*, 25(1), 63-82.
- De Groot, M., van der Wouden, J. M., van Hell, E. A., & Nieweg, M. B. (2013). Evidence-based practice for individuals or groups: let's make a difference. *Perspectives on medical education*, 2(4), 216-221.
- Feser, C., Mayol, F., & Srinivasan, R. (2015). Decoding leadership: What really matters? *McKinsey Quarterly*. January 2015. Retrieved from: http://www.mckinsey.com/insights/leading_in_the_21st_century/decoding_leadership_what_really_matters 01 August 2016
- Francis, B., Mills, M., & Lupton, R. (2017). Towards social justice in education: contradictions and dilemmas. *Journal of Education Policy*, 1-18
- Gardner, W. L., & Martinko, M. J. (1996). Using the Myers-Briggs Type Indicator to study managers: A literature review and research agenda. *Journal of Management*, 22(1), 45-83.
- Goldacre, B. (2013). *Building evidence into education*. DFE
- Goleman, D. (2000). Leadership that gets results. *Harvard business review*. Mar-Apr 2000
- Goleman, D., Boyatzis, R. E., & McKee, A. (2001). Primal leadership: The hidden driver of great performance. *Harvard business review*, 79(11), 42-53.

- Gorard, S. (2015) *A proposal for judging the trustworthiness of research findings*, ResearchED January 2015, http://www.workingoutwhatworks.com/en-GB/Magazine/2015/1/Trustworthiness_of_research
- Gottfredson, L. S. (1997a). Mainstream science on intelligence: An editorial with 52 signatories, history, and bibliography. *Intelligence*, 24, 13-23. Page 13
- Gupta, A. (2013). Fraud and misconduct in clinical research: A concern. *Perspectives in clinical research*, 4(2), 144.
- Guskey, T. R. (2002). Does it make a difference? *Educational leadership*, 59(6), 45-51.
- Hansen, K., Gerbasi, M., Todorov, A., Kruse, E., & Pronin, E. (2014). People claim objectivity after knowingly using biased strategies. *Personality and Social Psychology Bulletin*, 40(6), 691-699.
- Hargreaves, D. H. (1996). *Teacher Training Agency Annual Lecture 1996. Teaching as a Research-based Profession: possibilities and prospects.*
- Hassey, N (2016), *The Next Move*. Teach First. Retrieved on 03 July 2017 from https://www.teachfirst.org.uk/sites/default/files/TF_The_Next_Move_LDP.pdf
- Jones, G. (2015) *Evidence-based practice - some common misconceptions*. The BERA Blog: Research Matters retrieved 07 July 2017 from <https://www.bera.ac.uk/blog/evidence-based-practice-some-common-misconceptions>
- Jones, G. (2015) *The school research lead and asking better questions - part one*. Retrieved 27 July 2017 from <http://evidencebasededucationalleadership.blogspot.co.uk/2015/01/the-school-research-lead-and-asking.html>
- Jones, G. (2016) *Evidence-based school leadership is an ethical requirement - it's as simple as that*. Retrieved 12 June 2017 from <http://evidencebasededucationalleadership.blogspot.co.uk/2016/09/evidence-based-school-leadership-is.html>
- Jones, G. & CEBMa (2016) *Evidence-Based Practice: A Handbook for Teachers and School Leaders*. Retrieved 26 July 2017 from <https://drive.google.com/file/d/0B3LU9PxnSZIZUVUSDJnUUE4M00/view>
- Kaiser, R. B., & Curphy, G. (2013). Leadership development: The failure of an industry and the opportunity for consulting psychologists. *Consulting Psychology Journal: Practice and Research*, 65(4), 294.
- Kime, S. (2016) *Five steps to EEF Toolkit success*. Retrieved 21 July 2017 from <http://www.evidencebased.education/toolkit-success/>
- Locke, E. A. (2005). Why emotional intelligence is an invalid concept. *Journal of Organizational Behavior*, 26, 425-432
- Martinko, M. J. (1996). Using the Myers-Briggs Type Indicator to study managers: A literature review and research agenda. *Journal of Management*, 22(1), 45-83.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2008). Emotional intelligence: new ability or eclectic traits? *American psychologist*, 63(6), 503.
- Millar, R., Leach, J., Osborne, J., & Ratcliffe, M. (2006). *Improving subject teaching: Lessons from research in science education*. Routledge.

