
The Case for Subject-Specific CPD

Robert Coe, January 2020

This paper sets out the evidence behind the case for subject-specific Continuing Professional Development (CPD) for teachers, within the wider case for investing in teacher CPD. It reviews a number of key challenges and opportunities in the system and offers a set of principles for the design of subject-specific CPD and things we should consider about implementation.

It argues that investing in systemic, high-quality CPD is probably one of the most evidence-based and cost-effective things we could do to raise attainment. CPD that focuses largely on subject-specific teacher knowledge and classroom practices should form a major part of that offer. We need a framework that sets out the content (what teachers should invest time in trying to learn) and modes of delivery for CPD that are best supported by evidence, and design programmes against this, with strong evaluation built in.

In order to keep the report short and focused, while still allowing complex arguments and evidence to be presented, some of the details have been relegated to a set of Appendices.

The case for CPD investment and quality

It now seems widely accepted that one of the biggest factors influencing student learning outcomes is teacher quality. In a classic review, Hanushek (2011) claims that “The magnitude of the differences is truly large, with some teachers producing 1.5 years of gain in achievement in an academic year while others with equivalent students produce only 1/2 year of gain. ... No other attribute of schools comes close to having this much influence on student achievement.” Burgess (2019) quantifies the size of the impact: “The typical result is remarkably consistent: a one standard deviation change in teacher effectiveness yields a 10–20% standard deviation change in pupil attainment”

A key question here, as posed by Burgess (2019), is the extent to which good teachers are ‘born’ or ‘made’:

Undoubtedly, the answer will be somewhere between the two extremes, but the distinction illustrates the two main tracks taken within the literature. If effective teachers are “born” then the salient issues revolve around selection, identifying that ability, hiring, and retention. On the other hand, if effective teachers are “made” then researchers should focus on the best training, mentoring, and feedback mechanisms.

Burgess concludes that there is evidence to support pursuing both routes to system improvement; our interest is in the second: training and supporting teachers to be more effective. Certainly, there is good evidence that teaching effectiveness can be enhanced by programmes of professional development (CPD) and that effectiveness grows with experience, particularly when certain support factors are in place (Cordingley et al, 2015; Burgess, 2019; Papay and Kraft, 2016). There probably is enough evidence now to be confident that CPD that has certain characteristics can be expected to have substantial positive impact on student attainment, though we also know that it often doesn't.

This paper draws on four main sources for a brief review of this evidence. The first is a review of reviews by Cordingley et al (2015). This is a systematic, comprehensive and reasonably recent review that answers key questions about the characteristics of CPD that have been found to be most likely to lead to improvements in student outcomes. The second is the Best Evidence Synthesis by Timperley et al (2007). Although this is already included in the Cordingley et al (2015) review – indeed it is the source for many of the strongest claims made there – it has been summarised again here because of its level of detail and the quality of its process and analysis. The third key review is by Darling-Hammond et al (2017), which post-dates the Cordingley et al review, is also of high quality and arguably presents its findings in a more succinct, practice-focused summary. The final review is by Cordingley et al (2018). This is an update to the 2015 review, with a focus on subject-specific CPD in the UK context. The main claims of each of these studies are presented in Appendix 1 (p15).

In addition to these four systematic reviews on the impact of CPD, two further reviews have also contributed to an understanding of the mechanisms and conditions under which subject-specific CPD is likely to be optimised. They are Kennedy (2016) and Kraft et al (2018).

Kennedy's (2016) review is distinctive for its conceptual approach. Instead of the usual practice of characterising CPD interventions by "their visible features", such as duration, rhythm, activities, collaboration, voluntary participation, status of the trainers, etc, Kennedy takes a more theoretically-driven approach and sets out to characterise CPD interventions according to their theories of action. Specifically, she argues, this means answering two questions:

- What problem of classroom practice does the CPD aim to address? Four types of problems are: portraying curriculum content, containing student behaviour, enlisting student participation and exposing students' thinking;
- What 'pedagogy' does the CPD use to create the teacher learning and drive adoption? Four mechanisms, with increasing requirements for teacher expertise and discretion are identified: prescription, strategies, insight and bodies of knowledge

Of the studies Kennedy reviewed, those that promoted the intermediate levels of teacher agency (pedagogies based on giving teachers strategies or insight) had bigger effects than either prescription (just telling them what to do, with limited choice) or knowledge (providing more extensive and theoretical underpinnings, but less directly linked to classroom practice). There were no clear differences according to which classroom problem was addressed: CPD with any of these foci could lead to improvements in student learning outcomes.

The literature on instructional coaching is also of interest, for three main reasons. One is that its effects seem to be at the top end of all forms of CPD. Effect sizes are, in the words of Kraft et al (2018), “larger than pooled estimates from causal studies of almost all other school-based interventions.”¹ The second reason is that this literature provides unique insights into the mechanisms by which participation in training leads to changes in classroom practices that in turn produce improvements in learning. Kraft et al’s definition of instructional coaching illuminates the key processes:

We characterize the coaching process as one where instructional experts work with teachers to discuss classroom practice in a way that is (a) individualized—coaching sessions are one-on-one; (b) intensive—coaches and teachers interact at least every couple of weeks; (c) sustained—teachers receive coaching over an extended period of time; (d) context specific—teachers are coached on their practices within the context of their own classroom; and (e) focused—coaches work with teachers to engage in deliberate practice of specific skills. (Kraft et al., 2018, p553)

A third reason is that the coaching process seems to fit well with feasible models of improvement in a school-led system. By definition, it takes place largely in classrooms (although Kraft et al 2018 found larger effects for programmes that combined coaching with building baseline skills or providing instructional materials); the ‘instructional experts’ are themselves teachers, albeit those teachers who are the best at the particular focus of the coaching. A nice example of this working at scale in real schools can be seen in Papay et al (2016).

Taken as a whole there is a lot of agreement across the reviews and broad congruence in the evidence about what characteristics of CPD are most likely to enable it to lead to improvements in students’ learning. An attempt to summarise the practical implications for the design of CPD is presented in Box 1.

