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Lost in translation? Can the use of theories of action be effective in helping teachers develop and scale up research-informed practices?

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HIGHLIGHTS

- Teachers need to tailor interventions to meet the specifics of their context.
- Theories of action (ToAs) can help teachers localise research based interventions.
- A ToA approach was employed with three primary schools.
- An evaluation of the TOA approach shows it improves teaching practice.
- Using ToAs also results in impactful interventions for students.

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1. Introduction

Theories of action represent the systematic exposition of why it is believed strategies or interventions have led, or will lead, to change (e.g. Earl and Timperley (2015)). The notion of research-informed teaching practice meanwhile corresponds to the use of research evidence to improve aspects of teaching and learning (Walker, 2017). To date there has not been substantive research into how best to engage teachers with research evidence on teaching and learning strategies and yet, at the same time, there are many examples of educational scale-up 'failure': in other words a failure by teachers to successfully replicate existing impactful evidence-informed practices (e.g. Bradford & Braaten, 2017; Dede, 2016.) Exploring the question 'Does engaging teachers with theories of action aid the development of impactful research-informed interventions?' this paper examines whether the use of theories of action can help teachers translate extant research evidence into contextually appropriate research informed teaching practices. Furthermore the paper also explores whether these practices are perceived to have positive benefits both for teachers and for students.

The paper is divided into nine sections. To begin with sections two and three focus on the concept of research-informed teaching practice, the current focus on using research to improve teaching and learning, as well as how it is thought research might actually be used by teachers in order to improve student outcomes. The tension between conceptual and instrumental uses of research are explored and, concluding that conceptual uses of research seem more likely, the paper then (in section four) shows how theories of action might be used to help teachers maximize the benefits of engaging with research: in other words how theories of action might help teachers apply research findings in their own settings in ways that tap into any perceived drivers of change while also producing contextually appropriate practices or teaching strategies. In section five we outline the empirical setting for the paper: the Chestnut Learning Federation. Here teachers were engaged with research and theories of action as part of a programme initiated by the federation principal and designed to foster evidence-informed school improvement. In sections six and seven the research approach and approaches to analysis are outlined. Finally in sections eight and nine, findings are presented and conclusions drawn. Suggesting that the use of theories of action can help teachers' engagement with academic research we then consider other situations in which these concepts might be introduced into teacher education.

2. What is research-informed practice?

Research informed teaching practice (RITP) is defined as the

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process of teachers accessing, evaluating and applying the findings of academic research in order to improve their teaching practice (Walker, 2017)[1] Considered to be the hallmark of high performing education systems (Furlong, 2014; Supovitz, 2015), RITP is regarded by many as a prerequisite for effective teaching and learning (Furlong, 2014; See, Gorard, & Siddiqui, 2016; Walker, 2017). While efforts to better connect educational research and practice are more than twenty years old (Nelson & O'Beirne, 2014)[2] RITP has recently come to the fore in school reform efforts in a number of counties and provinces worldwide. These jurisdictions include, but are not exclusive, to England, Ontario, the Netherlands, Norway and the USA (Malouf & Taymans, 2016; Østern, 2016; Peurach, 2016; See et al., 2016). The stated goals and outcomes expected as a result of the implementation of RITP in these areas include: continuously improving school standards; the spread of innovative approaches for delivering education both now and in the future; a 21st century teaching workforce that acts collaboratively to self improve through research and development activity; and students with the skills required for the knowledge economy (Malouf & Taymans, 2016; OECD, 2016; Peurach, 2016; Walker, 2017; Østern, 2016). In many ways therefore RITP is considered a panacea for a number of ills facing educational policy makers.

3. How research-informed practice materializes in classrooms

A common approach to realising RITP is the significant efforts underway to provide an accessible research base on effective educational interventions (Malouf & Taymans, 2016; See et al., 2016). Examples of such efforts include the syntheses of extant research findings undertaken by Hattie (2011); the Best Evidence Encyclopedia; the Education Endowment Foundation; the Campbell Collaboration; and the What Works Clearing House. Underpinning the work of these organizations is the notion that effective practices (i.e. forms of 'best practice') identified by research both can and should be replicated (i.e. scaled up) by teachers and school leaders in schools and across school system. It is intended that such replication should occur via an engagement with this research base followed by teachers undertaking specified actions/implementing specified programs suggested by it. Yet while research evidence on effective strategies may well be available, how RITP materializes in classrooms is a function of how teachers and schools act following any engagement with research: i.e. how research on effective interventions is used in practice (Dimmock, 2016; See et al., 2016).

In our professional experience as researchers and educators, the goals of teachers in using research are typically one of the following: 1) to aid the design of new bespoke strategies for teaching and learning (or indeed approaches to school management) that are to be employed as part of their and/or their school's teaching and learning (or management) activity in order tackle specific identified problems. As Coldwell et al., (2017: viii) note "for teachers, evidence-informed teaching usually meant drawing on research evidence to integrate and trial in their own practice". One example is a school we worked with who used research to design a 'mistake typology' (see *[removed for peer review]*.): informed by Dweck's (2006) work on growth mindsets, this typology was designed to help teachers and pupils recognize various types of mistakes and how different mistakes could be used as the basis to improve how pupils learn and approach their work; 2) a second goal is that teachers use research to provide ideas for how to improve aspects of their day to day practice by drawing on approaches that research has shown appear to be effective. For instance research can provide clues for how to respond to pupils during lessons in order to maintain their resilience or grit (Duckworth, 2016); 3) teachers can also seek to use research to expand, clarify and deepen concepts, including the concepts they use to understand students, curriculum and pedagogical practice (Cain, 2015, for instance provides a case of teachers examining the notion of 'gifted and talented' pupils and the way in which such pupils might be identified and the nature of a suitable curriculum for such a group). While this third goal does happen, it is less common: Coldwell et al., (2017) for example suggesting that in their study of schools teachers' use of research evidence was generally prompted by a need to solve a practical problem; finally 4) teachers and schools may also seek out specific programs or guidelines, shown by research to be effective, which set out how to engage in various aspects of teaching or specific approaches to improve learning (again typically to tackle identified problems). For example, programmes which suggest how to begin each lesson in order to minimize disruption or poor behaviour, or specific schemas for providing feedback.

