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Designing Professional Development for Teacher Change

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Contents

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1. Introduction and approach

This paper reviews the existing evidence around professional development to argue for the importance of an underlying theoretical model teacher educators can use.

The current evidence provides a list of ingredients, but does not allow teacher educators to create a full meal. Teacher educators need to understand the underpinning mechanisms in training which lead teachers to change their practice.

2. The consensus view

2.1. What is the consensus view?

A consensus view exists about what makes professional development effective

Recent reviews have suggested a consensus around the features of effective professional development. Laura Desimone (2009) describes a "research consensus"; Linda Darling-Hammond and her colleagues argue that "Positive findings have stimulated a general consensus about typical components of high-quality professional learning for teachers (Darling-Hammond, Hyler and Gardner, 2017)", and Cordingley et al., (2015) suggested that the "most rigorous" claims of the consensus are sufficiently well evidenced to merit "four padlocks" on the EEF Toolkit: which is to say, they are highly secure.

The features proposed are similar in each case, and can be exemplified by the conclusions of Timperley (2008) who suggested that professional development should:

1. Focus on important student outcomes
2. Develop teacher knowledge and skill which leads to improved student outcomes
3. Integrate knowledge and skill in practice
4. Be guided by the assessment of student learning, leading to teacher self-regulation
5. Offer multiple opportunities for change, in an environment of support and trust
6. Engage with and challenge teachers' existing theories.
7. Provide for collegial interaction to support learning
8. Draw on external expertise
9. Benefit from leadership support
10. Benefit from long-term support

2.2. Theoretical problems with the consensus

This consensus is not always helpful in designing professional development.

The research consensus is not necessarily helpful to those designing professional development however. The consensus is rarely specific enough to be useful (Wayne et al., 2008): for example, successful programmes include collaboration, according to Darling Hammond, Hyler and Gardner (2017), yet their definition of collaboration ranges

"from one-on-one or small-group interactions to school-wide collaboration to exchanges with other professionals beyond the school."

A list of best practices may not help make design choices: best practice of sustained coaching implies either significant cost or limited beneficiaries (Wayne et al., 2008): knowing it is best practice may not help leaders make decisions about professional development therefore. Studying professional development programmes provides evidence on the effectiveness of a package of measures (programmes which are sustained, subject-specific, knowledge-focused and so on); this offers no answers to specific questions, such as whether training is more effective online or in-person (Hill, Beisiegel and Jacob, 2013).

This is acknowledged in one recent review, which accepted that "Because studies of PD [professional development] typically examine comprehensive models that incorporate many elements, this paper does not seek to draw conclusions about the efficacy of individual program components (Darling-Hammond, Hyler and Gardner, 2017)." The research consensus is not sufficient to answer many questions teacher educators have.

Moreover, guidance from carefully-designed research may apply poorly in practice. Most studies which show an impact on teaching are delivered to small groups of teachers by the designers of the programme. These efficacy trials are designed to give the programme a good chance of working; when applied at larger scale, without the support of programme designers, the effects may not hold (Wayne, et al., 2008). Most professional development is short and local: big randomised-controlled trials take too long to provide answers. Careful, small-scale testing of specific design features might be a more helpful way to begin studying a programme, (for example, what difference individual coaching makes to a programme), with a move to more formal trials once there is a clear sense which aspects of the programme work: this would be quicker, cheaper and provide more robust answers (Hill, Beisiegel and Jacob, 2013).

Ultimately, a focus on programme design features has proved unhelpful (Kennedy, 2016): design features are important, but focusing on them in isolation from the context and desired goals is unhelpful.

2.3. Practical problems with the consensus

Moreover, the consensus does not lead to successful professional development.

Randomised-controlled trials testing consensus approaches to professional development have struggled to show they are effective, and have suffered significant implementation difficulties (Hill, Beisiegel and Jacob, 2013):

- One maths teaching professional development programme lasted a year, employing a summer course, collaborative discussion and video coaching; it led to significantly improved mathematical knowledge and changed teachers' behaviour, but no significant change to student achievement (Garet et al., 2016).
- A two-year professional development programme offering summer training, coaching and follow-up seminars influenced subject knowledge for teaching and improved teachers' elicitation of student thinking in one year but did not lead to significant change in student learning (Garet et al., 2011).