¹ See also a 2019 blog post by Sam Sims that provides a good summary of wider evidence on instructional coaching: <https://samsims.education/2019/02/19/247/>

Practical summary of the evidence about effective CPD

CPD that aims to support the kinds of changes in teachers' classroom practice that are likely to lead to substantive gains in student learning should:

- 1) Focus on promoting the teacher skills, knowledge and behaviours that are best evidenced as determining student learning. Such content should be appropriately sequenced and differentiated to match the needs of participants.
- 2) Have sufficient duration (two terms) and frequency (fortnightly) to enable changes to be embedded
- 3) Give participants opportunities to
 - a) Be presented with new ideas, knowledge, research evidence and practices,
 - b) Reflect on and discuss that input in ways that surface and challenge their existing beliefs, theories and practices
 - c) See examples of new practices/materials/ideas modelled by experts
 - d) Experiment with guided changes in their practice that are consistent with these challenging new ideas and their own context
 - e) Receive feedback and coaching from experts in those practices, on an ongoing basis
 - f) Evaluate, review and regulate their own learning
- 4) Create/require an environment where
 - a) Participants can collaborate with their peers to support, challenge and explore
 - b) School leadership promotes a culture of trust and continuous professional learning
 - c) Teachers believe they can and need to be better than they are
 - d) The process and aims of the CPD are aligned with the wider context (eg accountability)

Box 1: Practical summary of the evidence about effective CPD, based on Cordingley et al (2015, 2018); Timperley et al (2007); Darling-Hammond et al (2017); Kennedy (2016) and Kraft et al (2018).

The evidence from these reviews makes it clear that, at its best, CPD can lead to big impacts on student learning. The exact conditions under which CPD is most effective may be seen as an emerging consensus: we currently have enough evidence to identify likely best bets and credible hypotheses about the mechanisms by which CPD is effective, though there is much that we either still do not know or should regard as provisional and seek to test. We certainly

have examples of CPD that followed all the best evidence but did not work (eg Garet et al, 2016). In that context, an evidence-based approach would be to design and implement programmes of CPD that are aligned with the best available evidence and to build in strong evaluation so that we can learn as quickly as possible whether and why they are working, and how to optimise them.

One further consideration in the case for CPD is its cost. If we knew it was effective but very expensive, we might judge that a finite budget could be better spent in other ways.

Despite a widespread perception that cost is a barrier to CPD uptake,² the cost of CPD is arguably quite modest compared to other things we could do. For example, an extra 10 days of training per teacher would add around 5% to the staffing budget. If the training were well designed and implemented, we might reasonably expect an impact on student attainment around 0.2sd. To achieve something comparable by reducing class size, we would probably have to halve it – approximately 20 times the cost. Plus, the cost of CPD is a one-off, but the benefit is ongoing, whereas class size reductions have to be funded each year. If we look at the range of interventions on offer to schools (eg in the EEF Toolkit or Programmes³), the vast majority have CPD as their active ingredient. If we compare the main policy levers favoured by governments (eg accountability, school governance), the evidence generally suggests they have small effects at best. Another option (as suggested by Burgess, cited above) would be to focus on better teacher selection and retention strategies. These probably could also make a difference and are certainly worth investigating. But they are unlikely to be cheaper than CPD and are politically much more problematic.

Summary of the case for investing in CPD

- The effectiveness of individual teachers makes a large difference to students' learning outcomes
- Teacher effectiveness can be increased substantially by in-service training and support
- Although CPD may sometimes be seen as an expensive, non-core element of running schools, compared to other things we could do to raise attainment it is extremely cost-effective.

² See, for example the DfE School Snapshot Survey, Summer 2018:

<https://www.gov.uk/government/publications/school-snapshot-survey-summer-2018> (Fig 26, Main barriers to accessing effective CPD, p53).

³ <https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/>, <https://educationendowmentfoundation.org.uk/projects-and-evaluation/reports/>

The case for subject-specific CPD

A number of reviews make the claim that ‘subject-specific’ CPD is generally more effective than ‘generic’ (eg Desimone, 2009; Blank and de las Alas, 2009; Wei et al, 2009; Cordingley et al, 2018). However, defining exactly what we mean by subject-specific CPD proves to be surprisingly difficult. A more detailed discussion of this issue can be found in Appendix 2 (p25). The key challenge is that even ‘generic’ teacher skills or behaviours may be different when teaching different content. For example, the skills and experience required to ‘manage class time and resources efficiently’ may actually be (slightly) different in physics than in drama or even history. So even supposedly ‘generic’ pedagogy is to some extent subject-specific.

It would be helpful if we had a framework that set out a comprehensive curriculum for teacher learning: a list of all the skills, attitudes, knowledge, beliefs and behaviours that comprise effective classroom teaching and hence everything that is worth learning for teachers if they want to become more effective. An example of such a framework is presented in Appendix 3 (p29), the result of an ongoing piece of work (Coe et al, forthcoming) to synthesise the best available research on teacher competences that make a difference to student learning (ie if teachers learn to be better at them, students learn more). Of course, such frameworks exist already, but none appears to be comprehensive, research-based and designed to be a useful tool for teachers.

This ‘Great Teaching Framework’ consists of four domains.⁴ The first is essentially subject knowledge, including both understanding of the subject itself and pedagogical content knowledge, the knowledge of student thinking, learning and assessment related to that content. This domain is clearly highly subject-specific.

The second domain is concerned with relationships and the classroom environment. Most of these behaviours are likely to be largely independent of the content being taught and the skills underpinning them are relatively transferable. Hence, these competences are highly generic.

The third domain is about classroom management. As discussed above, there will be some dependencies on the types of task being used, but there is a lot of generality to the skills in this domain, so they are mostly generic, and certainly more so than subject-specific.

The fourth domain is about instructional practices that activate thinking, and most of these are at least partly dependent on the content, ideas, knowledge, skills, etc that are being taught, and in some cases, highly dependent. For example, the ability to present new material

⁴ User testing may lead us to collapse some of the categories and end up with three domains – it is still work in progress at this time

(4.2) is very topic-specific, as are modelling, sequencing, questioning and task selection (4.3, 4.4, 4.5, 4.8, respectively). Skills such as giving and responding to feedback, or reviewing prior knowledge (4.6, 4.7, 4.1) are reasonably dependent on the content being learnt, though there may also be generalisable techniques and principles teachers can draw on in these competences. Supporting goal-setting and metacognition (4.9, 4.10) may be more generic. In other words, the individual competences listed in this domain vary in their subject-specificity, but most are significantly subject-specific.

Overall, the current version of the Great Teaching Framework has 26 competences. Of these, probably 14 could be classed as largely subject-specific. Hence, one way to define 'subject-specific CPD' would be as CPD whose main aims are to help teachers to get better at one or more of the competences listed in Box 2.