There are also numerous studies and commentaries that have examined the ways in which research evidence can affect practice (e.g. Biesta, 2007; Cain, 2015; Cooper & Levin, 2010; Nutley, Walter, & Davies, 2007), including the seminal work of the late Carol Weiss (e.g. 1979, 1980, 1982). In this paper, however, we engage with recent work undertaken by Penuel et al. (2017), which broadly encapsulates the core issues involved. The particular study undertaken by Penuel et al. (2017) involves the development of a survey to capture a broad range of potential uses of research evidence in order to gain a baseline assessment of school leaders' use of research. Adopting categories first identified by Weiss and Bucuvalas (1980), Penuel et al. (2017) use their survey to examine *instrumental*, *conceptual* and *symbolic* uses of educational research by school and school system leaders. They explain the first of these use types - instrumental use - in the following way: "when policy makers encourage education leaders to use research to inform their decision making, they implicitly invoke a theory of action in which evidence from research findings directly shape decisions related to policy or practice" (Penuel et al., 2017, p. 2). Penuel et al., then define conceptual use, as occurring "when research changes the way that a person views a problem or the possible solution spaces for a problem". Symbolic use, meanwhile, occurs when research evidence is used to validate a preference for a particular decision or to justify a decision already made (Penuel et al., 2017).

For the purposes of this paper we ignore the notion of symbolic research use, since with it there is no intention that research should be employed to develop new practices; instead symbolic use simply serves to justify existing activity. The remaining two forms of research use do correspond to research related practice development however, and what makes them interesting is that they envisage this development occurring in very different ways. This is because definitions of instrumental and conceptual research use diverge in terms of *how* they envisage educators using research to make decisions and so taking action as a result of this use. Specifically instrumental use is thought to involve a *direct* translation (i.e. replication) from research to practice: i.e. with instrumental use,

[1] Typically, the engagement of teachers in and with research can take two forms. The first may be thought of as 'action research' or 'practitioner research': in other words, an investigative research project undertaken by an individual teacher as a means through which to instigate change in their classroom. The second can be described as teachers engaging in 'research informed teaching practice' (RITP). Here, teachers employ existing research with the aim of improving or innovating current pedagogic practices. Of these, it is the latter that is currently dominating the discourses of both policy and practice and, as such, provides the focus for this paper.

[2] During this time there has been a shift in from the idea that teaching should be *based* on research evidence (e.g. see Biesta, 2007), to the realization that it is perhaps more realistic, relevant, and effective to consider a situation where teaching practice is *informed* by research evidence. The reasons for this shift are tackled in the discussion of instrumental vs. conceptual research use in section 2.

research evidence is seen as pointing towards a solution in relation to a problem of practice, with this solution or strategy subsequently being accepted and/or implemented. Typically this type of use is thought to go hand in glove with notions of the synthesized research bases outlined above and concomitant notions of evidence-*based* practice. This is because proponents of instrumental use typically believe that through the use of randomised control trials or systematic reviews, such research can provide concrete calls to action through the provision of research informed guidelines or interventions that can be implemented with fidelity (Fixsen, 2017). In other words an instrumental decision is one of 'this is what we will do and how': instrumental decisions thus corresponding with notions of schools as systems that are mechanical and standardized (Hoyle, 1974). Conceptual use, however, is regarded as more indirect in that it points to situations in which research evidence informs thinking in relation to a given problem/solution to that problem (i.e. to situations in which there is research-*informed* practice). With conceptual use, therefore, research evidence is not regarded as directly replicable since it is not the sole source of information upon which educators base their decisions (the decision made thus being 'these are the kinds of things we will do', which corresponds to schools seen as ecological systems involving professionality: Hoyle, 1974).

Even if we just consider the more instrumental goals teachers may have for using research (i.e. goals one and four of those listed above), a variety of sources would seem to imply that instrumental perceptions of research use tend to be unrealistic. Not withstanding the fact that a given evidence base is often not concrete enough to provide a definitive course of action in relation to a problem of practice (although for the purposes of this paper we have focused on an intervention where concrete evidence does exist so sideline this issue for now) teachers simply do not seem to employ research in this way. For instance Coldwell et al., (2017, p. ix) suggest that there is "limited evidence from [their] study of teachers directly importing research findings to change their practice. Rather, research more typically informed their thinking and led - at least in the more engaged schools - to experimenting, testing out and trialling new approaches in more or less systematic ways". Likewise, März and Kelchtermans (2013, p. 13) conclude from an examination of the relationship between research and its implementation that "teachers' practices are never simply a matter of executing prescriptions and procedures". Gambrill (2010) reports that instrumental research use tends not to occur because practitioners' decision-making processes are complex; involving the synthesis of knowledge relating to local and individual characteristics, values, preferences and resources as well as the domain specific knowledge associated with teaching. As such we argue that research use is never 100% instrumental and correspondingly RITP should be thought of as decision making that encompasses a combination of knowledge types. This makes research use fundamentally conceptual in nature but with research evidence playing a greater or lesser role depending on a variety of factors such as the availability of research evidence and its concreteness, but also the presiding contextual factors and the practical knowledge also in play.

4. Helping teachers engage with research through theories of action

Our notion of RITP coheres with extant thinking concerning the spread of educational interventions. For example it is suggested that the scale-up of interventions is achieved through adaption not adoption (Bryk, 2016; Dede, 2016): i.e. that schools should seek to replicate interventions, not as faithful copies, but in ways best suited to their settings. We can liken this notion of adaption to that of translating from one language to another (Eco, 2003). As a result, adaption can be considered as finding the best approach to convey original meaning in a new setting taking into account the opportunities and constraints afforded by the context for that setting. The implication for the spread of interventions is clear: rather than attempt to copy exactly how individual parts of an intervention were operationalised, schools should instead seek to understand the role these parts were playing as part of an overall process designed to realise change of one form or another (Cartwright, 2013). Such thinking has substantive implications for RITP. Specifically, it suggests that to facilitate RITP there is a need to conceive of approaches that enables teachers to engage with research evidence on effective interventions that also aid understanding of how such interventions can be tailored to meet the specificities of the local situation (Cartwright, 2013; Dimmock, 2016).