- Mook, D. G. (1983). In defense of external invalidity. *American psychologist*, 38(4), 379.
- Morris, Wooding & Grant (2011) The answer is 17 years, what is the question: Understanding time lags in translational research. *JRSocMed*, 104(12): 510-520
- Nelson, J. and O'Beirne, C. (2014). *Using Evidence in the Classroom: What Works and Why?* Slough: NFER [online]. Available: <https://www.nfer.ac.uk/publications/IMPA01/IMPA01.pdf> retrieved 12 June 2017
- Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). *Organizing Instruction and Study to Improve Student Learning*. IES Practice Guide. NCER 2007-2004. National Center for Education Research.
- Paul, A. M. (1999). *Promotional intelligence*. Salon. Retrieved from <http://www.salon.com/1999/06/28/emotional/> 02 June 2016
- Pfeffer, J., & Sutton, R. I. (2006). *Hard facts, dangerous half-truths, and total nonsense: Profiting from evidence-based management*. Harvard Business Press.
- Pittenger, D. J. (1993). The utility of the Myers-Briggs type indicator. *Review of Educational Research*, 63(4), 467-488.
- Quigley, A. (2016) *Just don't call it research!* Retrieved 03 July 2017 from <https://www.theconfidentteacher.com/2016/02/just-dont-call-it-research/>
- Robinson, V. M. J. (2010). From instructional leadership to leadership capabilities: Empirical findings and methodological challenges. *Leadership and Policy in Schools*, 9(1), 1-26.
- Robinson, V., Hohepa, M., & Lloyd, C. (2009). *School Leadership and Student Outcomes: identifying what works and why*. Best evidence synthesis iteration (BES). Wellington: Ministry of Education.
- Saunders, L. (2017) *Just what is 'evidence-based' teaching? Or 'research-informed' teaching? Or 'inquiry-led' teaching?* IOE London Blog. Retrieved 25 July from <https://ioelondonblog.wordpress.com/2017/03/23/just-what-is-evidence-based-teaching-or-research-informed-teaching-or-inquiry-led-teaching/>
- Sharples, J. (2015). Developing an evidence-informed support service for schools-reflections on a UK model. *Evidence & Policy: A Journal of Research, Debate and Practice*, 11(4), 577-587.
- Shermer, M. (2002). Skeptical sayings: Wit and wisdom from skeptics past & present. *Skeptic*, 9(2), 24-33.
- Stromberg, J. & Caswell, E (2014) *Why the Myers-Briggs test is totally meaningless*.
- Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007) *Teacher Professional Learning and Development: Best Evidence Synthesis Iteration*. Wellington, New Zealand: Ministry of Education.
- White, R.F. (2011) Toward an integrated theory of leadership. *Politics and the Life Sciences*, 30(1), 116-121.
- Wiliam, D. (2014) *Is the feedback you're giving students helping or hindering?* Retrieved 10 July 2017 from <http://www.dylanwiliamcenter.com/is-the-feedback-you-are-giving-students-helping-or-hindering/>
- Wiliam, D. (2015) *The research delusion*. TES 10 April 2015

Wong, C. S., & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *Leadership Quarterly*, 13, 243-275.

Zeidner, M., Matthews, G., & Roberts, R. D. (2004). Emotional intelligence in the workplace: A critical review. *Applied Psychology*, 53(3), 371-399.

Appendix 1: Suggested resources

Respondents were asked for suggestions for where early career teachers might find useful and reliable resources which might inform their teaching practice and develop their background knowledge for taking an evidence-informed approach.

Books

Brown, P.C., Roediger, H.L. & McDaniel, M.A. (2014) *Make It Stick: The Science of Successful Learning*. Harvard University Press

Christodoulou, D. (2014). *Seven myths about education*. Routledge.

Christodoulou, D. (2017) *Making Good Progress?* Oxford: OUP

De Bruyckere, P., Kirschner, P. A., & Hulshof, C. D. (2015). *Urban myths about learning and education*. Academic Press.

Didau, D. & Rose, N. (2016). *What every teacher needs to know about psychology*. John Catt.

Didau, D. (2015). *What if everything you knew about education was wrong?*. Crown House Publishing.

Goldacre, B. (2010). *Bad science: quacks, hacks, and big pharma flacks*. McClelland & Stewart.