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| 1.1 | Having deep and fluent knowledge and flexible understanding of the content you are teaching | 4.1 | Re-activating/checking prior knowledge to ensure prerequisite skills/knowledge are in place (and responding if not) |
| 1.2 | Knowledge of the requirements of curriculum sequencing and dependencies in relation to the content and ideas you are teaching | 4.2 | Presenting new material clearly, with concise, appropriate, engaging explanations, using examples appropriately to help learners understand abstract ideas and connecting new ideas to what has previously been learnt |
| 1.3 | Knowledge of relevant curriculum tasks and activities, their diagnostic & didactic potential | 4.3 | Modelling/demonstrating new skills or procedures with appropriate scaffolding and challenge |
| 1.4 | Being able to generate/select good assessment activities related to the content you are teaching | 4.4 | Giving students an appropriate sequence of learning tasks, with initial scaffolding to make them accessible to everyone, but gradually removed so all master it fully |
| 1.5 | Knowledge of common student strategies, misconceptions and sticking points in relation to the content you are teaching | 4.5 | Using questions and dialogue to promote elaboration and connected thinking (flexible understanding), and to elicit the thinking of all students |
| 1.6 | Being able to generate varied explanations and multiple representations/analogies/examples for the ideas you are teaching | 4.6 | Giving students actionable feedback to guide their learning |
| | | 4.7 | Responding appropriately to feedback from students about their thinking/knowledge/understanding – especially where there are gaps |
| | | 4.8 | Giving students tasks that embed learning, requiring them to practise until learning is fluent and secure and ensuring that once-learnt material is reviewed/revisited to prevent forgetting |

Box 2: Subject-specific components of great teaching

Challenges in the current system

There are a number of existing reviews of the challenges of providing, selecting and participating in high-quality CPD (eg Cordingley, et al, 2018; <https://tdtrust.org/about/evidence>). For brief discussion here, and a more personal perspective than the previous sections, I have chosen five issues: culture, practicalities, progression, quality and coaches.

1. No culture of support for professional learning

A 2016 TDT report (Weston, 2016) indicates that few schools in England spend more than 1% of their budget on CPD, and a significant number spend nothing at all. For context, according to a 2007 McKinsey report (Barber and Mourshed, 2007, p41), in the world's best performing systems, teachers typically spend 10% of their time on professional development. Of course, budgets are highly constrained so real choice may be limited, but spending is a good indicator of what is considered important. Even in less austere times, CPD was a low-spend for most school leaders. When you ask people what barriers prevent them from doing things they will always cite cost and time, and of course these are real reasons. But if something is really important to us, we find the money and make the time to do it. Lack of spending is therefore a good indicator of lack of priority.

Perhaps even more depressingly, where CPD is prioritised, it is often reactive and remedial, rather than a positive entitlement to professional growth: "the most commonly booked courses tend to be in reaction to external threats and changes (e.g. Ofsted inspections, new regulations, changing exam syllabuses)."⁵ Subject-specific CPD may be more often seen as fixing a problem (lack of qualified subject teachers) rather than something that even the best teachers should want to do to get still better.

This creates a 'chicken and egg' situation of supply and demand. If providers want to offer a high-quality CPD programme (which is likely to be more expensive and require more time to participate) they will find there is not much demand for it. If teachers seek high-quality CPD, they will find the supply is very limited.

This is a culture we should try to change, through concerted national action and investment.

⁵ <https://tdtrust.org/about/evidence>

2. Practical difficulties

There are many we could list here, all of them genuine problems. For example,

- If CPD should be sustained and intense, where does the time come from? If it comes out of teaching time, it disrupts classes, requires supply cover, adds to workload and stress. If not, it eats into leisure time and adds to workload and stress.
- If CPD trainers should be experts, how do we prevent our best teachers being taken out of the classroom to deliver training? Or mitigate the impact on students in some other way? This may be a particular problem when there are already shortages (eg in physics).
- Investing in infrastructure and programmes for high-quality CPD probably must require additional funding. Where is that money going to come from?

3. Coherence and progression

There are currently no good systems in England for recognising or accrediting either participation in CPD or the learning that has resulted. There is no clear ‘curriculum’ for CPD that sets out a framework for what teachers should learn to be better at – although the ECF may be the start of something in that direction. In particular, such a ‘CPD curriculum’ should indicate the sequencing and dependencies of the learning: What do I need to know already before I can study that? Once I can do that, what should I do next? - but we currently do not have this. There are no ‘assessments’ that will embody the standard that is intended to result from CPD and evaluate or certify how far it has been met. We do not have diagnostic or formative assessments of CPD learning and teacher competences that could help participants to choose appropriate courses and provide actionable feedback to help them understand how to close any gaps.

Most teachers would think the equivalents all of these things would be necessary for them to be able to teach their students. If we want students to understand hard ideas and complex knowledge, no one doubts that we need a clear curriculum and good assessment. But for teachers’ professional learning, we have none of these things.

4. Quality

A perception that the quality of available CPD is either poor or variable is a widely cited barrier to participation (eg Perry et al, 2019; Cordingley et al, 2018). Many suggestions have been made for forms of quality assurance or kitemarking, both to help users choose well and to incentivise quality in the market. Clearly, both aims are highly desirable. And it is clear that some other systems – in other countries, professions or areas of education – do incorporate forms of quality assurance for professional learning (Perry et al, 2019). However, the fact that

these QA processes exist, and may be widely seen as positive, does not necessarily imply that they work well. The challenges of identifying genuine quality are considerable.

One real challenge is our lack of secure knowledge about what 'quality' should mean in relation to CPD. As argued above, the current evidence base provides working hypotheses rather than definitive knowledge about what good CPD should look like. Even if we had theoretically good criteria for quality, operationalising them into workable and potentially high-stakes measures is a further challenge. Many quality assurance systems reify selected, superficial features and end up driving compliance with these gameable proxies rather than genuine quality.

Perhaps the best kind of quality indicator for a CPD programme would come from direct evaluation of its impact. But of course, this is very hard to do and is probably not feasible for anything other than large-scale, well standardised programmes.

For all these reasons, and despite their appeal, we should perhaps be cautious about what quality assurance systems can offer.

5. Cultivating coaches

Many of the reviews (eg Cordingley et al 2015; Darling-Hammond et al, 2017) point to the need for CPD trainers to have appropriate expertise. In general, this means that the trainers should themselves be really good at the things they are trying to help teachers to learn, as well as having relevant 'generic' pedagogical skills in the context of adult and professional learning. It may be that for different types of CPD, different balances of skills are required. If the focus is mainly on coaching, then the ability to model the practices and to break down complex tasks into more easily learnable components could be key. For support in specific subject knowledge, it could be having deep knowledge of the material and the ways students typically understand it that matters most.

