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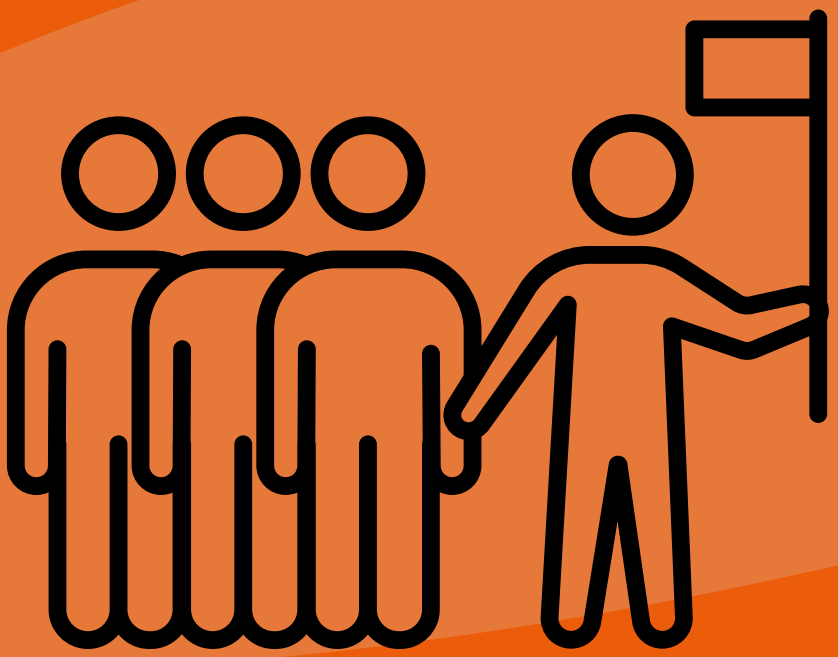
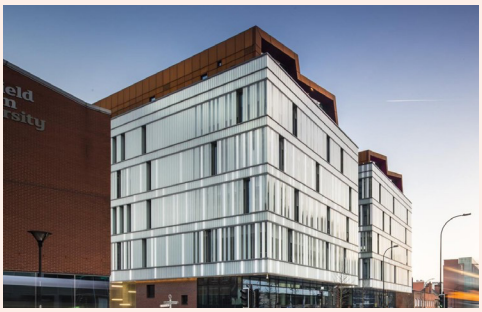


# Making change happen in teacher professional development

## Understanding mechanisms for change in policy and school environments which lead to embedded teacher professional development

September 2024

Summary Report



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For more information about this report please contact:

Professor Emily Perry

Sheffield Hallam University, Sheffield, S1 1WB

e.perry@shu.ac.uk

0114 2256060

www.shu.ac.uk/sioe

# Contents

# Authors and acknowledgements

The authors of this report are: Emily Perry, Stuart Bevins, Josephine Booth, Mark Boylan, Dee Rutgers, Bernadette Stiell and Mike Coldwell, of Sheffield Hallam University.

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# Summary

In this research study, our intention was to develop greater understanding of how to make change relating to teacher professional development (PD) happen, by researching:

- the implementation of professional development innovations and programmes in relation to policy, teacher entitlements and the school environment;
- the leadership of processes, practices and conditions which underpin and support change.

We wanted to understand the actions, behaviours, policies and practices which support the effective implementation of professional development at multiple system levels. In identifying these 'mechanisms for change', we hope to support stakeholders including school leaders, teachers and policy makers in making decisions which lead to sustained, embedded improvement in teachers' professional development in England.

We used a mixed methods approach combining three complementary strands of research: a systematic review of the national and international literature, an analysis of policy implementation in teacher professional development, focussing on 'Hub' models of professional development in science and mathematics, and case studies of schools looking at the implementation of teacher professional development in the current English school context.

The leadership of professional development, operating across multiple system levels, emerged as an essential repeating theme throughout the study. We found a complex network of varying, interacting professional development leadership roles, from the leadership of policy-driven, subject-focussed professional development initiatives, through the distributed leadership of PD within the school environment, to the leadership of professional development activities themselves. We identified complementary and overlapping dimensions of professional development leadership, including trusting leadership, engaged leadership and learning leadership, which highlight the ways in which school and professional development leaders can support the implementation of PD within their contexts.

Professional development leadership roles can be formal or informal, explicit or tacit, sometimes described in job descriptions and sometimes left unspecified. More formalised roles include the coordination, design and facilitation of professional development, which function across and between system levels with context-dependent variations in autonomy. Less formalised roles, such as networker, broker and innovator, are equally important, promoting and sustaining teachers' engagement across organisational and system boundaries. A shared sense of purpose between professional development leaders operating in different parts of the system appeared to play an essential role in helping teachers to understand the purpose and outcomes of their PD.

School leaders play essential roles in the implementation of professional development and can take action to improve this. The successful implementation of professional development requires continual navigation of

interacting decisions and priorities. This involves balances such as the need to provide direction while also enabling teacher autonomy; supporting collaboration alongside individualised professional development; and leading a vision for professional development which responds to whole school priorities while also drawing on individual teachers' perspectives and experiences.

We identified a series of professional development implementation mechanisms: vision, community, communication, agency, investment, data, security and advocacy. These mechanisms underpin the actions which can be taken by school leaders and policy makers to improve the implementation of professional development. Examples of actions include: involving teachers in establishing a vision for professional development, distributing responsibility for PD leadership, sharing the challenges of decision-making relating to professional development, giving teachers choice over aspects of their PD, using financial resource to support the development of PD leaders, using data to align individual and whole-school PD, enabling teachers to trial new practices, and actively engaging in PD alongside teachers.

Policy makers can also support the implementation of professional development by recognising the need to support school leaders and others in professional development leadership roles. This support includes helping in the prioritisation of resources, building enabling cultures for professional development and identifying individual and whole-school PD needs. Further, we found that credibility for organisations which offer professional development derives, at least in part, from their subject expertise. For policy makers, this points to an important factor in the successful implementation of professional development initiatives linked to policy-driven priorities.

The challenges to teachers' engagement with effective professional development are well-established, including issues such as time, quality, relevance and cost. Throughout this study, we encountered school leaders and professional development leaders within schools and other organisations who are overcoming these challenges and successfully implementing professional development to the benefit of their school communities. We hope that all those involved in teacher professional development will find useful examples in our study to help them change their practice to improve teachers' engagement with, and learning from, professional development.

# Introduction

In this research study, we set out to investigate the implementation of teacher professional development. We wanted to understand how to implement professional development which supports sustained change in teachers' practice, and what are the processes and mechanisms which underpin change.

We applied insights from implementation science and theory-based evaluation, to explore 'mechanisms for change' applicable to teacher professional development policy and practice in England. Our intention was to better understand how professional development can be effectively implemented at multiple system levels, whether local (for example, a single department or school-wide professional development activity), area (for example, programmes for a specific teacher subject group or phase) or the whole education system (for example, by increasing teachers' access or entitlement to professional development).

This study, carried out over two years, was funded by Wellcome (grant reference 224016/Z/21/Z). Each strand of the study used a different approach: a systematic evidence review of national and international research (Strand 1); an analysis of policy implementation in mathematics and science professional development (Strand 2); and primary mixed methods data collection (Strand 3).

Each strand of the study has its own report, which describes in detail its aims, methods, findings and implications for policy and practice. The project website[1] contains summaries of emerging findings and outputs from stakeholder dissemination events.

This report brings together findings from the three strands of the study. The next section provides the background to, and aims of, the study, including the research and policy landscape of teacher professional development. We then describe our overarching approach and theoretical framing. This is followed by an outline of the methods used in each of the study's strands and a summary of each strand's major findings, and their implications for policy and practice. We finally review the limitations of the study, before considering its implications for policy and practice, and offering some suggestions for school leaders and policy makers and for further research.

[1] https://research.shu.ac.uk/psemc/.

# Background to the study

Teacher professional development is important. There is a strong, and growing, international consensus that teacher professional development leads to improvements in teaching and thereby improved educational outcomes for children and young people (OECD, 2019). Effective engagement with good professional development can lead to changes in teachers' practice, increased pupil attainment and is associated with positive career experiences and retention (Coldwell, 2017; Day & Gu, 2010; Fischer et al., 2018; Meissel et al., 2016).