Hattie, J., & Yates, G. (2014). *Visible learning and the science of how we learn*. New York: Routledge.

Hirsch, E.D. (2016) *Why Knowledge Matters*. Harvard Education Press

Koretz, D. (2009) *Measuring up: What educational testing really tell us*. Harvard University Press

Marzano, R. J., Marzano, J. S., & Pickering, D. (2003). *Classroom management that works: Research-based strategies for every teacher*. ASCD.

Pfeffer, J. (2015). *Leadership BS: Fixing workplaces and careers one truth at a time*. HarperCollins.

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive Load Theory. Explorations in the learning sciences, instructional systems and performance technologies: Vol. 1*. New York, NY: Springer Science

Wiliam, D. (2011). *Embedded formative assessment*. Solution Tree Press.

Wiliam, D. (2016) *Leadership for Teacher Learning: Creating a Culture Where All Teachers Improve So That All Pupils Succeed*. Learning Sciences International

Willingham, D. (2010) *Why Don't Pupils Like School?: A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom*. Jossey Bass

Willingham, D. (2012) *When Can You Trust the Experts?: How to Tell Good Science from Bad in Education*. Jossey Bass

Willingham, D. T. (2015). *Raising kids who read: What parents and teachers can do*. John Wiley & Sons.

Articles

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving pupils' learning with effective learning techniques promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4-58.

Gathercole, S. E., Lamont, E., & Alloway, T. P. (2006). Working memory in the classroom. *Working memory and education*, 219-240.

- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, 77(1), 81-112.
- Hirsch Jr, E. D. (2002). Classroom research and cargo cults. *Policy Review*, 115, 51.
- Kirschner, P. A., & van Merriënboer, J. J. (2013). Do learners really know best? Urban legends in education. *Educational psychologist*, 48(3), 169-183.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational psychologist*, 41(2), 75-86.
- Nuthall, G. (2005). The cultural myths and realities of classroom teaching and learning: A personal journey. *Teachers College Record*, 107(5), 895-934.
- Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). *Organizing Instruction and Study to Improve Pupil Learning. IES Practice Guide*. NCER 2007-2004. National Center for Education Research.
- Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles concepts and evidence. *Psychological science in the public interest*, 9(3), 105-119.
- Sweller, J. (2010). Element interactivity and intrinsic, extraneous and germane cognitive load. *Educational Psychology Review*, 22, 123-138.
- Sweller, J. (2011). Cognitive load theory. In J. Mestre & B. Ross (Eds.), *The psychology of learning and motivation: Cognition in education* (Vol. 55, pp. 37-76). Oxford: Academic Press.
- Sweller, J. (2012). Human cognitive architecture: Why some instructional procedures work and others do not. In K. Harris, S. Graham & T. Urdan (Eds.), *APA Educational Psychology Handbook* (Vol. 1, pp. 295-325). Washington, D.C.: American Psychological Association.
- Timperley, H. (2008). *Teacher professional learning and development*. (Educational Practices Series. Number 18). Brussels: International Academy of Education.

Summary articles

- Centre for Education Statistics and Evaluation (2017) *Cognitive load theory: Research that teachers really need to understand*. NSW Department of Education. August 2017
https://www.cese.nsw.gov.au//images/stories/PDF/cognitive_load_theory_report_AA1.pdf
- Coe, R., Aloisi, C., Higgins, S., & Major, L. E. (2014). *What makes great teaching? Review of the underpinning research*. Sutton Trust <https://www.suttontrust.com/wp-content/uploads/2014/10/What-Makes-Great-Teaching-REPORT.pdf>
- Deans for Impact (2015). *The Science of Learning*. Austin, TX: Deans for Impact.
http://www.deansforimpact.org/wp-content/uploads/2016/12/The_Science_of_Learning.pdf
- Deans for Impact (2016). *Practice with Purpose: The Emerging Science of Teacher Expertise*. Austin, TX: Deans for Impact. https://deansforimpact.org/wp-content/uploads/2016/12/Practice-with-Purpose_FOR-PRINT_113016.pdf
- Pomerance, L., Greenberg, J., & Walsh, K. (2016). *Learning about Learning: What Every New Teacher Needs to Know*. National Council on Teacher Quality.
http://www.nctq.org/dmsView/Learning_About_Learning_Report
- Smith, M. & Weinstein, Y. (2016) *Six Strategies for Effective Learning*.
<http://www.learningscientists.org/blog/2016/8/18-1> retrieved on 28th April 2017.