One mooted approach that meets this goals is the use of theories of action (ToA) (e.g. Hubers, 2016; Jones, 2017). Theories of action are described by Earl and Timperley (2015, p. 19) as the reasoning organizations use to describe how they will make change in the world; with the 'theory' aspect of a ToA providing an "explanation of why certain things happen". This perspective resonates with that of Hatch who observes that theories of action are the "beliefs and assumptions, often implicit and unarticulated, that lead people and groups to act in certain ways" (1998, p. 4); whilst noting of ToAs that "such theories help to explain how particular social and educational programmes are constructed and why the developers believe these programmes will work" (Hatch, 1998). Theories of action are thus perhaps best thought of as the journey guide for impact – ToAs provide strategies - or route maps - that steer educators towards their intended long term outcomes, or the difference an innovation is designed to make for a given group or set of stakeholders. Correspondingly, to help educators reach this long-term vision ToAs provide the steps that need to occur along the way.

One suggested representation of a ToA comes from *[removed for peer review]*. Synthesizing seminal impact measurement literature (e.g. Earl & Timperley, 2015; Earley and Porritt, 2014; Guskey, 2000; Wenger, Trayner, & de Laat, 2011) *[removed for peer review]* suggest that interventions can be conceived as being informed by and affecting change across a number of 'domains'. These domains are identified as:

1 The **context** in which the school or setting is situated
2 The **problem or driver** for the intervention
3 Detail on **the intervention** and how it was intended to result in change
4 **Activities and interactions** related to the introduction and roll-out of the intervention
5 The **learning** that results from teachers engaging in these activities/results from these interactions
6 **Changes in teachers' behaviour,** and the extent to which something is being used
7 The **difference** behavioural changes have made to student outcomes

At the same time, *[removed for peer review]* note when using these dimensions to understand how an intervention works teachers will necessarily need to differentiate between the *why* and *how* of an intervention. Here the *why* refers to the logical operation of the intervention: the intended cause and effect that should result in a desired outcome or form of impact. Fixsen (2017) in order to explain the *why* of an intervention (such as for professional learning communities) uses as a simple heuristic - a sequence of IF/THEN statements, which result in a strategy for action. The following example uses Fixsen's approach in relation to professional learning communities: IF there are professional learning communities, THEN there will a scheduled time for teachers to discuss their work and the work

students produce; and IF teachers share their work and the results with each other, THEN they will be able to learn from each other's successes and draw upon the expertise of their colleagues around common challenges (and so on until we reach impact for students). The *how* on the other hand considers the operationalisation of the intervention and should provide a detailed description of the activities, resources, interactions, supporting structures, processes, policies and routines used to roll-out the intervention to ensure that it has the desired effect. In particular the *how* includes the approaches that were or will be used to foster desired learning, to encourage behaviour change amongst educators and to support improvements in student outcomes.

In splitting out the *why* and the *how* of an intervention, it is clear that, in providing the logic of its operation, the notion of a theory of action corresponds most closely with the *why* of an intervention. For the purposes of this paper therefore, the *how* of an intervention is referred to as the intervention's 'toolkit'. Distinguishing between the theory of action and toolkit is vital if research-informed interventions are to be employed effectively across a variety of contexts. This is because, recalling the notion of adaptive translation above (as well as the spirit of ecological professionality: Hoyle, 1974), the scale up of interventions requires us to copy interventions in essence, rather than replicate them exactly; and in doing so consider how they might best fit with the characteristics of where we are copying them to. But if we are to achieve impact we must be able to understand how to translate – or more pertinently we must focus on translating the *how* in order to achieve the *why* (the driver of cause and effect) in any new setting.

This notion of translating the *how* to achieve the *why* can be illustrated using Cartwright's (2013) examination of the success of class size reduction programmes in the United States. The theory of action underpinning such programmes is that smaller class sizes should result in more individual attention placed on students by teachers. In turn this attention should result in an increase in one-on-one personalized teaching as well as a fall in low level disruption and behaviour. In Tennessee class size reduction led to better exam results for students, but in California, class-size reduction did not succeed in improving test scores: although the ToA was still logically pertinant, it could not be realised by directly replicating Tennessee's approach. This was because in California a lack of high quality teaching staff meant there was inadequate cover for the increased number of classes. In other words, small classes per se on were not enough to improve scores; at least the presence of good teachers was also required. In such situations, alternative ways to realise the ToA could and should have been considered: e.g. a revised toolkit should have been devised, comprising, for example, the use of teaching assistants or more peer-to-peer instruction.

The example of class size reduction illustrates the need for individuals to fully understand the reasoning behind why effective programmes or interventions are effective. At the same time these examples illustrate the fallacy of more popular notions of fidelity and help us understand that innovation or the introduction of new ideas (such as those set out in the types of research synthesis described above) can spread without the necessary roll out of identical programmes or approaches that are followed in exactly the same way in a variety of contexts (Bryk, 2016; Dede, 2016; LeMahieu, 2011; Moss, 2013). This is because differentiating between ToA and toolkit means it is possible to consider two forms of replication for the scale up of interventions. These are set out in the left hand column of Fig. 1. Here the horizontal axis of Fig. 1 refers to whether the theory of action holds in a new setting or context. The vertical axis refers to whether the toolkit can be replicated in the new setting or context. The notion of directly 'equivalent' replication (the top left square of the matrix) occurs when the theory of action holds in the new setting (i.e. culturally the theory of action

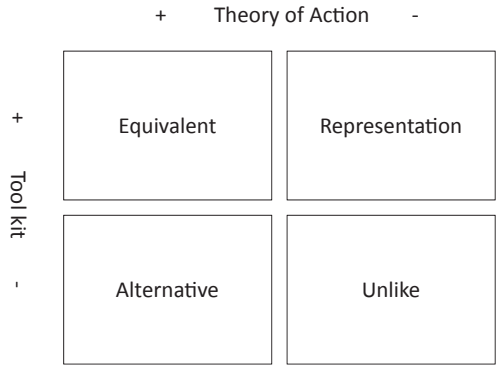

Fig. 1. Possible forms of replication for the scale up of interventions.

still 'makes sense' and will result in similar types of cause and effect) and there are also the resources required by the setting to realise the approach: in other words the toolkit can also be replicated. For all intents and purposes with *equivalent* replication the replicated intervention is the same as the original. Where the theory of action holds but the toolkit cannot be replicated, however, we have an 'alternative' version of the replication (the bottom left square in Fig. 1). An alternative replication thus represents situations such as where alternatives have been found (for example) to enable more teacher student interaction to take place without reducing class sizes. In other words, with alternative replication the desired end result of an intervention is still achieved but this is done through different means. To complete the explanation of the matrix, a 'representation' simply resembles the original intervention but its purpose is different. For instance in Japanese versions of lesson study a public lesson is often used to showcase the final perfected version of a given lesson so that others can learn from it (Ming Cheung & Yee Wong, 2014). Virtual reality simulations of interventions would also feature within this quadrant. An unlike replication refers to the use of a totally different intervention to tackle the issue in hand.