There is a growing evidence base about the content and models of professional development which support positive outcomes for teachers and pupils (for example, Cordingley et al., 2020; Kennedy, 2016; Maandag et al., 2017; Sims et al., 2021). This evidence base extends to models and frameworks used in researching and evaluating professional development (Boylan et al., 2017). However, some professional development, even when designed with attention to this evidence base, does not lead to improved outcomes (Cordingley et al., 2020; Kennedy, 2016). Meanwhile, there have been many studies which have identified barriers to sustained change in professional development, whether this is considered as teachers' ability to participate, the quality and relevance of content, or the implementation of changes in practice as a result of participation (OECD, 2019)

In spite of all this research into teacher professional development, there continues to be limited sustained movement, in England at least, towards a goal of all teachers being able to participate in high quality professional development throughout their careers (Fletcher-Wood & Zuccollo, 2020; Van Den Brande & Zuccollo, 2021). To address this, greater understanding is needed of how to make change happen.

Teacher professional development is complex. Many studies of professional development treat it as a standalone activity which can be examined without its context (Ehrenfeld, 2022). However, multiple interacting factors influence teachers' and school leaders' engagement in, and choices relating to, professional development. These include local availability of professional development activities, perceptions and experiences of quality and relevance, schools' and teachers' development priorities, structures supporting or limiting teacher autonomy, and government and other policies (Clarke & Hollingsworth, 2002; Ehrenfeld, 2022; Taylor, 2023). Any study of the implementation of professional development therefore needs to acknowledge the complexity of the system within which it operates.

In England the teacher professional development system appears particularly difficult to navigate (Chedzey et al., 2021). Professional development is offered by schools and Multi-Academy Trusts, and commercial and non-profit organisations including subject associations, charities and publishers. These activities operate alongside, and may compete with, large-scale, policy-driven, government-funded professional development initiatives, such as the specialist National Professional Qualifications, and national 'Hub' models including the Science Learning Partnerships and Maths Hubs (Department for Education, 2020, 2023). Although no career-long entitlement to

ongoing professional development has yet been implemented, the government-funded Early Career Professional Development programme provides a mandatory framework of support for teachers in the first two years of their career (Department for Education, 2022).

In recent years, several organisations in England, including our own, have called for improved systems of teacher professional development (for example, Institute of Physics, 2020; NAHT, 2020; Perry et al., 2022; Royal Society, 2021; Teacher Development Trust, n.d.). To respond to these calls, we need greater understanding of how to make change happen: the implementation of professional development innovations and programmes which support teachers in changing their practice, and the mechanisms and processes which underpin these changes.

# Understanding the implementation of professional development

## Our approach

Our intention in this study was to develop greater understanding of how to make change relating to teacher professional development happen, by researching:

- the implementation of professional development innovations and programmes in relation to policy, teacher entitlements and the school environment;
- the leadership of processes, practices and conditions which underpin and support change.

We set out to identify 'mechanisms for change', that is, the actions, behaviours, policies and practices which support the effective implementation of professional development at multiple system levels. In identifying these mechanisms for change, we hope to support stakeholders including school leaders, teachers and policy makers in making decisions which lead to sustained, embedded improvement in teachers' professional development in England.

Looking across teachers of all subject areas and age phases in England, we focused on two connected, complementary aspects of professional development:

- how professional development can be embedded in schools' practices and teachers' professional lives so that teachers are able to engage in sustained, effective professional learning.
- how teachers can be supported to make sustained changes to their practice as a result of their learning from professional development.

A mixed methods approach (Table 1) combined three complementary strands of research over two years. The strands are: a systematic review of the national and international literature to identify what is known about leadership in the school environment, interviews with leaders of 'Hub' models of professional development in science and mathematics (Department for Education, 2023) to gain understanding of the effective implementation of large-scale, policy-driven professional development initiatives, and case studies of schools in England through which we hoped to learn about the implementation of teacher professional development in the current school context.

*Table 1. Our approach to the study*

| | | | |
|---|---|---|---|
| Strand 1 | Leadership for professional development: supporting schools and empowering teachers to be PD ready | Systematic evidence review of national and international research | Identifying what is known about leadership in the school environment that has led to sustained, effective teacher professional development |
| Strand 2 | System leadership: policy implementation in mathematics and science professional development | Analysis of policy implementation in mathematics and science professional development | Exploring 'Hub' models of professional development in science and mathematics, and mapping the implementation of large-scale, sustained policy initiatives relating to professional development for teachers of STEM subjects |
| Strand 3 | Embedding change: leadership of professional development in English schools | Primary mixed methods data collection: survey and case studies | Understanding the leadership of teacher professional development in the current school context in England |

The three strands of research ran in parallel, so that each informed and was informed by the others. This enabled us to strengthen and test our understanding of emerging findings between the different contexts within each strand. For example, as we learned, in our case studies, about the leadership of professional development in schools, we checked the emerging themes against those arising from the evidence review and from our analysis of policy implementation, and reflected these back into our ongoing analysis of interview data.

## Defining professional development

The language of teacher professional development varies in the literature and in educational practice (Basma & Savage, 2023). Terms such as continuing or continuous professional development, teacher professional development, professional development and learning are often used interchangeably. Some authors advocate for a distinction between development, learning and growth, or between professional development as a process and an output (for example, Evans, 2008; Mitchell, 2013; Pedder & Opfer, 2010; Taylor, 2023). However, all these definitions broadly encapsulate an idea of professional development as the career-long, post-qualification learning of teachers (OECD, 2019).

In England, terms such as (teacher) professional development (PD), continuing professional development (CPD), and, sometimes, continuing professional development and learning (CPDL) are widely used and recognised (for example, Department for Education, 2016). In this study we often used 'CPD' in conversations with stakeholders and participants to refer to professional development. In this report, and the others associated with the study, we use professional development or PD.

Some studies of professional development draw a distinction between 'formal' and 'informal' activities (Richter et al., 2014), where formal refers to structured, planned activities such as courses, conferences, webinars and workshops, and informal to in-the-moment activities such as conversations with colleagues. Many studies consider only formal professional development, since this is likely to be easier to define and research (Greany et al., 2023). In this study, we considered the implementation of 'intentional' activities, in order to encompass formal activities and informal learning where this took place within an environment which was deliberately supportive of professional development.

We began this study with a shared, broad definition of professional development, drawing on our previous work in the area (Perry et al, 2022), which captured the idea of professional development as both a process and an outcome, as: *intentional activities intended to support teachers in developing their teaching expertise*. As the study progressed, the three project strands diverged in their definitions, aligning to the methods used and to early emerging findings (Table 2).

*Table 2. Defining effective professional development*

| | | | |
|---|---|---|---|
| Strand 1 | Leadership for professional development: supporting schools and empowering teachers to be PD ready | Professional learning that 'enhance[s] teachers' effectiveness as professionals, for students' ultimate benefit' (Stoll et al., 2006), p.229). This learning can be formal, informal, or incidental in nature, and the change brought about through learning can be transformational or incremental. | Effective defined by authors of papers under review |
| Strand 2 | System leadership: policy implementation in mathematics and science professional development | Formal, planned, externally stimulated programmatic professional development, which aims to enhance teachers' subject and pedagogical knowledge | Effective defined as sustained implementation over multiple government changes, with high rates of participation |
| Strand 3 | Embedding change: leadership of professional development in English schools | Intentional processes and activities which aim to enhance the professional knowledge, skills and attitudes of teachers in order to improve student outcomes. | Effective defined by participating teachers and school leaders |

Further, we wanted to explore the implementation of *effective* professional development. In this context, effective has a range of meanings, from participation and engagement to improving pupil outcomes (Guskey, 2000). We were not intending any evaluation of the initiatives and studies we encountered and so we were flexible in our understanding of effective professional development. For example, in Strand 3, where teachers and school leaders identified examples of effective professional development, we trusted that they were able to make this judgement from their experience of the activities they described. We did not attempt to gather data to

confirm this; instead, we focussed on gaining understanding of what policies and practices had contributed to its implementation.