A number of questions spring to mind here:

- Can a teacher who is not a particular expert in a competence nevertheless be an effective coach (eg in a reciprocal peer-coaching role)?
- How do we reliably identify genuine experts (or teachers/trainers who have the potential to be experts)?
- What kinds of CPD (initial or ongoing) do coaches/trainers need to become more effective?
- What kinds of coach peer support networks or structures might be helpful here?
- If our most effective teachers are taken out of the classroom to become coaches, does the benefit for the students of the teachers they coach outweigh the loss to the students they would have taught?

Principles for the design of subject-specific CPD

Implications for the design of subject-specific CPD

There is enough good evidence to support the promotion of high-quality subject-specific CPD as being a good investment to raise standards of attainment for children and young people.

Subject-specific CPD should not focus purely on teaching subject knowledge, but integrate this knowledge with how to present, model, assess, etc those ideas for students

To achieve the necessary duration and frequency, CPD programmes need to be integrated into ongoing school development processes – not a bolt-on or extra. Instructional coaching models may be useful here.

Recruitment, selection, training, support and quality assurance for trainers/coaches will be a key challenge. Creating incentives (eg career progression, status, recognition) for trainers/coaches may be crucial. A related challenge is doing this without depleting school classrooms of the best teachers.

The use of video or web-based coaching may offer a cost effective way of stretching limited teacher and trainer time.

We may need to explore ways of using social networks (real and virtual) to support collaboration and engagement of participants (eg EAST framework – Easy, Attractive, Social, Timely⁶). Professional communities of teachers and trainers within a subject may be key to this.

We need to learn more about the impact of CPD on wider aspects of teacher professionalism, wellbeing, agency, or retention. If high-quality CPD leads to good teachers remaining in the classroom, the indirect benefits for learners could be substantial. Is there any good evidence about these effects?

Some things we should consider

1. Develop a framework that sets out a curriculum for effective teaching: ‘What is worth learning for teachers?’ This would include content, sequencing and assessment for this learning. Our Great Teaching Framework, or the Early Career Framework in England could be a starting point for this, but the CPD curriculum needs to be specific to each subject

⁶ http://www.behaviouralinsights.co.uk/wp-content/uploads/2015/07/BIT-Publication-EAST_FA_WEB.pdf

2. For each subject, develop/refine a coherent set of CPD programmes. Each programme should have
 - a. Well-defined learning aims (supported by evidence that they are things that matter)
 - b. Clearly articulated dependencies/relationships with other programmes: prerequisites, sequencing, levels
 - c. Assessment frameworks that specify how we will know if the intended learning has been achieved
 - d. Explicit information about the skills, knowledge, experience, etc required for trainers/coaches
 - e. Processes for recruitment, selection, training, support and quality assurance for trainers/coaches
 - f. Eligibility and delivery requirements for participants (eg, non-specialists teaching KS4; whole departments working together). The mode of delivery must make it accessible (eg online/blended or locally distributed; web/video-based coaching)
 - g. A marketing strategy that recruits appropriate participants (teachers) at a cost that makes it attractive (which might be zero)
 - h. Funding to support running the programme
3. Design and implement evaluation structures that will allow us to
 - a. Learn what is working and how it can be improved, in real time
 - b. Demonstrate impact and value for money of these programmes

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Appendix 1: Summary of the evidence about what kinds of CPD are effective

We offer here a brief summary of the evidence, based on four key systematic reviews and the two additional reviews.

Key systematic reviews

Cordingley et al (2015): review of reviews

An 'umbrella review' by Cordingley et al (2015) provides a systematic review and summary of existing high-quality reviews of the impact of CPD. The main findings from this review were:

- “Prolonged or extended CPDL interventions were found, more or less universally, to be more effective than shorter ones” (an exception is CPD with a very narrow focus, where shorter can be effective). Typically, a duration of at least two terms is required, but it matters how the time is used.
- A rhythm of fortnightly sessions/support is optimal, especially where the intended learning involves complex changes in practice or beliefs
- CPD must focus on content that is relevant to participants and their values
- CPD must include time and support for teachers to explore and refine their personal theories, beliefs and practices; in particular to
 - Surface and explore their own beliefs, theories and practices
 - Have these challenged in a non-threatening way
 - Engage in discussion about how to apply new ideas in practice, in their own context, subjects, etc
 - Experiment with new practices in their own context
 - Analyse and reflect on the “underpinning rationale, evidence and assessment data”
 - Develop metacognitive awareness among participants
- Peer learning and support is a key element of effective CPD, but collaboration alone is not enough
- Provided a shared sense of purpose is created during CPD, it does not matter whether participants are initially volunteers or conscripts
- Effective CPD may focus on either general pedagogical strategies or subject content, but the former are most effectively instantiated in the context of the latter. In particular, CPD should cover elements such as:
 - Subject knowledge
 - Pedagogic knowledge
 - Learner progressions

- How these three fit together in effective teaching
- CPD facilitators should be experts in the areas they are training and in the processes of adult learning
- Facilitators who are external to the participant's organisation may find it easier to
 - Present a wide range of relevant and accessible research and evidence regarding pedagogy, subject knowledge and strategies
 - Raise expectations and beliefs about what is possible
 - Help the teacher connect their learning in the training to the pupil learning they hope to improve
 - Accommodate different starting points for different participants
 - Handle the emotional content of the learning appropriately
- Facilitators should support teachers "by modelling, providing observation and feedback, and coaching"
- Support from school leadership is crucial for realising benefits from teachers' CPD

Timperley et al (2007): most detailed and highest quality review

The Best Evidence Synthesis by Timperley et al (2007) was identified by Cordingley et al (2015) as "the most rigorous, robust and large scale in the sample" and is itself highly detailed, running to 344 pages. It therefore warrants consideration on its own. The main findings of this systematic review can be summarised as follows:

- Forms of CPD that do not work include
 - "listening to inspiring speakers or attending one-off workshops"
 - Giving teachers time and resources and allowing them to construct their own learning experiences as "self-regulating professionals"
 - Having outside experts "present prescribed practices to teachers with an underpinning rationale and monitor their implementation carefully to ensure integrity" (teacher practices may change but either do not affect student learning or are not sustained)
- Features of the context of CPD that are important for gaining impact on student learning include
 - "providing sufficient time for extended opportunities to learn and using the time effectively;
 - engaging external expertise;
 - focusing on engaging teachers in the learning process rather than being concerned about whether they volunteered or not;
 - challenging problematic discourses;
 - providing opportunities to interact in a community of professionals;