- A three-year study including problem solving and examination of student work and misconceptions showed positive reactions from teachers, increases in maths content knowledge, no changes in instruction or in student achievement (Jacob, Hill and Corey, 2017).

Conversely, other programmes have proved successful without including all of the ingredients suggested by the consensus around effective professional development. One study found an impressive impact of coaching, even though the programme lasted only four to five weeks (Kraft, Blazar and Hogan, 2016). Numerous studies of interaction coaching have proved successful without any subject knowledge component (see e.g. Allen et al., 2011; Allen et al., 2015). This highlights the limited usefulness of the consensus guidelines; an issue recognised by one recent review which stated that the authors were:

"Unable to comment on the elements of PD models that did not yield positive results on student achievement. It is conceivable that these ineffective models share one or more elements with those highlighted in this study and yet fail to produce positive effects on student achievement, perhaps due to weaknesses in content, design, or implementation (Darling-Hammond, Hyler and Gardner, 2017)."

The authors are right to highlight the importance of effective implementation, but their comment also emphasises the limited value the consensus view has for teacher educators.

Many carefully-designed research studies have failed to demonstrate an impact on student learning; professional development in schools has often had similarly disappointing effects. Although a significant sum of money is being spent on professional development, it is having a very limited impact. Teachers judged ineffective in specific skills tend to remain ineffective in those skills; teacher growth cannot be linked to almost any observable characteristic, except self-assessment (TNTP, 2015). In England, most professional development observed in a 2011 audit was designed to inform or influence, but not to transform practice (CUREE, n.d.). It seems therefore, that we lack both research guidance and demonstrably-effective practical examples of successful professional development. The rest of this paper suggests more effective ways to design professional development, based on the existing evidence.

No recipe for effective professional development exists.

3. Planning from need

Rather than starting with how to do professional development, we should be clear about what we hope to achieve and what teachers already know and do.

Before teacher educators select the features of their professional development programmes, it is helpful to be clear about the goals. Features, such as duration, are less important than what teacher educators do in the time available (Kennedy, 2016). It may be unsurprising, for example, that a professional development programme designed to promote collaboration between schools had no impact when what schools collaborated to achieve was left entirely to them (West et al., 2017). Just as teachers start by identifying what they hope students will learn, teacher educators should begin with what they hope teachers will learn or do differently, then select the approaches to achieve this.

This entails:

3.1. Setting a clear goal

Dylan Wiliam (2011) notes that teacher educators often begin with a commitment to a particular form of teacher development, such as coaching, rather than with a goal in mind. He notes the need to "focus on what we want teachers to change, or change about what they do, and… to understand how to support teachers in making these changes (p.188)". He emphasises the importance of doing so in this order: "content, *then* process." Identifying what we hope teachers will learn "has to be the first step: content, *then* process (p.201)." Identifying clear goals relies on the existence of clear, shared goals for teachers: a sequence of knowledge and skills which they are to develop (see Deans for Impact, 2016; Ericsson and Pool, 2016).

Teacher educators need to begin by identifying a clear, worthwhile goal.

3.2. Identifying clear needs

Even with a clear goal, there is still no simple recipe which will necessarily ensure it is achieved. For example, Harland and Kinder (1997) suggested nine areas through which teacher development might support change in teaching practice: resources, information, awareness, motivation, feelings, institutional support, value congruence and knowledge and skills.

Change in teacher practice is more likely the more of these nine areas are met for a teacher or school, but many teachers will already have strengths in many of these areas. Professional development therefore needs to be tailored towards teachers' and schools' needs therefore: a teacher with resources, motivation, excitement and support made lead a limited amount of training focused on skills in order to change, for example. More recent empirical work has drawn similar conclusions: one report on an ineffective programme reached strikingly similar conclusions, noting the need for leadership support, curricular and teaching materials, and meeting teachers' existing needs (Jacob, Hill and Corey, 2017). Teacher educators therefore need to be able to identify both the knowledge and skill of teachers and the broader support needed in schools (see 'What affects teacher development?').

Teacher educators need to identify teachers' existing strengths, and focus their work on the training and support still needed to support teacher change.

3.3. Aligning professional development to goals and needs

With clear goals and an assessment of what is needed to achieve them, training can be focused on meeting those needs. The most successful professional development systems align their support, training and systems around their goals (Jensen et al., 2016); the most effective teacher education programmes align their work around shared goals (Deans for Impact, 2017): schools need to achieve similar alignment around purpose (the value of considering all aspects of school culture and practice in designing for teacher change is discussed further in 'What affects teacher practice?').