Throughout this study, we focussed on qualified teachers' professional development, not initial teacher education or training. All school staff, such as teaching assistants, science technicians and others, are potential participants in, and beneficiaries of, improved approaches to the implementation of professional development. Therefore, while our main consideration was teachers, we also included, where relevant, professional development in which other school staff participated.

## Theory-based evaluation, implementation science and complexity theory

In designing our approach, we drew on previous research, as described elsewhere in this report, relating to professional development and its leadership. In addition, we applied insights from theory-based evaluation, implementation science and systems and complexity theory (Figure 1) to explore how change relating to professional development can be embedded in practice.

We also used information about how research evidence can be used to support decision-making in policy and practice (for example, Langer et al., 2016). These approaches acknowledge and work with the complexity inherent in the education system, enabling professional development to be examined in relation to other parts of the system.

Figure 1: Theoretical framing of the study

### *Theory-based evaluation*

Theory-based evaluation is a methodological approach developed since the 1970s drawing on the seminal work of Chen (1996), Rogers (2008) and Weiss (1998). This places the articulation and explicit testing of causal theory at the heart of evaluation (for a recent review, see Belcher et al., 2020), in contrast with what is sometimes called 'Black Box' evaluation (Astbury & Leeuw, 2010) that focuses on impact and implementation and can pay little attention to causal theory. Our analysis of models of professional learning (Boylan et al., 2017) identified that explicit theory in relation to teacher professional development can be missing or under-developed, and so lead to an incomplete understanding of how professional development affects practice and – in the case of this study – how organisations can embed effective professional development.

### *Implementation science*

Implementation science (Nilsen & Birken, 2020) focuses on understanding the strategies and activities that enable effective approaches (in this case, professional development in schools and wider systems) to become embedded in practice and policy.

### *Complexity theory*

We draw on systems and complexity theory, since we have identified that studies of change processes in education contexts – including in teacher professional development – underplay the complexity of such processes (Maxwell et al., 2022). They can rely on what Opfer & Pedder (2011) refer to as 'process-product' models. Lai & Huili Lin (2017) identify elements of complexity in systems and complex organisations including the interdependence of system components (such as teachers, leaders and school departments), holistic rather than fragmented outcomes of system components acting together; feedback loops; and nesting and layering of change within systems.

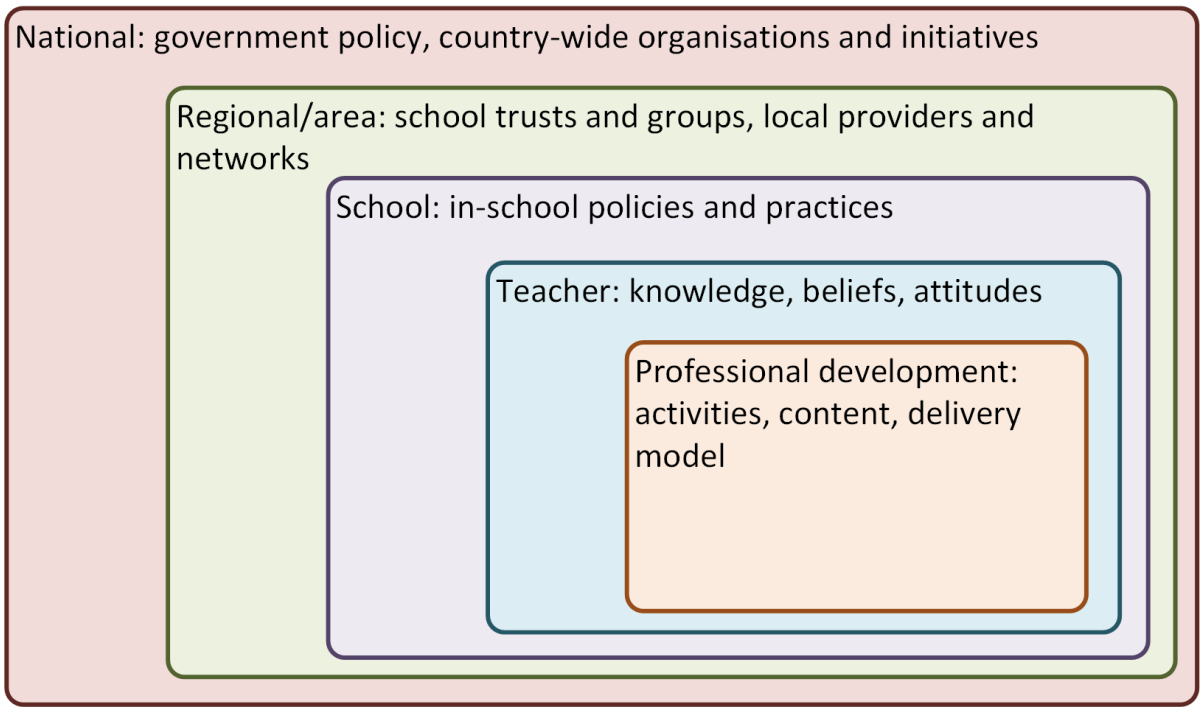
Taken together, these three approaches highlight the importance of strong theory, a focus on implementation of change to practice and the complexity of embedding such changes.

## Systems: national policy and the school environment

Policies and practice related to teacher professional development function at multiple levels of the education system (Figure 2). These include: national-level government policy and country-wide professional development initiatives, regional activities which are delivered across and within groups of teachers, schools and school groups, and individual teachers' engagement with, and the content and delivery of, individual professional development activities.

Complexity theory recognises that system levels do not stand alone. Decisions made and actions taken at each system level have an impact on the quality, quantity and outcomes of teacher professional development (Perry et al., 2019). Therefore, if we are to understand the implementation of sustained, effective professional development, we need to look across and within multiple system levels to consider their interactions.

*Figure 2. Professional development systems*




A substantial body of evidence already exists which supports understanding the activities, content and delivery of professional development (for example, Cordingley et al., 2015; Sims et al., 2021). By contrast, there is currently relatively little evidence about the effective implementation of professional development at other system levels, whether these are being delivered nationwide or in an individual school. Therefore, in this study, we focused mainly on systems operating at national, regional and school level (Table 3), although naturally, given the interactions between system levels, at times we explored practices operating elsewhere.

*Table 3. System level focus of each strand*

| | | National | Regional/ area | School | Teacher | Professional development |
|---|---|---|---|---|---|---|
| Strand 1 | Leadership for professional development: supporting schools and empowering teachers to be PD ready | | ✓ | ✓ | ✓ | ✓ |
| Strand 2 | System leadership: policy implementation in mathematics and science professional development | ✓ | ✓ | | | ✓ |
| Strand 3 | Embedding change: leadership of professional development in English schools | | | ✓ | ✓ | ✓ |

## The importance of leadership

In line with the aims of the study, we were interested to explore how leaders of professional development create environments which support the effective implementation of professional development and the change which arises from it. As the study progressed, leadership of professional development emerged as an essential repeating theme operating across multiple system levels. Therefore, we investigated, in depth, this aspect of professional development as being of major importance, especially since it has often been overlooked and under-represented in research (Kennedy, 2016).

The professional development leaders we identified and explored included:

- school senior leaders and headteachers whose roles include responsibility for or oversight of professional development (Bevins et al., 2023)
- practitioners who have specific professional development leadership roles, both internal and external to schools, such as in-school PD leads and those who design and facilitate professional development activities, workshops and courses (Perry & Boylan, 2018)

The ways in which leadership are conceptualised within each strand of the study vary depending on its particular focus, but the common themes for investigation included:

- the formal and informal roles of professional development leaders
- the processes and resources which support professional development leaders to carry out their roles
- the processes and practices by which professional development leaders support others in their professional development
- the interactions between professional development leadership at different system levels

This focus on leadership is not to downplay the importance of other aspects of professional development implementation. Instead, our intention is to identify how leaders of professional development at multiple system levels can support its successful implementation, and thereby contribute significant learning about this vital, but often under-valued, aspect of professional development.