Evidence suggests that the word of education is replete with examples of scale up failure (Bradford & Braaten, 2017; Dede, 2016). At the same time there is also increasing evidence that 'alternative' replication done well is more effective at achieving positive outcomes than 'equivalent' replication undertaken poorly (Bradford & Braaten, 2017; Bryk, 2016; Garner et al., 2017; LeMahieu, 2011; Moss, 2013; Stoll, 2017). Combined with the previously discussed conceptual nature of research use our analysis thus points to the need to help teachers engage with research such that they can identify a given interventions' ToA and toolkit and relate these back to their setting in order to ascertain the most effective way to make use of it. To date however there has not been substantive empirical investigation into how best to engage teachers with existing research evidence on teaching and learning strategies such that they are enabled to both recontextualise the implementation of these strategies while also maintaining fidelity to the theory of action involved: i.e. research into how to support teachers scale up research informed interventions in ways that ensures their relevance to the setting in question while maintaining their impact. There have however been calls to give such research more priority (e.g. see Bryk, 2016), and interest in this area can now be seen across fields such as implementation science and design based research (Bryk, 2016; Coburn, Penuel, & Geil, 2013). In light of such calls this paper presents the findings of a small scale research study designed to explore whether 'Does engaging teachers with theories of action aid the development of impactful research-informed interventions?'

5. Chestnut learning federation: seeking to become research engaged

The research setting for this paper is the Chestnut CE Learning Federation. The Federation represents a family of three small Church Infant Schools based in the Hampshire villages of Rosebush, All Saints and Southampton Common, who all work closely together under the leadership of the federation principal (the names of the federation and schools have been anonymised). One of the federation's improvement plan objectives is for it to become an evidence-informed federation where the schools collaborate to rigorously evaluate the quality of the education they offer, understand what they need to do to improve, to take appropriate evidence-informed action and evaluate the impact of their actions, enabling them to achieve together. To meet this objective, the executive principal of the federation devised a model of professional learning where (as of 2016) four of the statutory staff professional development days allocated to schools in England were dedicated solely to evidence-informed professional development. Using a cycle of enquiry approach, the aim of the model is to enable teachers to engage collaboratively with research, to identify new practices, to trial these practices, to measure their impact and then roll out the most successful within and across schools in the federation.

The first author of this paper was asked by the principal to support Chestnut's process (on an unpaid basis) by facilitating each of the four workshops and providing pertinent high quality research and support to Chestnut's teachers to enable them to engage with this research in order to develop RITP. The subject of the research was effective teacher-student feedback, chosen by the federation principal as a key area for improvement. The subject of teacher-student feedback has a substantive detailed and secure research base with which to engage teachers (e.g. see the Education Endowment Foundation's 'toolkit'[3] and Hattie, 2011). To support the federation, and in keeping with the analysis above, two sets of activities were employed by the first author. The first concerned the brokering of research to Chestnut's staff, thus ensuring that they could engage with the research on feedback as well as understand the nature of its ToA and toolkit. The second involved helping the teachers involved in the project to understand how to combine these research findings with their understanding of their context in order to develop, trial and embed research informed interventions with clear ToAs and toolkits that set out pathways for change and impact.

Starting with the first set of activities, to begin with a review of extant high quality research (using extant syntheses) on teacher-student feedback was produced by author one. This research base was augmented with related and thematically appropriate research on growth mindsets and metacognition. In keeping with the literature on effective knowledge brokering (e.g. see Hubers, 2016; Morton & Seditas, 2016) the research review was designed to provide the following information:

- **Research detail:** an outline of the available research into teacher-student feedback as well as how it was conducted. Also provided was commentary on the strengths and weaknesses of this research
- **Impact data:** this outlined what current research says about the effectiveness of teacher-student feedback, in which areas of teaching and learning it is effective and for whom.
- **Outline of the intervention:** detail on researched approaches to teacher-student feedback and the thinking underpinning these uses of feedback (i.e. the ToA for why feedback should improve teaching and learning).
- **Detail on the intervention:** this explored how teacher-student feedback has been implemented (i.e. detail on its toolkit), in what contexts and in order to address what problems.

Care was taken to ensure the language used in the review was accessible and teacher-friendly (Cain, 2015). The facilitator was also on hand to answer questions and clarify areas of confusion.

In workshop two, participants began to develop interventions to improve teacher-student feedback; with a necessary requirement being that these interventions should be informed by not only the research they engaged with in workshop one but also their own personal practice based knowledge and experience and/or the knowledge and experience of others. To aid this process, participants were introduced to the notion of theories of action as well as to the specific theory of action format designed by *[removed for peer review]* (set out above). The concepts of adaptive replication and toolkits were also discussed. Finally a rubric was provided along with questions for participants to consider when developing their interventions. A copy of this rubric is provided in Table 1, below. Participants were then introduced to effective ways of trialing new innovations – such as lesson study and forms of joint practice development, and left the workshop with the expectation that the trial of their approach should occur between workshops two and three (with the refinement and wider roll out of their intervention occurring between workshops 3 and 4).

6. Research aims and questions

The research undertaken in relation to these activities was designed to explore if and how the activities helped participating teachers develop research informed interventions. It was also intended that this research should provide insights and lessons into effective ways to facilitate RITP moving forward. More specifically, the study examines the extent to which the activities described above: 1) aided teachers to engage with educational research on effective feedback and related subject areas; and 2) helped teachers use this research to develop research-informed interventions for their classrooms with clearly defined pathways for change and impact. The study also examined the nature of the interventions developed, both in terms of whether they could be classed as 'equivalents' or 'alternative' replications. Finally the study explored whether participants believed the strategies developed as a result of this model had had an impact on teaching and learning. As noted earlier, the overarching research question guiding the project was: Does engaging teachers with theories of action aid the development of impactful research-informed interventions? This overarching question was addressed through the use of four specific sub questions:

- **Research question 1:** To what extent did the activities undertaken help participants engage with the research in question?
- **Research question 2:** To what extent did the activities undertaken help participants develop interventions with clear ToAs and toolkits?
- **Research question 3:** In what ways did the interventions developed by participants cohere with the *equivalent/alternative* typology set out in Fig. 1?
- **Research question 4:** How did participants perceive that as a result of these activities, they were developing interventions which made a difference to teaching and learning?