- ensuring content was consistent with wider policy trends;
 - in school-based initiatives, having leaders actively leading the professional learning opportunities”
- CPD should support the integration of different aspects of the professional learning, for example,
 - Integration of theory and practice, eg understanding how theory provides the basis for making curricular and pedagogical decisions, or assisting teachers to translate theory into classroom practice
 - Integration of pedagogical content knowledge, of assessment information, and of how students learn particular curricula. Emphasis on curriculum content knowledge is more important in mathematics, science, and writing than in reading.
- CPD should establish clear, well-theorised links between what teachers do in their classrooms and the learning and relationships that follow; teachers must believe they are responsible for the learning of all students and for the relationships that exist in their classroom.
- Around half the effective CPD interventions used assessment to focus teaching and enhance self-regulation, specifically:
 - “Providing a catalyst for initial and ongoing engagement;
 - Identifying professional learning needs;
 - Identifying student learning needs through assessment of their understandings and skills in order to focus teaching;
 - Inquiring into the effectiveness of practice with particular students for the purpose of confirming or refining practice.”
- “Sustainability of the impact of CPD was dependent on teachers acquiring both of the following:
 - In-depth understanding of theory, which served as a tool to assist instructional decision making;
 - The skills of inquiry to judge the impact of teaching on learning and to identify next teaching steps.”
- No particular activity or form of CPD was identified as being more effective than others. “What was important was that teachers were able to engage in multiple and aligned opportunities that supported them to learn and apply new understandings and skills.” However, the following were identified as characteristic of effective CPD pedagogy:

- Content and activities **aligned**: a clear alignment between the intended learning goals and the activities was evident. Individual activities often served multiple purposes.
- A **variety** of activities needed: Teachers were provided with a variety of ways to understand the content. Listening to those with expertise was common to all interventions, but on its own was not sufficient to change practice.
- **Content** conveyed through the activity was more important than any particular activity: every type of activity that was associated with positive outcomes was also associated with low or no impact
- Professional instruction **sequenced**: typical sequences involved a rationale or catalyst to engage, instruction in key theoretical principles, and then opportunities to translate theory into practice and deepen understanding of theory
- Understandings **discussed** and negotiated: professional development pedagogies shared a focus on providing opportunities for teachers to discuss and negotiate the meaning of concepts taught; understanding of new theories was sometimes developed through engaging teachers' existing theories. Initial activities sometimes showed that there were problems with teachers' existing theories of practice.
- **Student** perspective maintained: a variety of activities served to develop teachers' understanding of the relationship between their teaching and student learning.
- The CPD literature generates the following insights into the processes by which teacher learning was converted into significant changes in practice:
 - Substantive change is difficult: specific learning processes and teachers' responses were usually implied rather than specified.
 - New understandings: the interventions in all the core studies involved teachers developing new understandings and extending their skills through becoming aware of new information; cueing existing knowledge was necessary for theory engagement but insufficient to change practice alone.
 - Some new understandings were consistent with current positioning and could be accommodated within teachers' existing conceptual frameworks. This situation occurred when specific skills were acquired or when teachers were aware that their existing knowledge was limited. Acceptance (not necessarily deep understanding) was usually achieved.

- Some new understandings created dissonance with current positioning, challenging teachers' current positioning with regard to students, curriculum content, and/or effective pedagogy. This situation typically occurred when teachers were more confident of their knowledge and practice base. Extreme reactions of rejection or engagement were likely.
- In a few interventions, teachers learned to regulate their own and others' learning. If teachers were to acquire the skills and habit of ongoing inquiry into practice, it was important that they were systematically introduced to such inquiry in the professional learning context. This response was fundamental to sustainability.

Darling-Hammond et al (2017)

This review post-dates the Cordingley et al (2015) review so offers potentially new insights. Seven widely shared features of effective professional development are succinctly summarised and may be quoted directly from the Executive Summary (p v-vi). Effective professional development:

***Is content focused:** PD that focuses on teaching strategies associated with specific curriculum content supports teacher learning within teachers' classroom contexts. This element includes an intentional focus on discipline-specific curriculum development and pedagogies in areas such as mathematics, science, or literacy.*

***Incorporates active learning:** Active learning engages teachers directly in designing and trying out teaching strategies, providing them an opportunity to engage in the same style of learning they are designing for their students. Such PD uses authentic artifacts, interactive activities, and other strategies to provide deeply embedded, highly contextualized professional learning. This approach moves away from traditional learning models and environments that are lecture based and have no direct connection to teachers' classrooms and students.*

***Supports collaboration:** High-quality PD creates space for teachers to share ideas and collaborate in their learning, often in job-embedded contexts. By working collaboratively, teachers can create communities that positively change the culture and instruction of their entire grade level, department, school and/or district.*

***Uses models of effective practice:** Curricular models and modeling of instruction provide teachers with a clear vision of what best practices*

look like. Teachers may view models that include lesson plans, unit plans, sample student work, observations of peer teachers, and video or written cases of teaching.

Provides coaching and expert support: Coaching and expert support involve the sharing of expertise about content and evidence-based practices, focused directly on teachers' individual needs.

Offers feedback and reflection: High-quality professional learning frequently provides built-in time for teachers to think about, receive input on, and make changes to their practice by facilitating reflection and soliciting feedback. Feedback and reflection both help teachers to thoughtfully move toward the expert visions of practice.

Is of sustained duration: Effective PD provides teachers with adequate time to learn, practice, implement, and reflect upon new strategies that facilitate changes in their practice.

Cordingley et al (2018): Subject-specific CPD

This 'rapid review' is an update to the 2015 review, with a particular focus on subject-specific CPD in the context of the four nations of the UK. It cites the 2015 review as finding that "subject-specific CPD is more effective, in terms of its impact on pupil outcomes, than generic pedagogic CPD", but the original 2015 review seems a lot less clear on this, instead comparing 'subject knowledge' and 'pedagogy', finding that they are 'equally important' (p5). In discussing implications for policy, Cordingley et al (2015) state: "The findings from this review indicate **the importance of focussing on generic and subject specific pedagogy**, so it will be important to consider how subject expertise in particular can be developed alongside more generic aspects as part of CPDL" (bold in the original). Neither review, it seems, is very clear exactly what is meant by 'subject-specific' in the context of either pedagogy or CPD; many aspects of pedagogy are inseparable from the content that is being taught, without necessarily being explicitly 'subject-specific'. This issue has been briefly mentioned above in discussing a definition of 'subject-specific' and we will return to it again.

The main claims of the 2018 report, in addition to those already presented, include:

- Demand factors
 - Many secondary school teachers do not have a post-A level qualification in the subject they teach (eg 37% of physics teachers in England).
 - Recruiting and retaining subject-qualified teachers is universally challenging, and particularly so for schools in socially disadvantaged areas.