# Our work on teacher professional development

This study builds on and adds to our extensive portfolio of development, research and evaluation projects, and of research outputs and publications exploring teacher professional development.

| | |
|---|---|
| Evaluation of DfE's Teaching and Leadership Innovation Fund | The longitudinal evaluation of a major Department for Education initiative, working in partnership with NFER, which intended to improve outcomes and social mobility for children and young people in England through professional development for teachers and leaders in areas and schools facing challenges (Straw et al., 2022). |
| Exploring the role of curriculum materials in teacher professional development | A multi-perspectival approach to analysis of a professional development programme in which teachers were supported to develop curriculum materials (Moore et al., 2021). |
| Market mirages and the state's role in professional learning: the case of English mathematics education | An analysis of current primary mathematics teacher professional development in England, in the context of a transnational policy of mastery in mathematics influenced by East Asian practices (Boylan & Adams, 2023). |
| Quality Assurance of Teacher Professional Development | The design, development and evaluation of a quality assurance system for teacher professional development, working in partnership with the Chartered College of Teaching and the Teacher Development Trust (Chedzey et al., 2021; Perry et al., 2019, 2021). |
| Re-imagining transformative professional learning for critical teacher professionalism: a conceptual review | A review of research on transformative professional learning that embraced educational and social change, and of accounts of professional learning associated with critical forms of professionalism: activist, transformative and democratic (Boylan et al., 2023). |
| Researching professional development leaders | A small-scale study investigating support for 'remote' professional development leaders to better understand the ways in which these professional development leaders, and others who operate in similar roles for other organisations, can be supported (Perry, Halliday, Booth, et al., 2022). |
| Rethinking models of professional learning as tools: a conceptual analysis to inform research and practice | An analysis and critique of five significant contemporary analytical models of teacher professional learning, using an analytical framework focused on model components, purposes, scope, explicit and implicit theories of learning and change processes, agency and philosophical underpinnings (Boylan et al., 2017). |

| | |
|---|---|
| The practices of professional development facilitators | A small-scale study of the facilitators of a teacher professional development programme in the Further Education and Skills sector in England (Perry & Booth, 2021). |
| The Wellcome CPD Challenge | A pilot initiative to understand what changes need to take place within the education system for schools to meet defined criteria relating to the quality and quantity of teacher professional development (Perry, Halliday, Higginson, et al., 2022). |
| Wipro STEM Teacher Fellows and Mentors programme | An evidence-based, individualised programme of professional learning designed to improve teachers' confidence, motivation and capability in one or more of the STEM subjects, funded by Wipro Ltd (Sheffield Hallam University, n.d.). |

# A mixed methods approach

Each strand of the study took a different approach to data collection and analysis, which we summarise here. Full details are provided in the individual strand reports.

## Strand 1: Systematic evidence review of national and international research

### Search strategy and screening

An extended literature search combined two key concepts: 'school environment' and 'change readiness' (Wang et al., 2023) with 'continuing professional development (CPD)'. To ensure that informal learning events were included alongside formal ones, we added a list of school-based professional development activities or processes, such as 'professional learning communities' and 'communities of practice'. All searches focussed on a timespan of 2012 to 2022. After removing duplicates, the remaining papers (over 6,000) were screened based on their title and abstract. The criteria for inclusion or exclusion included their scope, geographical range and methodological approach (Table 4).

*Table 4. Inclusion and exclusion criteria*

| Criteria | Description |
|---|---|
| Date range | 2012 (Jan) - 2022 (May) |
| Scope | *Included*<br>Studies needed to report on:<br>the enactment or implementation of a formal PD intervention or interventions for in-service teachers, OR<br>a school-based teaching and learning innovation that included a focus on:<br>the professional learning of teachers, both formal or informal, or<br>a professional development strategy or plan as part of the innovation (see note). |
| | *Excluded*<br>Studies focused primarily on PD content or design, and without explicit implementation support as part of this design.<br>Studies exploring teachers' engagement in professional development through social media, as this form of professional development is primarily individual and occurs beyond the boundary of the school. |

| Criteria | Description |
|---|---|
| Geographical range | *Included*<br>Studies from the UK, USA, Canada, Australia, Europe, Hong Kong, Singapore, Japan and Shanghai. |
| | *Excluded*<br>Studies in countries with substantially different educational systems and contexts, and therefore teaching realities and teacher needs, from England. |
| Methodology | *Included*<br>Both quasi-experimental and case studies and both quantitative and qualitative studies.<br>Review studies were included but were analysed and interpreted separately from the empirical studies. |
| | *Excluded*<br>Theoretical studies. |
| Note: Where studies from other professional fields were considered, the words 'teachers' and 'school-based teaching and learning innovation' were replaced by the broader categories of 'staff', and 'work-based organisational change or reform'. | |

As mentioned earlier, we did not attempt to judge the quality of the professional development against any evaluative criteria. Instead, we accepted authors' findings relating to the quality and impact of the professional development activity being researched.

## Coding and analysis

Coding and analysis of the papers took place in three phases (Table 5). These included a broad mapping of the field returned through the initial search process, a more focussed mapping of the studies in terms of their content relating to the professional development activity and its leadership, and a final, detailed coding of the role of leadership in those activities.

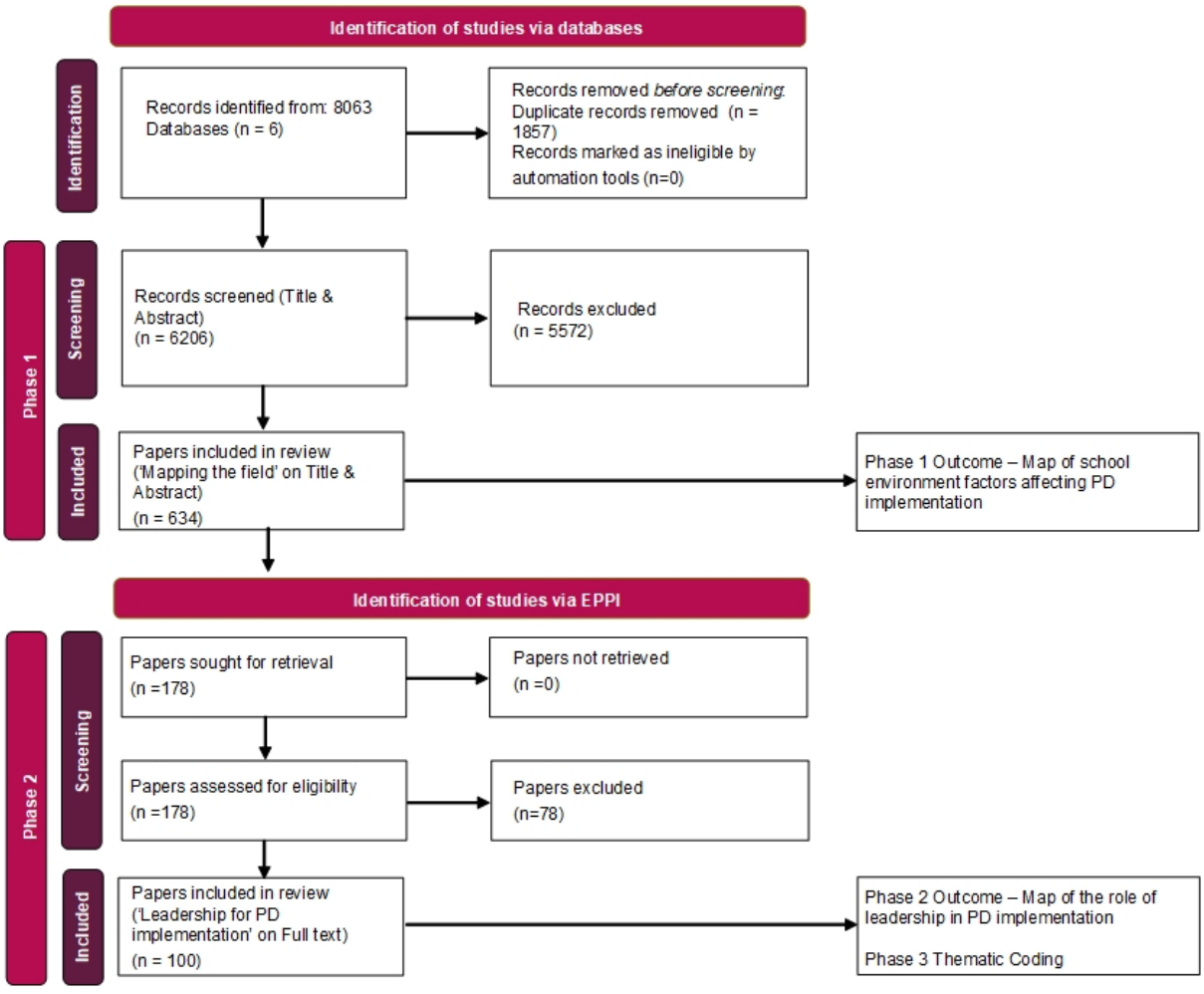
*Table 5. Systematic review coding and analysis process*

| | | | |
|---|---|---|---|
| Phase 1 | Mapping the field | Coding on title and abstract | Methodology; psychological attributes, sociocultural processes and structural conditions comprising the school environment |

| | | | |
|---|---|---|---|
| Phase 2 | Mapping the role of leadership | Coding on full text | Outcome(s) of the professional development; type(s) of professional development; school setting; data sources; leadership attributes and actions |
| Phase 3 | Focussing on the role of leadership in PD implementation | Coding on text extracts relating to leadership | The positive influences of leadership that affect professional development, engagement and implementation; the evidence for and effectiveness of these influences (see below) |