[3] See: https://educationendowmentfoundation.org.uk/resources/teaching-learning-toolkit.

Table 1
A copy of the rubric provided to participants to help them design their intervention.

ToA domain	Questions to consider
1) Context	– What is the context of the school/group of schools, in which you are situated?
2) Problem or driver for intervention	– What is the problem you are facing? – Who does it affect? – How long has it being going on for? – What do you know about any underlying causes? – Conversely, what is the motivation to innovate? – What can the driver for innovation be attributed to? – Are these internal or external drivers?
3) The intervention	– Provide an overarching summary of your feedback innovation, what does it aim to do and how is it supposed to work? – Where does the intervention originate from and why? – Why is it believed it might be effective? – Who is involved (who intended to received it and who rolled it out)?
4) Activities and interactions	– What are the activities involved in its roll out (including detail on length, number of sessions, where activities will be held etc.). – What encouragement, support or resource will be offered or provided? – How will participating teachers become aware of the activities, support or resource (who/what will be involved)? – How is it was envisaged participants will engage with these activities supports or resources? What will be the value to them of doing so? – Relevance – how will the intervention be introduced/how will it be perceived? – Reaction to the activity – how is it hoped participants will respond? – How is it hoped that participant's attitudes might change?
5) Learning	– What learning is it hoped will result from the activities? – Will participants gain new knowledge or skills? – How will their understanding or perspectives change? – What access to new people will be gained and how will this help with learning? – What access to new resources will be gained (e.g. new tools, methods …) and how will this help with learning? – Will participants have access to new sources of information? What?
6) Changes in behaviour	– How is it intended that participants will use the intervention? – How will participants be helped to feel confident to do what is required? – What support will be provided to facilitate changes to their behaviour?
7) Difference	– What effect is it hoped the implementation will have? – How will teachers be more successful? – How will pupils be more successful?

To address these questions both pre and post intervention surveys (undertaken at the start and end of the project) as well as post intervention in-depth semi-structured interviews used to collect data. Specifically, total 15 teachers and school leaders (representing the whole of the federation's teaching staff) were interviewed in July 2017 a month after the final workshop. The characteristics of the respondents are set out in Table 2. In keeping with Wenger et al. (2011), participants were asked to bring with them impact data relating to their interventions in order to facilitate a way to triangulate their responses and provide a level of objectivity to their accounts. Furthermore the pre and post intervention surveys relating to teachers' use of research provided a further level of insight in terms of respondents' perceptions relating to research use. The questions used from the survey in this paper, as well as the responses provided, are set out in Table 3. External observation is provided by OFSTED, England's accountability body[4] since a school inspector from OFSTED also visited one of the three schools involved towards the end of the project.

7. Analysis

All interviews were recorded. Immediately after each interview and before the data were fully transcribed, contact summary sheets were written up. As suggested by Boyatzis (2008) the sheets were used to record initial information on: the participant; the main themes or issues raised during the interview; the research questions the participants focused most attention on; and suggestions for where the research team should place most energy during the next interview. Once data from the recordings were transcribed they were then analysed thematically. Inductive analysis was initially used by both authors to provide an individual categorisation of responses, with codes allocated to individual lines or turns of speech, or larger segments of text. Following this initial coding, a process of joint reflection and interpretation was undertaken to enable the research team to consider our growing understanding of the data and to consolidate the codes (Robson, 2002). The relationships between codes were then assessed and mid level codes were built from the aggregation of the initial codes until all of the initial codes could be adequately explained in a conceptually meaningful way (Lincoln & Gubba, 1985). For questions 1, 2 and 3 this process was then repeated using inductively developed top level codes to organize the mid level codes. For question 4 the domains of *[removed for peer review]* theory of action were used to provide top level codes (see Table 1) for the interview data as well as providing an organizing framework for the impact data provided by teachers. The top level codes that result for each research question can be seen in Fig. 2 below:

Table 2
Characteristics of the interview respondents.

Gender	14 Female, 1 Male
Average time in post	10 years
Average age bracket	41–46
Number with post graduate qualifications	5
Middle or senior leaders	6

8. Findings

The findings from the surveys and interviews are presented below, organized by research question. For the sake of brevity, only

[4] See: https://www.gov.uk/government/organisations/ofsted.

Table 3
Pre and post survey questions and responses.

Question[a]	Pre response (average)	Post response (average)	Difference (average)
1) Knowledge of research methods	2.8	3.6	0.9
2) Relating academic research findings to your practice	2.8	3.8	1
3) Confidence around having conversations about academic research	2.9	3.8	0.9
4) Confidence around interpreting academic research findings	2.6	3.7	1.1
5) Using academic research to inform the design of teaching and learning strategies	2.5	3.5	1

[a] Respondents were asked to rate their knowledge and skills against a five point scale, with 5 equaling 'high', 3 equaling 'average' and 1 equaling 'low/none'.

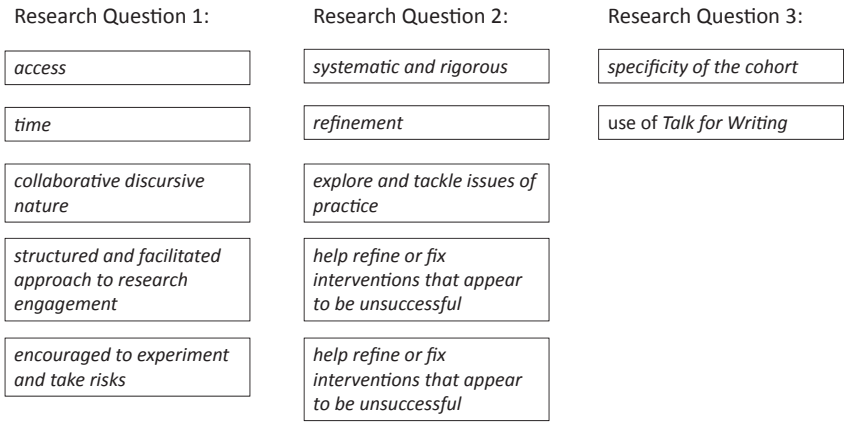

Fig. 2. Top level codes resulting from the analysis.

top level interview codes discussed in this paper (and can be identified through the use of italics).