American Educator

Bennett, T. (2015). Group Work for the Good. *American Educator*. Spring. 32-37
<http://files.eric.ed.gov/fulltext/EJ1063868.pdf>

Clark, R. E., Kirschner, P. A., & Sweller, J. (2012). Putting Pupils on the Path to Learning. *American Educator*, 36 (1). 6-11. http://www.aft.org/sites/default/files/periodicals/ae_spring2012.pdf

Dunlosky, J. (2013). Strengthening the pupil toolbox: Study strategies to boost learning. *American Educator*, 37(3), 12-21. <http://files.eric.ed.gov/fulltext/EJ1021069.pdf>

Hirsch Jr, E. D. (2000). You can always look it up—or can you. *American Educator*, 24(1), 4-9.
<http://www.aft.org/sites/default/files/periodicals/LookItUpSpring2000.pdf>

Koretz, D. (2008) Measuring up: What educational testing really tells us. *American Educator*. Fall 2008
https://s3.amazonaws.com/media.wbur.org/wordpress/12/files/2011/07/Koretz_Measuring_Up.pdf

Rosenshine, B. (2012). Principles of Instruction: Research-Based Strategies That All Teachers Should Know. *American Educator*, 36(1), 12. <http://files.eric.ed.gov/fulltext/EJ971753.pdf>

American Educator: Willingham articles

As part of a regular feature, “Ask the Cognitive Scientist”, Daniel Willingham has contributed a host of thought-provoking and applicable articles linking the science of learning to the classroom. A number of respondents made reference to the usefulness of these articles. A small selection of these resources are listed below:

Willingham, D. T. (2015). For the Love of Reading: Engaging Pupils in a Lifelong Pursuit. *American Educator*, 39(1), 4. <http://files.eric.ed.gov/fulltext/EJ1063918.pdf>

Willingham, D. T. (2015). Do Pupils Remember What They Learn in School?. *American Educator*, 6(2015), 7. http://www.aft.org/sites/default/files/ae_fall2015willingham.pdf

Willingham, D. T. (2012). Why Does Family Wealth Affect Learning?. *American Educator*, 36(1), 33-39. <https://www.aft.org/sites/default/files/periodicals/Willingham.pdf>

Willingham, D. T. (2011). Can Teachers Increase Pupils' Self-Control?. *American Educator*, 35(2), 22-27. <http://files.eric.ed.gov/fulltext/EJ931212.pdf>

Willingham, D. T. (2009). Why Don't Pupils Like School?. *American Educator*, 5. 4-13.
<http://www.aft.org/sites/default/files/periodicals/WILLINGHAM%28%29.pdf>

Willingham, D. T. (2008). What will improve a pupil's memory. *American Educator*, 32(4), 17-25.
https://www.aft.org/sites/default/files/periodicals/willingham_0.pdf

Willingham, D. T. (2008). What is developmentally appropriate practice?. *American Educator*, 32(2), 34. https://www.aft.org/sites/default/files/periodicals/willingham_1.pdf

Willingham, D. T. (2008). Ask the Cognitive Scientist Should Learning Be Its Own Reward?. *American Educator*, 6, 2007-2008. <https://www.aft.org/ae/winter2007-2008/willingham>

Willingham, D. T. (2007). Critical thinking. *American Educator*, 31(3), 8-19.
http://www.aft.org/sites/default/files/periodicals/Crit_Thinking.pdf

Willingham, D. T. (2006). The usefulness of brief instruction in reading comprehension strategies. *American Educator*, 30(4), 39-45. <https://www.aft.org/sites/default/files/periodicals/CogSci.pdf>

Willingham, D. T. (2006). How knowledge helps: It speeds and strengthens reading comprehension, learning-and thinking. *American Educator*, 30(1), 30. <http://www.aft.org/periodical/american-educator/spring-2006/how-knowledge-helps>

Willingham, D. T. (2005) How Praise Can Motivate—or Stifle. *American Educator*. Winter 2005-2006. <https://www.aft.org/ae/winter2005-2006/willingham>

Willingham, D. T. (2004). Why Pupils Think They Understand-When They Don't. *American Educator*, 27(4), 38-41. <http://www.aft.org/periodical/american-educator/winter-2003-2004/ask-cognitive-scientist>