The process of screening and exclusion ended with a set of 100 papers being fully coded and analysed in Phase 3 (Figure 3).

*Figure 3. PRISMA flow diagram of the systematic review*



Coding phases 2 and 3 used a framework (Table 5) to identify and categorise the leadership influences, characteristics, actions and behaviours which supported the professional development activities, teachers' engagement in them and their implementation.

*Table 5. Summary of the five dimensions of the leadership of PD implementation coding framework*

| Framework dimension | Description |
|---|---|
| *Outcome(s) of the professional development event* | Primary outcomes:<br>student outcomes<br>teacher outcomes pertaining to changes in classroom practice.<br>Intermediate outcomes:<br>teacher outcomes involving changes in cognition, attitudes, and collaborative professional inquiry<br>school organisational outcomes involving CPD supporting structures, processes and collective attitudes or beliefs. |
| *Type(s) of professional development event* | Type, duration, location etc |
| *School setting* | Characteristics of the school setting, including:<br>school phase<br>country/region<br>policy context<br>match between the PD activity and the school priorities |
| *Data sources* | Data sources underpinning each study's results, including:<br>their nature, and whether they reflected observed behaviour or self(perceived) behaviour;<br>the stakeholders' perspective that the data represented;<br>whether the stakeholders were observed or asked to report on a specific, contained and implemented PD event or were self-reporting on PD in general terms |
| *Leadership attributes and actions* | Leadership characteristics, behaviours, actions etc |

# Strand 2: Analysis of policy implementation in mathematics and science teacher professional development

We used a case study approach to data collection and analysis (Table 6).

*Table 6. Strand 2 approach*

| | |
|---|---|
| **Policy review** | Review of policy texts from the last thirty years looking at generic PD policy and Science and Mathematics specific PD policy |
| **Data collection** | Interviews, documents and correspondence with national leads from STEM Learning and NCETM<br>Interviews with Maths Hub and Science Learning Partnership leads<br>Interviews with PD facilitators in Maths Hubs and SLPs |
| **Analysis** | Thematic analysis framework informed by models of PD implementation and PD leadership<br>Cross case analysis across Science Learning Partnerships and Maths Hubs |

## Policy review

In a review of English government policy relating to teacher professional development and to mathematics and science teacher PD we looked back over the last thirty years, identifying:

- governmental policy documents including evaluation reports
- policy interventions and reports published by key stakeholders
- policy research and analysis published in peer-reviewed journals

For each policy we considered its importance and success, whether documented through formal evaluation studies or through other evidence such as sustained presence in the system or breadth of participation. This led to the creation of a chronological map of policies, their aims, impacts, importance and success.

## Case studies

The national networks of Maths Hubs and Science Learning Partnerships (SLPs) (Department for Education, 2023) were used as case studies of teacher PD policy implementation. Further details of these initiatives are provided in the separate report for this strand of the study. We chose these initiatives because of their sustained implementation through changes of government and shifting policy and their acceptability and reach to practitioners (Table 7).

The initiatives have been successful in achieving policy goals of supporting teachers of science and mathematics. For example, in mathematics, the Maths Hubs have been central to implementation of a policy of 'mastery' mathematics (Pratt & Alderton, 2023). Further, the establishment of other hub networks by the

Department for Education (Department for Education, 2023) has been influenced by the implementation of the Maths Hubs and SLPs.

*Table 7. Implementation success*

| | Implementation by the initiatives |
|---|---|
| **Acceptability to users** | PD activities are widely taken up by teachers; organisations and networks are respected; activities have high levels of user satisfaction |
| **Reach to intended users** | The two networks have achieved considerable reach with schools and teachers |
| **Programme is sustainable** | Implementation over a 10-year period during which the composition of area leads, number of Hubs and SLPs, and the programme offer have changed but the initiatives have continued |
| **Replicability in different contexts and settings** | The Hub and SLP models have spread geographically to different contexts; programme delivery models and mechanisms have been replicated and adapted for different users and content |

We carried out interviews, gathered documents, and engaged in dialogue with national leads from STEM Learning and NCETM, and then interviewed staff from a sample of ten Maths Hubs and Science Learning Partnerships, giving us a series of 'area cases'. The 'area cases' were recruited with the support of NCETM and STEM Learning, with whom we developed a sampling strategy to provide a range of geographic locations, scale, experience of the leads and the lead organisation in this type of activity and type of organisation. The interviewees included Hub and SLP leads and assistant leads and primary and secondary professional development leaders.

The case studies were thematically analysed using a framework initially informed by models of PD leadership and policy implementation. We analysed each area case individually at first and then, through an iterative process of review and discussion, we further revised the analysis framework, bringing in models of complexity and system leadership, to carry out cross-case analysis.

## Strand 3: Primary mixed methods data collection

We combined a survey of PD leads with case studies of professional development in English schools (Table 8) to give in-depth insights into a range of experiences and contexts. Through both methods, we asked about leaders' and teachers' experiences and perceptions of effective PD, thereby gathering a rich understanding of what works well in the implementation of professional development, and avoiding well-documented discussion of barriers and challenges to PD.

*Table 8. Strand 3 methods*

| | Participants | Purpose |
|---|---|---|
| **Survey** | In-school PD leads | Provide data about the structures and processes that support PD in schools |
| **Case studies** | Head teachers, Governors, PD leads, Classroom teachers, Teaching assistants | Provide data about what works well in differing school contexts such as phase and setting and generate a rich picture of a range of participant experiences within their situation. |

## Survey of school CPD leads in England

The online survey was designed to be completed by staff in schools in England who hold a professional development leadership role. The first section of the survey focused on PD leads' roles, PD policies and strategies in their contexts, and their perceptions of the culture of PD in their schools. In the second section, PD leads were asked to identify an example of effective PD in their contexts, against which they then responded to a series of prompts relating how which the PD activity was implemented. Data from the survey was tallied and tabulated and, where appropriate, analysed thematically.

## Case studies of English schools

Using purposive sampling, we identified eleven case study schools through survey responses, existing networks and contacts, and suggestions from the project advisory group. Selection was based on recent PD activity, willingness to participate in the study, and a mix of phase, type, and geographical contexts. In each school, we carried out semi-structured interviews with headteachers, PD leads and school governors, and focus groups with 2-5 classroom teachers. We also collected relevant documents such as PD plans and records of PD interventions.

Interviews and focus groups were audio recorded and transcribed, alongside summary notes of each case study visit. Data were analysed thematically, initially using predetermined codes and themes (e.g. teacher collaboration, PD structure, PD culture), and then cross-checking and refining these with additional emerging themes where appropriate, also drawing on emerging findings from the other strands of the study.

## Stakeholder engagement

The three strands of the study were supported throughout by stakeholder engagement activity (Table 9). This enabled us to gain feedback from practitioners, school leaders and others with expert insight into the current professional development landscape, helping to shape our methods of data collection and analysis, and test and clarify our findings and their implications.