- Perception of the need for subject-specific CPD varies by phase, subject and accountability pressures. The latter often drive quite limited forms of CPD (eg exam board briefings). For younger children, 'subject-specific' is less about traditional school subjects and more about specialist development (eg of oracy or early reading)
- 'Struggling' schools (ie those with poor outcomes or inspection results) seem less likely to prioritise subject-specific CPD
- Results from TALIS for England suggest significantly lower engagement in CPD generally and especially subject-specific CPD than in high performing jurisdictions
- Barriers/enablers
 - School leaders can make a lot of difference to a range of mediators of participation in CPD, including culture, priorities, support and teacher autonomy
 - Despite all the barriers, there are certainly some schools where high-quality CPD is evident
 - Budgets are consistently seen as a barrier
 - Perceptions of poor quality in available (or experienced) CPD
 - Workload
 - Tensions between the need for quick fixes and longer-term investment (exacerbated by accountability pressures)
 - Low expectations or awareness/belief of what is possible (in some schools)
- Supply
 - Recent political/organisational changes (eg reduction of LA role in England) have impacted differently in the four nations.
 - In England and Wales the tradition of separation between external and internal support is becoming blurred, with a growth in school-led CPD and school-school networks. This may have driven increasing emphasis on whole school improvement and generic pedagogic CPD, at the expense of subject-specific CPD. It may also have led to greater inter-school range in access to quality CPD.
 - 'Cascading' is often seen as a cheap and manageable way to spread the impact of CPD

Other evidence

As well as the systematic reviews, there are a number of other studies that provide evidence or insight into the mechanisms by which CPD can be designed to maximise teacher learning, changes in practice and impact on student learning. These may not be systematic reviews, or

may limit themselves to a particular focus, so their claims should be seen as less secure than those of the systematic reviews cited above.

Kennedy (2016): CPD problems and pedagogies

One interesting and innovative study of CPD is by Kennedy (2016). Instead of the usual practice of characterising CPD interventions by “their visible features”, such as duration, rhythm, activities, expertise of the trainers, context of the school, etc, Kennedy takes a more theoretically-driven approach and sets out to characterise CPD interventions according to their theories of action. Specifically, she argues, this means answering two questions:

- What Problems of Practice Do Programs Aim to Inform?
- What Pedagogy Do Programs Use to Facilitate Enactment of Their Ideas?

Answering the first question implies going beyond looking at what teachers do and asking why they do it. Kennedy suggests there are four persistent problems of teaching and most CPD programmes are designed to address one of them. The four problems of practice for classroom teachers are to:

- portray curriculum content in a way that enables naïve minds to comprehend it
- contain student behaviour
- enlist student participation
- expose their students’ thinking

For the second question, we need to consider the ‘pedagogy’, or teaching and learning practices, employed in the training. The requirements of CPD pedagogy are a little different from the classroom pedagogies used by teachers, since the aim in CPD is not just to generate learning but also getting teachers to adopt and sustain new practices in place of those that are “already satisfactory”, in ways that are effective in promoting student learning.

Kennedy identifies four broad mechanisms by which CPD programmes can try to facilitate the enactment of their ideas.

- Prescription: specify a best way to do it and minimise any personal discretion or judgement
- Strategies: “convey a specific goal that teachers should strive for and then provide a collection of illustrative practices that will achieve that goal ... accompanied by a rationale that helps teachers understand when and why they should implement these strategies.”
- Insight: CPD programmes may “force teachers to reexamine familiar events and come to see them differently” and thus change the fundamental interpretations, theories and intuitions that guide teachers’ in-the-moment choices and behaviours.

- Knowledge: provide “bodies of knowledge” that “often look like traditional university courses with textbooks and syllabi”. A body of knowledge does not directly dictate particular practices but provides underpinning expertise that gives teachers maximum discretion. The rationale for this approach is that although any changes in practice may be less obvious or recognisable, they may also be more authentic and hence sustainable.

Of the 28 evaluations of CPD programmes that met Kennedy’s inclusion criteria, just over half (15) set out to address the first problem (portraying curriculum content). Those that used strategy or insight as their mechanism had the biggest effects, with smaller effects for knowledge and pretty much no effect on student learning for CPD that invoked prescription. When split by the persistent challenge of practice the CPD set out to address, there were no differences among them: CPD with any of these foci could lead to improvements in student learning outcomes.

Instructional coaching

Another area of research that is relevant and provides useful insights is work on teacher coaching. The development of coaching approaches may be traced to the work of Joyce and Showers in the 1970s (eg Joyce & Showers, 1980; 1981). In recent years there has been renewed interest in this approach and a meta-analysis in 2018 by Kraft et al. synthesised 60 relevant studies, the earliest of which was published in 2006.

Coaching programmes may be defined as “all in-service PD programs where coaches or peers observe teachers’ instruction and provide feedback to help them improve” (Kraft et al., 2018). More specifically,

We characterize the coaching process as one where instructional experts work with teachers to discuss classroom practice in a way that is (a) individualized—coaching sessions are one-on-one; (b) intensive—coaches and teachers interact at least every couple of weeks; (c) sustained—teachers receive coaching over an extended period of time; (d) context specific—teachers are coached on their practices within the context of their own classroom; and (e) focused—coaches work with teachers to engage in deliberate practice of specific skills. (Kraft et al., 2018, p553)

Kraft et al (2018) find pooled effect sizes of 0.49 standard deviations (SD) on high-quality observation instruments of classroom instruction quality and 0.18 SD on standardised student achievement tests. Such effects are “of similar or larger magnitude than estimates of the degree to which teachers improve their ability to raise student achievement during the first 5 to 10 years of their careers [and] larger than pooled estimates from causal studies of almost all other school-based interventions”

Key moderators of this effect included finding larger effects for content (ie subject)-specific than general coaching programmes, and larger effects for programmes that combined coaching with building baseline skills or providing instructional materials. No differences were found for the age of students, whether coaching was in-person or virtual, or the total number of hours of coaching in the programme. The authors also note that the studies generally involve volunteer teachers and schools, so may not generalise to mandated coaching programmes, and the lack of evidence about long-term impacts.

Key variables for categorising and conceptualising CPD

Conceptualisations of professional learning and its effectiveness need to begin with clarity about three main dimensions: the content of the CPD learning, the context in which the teacher operates and mode of delivery of the CPD. An outline of such a conceptualisation is shown in Box 3.