Teacher educators need to ensure that schools' training, resources and approach are aligned to achieving their goals.

4. Designing learning for teachers

Designing teacher learning is like any other form of learning design.

Teacher educators may hope teachers will learn knowledge and skills specific to teaching, but teachers learn just like any other human. Teacher learning should therefore be designed in accord with what we know about learning more generally.

Teacher learning might helpfully be thought to include all three views of learning articulated in the last century: behavioural, cognitive and sociocultural. Medical educators have moved from seeing learning in behavioural terms (focusing on practice, feedback, and small chunks of learning) via cognitive learning (drawing on prior knowledge, actively constructing answers) to social construction (learning in groups (Wilkinson and Irby, 1998)). Teacher learning can be seen as incorporating features of all three. For example, teaching is both a cognitive skill, in which teachers draw on and develop their knowledge structures, and an improvisational activity, reflected in teachers' choices of behaviour in social contexts (Livingston and Borko, 1989). Teachers need to be able both to make good decisions – a cognitive skill – and to act effectively on those decisions (McDonald, Kazemi and Kavanagh, 2013). Teacher education must therefore attend to:

- Teachers' knowledge structures: the basis for making instructional decisions
- Teachers' behaviours: techniques for putting those decisions into practice
- Teachers' contexts and environments: teachers' ability to act and decide in ways which suit the school, class and moment

Teacher educators need to draw upon and build all three of these areas: good teacher education will integrate and create consciousness in all three domains.

> *Teacher educators should look to develop teachers' thinking, actions and ability to act in social contexts.*

4.1. Be domain and context specific

Learning is more likely to stick, and be used, if it fits teachers' contexts.

Learning transfers from one context to another reluctantly, if at all. Knowledge and expertise is domain specific: expertise requires knowledge and skill in a field, it is not a general skill (Balin et al., 1999; Perkins and Salomon, 1989). New learning is intimately linked to the context in which it is learned (Brown, Collins and Duguid, 1989): transfer is not impossible, but it is very unlikely without cues to transfer (see, for example, Gick and Holyoak, 1980). Doctors cannot transfer expertise in one procedure to a similar procedure, or skill gained in one hospital to another hospital (Kirkman, 2013).

Conversely, students learn more when their teachers keep teaching the same subject and grade (Kini and Podolsky, 2016). Developing techniques in isolation from teaching and from the subject discipline divorces teachers' thinking from student learning and makes it hard to integrate what has been learned into the lesson (Coffey et al., 2011). Likewise, general content knowledge, and knowledge focused on courses teachers do not teach seems to have no impact on student learning (Garet et al., 2016).

Any teacher learning must therefore be as specific as possible to the context in which it will be used: to the subject, topic and year group; to the location; and to superficial features of the teacher's practice and behaviour in the classroom.

Longer-term, teacher educators will wish to promote transfer and reduce specificity, for example, asking teachers to demonstrate the same skill in different contexts: this should be introduced carefully and intentionally once teachers have strong foundations in the practices they are learning.

4.2. Treat novices and experts differently

Novices learn differently from experts: what helps an expert differs from what helps a novice.

Novices think and act differently to experts. Experts display something which appears to be intuition, but reflects extensive experience, allowing them to see and think differently (Berliner 1988; Klein, 1998; Westerman, 1991). This is because experts have intricate, organised knowledge structures committed to memory, which allow them to approach problems differently to novices and solve problems more quickly and accurately. Novices have to work towards the desired solution, experts have the desired solution committed to memory as a procedure – and have to make fewer steps to get there (Larkin et al., 1980). Experts think and decide fluently, having converted existing academic knowledge into a more useful and efficient knowledge based on the cases they have experienced (Schmidt and Rikers, 2007); they do not rely on analytic rules but on the patterns they perceive based on their experiences (Eva, 2005). Since experts and novices think in different ways, learning for them must be designed differently.

Differing knowledge and skill means novices and experts learn in different ways. Novices benefit from seeing models and worked examples, they may require extensive support; experts benefit from more open problems and can be distracted by the support novices require (Sweller et al., 2003; see also Deans for Impact, 2017). Experts are better able to learn from experience, identifying what matters most and gaining new insights (Sternberg and Horvath, 1995).