*Table 9. Stakeholder engagement activity*

| | |
|---|---|
| Expert advisory group | Three-monthly meetings of a group of school leaders, researchers, policy makers and professional development providers with the project team |
| Dissemination events | Webinars, conference presentations and workshops by project team members |
| Website and blog | Regular blog posts and sharing findings |

## Ethics

The study followed Sheffield Hallam University ethical protocols[2], receiving approval from the university research ethics committee (references ER43465841 and ER43438613). All participants in data collection gave informed consent before completing surveys, interviews or focus groups. Further details of ethical protocols specific to each strand are given in the individual strand reports.

[2] Sheffield Hallam University Research Ethics and Integrity webpages: www.shu.ac.uk/research/excellence/ethics-and-integrity.

# Findings

In this section we provide an overview of the findings from each strand of the study. For each strand we identify the conditions, processes and actions taken by leaders of professional development across the system which support the effective implementation of professional development. Detailed findings are available in the separate reports for each strand.

## Strand 1: Leadership for professional development: supporting schools and empowering teachers to be PD ready

The search and screening process led to a final corpus of 100 papers, from a range of contexts and types of studies. A full list is given in the separate report on this strand of the study. Qualitative approaches, and studies from North America, were commonly found in the literature reviewed, with professional learning communities the most frequently researched PD activity. Most studies reported on teacher outcomes, from teachers' self-reported perspectives, with the types of outcomes spread quite evenly between pedagogical, behavioural and attitudinal.

Through thematic analysis of these papers, we identified eleven interlinked themes which were represented in multiple studies, which we grouped into three overarching leadership dimensions: trusting leadership, engaged leadership and learning leadership (Table 10). Next, we describe each of these dimensions in turn. For simplicity of presentation, we have removed details of the publications from this section. The separate report focussed on this strand contains a full list of studies identified within each dimension of leadership and further details of our analysis and its findings.

*Table 10. Leadership dimensions and underpinning themes*

| Leadership dimension | Underpinning themes | Number of studies |
|---|---|---|
| Trusting leadership | School leaders are responsible for creating and sustaining a safe culture for professional learning | 28 |
| | Responsibility and accountability for professional learning go beyond the school leadership | 32 |
| | Teachers can be empowered to have agency over their own professional development | 22 |
| Engaged leadership | School leaders can provide leadership for professional learning by engaging in, and supporting others to engage in, appropriate professional development | 37 |

| | | |
|---|---|---|
| | School leaders can encourage, develop and support professional collaboration for professional development | 28 |
| | School leaders can recognise and integrate the professional development needs of individuals, the team and the school as a whole | 21 |
| | Material-economic support is necessary for professional development to be successful | 21 |
| | School leaders can prioritise making time and space for professional development – before, during, and after | 17 |
| Learning leadership | School leaders should communicate a clear vision for their schools for professional learning | 34 |
| | Appropriate use of data by school leaders can support access to, and implementation, of professional learning | 17 |
| | School leaders can broker connections and access to external sources and activities to support professional learning | 11 |

## Trusting leadership

We identified strong evidence for the benefits of distributed and shared leadership in the implementation of professional development, leading to increased teacher accountability and ownership of PD. Where teachers are involved in decision-making, they are more likely to see change as purposeful, with participation in PD more relevant to their needs, and building PD around teachers' needs leads to higher engagement and satisfaction. Opportunities for teacher leadership and shared decision-making lead to higher levels of collective responsibility, with more frequent interactions between staff and school leaders. Teachers can hold accountability and responsibility for PD outcomes and implementation, for example via steering groups and project-specific groups, and defining learning goals. Treating teachers as partners in the planning and delivery of PD allows them to define goals and therefore makes participation more relevant to their needs.

Mutual trust is important in establishing supportive structures for collaboration and problem-solving, with staff being given opportunities to share values and celebrate improvements. In these environments, teachers can act as change agents, with greater ability to transfer new practice to the classroom and to disseminate new ideas; improved communication between teachers is evident. Importantly, teachers who are new to these ways of working should be supported to learn about setting goals, agendas and ways of working. Collaborative working as part of distributed and shared leadership is important, leading to increases in teachers' self-efficacy, and shared decision-making and responsibility may mitigate shortcomings in PD delivery.

School leaders are responsible for building these open learning environments, where new ideas can be shared without fear, contributions from all staff are valued and accountability is balanced with agency. These

approaches to leadership include school leaders working with teachers as peers in PD, in planning for change, and in deciding the directions for professional development, with other staff members determining choices of PD or acting as instructional coaches. School leaders might ask teachers what they want to learn, and how, thereby connecting teachers to the process of professional learning and increasing their motivation. Professional learning communities and similar models of PD may offer approaches to support active teacher decision-making and collaboration. Other supportive practices include team coaching, exercises on giving feedback, gathering evaluative feedback from teachers, and looking within school to share knowledge and expertise.

## Engaged leadership

As we have described, school leaders play vital roles in creating teacher learning communities, with their support and input leading to greater motivation and empowerment for teachers' participation in professional development. School leaders can promote collaboration and learning through structures such as those used in action research and professional inquiry. Where schools have strong professional learning communities, whether formalised or not, leadership is focussed on teacher learning alongside pupil learning, with the provision of structures, processes and resources to facilitate teacher learning.

School leaders are well-placed to draw on the knowledge and skills of teachers to support the needs of their colleagues. They can act as role models for professional learning, by demonstrating behaviours which prioritise PD, using evidence from research, and giving colleagues time and space for discussion. However, school leaders and their colleagues may need professional development to better understand how to support effective collaboration between teachers.

Our review identified the importance of balance between individualised and collective, whole-school PD, so that the diverse needs of teachers are recognised across subjects, career stages and personal circumstances. This might be gained by considering the interactions between formal and informal learning, so that school leaders formalise learning structures, while also promoting more informal innovation, cooperation, collaboration and shared decision-making. Professional learning plans, when used as joint endeavours between school leaders and teachers, can integrate and align teacher learning with school priorities, and also identify in-school expertise to lead PD alongside external PD opportunities.

Shared physical spaces go hand-in-hand with shared intellectual workspaces, so school leaders and teachers might reflect on how teachers work together in school. School leaders can provide processes, structures and resources, such as setting up regular meetings or supporting models of inquiry, identifying areas of focus for improvement, or providing evaluation processes to inform shared decision-making about professional development. They can also ensure appropriate economic support is available to cover the costs of professional development and the implementation of new or adapted practices.

Time is particularly important for collaborative PD, and, for all teachers, time is needed for participation and follow-up, such as planning for implementation. The studies in our review identified that it is possible for school

leaders to take action to set aside and maintain consistent time for preparing, participating in and reflecting on PD, updating resources and sharing learning.

## Learning leadership

A theme which emerged from all three leadership dimensions is the identification, and communication, of a clear, collective vision for change, which includes professional development. Professional development can be linked to the school vision, and in turn the school vision can be linked to professional development, thereby embedding accountability for teachers and school leaders in their implementation of PD and its associated learning and change.

School leaders can define goals and objectives, share these with teachers and build explicit strategies to deliver them through PD. This approach, building shared understanding and identifying how teachers contribute, supports buy-in to PD and change. As we described earlier, evidence shows that PD can be implemented effectively when teachers are involved in developing the vision and goals, so that these align with their professional identities and offer opportunities for intellectual challenge and collaboration. School leaders can also form partnerships with other organisations and enable teachers to share information and build external networks. They might act as brokers, signposting information and opportunities for teachers, or enabling visits and exchanges with other schools and organisations.

School leaders hold an essential role in enabling or moderating the implementation of changes as a result of professional development, for example by changing whole-school practices or regulations. As part of this, deliberate data usage is imperative in supporting change. Data can be used to identify PD needs, such as through teacher surveys, or to find and analyse the impact of new approaches or interventions. In these circumstances, data should be used transparently with clear goals and goal-setting processes, and collectively understood performance management structures. There may be a professional development need here for school leaders in using data appropriately.