Willingham, D. T. (2004). The Privileged Status of Story. *American Educator*, 28, 43-45. <http://www.aft.org/periodical/american-educator/summer-2004/ask-cognitive-scientist>

Willingham, D. T. (2004). Practice Makes Perfect, But Only If You Practice Beyond the Point of Perfection. *American Educator*, 28(1), 31-33. <http://www.aft.org/periodical/american-educator/spring-2004/ask-cognitive-scientist>

Willingham, D. T. (2003). How We Learn: Ask the Cognitive Scientist. Pupils Remember... What They Think About. *American Educator*, 27(2), 37-41. <http://www.aft.org/periodical/american-educator/summer-2003/ask-cognitive-scientist>

Willingham, D. T. (2002). Inflexible Knowledge: The First Step to Expertise. *American educator*, 26(4), 31-33. <http://www.aft.org/periodical/american-educator/winter-2002/ask-cognitive-scientist>

Willingham, D. T. (2002). Allocating Pupil Study Time" Massed" versus" Distributed" Practice. *American Educator*, 26(2), 37-39. <http://www.aft.org/periodical/american-educator/summer-2002/ask-cognitive-scientist>

Education Endowment Foundation (EEF) resources:

News updates on project findings, new opportunities to get involved in research, the latest resources - <https://educationendowmentfoundation.org.uk/news/>

The 'Making best use of Teaching Assistants' guidance, implementation resources and online course - <https://educationendowmentfoundation.org.uk/resources/making-best-use-of-teaching-assistants/>

The Families of Schools database - <https://educationendowmentfoundation.org.uk/resources/families-of-schools-database/>

Assessing and Monitoring Pupil Progress online course - <https://educationendowmentfoundation.org.uk/resources/assessing-and-monitoring-pupil-progress/>

The DIY Evaluation Guide - <https://educationendowmentfoundation.org.uk/resources/diy-guide/getting-started/>

All of the EEF's work and evidence organised by school themes - <https://educationendowmentfoundation.org.uk/school-themes/>

Organisations / Websites

3-star Learning Experiences: <https://3starlearningexperiences.wordpress.com/>

American Educator: <http://www.aft.org/our-news/periodicals/american-educator>

American Psychological Association: <http://www.apa.org/ed/schools/teaching-learning/top-twenty-principles.aspx>

Best Evidence in Brief: <http://www.beib.org.uk/>

British Educational Research Association: <https://www.bera.ac.uk/>

Centre for Monitoring and Evaluation: <http://www.cem.org/blog/>

Centre for the Use of Research Evidence in Education: <http://www.curee.co.uk/>

Chartered College of Teaching: <https://chartered.college/>

Education Endowment Foundation: <https://educationendowmentfoundation.org.uk/>

EEF Newsletter: <https://www.eef.org.uk/login/newsletter>

IES: What Works Clearinghouse: <https://ies.ed.gov/ncee/wwc/>

Institute of Education Sciences: <https://ies.ed.gov/>

Institute of Effective Education: <https://www.york.ac.uk/iee/publications/beib/>

Knowledge Matters: <http://knowledgematterscampaign.org/dig-deeper/>

Learning Spy: <http://www.learningspy.co.uk/>

NFER (e.g. school evaluation of research engagement: <https://www.nfer.ac.uk/research/evidence-informed-education/>)

Research Schools Network: <https://researchschool.org.uk/>

ResearchED: <https://www.workingoutwhatworks.com/en-GB/Resource-library>

The Confident Teacher: <https://www.theconfidentteacher.com/>

The Learning Scientists: <http://www.learningscientists.org/>

Appendix 2: Interview questions

The Carter review of initial teacher training suggested that providers needed to do more support an “expectation and enthusiasm for teaching as an evidence-based profession” and help new teachers become “intelligent consumers of research”.

- What does it mean to be an ‘intelligent consumer of research’, in your opinion?
- In order to find the best available evidence, what are the key sources trainee teachers should refer to?
- What might be the sequencing across a two-year programme to achieve this?
- What additional knowledge or expertise might a school leader need beyond that required for a classroom teacher?
- How best might TF evaluate whether we were successfully supporting participants in becoming ‘intelligent consumers of research’?
- Is there anything else related to ‘evidence-based practice’ that I haven’t asked which you consider important for teacher early career development?