There is no clear line at which a teacher switches from being a novice to being an expert: attempts to distinguish such transition points in other fields have proved challenging (Kyun, Kalyuga and Sweller, 2013) and have sometimes identified intermediate stages between being a novice and an expert with their own characteristics (Schmidt and Rikers, 2007). Nonetheless, the bigger danger is in treating novices as experts: designing training for novices, such as focusing initial training on a handful of techniques, seems to help trainees, and their students, significantly (TNTP, 2014); novices need time to learn, the chance to learn routines and simple techniques to follow (Berliner, 1988).

Novices needs clearly guided instruction to acquire knowledge and skills. This includes the careful choice of the models they experience and supported reflection to identify critical points.

5. Designing training for teachers

Kennedy (2016) divided approaches to professional development into four:

- **Prescription** – describing or demonstrating the best ways to address a problem
- **Strategies** – conveying goals and sharing ways of achieving them, leaving teachers to choose what to do
- **Insight** – provoking teachers to re-examine what is familiar, to reach 'Aha' moments
- **Knowledge** – presenting a body of knowledge (which may not imply a particular action)

Kennedy found professional development programmes which effectively supported teachers to address all major aspects of teaching (using her categories: presenting content, getting students to engage, exposing their thinking and managing behaviour), she found evidence for only two of these four approaches to professional development worked: strategy and insight. Effective professional development should therefore avoid the extremes of prescribing exactly what to do, or offering knowledge without guidance on how to apply it. The rest of this paper focuses on strategy and insight; distinguishing, for the sake of convenience, between supporting teachers to:

1. Act differently
2. Think differently

Effective professional development is likely to combine these two features: new knowledge may lead to insight, insight may lead to intentional change in practice, practice may lead to new insight. Teacher knowledge can be increased, but this has limited impact on teacher practice and student achievement (NCEE, 2016). Focusing on specific teaching techniques is helpful, but it is important to link this with deeper enquiry and the social and cultural aspects of education: practice is necessary, not sufficient (Zeichner, 2012). Teacher educators therefore need to support teachers' developing knowledge and changing practice.

> *Teacher educators may be best advised to begin focusing on either teacher thinking or actions, then to identify ways to integrate the other goal, for example, by adding pauses for reflection during practice, or practice during knowledge-building sessions.*

5.1. Deliberate practice

Anders Ericsson offers the useful distinction between purposeful practice – trying to improve – and deliberate practice: intentionally-designed improvement. Deliberate practice entails:

- Effortful practice
- Developing specific skills
- Oversight from a skilled coach
- Developing (and relying upon) mental representations
- Feedback and modification of effort (Ericsson and Pool, 2016).

Despite suggestions that Ericsson may have overstated the impact of deliberate practice (McNamara, Hambrick and Oswald, 2014) this provides a very useful framework, which has been applied productively to teacher development, albeit with the reservation that we lack shared notions of effective practices and sequencing of skills (Deans for Impact, 2016). Deliberate practice represents a conscious departure from approaches which prioritise discussion and teaching but not practice (see, for example, Garet et al., 2011; Garet et al., 2016). Simulation and deliberate practice are dramatically more effective than traditional clinical education for surgical procedures (McGaghie, Issenberg and Cohen, 2011); organisations which have made similar changes in initial teacher training report similarly impressive effects (TNTP, 2014). Deliberate practice supports teachers to automate simpler tasks: this allows them both to work more efficiently and to focus their attention on bigger challenges (see, for example, Berliner, 1988): when a teacher has rehearsed their explanation and is able to deliver it clearly and easily, they can focus on assessing how much students have understood.

> *Teacher educators must provide teachers the opportunity to practice: to rehearse and refine what they have learned before future performances (Lampert, 2010).*

Effective deliberate practice provides scaffolded opportunities to master the most important teaching practices. This relies on the identification of specific 'core practices' – tasks which teachers face regularly, which are teachable, evidence-based and lead to student learning (Grossman, Hammerness and McDonald, 2009; Forzani, 2014; NCEE 2016; TNTP, 2013). Teacher training has tended to focus on supporting teachers to improve at 'preactive' tasks, such as planning, rather than interactive tasks, such as responding to student learning (Grossman et al., 2009): core practices should include how teachers behave in the classroom, not just how they prepare for it. Refining core practices supports teachers' learning by providing teachers with common frameworks to discuss, refine and experiment with (Kazemi et al., 2016).