## Summary: Strand 1

Our systematic review focused on school leaders' roles in the school environment, identifying mechanisms underpinning successful PD implementation. We found strong evidence that a balance between school leaders' direction and teacher autonomy is central to establishing greater teacher self-efficacy, motivation, engagement and commitment to PD in the short and long-term. We identified a need for clearly defined, differentiated outcomes for differing contexts, which take into account teacher collaboration structures, individual and collective teacher readiness for change, and organisational leadership structures. School leaders need to be actively involved in PD processes, through needs identification, resource allocation and learning alongside colleagues, while also ensuring that teachers are given opportunities to direct and collaborate in their own and each other's professional learning.

Our three leadership dimensions: trusting leadership, engaged leadership and learning leadership offer a way of describing school leaders' roles in the implementation of professional development. These dimensions indicate how school leaders can, on the one hand, formalise the learning process, visualising and giving value to it, while on the other hand, promoting the cooperation, innovation and collaboration associated with ongoing informal learning through decentralising its organisation and decision-making. They thereby also point towards some ways in which school leaders themselves might be supported to develop their skills and practices in leading professional development.

# Strand 2: System leadership: policy implementation in mathematics and science professional development

Our analysis of policy implementation in mathematics and science professional development focussed on the Maths Hubs and Science Learning Partnerships, two large-scale, sustained initiatives linked to government policy in England (NCETM, n.d.; STEM Learning, n.d.). We examined their implementation at multiple system levels (Table 11), focussing in particular on leadership roles at the *national* and *area* levels.

*Table 11. System levels of policy implementation analysis*

| System level | Focus |
|---|---|
| Policy | Government strategy, funding |
| National | Country-wide organisations |
| Area | Local, regional, network professional development |
| Activity | Professional development activity, participants and site |

## Influences on implementation

We identified several influences on the implementation of the two initiatives. These interconnected influences, which function both at subject level and across the whole system, include:

- government policy and its drivers, such as the long-standing shortfalls in mathematics and science teacher recruitment (Maisuria et al., 2023)
- antecedents and precursors to the initiatives, including previous iterations of the two networks
- the landscape of teacher professional development, both in the subject areas and more widely
- subject community traditions, such as the roles of subject associations, teacher networks, publishers and ways of working
- curriculum, pedagogies and assessment systems within the two subject areas

## Similarities and differences in implementation

Comparison of the two initiatives enabled us to identify several similarities and differences in their implementation (Table 12). One significant difference which runs throughout the system levels is in funding: the government fully funds professional development offered through the Maths Hubs so that schools do not have to pay to participate, whereas professional development offered through the Science Learning Partnerships often incurs a financial charge, albeit at subsidised rates.

*Table 12. Structural comparisons of Maths Hubs and SLPs*

| System level | Maths Hubs | Science Learning Partnerships |
|---|---|---|
| National | NCETM, with government funding | STEM Learning, with government funding |
| Area | Around forty Maths Hubs | Around thirty Science Learning Partnerships |
| Local (schools and teachers) | Hundreds of schools and potentially thousands of teachers engaged with each Hub or SLP | |
| Professional development: activity | Workgroups: collaborative professional development, centred school, subject or teachers' practice with a specific focus; programmes: equivalent to training courses or series of workshops; communities: looser professional learning networks | Core programme of 80+ courses of varying lengths on specific topics; themed subject network meetings, bespoke offers, coaching and mentoring; complements on-site programme at National Centre |
| Professional development: content and participants | All phases, with mastery central; around half the work groups have a policy delivery focus; more primary than secondary focused | All phases; majority secondary focused; participants teachers and school science technicians |

## Leadership of professional development

For our analysis of leadership, we used a model of professional development leadership which identifies three leadership roles: coordinator, designer and facilitator (Perry, 2020; Perry & Boylan, 2018). From a national perspective the models of leadership in the two initiatives are broadly similar. For example, both initiatives are coordinated nationally by a single organisation, and at area and local level by largely school-based lead Hubs and Partnerships containing several staff members. The design of the professional development activity is also, on the whole, led nationally for the network, whether through a central team or through local leads, and professional development facilitation is carried out by local professional development leaders.

## Autonomy and centralised control

There are varying levels of national, area and local decision-making and autonomy throughout the system. For example, working within the government's overarching aims and performance indicators, the national-level

organisations make choices about the locations of Maths Hubs and Science Learning Partnerships; at area level, Hubs and Science Learning Partnerships have options over which professional development activities are offered; and, at activity level, professional development activities might be developed and adapted locally by PD designers and facilitators. The opportunities for agency afforded here enable flexibility and adaptability within the system, especially in response to local and area-level contexts and changes.

## Formal and informal activity

At each level of the system, and within each of the professional development leadership roles, we found formalised roles and functions interacting with informal, tacit knowledge and expertise (Table 13). For example, professional development designers plan PD which will address the government's and national organisations' requirements of the initiative and its policy drivers, while also attending to the traditions and expectations of the subject community, such as the collective understanding of how teachers typically work together.

*Table 13. Formal and informal mechanisms in the implementation of the two initiatives*

| | |
|---|---|
| **Formal** | Administrative, bureaucratic, visible, explicit roles; what is expected and measured; what is done |
| **Informal** | Cultural, relational, less visible/invisible, tacit roles and expertise; how it is done |

The interplay between these formal and informal mechanisms contributes to the successful implementation of the two initiatives, enabling professional development leaders to operate across multiple system levels and within the various influences described earlier. As an example, looking in more detail at a single system level (in this case, area level), we identify several interacting formal and informal mechanisms operating within each of the professional development leadership roles (Table 14).

*Table 14. Formal and informal mechanisms at area level of implementation*

| | Coordination | Design | Facilitation |
|---|---|---|---|
| **Formal** | Managing and promoting the area's network, reporting to national level | Selecting and adapting PD activities, providing venues and other local infrastructure | Identifying, recruiting and supporting local PD leads |
| **Informal** | Developing a local culture with schools, teachers and local PD leads, creating feedback loops | Providing varied, plentiful provision, supporting local PD leads | Fostering subject teacher identities and connections to the network |

Our findings suggest that these mechanisms combine to support each other, thereby strengthening the implementation of the initiatives. For example, the formal management of the network combines with a less formalised curation of a diverse and plentiful professional development offer to extend reach to teachers, enhance choice and agency for participants with multiple routes to engagement and maintain the perceived quality of the offer. Further, formally supporting PD leads through activities such as 'train the trainer' programmes, quality marking activities and opportunities for collaboration combines with less formalised routes to increased leadership and career progression opportunities to create and maintain a cadre of committed, high quality professional development leaders.

## Alignment of purpose

Throughout the system we found an alignment of purpose supporting the implementation of each initiative. This purpose, centring around the promotion of a strong subject identity with a form of collaborative professionalism, and supported through the professional development offer, was central to the delivery of each initiative. Sometimes this purpose is formalised and explicit, such as in the provision of collaborative professional development to bring networks of teachers together, but often it is informal and tacit, for example in the models of support for professional development leaders and in communications with teachers. This alignment of purpose also informed the ways in which leadership operates and interacts across system levels, such as in the processes used to gather and use feedback from teachers and PD leaders to inform the development of the professional development offer.

We have observed this sense of shared purpose in other professional development systems (for example Perry, Halliday, Booth, et al., 2022). It appears professional development leaders throughout the system are able to reconfigure the professional development offer, and its supporting structures, while holding on to a shared vision, thereby providing a level of resilience and sustainability within complex, changing environments.

## Summary: Strand 2

Our systematic review focused on two large-scale, policy-driven professional development initiatives in England. The two initiatives have been sustained over time and through multiple governments, with wide reach to teachers and schools. We identified influences on the initiatives which run through their implementation, such as the landscape of teacher professional development and the traditions and expectations of the subject communities. The two initiatives differ in some of the details of their delivery while also sharing several features.

Through a focus on leadership of professional development at multiple system levels, we found that the interplay of various implementation mechanisms combined to support a sustained, adaptable network of professional development. These include: a balance of centralised decision-making and local autonomy, and interactions between formal and informal roles and activities. We also identified the importance of an alignment of purpose running throughout the system, which provides a level of resilience and sustainability within complex, changing environments.

# Strand 3: Embedding change: leadership of professional development in English schools

We identified three overarching leadership mechanisms that enable the implementation of effective professional development in schools: investing in professional development through time, money and leadership; building collective efficacy for and through professional development; enabling collaboration in and through professional development (Table 15).