8.1. (RQ1) research question 1: to what extent did the activities undertaken help participants engage with the research in question?

Respondents suggested that the activities helped them engage effectively with the research literature in the following ways: 1) by providing *access* to research where previously this had been difficult: "[previously] that's the bit that I've found hardest with the inquiry, is accessing that kind of material … knowing more where to go and accessing [research]. So having access to that and time to read through things was really helpful" (respondent #3); 2) this first quote also highlights the value placed on having *time* to engage with research. Other similar comments about the model providing the *time* needed to do research included: "having those inset days made all the difference this year. You know, when we were trying to fit it in, sometimes it didn't happen, and we'd grab half an hour and it didn't have the momentum it had this year" (respondent #3) (respondents #5, #8, #9, #10, #13 and #14 also made similar points); 3) The approach to research engagement was seen to have two key components: participants enjoyed the *collaborative discursive nature* of the activities: "I'm not one to sit and read through reams of research, but actually when we did the, everyone read a little bit and then fed back and discussed it. I found that a much easier, way to engage with the research … to go through and talk about, or to analyse together." (respondent #2); "the communication and working as part of a team is important, if you can sit down with [research] and unpick [its meaning] together. I think that's better than trying to work in isolation (respondent #7) (similar points also made by respondents #10, #11, #12, #13 and #14). Furthermore the *structured and facilitated approach to research engagement* meant that participants felt they were able to engage more meaningfully with the literature (respondents #2, #5, #9, #13 and #14); 4) respondents also appreciated that they were being *encouraged to experiment and take risks*: "I think for me, it was the knowledge that it was okay to get it wrong. That didn't matter, because it's not necessarily finding the answer" (respondent #6). Likewise respondent #9 noted of the federation leader that: "she is always reassuring us that 'if you trialled it and it didn't work, that's fine'".

Current literature on how school leaders can foster a research informed environment highlight the importance of providing resource and structures (for example, time, space and access to research), and facilitating an effective learning environment which includes collaborative dialogue and promoting trusting relations that enable innovation through risk taking (e.g. Stoll, 2017; Walker, 2017). The interview findings would thus seem to add empirical weight to these suggestions. It has also been suggested effective engagement with research requires that teachers can understand strengths and limitations of different research methods, can contextualise research findings (i.e. see how research findings can be applied to one's own setting and practice) and can engage in learning conversations using research as part of collaborative approach to designing new teaching strategies (e.g. Cain, 2015; Godfrey, 2016; Nelson & O'Beirne, 2014; Roberts, 2015). These three requirements are reflected in survey questions 1, 2 and 3 in Table 3 above. In all three areas it can be seen that over the course of the project respondents typically believed that they had improved their knowledge and skills in each of these areas, with average scores moving from below the mid point score of 3 ('average') at the start of the project to closer to 4 ('above average') by its end.

Correspondingly it was felt that across federation level teachers were becoming research informed as a result of the approach: "there is [now] evidence-informed professional conversation all the time. People have been far better about the idea of providing evidence for what they're saying" (respondent #1); "[we're] actually beginning to embed the fact that everything we do, should

actually be shrouded in research … and that's what we've got to continue doing (respondent #8). Furthermore a school inspection undertaken by OFSTED (England's school inspectorate) towards the end of June 2017 provides an external assessment, suggesting teachers are now using research evidence to improve specific aspects of teaching and learning. In particular the report notes that: "leaders have embedded a research-based culture where strategies to improve teaching are investigated and evaluated in terms of outcomes for pupils. As a result, the whole school community is deeply dedicated to continuous improvement and sharing expertise to raise standards further". This report thus lending further weight to the notion that the approach and activities used have been successful in helping teachers engage in research evidence and collaboratively develop research-informed teaching practices to tackle areas requiring improvement.

8.2. (RQ2) research question 2: to what extent did the activities undertaken help participants develop interventions with clear ToAs and toolkits?

From analyzing the interview data it could be seen that all respondents could espouse a theory of action for their developed intervention which follows the impact domains set out in Table 1. In other words respondents were able state what their intervention was, the logic underpinning its design, how it was intended that the intervention be realised and the changes it was intended should result. An example of one such ToA is set out in Table 4. This was created by taking interview data from respondent #4 and organizing it by impact domains. As can be seen in the table respondent #4 sets out in detail how they were able to deconstruct the nature of their intervention and its intended and actual changes in knowledge and practice as well as evidence the impact on students that resulted. The other examples provided by interview respondents are similar in detail and length making it impossible to reproduce them all in a single journal article. Correspondingly this section is used instead to explore participants' views in relation to using ToAs to develop new approaches to teaching and learning.

Respondent #3 suggested that the ToA approach had made her realise the importance of being *systematic and rigorous* in how interventions are developed as well as how baselines are established and how impact is assessed. Furthermore that the ToA approach meant that if interventions were not delivering the desired impact that tweaking and *refinement* could be undertaken by reexamining the logic of the approach and whether its constituent parts were being implemented or supported effectively. This was also reflected by respondent #5 who noted the ToA approach meant that they were able to *systematic*ally explore "what is the problem? What am I doing about it? What's changed?". In addition it was also recognized that the ToA approach could be *used generally to explore and tackle issues of practice*: "if you've got your theory of action, I find that you can then drop in a variety of questions, can't you? And, it's a similar process. I mean, once you've got the process of the research and that systematic approach and looking at it, then I feel that you can drop any question in [and explore how to address it" (respondent #12). Alternatively that the ToA approach can *help refine or fix interventions that appear to be unsuccessful*: "it also helps you address "Well, actually, it didn't work, so where do I go now?" Or, to somebody else, they come back and say, "Well, it did work for me, but it didn't work for B." "It did work for you, why? Why? Was it your approach? Was it the cohort?" So, then it opens up another question on where you're looking at" (respondent #12).

Interview data also suggests that the ToAs developed by respondents were fully grounded in the research they engaged with in workshop 1. In particular, three respondents could specifically identify the research underpinning their intervention: for example see Table 4 for respondent #4's responses. All others could not recall the name of the research(er) but could describe what the research was about and its implications for practice. Furthermore, survey data too suggests that participants felt, by the end of the project, they had developed the skills to interpret and then apply academic research to the design of new teaching and learning strategies. Survey questions 4 and 5 in Table 3, for instance, indicate that over the course of the project respondents typically believed that they had substantively more confidence than before in interpreting research findings. They also reported a higher ability to employ research effectively when developing new pedagogies. These responses reinforcing the suggestion that the theories of action developed for interventions had a basis in the research concerned.