> *Teacher educators must identify the core practices their teachers should master.*

Deliberate practice supports teachers not just to know about core practices, but to employ them in their schools (Grossman, Hammerness and McDonald, 2009; NCATE, 2010); (conversely, practice puts teachers' knowledge to use (Ball and Forzani, 2009)). In designing effective practice, teachers need to:

- Decompose the teacher's work into units which are individually worthwhile, but are sufficiently small to learn and practise.
- Collect representations: models which demonstrate these practices.
- Identify approximations of teaching to practise.

This necessitates some artificiality: a good representation of teacher questioning may obscure other aspects of teaching, such as classroom management. Teacher educators need to remain aware of the distortions they have made, and integrate their decompositions gradually to approach increasingly realistic practice (Grossman et al., 2009). Practice relies on a culture which makes practice and analysis of practice public (Kazemi et al., 2016; Lampert et al., 2013).

Deliberate practice can help teachers gain new insights: it increases both teachers' skill and their understanding of individual techniques and of learning generally (Lampert et al., 2013). Deliberate practice demands practise, but also preparation and reflection: one way this may be shaped productively is around specific instructional activities which form a teaching episode (McDonald, Kazemi and Kavanagh, 2013). Practice provides a fertile environment in which teacher educators can support and challenge teachers to improve: deliberate practice differs from microteaching in that teachers receive extensive, rapid feedback and gain communal understanding of key ideas through becoming accustomed to routines (Lampert et al., 2013).

> *Effective deliberate practice requires teacher educators to help teachers put core practices to use, through decomposing the work of teaching, sharing representations of effective teaching and helping teachers to practise approximations of that work.*

Deliberate practice may also encourage teachers to reflect upon their knowledge and practice and provide a foundation for insight.

5.2. Gaining insight

Designing professional development to help teachers gain new insights is necessarily more complicated and less predictable than designing practice. For example, while deliberate practice can allow teacher to gain confidence in a skill, while it may be possible to reduce technical uncertainty some elements of personal and conceptual uncertainty will always remain: for example, a teacher may gain new knowledge about demonstrably effective assessment techniques, but they can never be totally certain that their choice of actions is completely correct (Hall, 2002).

The work of deliberate practice may one day feel completed; the work of gaining insight never can. Promoting insight means helping teachers to reach fresh realisations about their work and student learning: such insights can motivate and drive intentional changes in their behaviour. For example, teachers may come to recognise the force of maxims such as:

- "Memory is the residue of thought"
- "Students learn more from what you do than from what you say"
- "Plan backwards"

These bald statements can be repeated easily, but understanding them, and how to act upon them takes longer (Polanyi, 1962). Designing training to promote insight requires opportunities for teachers to be exposed to provocative ideas, both through abstract knowledge and practical experiences; it then requires time for teachers to make sense of these ideas. It may be helpful to view insights teachers may gain as 'threshold concepts': transforming, troubling and integrative changes in the way that people view the world (Mayer and Land 2003). It may also be helpful to see it as an aid to decision making.

> *Teacher educators can promote insight; they should accept that teachers' responses will be individual, and that insight, while important, will have consequences which are hard to predict.*

An important aspect of helping teachers gain insight lies in understanding the impact they are having on their students. This entails moving away from an interest in what is taught to a focus on how the teacher's actions link to student learning. This process is aided by professional learning communities and by the regular discussion of video (Supovitz, 2013; Sherin and Han, 2004) which has led teachers to change their behaviour and teach more effectively (check that paper Hill& Beisegel refer to) A focus on student learning has been identified as crucial in successful professional learning communities; (Vescio, Ross and Adams, 2007), particularly in leading to the kind of thinking which leads to greater collaboration, better ideas and teachers' examination of their values (Popp and Goldman, 2016). Conversely, unsuccessful professional development has focused on focused on teacher exposition not student learning (see e.g. Garet et al., 2016). Bringing together teachers from differing faculties and traditions to reflect collectively is challenging: attempts to do so have found that personality clashes and differences in subjects and beliefs pose significant barriers to collective understanding and improvement (Grossman, Wineburg and Woolworth, 2001).

> *Insight may be promoted through collective reflection about student learning, but what can be achieved has its limits: insight may usefully be turned back to action, through deliberate practice.*

Ultimately, deliberate practice and insight should support one another: theoretical knowledge becomes organised and usable through experience of practice (Schmidt and Rikers, 2007).