- 1) **Content: What teacher learning or change is intended:**
 - a) Which skills/knowledge/practices/components of effective teaching are targeted for development by the CPD?
 - b) What level/depth of teacher learning/change is required? (awareness, concepts, skills, application; Joyce & Showers, 1980; Prescription, Strategies, Insight, Knowledge; Kennedy 2016)
- 2) **Context: Where the CPD learning is to be applied:**
 - a) The wider school curriculum and specific subjects and topics that are intended to be taught to and learnt by students
 - b) Characteristics of the students: their knowledge, skills, attitudes, behaviours, motivations, etc
 - c) Characteristics of the school/department: eg availability of shared expertise, culture of collegiality and collaboration, trust, leadership priorities and capacity, accountability pressures, dominant/promoted theories of teaching and learning
- 3) **Mode: What is the CPD *modus operandi*:**
 - a) Delivery mechanism: what modes (eg face-to-face, online), activities, structures, support, frequency, intensity etc does the CPD use?
 - b) Pedagogy: use of practices such as presentation/description, modelling/demonstration, (deliberate) practice, feedback, scaffolding, coaching, facilitating reflection, supporting principled adaptation, etc.
 - c) Quality: quality of enactment of the training delivery/pedagogy – how well are they done? Skills and expertise of the trainers

Box 3: Key variables for categorising and conceptualising CPD

Appendix 2: What do we mean by subject-specific CPD?

Defining CPD

Professional development is often defined quite broadly, to include informal and unplanned activities or reflection that contribute to teachers' 'development' in a wide range of ways. For example, a widely quoted definition of CPD is this one from Day (1999):

Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school, which contribute, through these, to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purpose of teaching; and by which they acquire and develop critically the knowledge, skills and emotional intelligence essential to good professional thinking, planning and practice with children, young people and colleagues throughout each phase of their teaching lives. (Day 1999, p4)

For our purposes we need to limit this somewhat. First of all, it is common to distinguish between *continuing* PD (ie CPD) and pre-service PD (often labelled Initial Teacher Education/Training – ITE/ITT). In practice, of course, this distinction is sometimes blurred (many training routes are on-the-job) and is driven more by organisational convenience than theoretical rationale: learning to be a teacher does not stop or change qualitatively at any genuine boundary between novice and expert; research is now clear that learning continues throughout a teacher's career (Papay & Kraft, 2015, 2016). A key principle we should embrace is that professional learning should follow a coherent curriculum from pre-service to long-service; another is that appropriate development should be driven by needs, context and current proficiencies rather than years served. Nevertheless, our focus here is on CPD undertaken in-service.

A second distinction is between formal and informal CPD. Increasingly, in England at least, where the policy direction has been to give schools autonomy over such matters, CPD is not limited to formal, externally provided training sessions. For example, in a May 2019 TeacherTapp survey, the most commonly cited frequency of taking part 'in a professional development session' was weekly (29%) and 43% of respondents engaged in PD at least fortnightly.⁷ Many of these sessions are likely to be organised and delivered within the school. Burgess (2019) identifies four levels of formality of teacher learning: informal learning, peer

⁷ <https://teachertapp.co.uk/what-makes-teacher-keep-teaching/>

mentoring, peer coaching, and evaluation. Papay and Kraft (2016) discuss school-level and environmental factors that may inhibit or accelerate teachers' growth in effectiveness, such as peer collaboration, teacher evaluation, coaching structures and organisational supports. From this it is clear that, even where CPD is part of a formal, externally provided programme, its impact on student learning may depend on characteristics of the school in which those teachers work. Our interest for this report is on CPD that is relatively formal, in the sense that it consists of a well-defined programme of training and development, with explicit learning aims and activities. Nevertheless, much of the activity, and indeed the learning, in such programmes may take place in school and in classrooms and the CPD programme may set out to provide a structure to optimise this.

A third distinction concerns the intended outcomes of the CPD. For example, Harland and Kinder (1997) identify nine different types of outcomes of CPD, from simply creating materials and resources to changing teachers' practices. Interestingly, the ultimate aim of improving student learning outcomes does not feature in their typology, but it seems reasonable for us to focus on this: we are interested in CPD that leads to enhanced student learning. Of course, there may be a range of mechanisms by which we hope that impact will take place (eg promotion of better curriculum materials, minimising time teachers spend on low-impact activities, developing teacher skills, strengthening pedagogical content knowledge, etc), but the CPD programme must aim to improve student learning, and be evaluated against that aim.

A fourth distinction is between 'subject-specific' and 'generic' CPD. Again, this distinction is problematic. Cordingley et al. (2018, p2), in a report focused on subject-specific CPD, identify three kinds of focus:

Subject-specific CPD is defined here in terms of programmes and activities which focus on enhancing teachers' understanding of the subjects they teach (i.e. subject knowledge); how pupils learn in those subjects and how to teach them (sometimes called pedagogic content knowledge); and/or helping teachers to understand how generic CPD might apply to specific learning issues in the subjects they teach, in explicit and structured ways.

However, 'subject-specific' vs 'generic' is not an overarching dichotomy, but depends on the type of learning being considered and in many cases will be more of a continuum. For example, the apparently general skill of 'questioning' (asking good questions of pupils to provoke their deep thinking and elicit their understanding) actually requires a fair level of 'subject-specific' knowledge (knowing and anticipating common misconceptions, having a repertoire of familiar assessment items, having deep and connected knowledge of the

content to respond effectively to pupil answers with suitable prompts and follow-ups, etc). And 'subject-specific' here really means 'topic and level-specific': physics teachers may vary in their knowledge of and familiarity with different topics such as light or forces, but even the same topic (eg light) will be quite different in Year 3 and in Year 12. As a teacher, my level of skill in 'questioning' is likely to be quite different in each case, depending on my familiarity with teaching each topic and level. If I undertake CPD to become better at questioning, my training may include examples and general principles that happily span this range, provided the topics are similar enough, but the further the stretch, the more difficult I may find it to apply those principles or examples to my own practice.

In order to understand fully what 'subject-specific' means, we need to have a clearer conception of the different kinds of teacher practices, knowledge and skills that CPD may aim to develop and how each depends on the subject-matter context in which it is applied. We will attempt to set out such a framework below (pp??). In the meantime, we may say that our interest in subject-specific CPD means CPD that has a primary focus on the particular demands of teaching specific topics, using examples and principles drawn from those topics, in order to provide teachers with the knowledge, skills and understanding to teach those topics effectively.

A final clarification is that not all CPD aims to focus on classroom practice or on teaching and learning. For example, training in first aid or safeguarding – which is certainly important and may even be a legal requirement – would not aim to impact on classroom practice and probably would not be expected to lead to any discernible impact on student learning. Our interest here is not in these kinds of CPD.