Table 4
One example of one respondent's theory of action.

Domain	Resp. #4
Problem or driver for intervention	As a school we have been tasked with supporting more children to exceed expectations in writing. For our early years children we felt that this wasn't going to be reached through more hand writing practice or more time sat at tables. Our previous observations and experience led us to believe that something else must happen before children would exceed in their writing.
The intervention	We had noticed over several years that many children were fearful of failure, getting things wrong or not being able to achieve something and that this was inhibiting them in taking risks in their learning. They would keep doing what they could easily do rather than taking a risk with something new or tricky that might possibly go wrong. We felt that this may well be what was preventing our children from exceeding. Our intervention was informed by Carol Dweck and her work around growth mindsets. From this work we hypothesized that if we were able to change children's feelings and attitudes towards failure/struggle and getting things wrong, then they would be more likely to take risks in their learning.
Activities and interactions	We have introduced the idea of being a 'Brave Learner'. This has not just been applied to writing and maths but to all aspects of learning and being. We have created two brave learner characters and have identified the characteristics of being a brave learner. Children have been awarded a certificate when they have been a Brave Learner and their picture is added to our Brave Learner display board in school.
Learning	The teachers involved better understand the need to show to children that getting it 'wrong' is part of the learning process and only by having another go, changing strategies or practicing will be get better: failure and getting things wrong are part of the learning process. They now also have an understanding of the need to give children a language to articulate their feelings while learning.
Changes in behaviour	When a child has been awarded a certificate, we now talk about how the child felt about the struggle they have had to be a Brave Learner. We now praise their effort and resilience and their endurance, not whether they were successful in their quest.
Difference	Over the last six months we have seen a huge change in the attitudes of our children. They talk about being a Brave Learner and when we, the adults, talk about needing to be a Brave Learner they know what they have to do. They also talk about how they and others have been or need to be Brave Learners. We feel our Brave Learner programme has impacted positively on all children's attainment in writing especially for those for which writing has been a struggle. The children have begun to understand that struggle is part of learning, not an indication they will never get there.

8.3. (RQ3) In what ways did the interventions developed by participants cohere with the equivalent/alternative typology set out in Fig. 1?

Returning to the replication types set out in Fig. 1, from analyzing the interview data it would seem that all but one of participants' had or were developing *alternative* interventions. Specifically these participants had engaged with the research provided in the workshops and then had used this to develop their own approaches to teaching and learning rather than attempt to replicate existing interventions. As noted above, these new approaches all had a clear theory of action informed by the research base, but the toolkits used to realise this ToA were context specific; they were also grounded in participants' own knowledge of how best to operationalise the ToAs in their settings. Reasons for producing *alternative* replications were predominantly regarding the *specificity of the cohort* of children involved: "one approach might work for these children, but get a completely different cohort and it might be completely different [so you have to rethink and tailor]" (respondent #2). Similarly respondent #7 noted "we very quickly realised that actually [specific research approach in question] wasn't going to be right for our children, so we … we adapted it (likewise similar comments were made by respondents #1, #3, #4, #6, #8, #9, #12, #14 and #15).

The one example of 'equivalent' replication was respondent #5's use of *Talk for Writing*, which it was noted "is a formulaic approach. The idea is that the children speak it, they use actions. You do story maps and they like to use repetitive stories. For certain words and things there are particular actions, so that the more stories you do you can use that actions again". Even here however respondent #5 noted that "we've changed [the approach] to fit in with our projects. We've tailored the stories. Pie Corbett likes you to be quite repetitive and there aren't many stories, particularly if you're leading up to a project, that are very repetitive. Some stories we had to rewrite to get that repetitive nature. Again, it's hard trying to source stories to fit in with your project that are repetitive to fit in with his approach. Yes, we did change it for our cohort".

8.4. (RQ4) how did participants perceive that as a result of these activities, they were developing interventions which made a difference to teaching and learning?

For question 4, responses were easily attributable to changes in learning, behaviours and outcomes for children (i.e. domains 5 to 7 of *[removed for peer review]* framework). An exemplar response in its entirety is set out in Table 5. Here data was taken from the interview in question and set out according to the relevant domain. For other respondents we have sought to provide example vignettes that capture changes in practice and children's outcomes in order to provide an illustration of what had been achieved as respondents journeyed along their ToAs. For example, respondent #2's research question was "if they're better risk takers, and they're more willing to try things, are their reading levels coming up?" Respondent #2's approach was to create "a small focus group [and worked with the group using] books and empathy of characters [to help them understand that] you can't learn without being uncomfortable, and all those sorts of things. So, break down the barriers, and make them risk takers, and that linked with the empathy, because we're all in the pit at different times. Bar one, the whole focus group did get to [working above expectations], so, it seemed to have been successful … but I've been doing it with all of them. I think it's been, outside of that group, it's been effective, as well".

Respondent #5 noted that with their project: "there were six boys who I was trying to get to age-related expectations for writing and at the beginning of the year they were predicted that they might not make it. Out of that four have made it, two haven't, so I guess the data is saying that it's more successful than not [in fact the data provided by the respondent showed that the four pupils in question had exceeded expectations]. The *Talk for Writing* [an approach developed by Pie Corbett's which research says is successful] works in particular for stamina of writing. When [the pupils] came in September, their stamina and confidence to write at length was zero. The *Talk for Writing* just gives them the toolkit to do that. They can regurgitate, shall we say, the story and it helps them think about actually the mechanics of the writing rather than, 'I have to think what to write and then how to write it.' It's that stepping stone and it's been a good scaffold for them. It has helped them grow in confidence and ability".

Respondents #6 and #8 were working collaboratively on a feedback project. Here it was noted that "using the Leuven capture sheet, it was clear that our focus children were slow to settle to a given task. Having checklist prompt cards and strategy cards [derived from research by Gibbs and Simpson, 2004] have certainly made things quicker and the children and all now engaged positively with their writing. The quality of writing has improved and outcomes in reading and writing [according to the end of year learning goals] are now significantly above average" (respondent #8). Further more data provided by these two respondents shows that the gap between highest and lowest achieving pupils in terms of meeting or exceeding age related expectations has closed during of the course of the project from 10% to 6%.