5.3. Coaching

The support teachers receive appears particularly important in causing change. Coaching has a frustratingly wide range of definitions, but here it is used to describe the intentional, often directive support of a more experienced teacher, providing feedback and designing practice to support teachers to think or act differently (it is not referring to more general coaching behaviours). Regular coaching leads to significant changes in teachers' behaviour and student learning, a finding which has been replicated in a variety of schools and areas (Allen et al., 2011; Allen et al., 2015). The coach is both the

source of feedback and also may support teachers to act on their feedback, through planning and practice. A separate form of coaching offers daily feedback based around single suggested action steps and planning associated with them led to better observations and student ratings and spilled over around the buildings (Kraft and Blazar, 2016). A review suggests it affects instruction and student achievement – not enormously but affordably. Real-time coaching can foster greater awareness in teachers of what is happening and what is possible (Stahl, Sharplin and Kehrwald, 2016). The role of the coach, in providing feedback, designing practice and supporting insight for teachers is crucial.

> *Teacher development is supported by coaches who offer feedback and design practice to support their changes in practice and fresh insight.*

6. Preparing pragmatically

Preparing for effective professional development includes anticipating and preparing for likely challenges.

6.1. Attrition and attention

Teacher attrition undermines professional development. High turnover made it impossible to demonstrate an impact in a number of recent studies (see, for example, Kraft and Blazar, 2016; Garet et al., 2016; see also Fryer, 2017, for principals): in one study 22 of 45 teachers left during the two years (Garet et al., 2011). This reflects a broader problem facing professional development leaders (and the system more broadly): high teacher turnover. Even in the schools serving the most well-off quintile of secondary students in England, 16% of teachers leave each year (17% in primary); in those serving the least well-off quintile, 22% leave each year (21% in primary). Professional development can also suffer from waning commitment. Teachers may have other priorities, leadership may change direction (see, for example, Jacob, Hill and Corey, 2017). Multi-year PD even had a negative effect by those picking up in Year 2. In the longer-term, by providing better professional development, teacher educators should be able to combat a major source of teacher stress and a big barrier to retention: teachers feeling unsupported and unable to meet the challenges they face, thereby reducing the challenge of retention.

In their design, teacher educators will need to:

- Create professional development which challenges teachers who have been retained, but helps induct new teachers into the school.
- Consider how professional development can achieve a significant impact as rapidly as possible, frontloading the most powerful learning.

In their delivery, they may seek to maintain teacher participation and enthusiasm by intentionally designing aspects of professional development to:

- Show their relevance and value to teachers
- Highlight and celebrate teachers' progress
- Be explicit about the choices they have made and the reasons for them

Teacher educators must plan to cope with high levels of teacher turnover, while also planning to reduce that turnover, both in their work and in schools more generally.

6.2. Systems and coherence

Professional development is just one aspect of a range of factors affecting teacher practice (Cambridge Assessment, 2017; Grol and Grimshaw, 2003). Educational systems are complex – have multiple moving parts – and resilient – they return to their original form.

Individual change initiatives often fail because they are viewed as individual changes when in fact they are tied together: a change in assessment must be tied to a change in teacher knowledge, professional development, accountability and so on. Change therefore requires constant monitoring and fine-tuning and the search for curriculum coherence through aligning a range of factors (Cambridge Assessment, 2017). For example, teachers and students confused about an intervention or not following the procedures they were supposed to follow (Smith and Gorard, 2005).

Effective systems link the people, evaluation structures and professional development needed to create change, so that incentives and pressures put in the right direction. International comparison highlights the importance of trained people, with professional progression, access to support and networks and clear responsibilities; evaluation which works and a systemic approach – all with the time required to achieve; tight on best practices of CPD, not on the details of how schools do it (Jensen et al., 2016). This is why professional development with "precise training and curriculum materials" which attends to many of the factors affecting professional development seems more powerful than more general professional development (Fryer, 2016).

Conversely, 'stuck' schools not improving were not linking professional development to student learning and suffered incoherence between leadership, vision, actions, systems and purposes (CUREE, 2015). This call to fit curriculum and training materials to teachers' needs has been echoed in discussion of failed professional development efforts (Jacob, Hill and Corey, 2017).

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