We can summarise by clarifying that our focus in this report is on CPD that:

- is undertaken by in-service teachers
- consists of well-defined programmes of training and development, with explicit learning aims and activities (some of which may take place in school).
- aims to lead to improvements in students' learning
- focuses on the requirements of teaching specific topics within subjects, in order to provide teachers with the knowledge, skills and understanding to teach those topics effectively

Conceptualising 'subject-specific'

At one end of a spectrum, we might classify CPD that focuses on building subject knowledge, albeit with discussion of how such content might be taught and learnt, as 'subject-specific'. At the other end, CPD that aims to build skills of classroom management would probably be classed as 'generic', in the sense that teachers of diverse subjects (eg physics or French

teachers) should find it equally valuable and the training materials and examples would not need to be altered to meet their needs.

On the other hand, it could be argued that a secondary drama or art teacher might face slightly different classroom management challenges, because of the different 'signature pedagogies' typically employed. The aim of classroom management is to maximise the time that students spend on task, and clearly this will depend on the kinds of task being used. In fact, there may even be differences in classroom practices between French and physics teachers, for example the use of oral work in French, or the need to solve abstract, multi-stage problems in physics, that give rise to differences in the kinds of classroom management skills required to optimise learning.

Equally, we could imagine a group of physics teachers, who do share the same subject, having quite different needs in relation to their subject knowledge gaps, and certainly in any discussion of common student misconceptions or learning prerequisites, differences in context and student characteristics could be highly significant. The subject knowledge required by a physics teacher in a selective, high-attaining school with a focus on KS4 may be quite different from that required by another focused on KS3 in a lower-attaining school serving a disadvantaged community.

Appendix 3: A Framework for Great Teaching

This is a currently ongoing piece of work (Coe et al, forthcoming), attempting to produce a framework that lists all the competences that constitute great teaching. Hence, any teacher skill, piece of knowledge, behaviour, belief or attitude that

- Has been shown in research to predict student learning gains
- Can be (or seems likely to be) learnt or improved by teachers undertaking deliberate study
- When such improvement in the competence takes place, students learn more (ideally, such a claim would be supported by robust evidence, but often this is lacking and the competence will have the status of a plausible hypothesis)

In other words, a list of what's worth learning for teachers.

Although much of the underpinning research has been reviewed, the framework is yet to be subjected to critical review from groups of researchers and teachers. It is likely that as a result of such critique, many of the statements will change, be merged or split, change position, be rejected or new ones created. This version has four domains, but we could well end up with three, for example. Nevertheless, the current version is as follows:

1. Understanding the content

- 1.1 Having deep and fluent knowledge and flexible understanding of the content you are teaching
- 1.2 Knowledge of the requirements of curriculum sequencing and dependencies in relation to the content and ideas you are teaching
- 1.3 Knowledge of relevant curriculum tasks and activities, their diagnostic & didactic potential
- 1.4 Being able to generate/select good assessment activities related to the content you are teaching
- 1.5 Knowledge of common student strategies, misconceptions and sticking points in relation to the content you are teaching
- 1.6 Being able to generate varied explanations and multiple representations/analogies/examples for the ideas you are teaching

2. Creating a supportive environment

- 2.1 Promoting interactions and relationships with all students that are based on mutual respect, care, empathy and warmth
- 2.2 Promoting a positive climate of student-student relationships, characterised by respect, trust and care
- 2.3 Promoting learner motivation through feelings of competence, autonomy and relatedness
- 2.4 Creating a climate of high expectations, with high challenge and high trust, so learners feel it is OK to have a go
- 2.5 Encouraging learners to attribute their success or failure to things they can change

3. Maximising time on task

- 3.1 Managing time and resources efficiently in the classroom to maximise productivity and minimise wasted time (eg starts, transitions), using (and explicitly teaching) routines
- 3.2 Giving clear instructions so students understand what they should be doing
- 3.3 Ensuring that rules, expectations and consequences for behaviour are explicit, clear and consistently applied
- 3.4 Reinforcing positive student behaviours
- 3.5 Preventing, anticipating & responding to potentially disruptive incidents, signalling awareness of what is happening in the classroom and responding appropriately

4. Activating hard thinking

- 4.1 Re-activating/checking prior knowledge to ensure prerequisite skills/knowledge are in place (and responding if not)
- 4.2 Presenting new material clearly, with concise, appropriate, engaging explanations, using examples appropriately to help learners understand abstract ideas and connecting new ideas to what has previously been learnt
- 4.3 Modelling/demonstrating new skills or procedures with appropriate scaffolding and challenge
- 4.4 Giving students an appropriate sequence of learning tasks, with initial scaffolding to make them accessible to everyone, but gradually removed so all master it fully
- 4.5 Using questions and dialogue to promote elaboration and connected thinking (flexible understanding), and to elicit the thinking of all students
- 4.6 Giving students actionable feedback to guide their learning
- 4.7 Responding appropriately to feedback from students about their thinking/knowledge/understanding – especially where there are gaps
- 4.8 Giving students tasks that embed learning, requiring them to practise until learning is fluent and secure and ensuring that once-learnt material is reviewed/revisited to prevent forgetting
- 4.9 Setting and sharing specific and challenging learning goals for students, with feedback
- 4.10 Helping students to plan, regulate and monitor their learning

This framework consists of four domains. The first is essentially subject knowledge, including both understanding of the subject itself and pedagogical content knowledge, the knowledge of student thinking, learning and assessment related to that content. This domain is clearly highly subject-specific.

The second domain is concerned with relationships and the classroom environment. Most of these behaviours are likely to be largely independent of the content being taught and the skills underpinning them are relatively transferable. Hence, these competences are highly generic.

The third domain is about classroom management. As discussed above, there will be some dependencies on the types of task being used, but there is a lot of generality to the skills in this domain, so they are mostly generic, and certainly more so than subject-specific.

The fourth domain is about instructional practices and most of these are at least partly dependent on the content, ideas, knowledge, skills, etc that are being taught, and in some cases, highly dependent. For example, the ability to present new material (4.2) is very topic-specific, as are modelling, sequencing, questioning and task selection (4.3, 4.4, 4.5, 4.8, respectively). Skills such as giving and responding to feedback, or reviewing prior knowledge (4.6, 4.7, 4.1) are reasonably dependent on the content being learnt, though there may also be generalisable techniques and principles teachers can draw on in these competences. Supporting goal-setting and metacognition (4.9, 4.10) may be more generic.