Finally, respondent #12's project was to explore children's understanding of mastery with the aim of helping them exceed age related expectations in writing and maths. It drew on research by Yarker (2016) and Schumaker and Carraccio. Two focus group of children were selected and learning conversations were held about the notions of mastery. Subsequently a language of learning was introduced across year 1 to help children see mistakes as part of the learning process rather that a set back and that these mistakes could help children master their learning. Modeling of mastery language and skills was undertaken by the teachers and teaching assistants. End of year data shows that the number of children in Year 1 meeting their age related expectations this year has risen in writing from 76% to 83% and in maths from 83% to 92%.

9. Conclusions and commentary

In this paper we have suggested that teachers use of research tends to be conceptual rather than instrumental. Furthermore that the successful scale up of educational interventions, such as those shown by research to be effective, tends to result from adaptive translation rather than literal adoption. Correspondingly we have argued that what is required to achieve both RITP and the scale up of effective interventions is an approach that can help teachers engage effectively with research evidence in order to adapt existing interventions such that they achieve desired impact. Our approach for this has been to use notions of theories of action and toolkits: presenting research to make both ToAs and toolkits visible and explicit; and helping teachers consider how to consider ToAs and tailor toolkits in order to ensure interventions operate most effectively in their own settings. From the analysis above we suggest that this approach has enabled Chestnut Federation's teachers to successfully engage with research evidence on effective pedagogic practices. Perhaps more important however is that the paper presents evidence to suggest that the effective scale up of interventions is less to do with the instrumental replication of existing strategies and more to do with understanding why interventions have been successful and how that success might be realised in a new setting and context.

We note in section four that there are many examples available

Table 5
One example of one respondent's impact statement.

ToA domain	Impact text and data (respondent #11)
5) Learning	The aim was to improve teachers' understanding of the effective characteristics of learning, and whether this approach impacts on writing outcomes for summer born children. Specific learning included: 'the approach has changed our perspective on the importance of some core skills [and has led to an] improved understanding of why certain provision is important to specific groups and individuals. From our staff questionnaire, it is clear that teachers and teaching assistants all have a greater knowledge of the learning characteristics'.
6) Changes in behaviour	Changes in teacher practice noted by respondent #11 included: – 'changes to teachers' planning activity – using characteristics of effective learning to move away from curriculum specific foci'; – that 'learning values are now driving teaching practice [rather than end of year goals]'; – that teachers were 'more actively looking for effective learning behaviours and planning activities to develop these behaviours'; and that – across the school there was a more general focus on 'getting children to use the language of learning, so reflecting on their own learning' It was also noted that, depending on the cohort/class, 'we have had to change the focus from role play writing opportunities to individual interests … we have also had to do much more fine/gross motor work'. In other words teachers were also taking a differentiated, learning centred, approach employing their understanding of the effective characteristics of learning
7) Difference	Leuven scale data shows greater engagement in learning by children, interview data with children suggests greater confidence and understanding. Parent questionnaires indicate that parents can see the differences in children's writing. For example, one parent noted that: 'the forming of Jill's letters and her interest in writing have both improved significantly'. Furthermore the school's writing data for 2015 highlighted that only 60% summer born children met their year 1 Early Learning Goals for writing. This compares to 83% of Autumn born children. Respondent #11 argued that the changes in practice noted earlier worked extremely well; ultimately leading to an rise the number of children meeting their writing Early Learning Goals in 2016 to 86% and in 2017 to 82%. In other words sustained improvements of over 20% per year.

of scale-up failure: simultaneously that there is increasing understanding that 'alternative' replication done well is more effective at achieving positive outcomes than 'equivalent' replication undertaken poorly. At the same time many academics continue to pursue strict notions of fidelity (e.g. Fixsen, 2017): insisting that once research has demonstrated that an intervention is successful that the intervention should then be rolled out elsewhere as an exact copy. The analysis in this paper however starts to address how to resolve the apparent contradiction between 'treatment fidelity' and the need for adaption that comes with the conceptual engagement that typifies teachers' use of research (Klieme, 2017).

Correspondingly, we suggest that it is time to reconsider the importance of fidelity to the scale up of research-informed interventions. Or perhaps, to be more precise, to reconsider what fidelity really means and why it is important in relation to teachers' engagement with research. At the beginning of the paper we suggested that any intervention is comprised of a *why*: 'its theory of action', and a *how*: its 'tool kit'. To us our data shows that it is the theory of action that matters most: teachers need to understand why an approach works and which aspects of an approach drive change. Of course, examples of how it has been implemented (i.e. toolkits) provide useful illustrations for teachers. But if an approach has been developed in a given setting there is no guarantee that in the specificities of a different school it is either possible or desirable to roll out the exact same approach elsewhere. In fact there is a danger that the impact experienced by another school is somehow lost through attempts at direct translation. Instead what is needed is to find ways of achieving similar success by helping teachers tap into the same social drivers as the original intervention (assuming they hold in a new setting); but to do so by using approaches that are suitable to the resources available, the children being taught, the skills of the teachers in place and so on. In other words, as we state earlier: the scale up of interventions requires us to copy interventions in essence, rather than replicate them exactly. Fidelity then should be regarded primarily as fidelity to a ToA not necessarily to the specific way that ToA has been operationalised.

With this paper we attempted to examine the extent to which engaging teachers with theories of action aided their development of impactful research-informed interventions. Our data shows that *alternative* replications can both be research informed and be impactful. In all cases teachers were engaged with research that had examples of specific interventions that could have been implemented through replication (e.g. *Assessment for Learning* feedback or *Talk for Writing*). In all but one situation teachers used the ToA to engage with the research in a conceptual way in order to develop an *alternative* intervention that worked best for them. In all situations teachers reported impact in terms of their knowledge, their practice and outcomes for their children. In some cases this impact was substantive (e.g see Table 5). Our argument is not, however, that *equivalent* replication should no longer be pursued but to add more nuance into what it means to scale up a research-informed approach. In an age when governments are increasingly encouraging teachers to once again be professionals (Campbell, Lieberman, and Yashkina (2016) it is important to work with teachers to build their capacity so that they have a choice: that rather than simply follow they can actively create where doing so is likely to be more effective. Of course this paper reports on a very specific approach - a partnership between an academic and three schools; but the capacity to engage with research and theories of action can be built in a variety of ways, from initial teacher education to ongoing professional development. What is now needed is the resource and will to achieve it.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.tate.2018.03.007.

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