*Table 15: Leadership mechanisms*

| Mechanism | Key themes |
|---|---|
| Investing in professional development through time, money and leadership | • Negotiation of budgetary issues to invest in PD<br>• Communication of purpose, context, structure of PD<br>• Supporting all staff and all pupils |
| Building collective efficacy for and through professional development | • Vision for learning, shared vision<br>• Culture of PD togetherness<br>• Teacher buy-in<br>• Modelling behaviours |
| Enabling collaboration in and through professional development | • Supportive environment, praise<br>• Team/team cohesion<br>• Sharing knowledge and expertise |

## Investing in professional development through time, money and leadership

The school leaders in our study recognised their moral and practical responsibility to invest in the individual development of staff. Often, this took the form of financial investment, demonstrating symbolically that a school values professional development, seeing this as a route not only to changed practice, but also to increased teacher engagement, and potentially retention. The school leaders in our study found ways to navigate budgetary issues to ensure that PD was not deprioritised and that investment in PD offered value for money, such as committing staff time to develop and lead in-house activity.

The design of professional development structures and activities fell mainly within schools' PD leads roles, supported by the headteacher and/or other senior leaders, with a variety of in-house approaches to PD. Many schools also engaged with external PD programmes and providers, depending on the most appropriate fit for school and individual teacher requirements measured against cost and time for teachers to engage.

Communication was of critical importance with regular discussions regarding PD approaches, structures, activities and messages. This enabled the development of a collective vision for PD, which in turn contributes to a school-wide culture of professional development.

## Building collective efficacy for and through professional development

School leaders built a sense of collective efficacy (Donohoo et al., 2018) via a shared vision for the school, so that staff understood the school's direction of travel regarding PD. This involved a shared commitment to high quality teaching, linked to a focus on quality PD. This was often reinforced by senior leaders visibly engaging in their own learning, as well as demonstrating responsibility for involving others in PD.

The school leaders in our study sought to influence the behaviour of their teaching staff rather than to command it, through intensely interpersonal leadership, working with individuals, department teams and senior leadership colleagues. This notion of collective efficacy, through trust and support, was demonstrated through a non-judgemental culture where risk-taking during practice was promoted and learning from mistakes valued. Our findings suggest that headteachers can be particularly influential when they attribute school outcomes to teachers and the actions they undertake. In our study, the school leaders rewarded success, significant achievements and important contributions to the school.

Engaging in professional development requires buy-in from teachers. Therefore, establishing and maintaining a positive culture of PD is a central component of collective efficacy, with PD leads and headteachers stating a belief that building this culture, which improves teaching, improves outcomes for pupils. Further, in promoting the value of PD, school leaders modelled the values and behaviours they expected from their staff. Essentially, senior leaders were not isolated from professional development in their school but embedded themselves in the team.

## Enabling collaboration in and through professional development

Collaboration in relation to professional development can take many forms. For example, a more collaborative culture of professional development can be built through a non-judgemental and supportive environment. Indeed, the teachers in our study identified the importance of developing a supportive school environment to provide them with the confidence to express their voice and discuss emerging issues. Meanwhile, senior leaders referred to praise as an important feature of leadership that not only provided motivation for engaging in PD but stimulated staff to develop their practice.

An idea of team cohesion was evident throughout our data. School leaders built structures, including the appointment of PD leads, that allowed staff to reflect together on learning and practice through departments, whole school groups and collaborations. They actively encouraged a team ethic which involved sharing knowledge and expertise, via PD activity in which teachers shared and supported the development of colleagues. Informal sharing of knowledge and expertise promoted supportive, collaborative, non-judgemental communities with peer-to-peer professional development.

All the school leaders we spoke to held high expectations of their staff and pupils, apparent in a belief that encouraging a curiosity about professional development leads to engagement and improved teaching quality,

which in turn, leads to improved pupil outcomes and experiences. They enabled teachers to participate in decision-making about PD, demonstrating the value placed on teachers' views. They articulated their understanding of their school environment through the values they promoted and the behaviours they displayed, and practised a style of leadership which had, at its core, a deliberate eclecticism.

### Summary: Strand 3

Through our exploration of leadership of professional development within the school environment, we identified three overarching leadership mechanisms that enable the implementation of effective professional development in schools: investing in professional development through time, money and leadership; building collective efficacy for and through professional development; enabling collaboration in and through professional development.

Given the complexity of school cultures and, particularly, teacher professional development, these mechanisms, and the key themes which underpin them, overlap and interact, reinforcing and supporting each other in the implementation of professional development. They vary in their contexts and the details of each school's approaches to professional development. Overall, though, these three mechanisms underpin school leaders' approaches to prioritising professional development, supporting teachers' readiness for change, embedding professional development in teachers' careers and thereby establishing sustained cultures of professional development in schools.

# Limitations

We took a mixed-methods approach to this study, strengthening our findings by using each strand to inform, and be informed by, the others. Within each strand, we used standard models of data collection and analysis. For example, in Strand 1, we followed established protocols for systematic reviews, using tested tools for searching, inclusion/exclusion and analysis. We cross-checked findings and interpretations across multiple reviewers, meaning that our findings are well-grounded in the data we analysed.

Our study was bounded in scope and time. For example, in Strand 2 we focussed on only two examples of policy-driven teacher professional development initiatives: science and mathematics. In Strand 3 our data was limited by the numbers of participants and, while drawn from a range of school types, not representative of all schools in England. In Strand 1 we focussed particularly on the roles of school leaders in the implementation of professional development within the school environment.

The landscape of teacher professional development has likely changed significantly in the last few years, since the Covid-19 pandemic and the concurrent shift towards online activity. In Strands 2 and 3, we did not ask about the impact of the pandemic on teachers' professional development, but our findings should be placed in the context of the challenges teachers faced as a result of the pandemic and its legacies. A literature search carried out now might offer insights into a changed landscape of professional development, with more synchronous and asynchronous online activity.

In Strand 2, we chose two professional development initiatives as case studies of successful professional development, because of their sustained implementation through changes of government and shifting policy, and their acceptability and reach to practitioners. In Strands 1 and 3 we did not attempt to evaluate the success of any professional development activity. Instead, we understood success as defined by the authors of published studies in our searches and the teachers and school leaders who participated in our data collection.

Throughout, we gave all types, aims and content of professional development equal consideration rather than considering any prioritisation of one model or another. Each strand of our study was contextually situated, in the initiatives and schools we considered in Strands 2 and 3, and in the individual circumstances of each study in Strand 1. Our findings throughout are intertwined within the complex environmental, professional, and cultural factors of each school and its teachers.

Given these limitations, we do not claim this study to be classically generalisable. However, given the consistency of our findings within and across its three strands, we are confident that the study offers a representation of the ways in which teacher professional development can be implemented successfully in current educational contexts.

# Implications for policy and practice

In this section we look across the three strands of the study to identify their implications for policy and practice, highlighting where our findings can be used to support the improved implementation of professional development. Further details of implications emerging from each strand of the study can be found in the separate strand-specific reports.

## Leadership of professional development is complex

There is no single model of successful professional development leadership. The leadership of professional development involves multiple roles and dimensions of leadership (Table 16). The professional development leadership roles offer ways of understanding the activities which are undertaken by professional development leaders throughout the system, while the leadership dimensions offer ways of thinking about the functions of, and relationships between, PD leadership activities. These roles and dimensions operate at all system levels including national, regional/area and school, and at the level of the PD activity itself, and interact within and between those levels. The particular ways they operate and their interactions vary depending on the particular focus of an individual's role or the mode of professional development.

*Table 16. Roles and dimensions of professional development leadership*

| | |
|---|---|
| PD leadership roles | Coordinator, designer, facilitator, innovator, networker, broker |
| Leadership dimensions | Adaptive, enabling, administrative, trusting, engaged, learning |

The PD leadership roles include formal and informal, and visible and less visible, activities. For example, the role of professional development leader may be formally allocated to a member of school staff, as we found with some of the practitioners who participated in strand 3 of our study. In many circumstances, this leadership role covers a blend of activities, including the roles we have identified, and, adding to its complexity, may be wrapped into a wider school leadership role. Explicit time or support for the leadership of PD within a wider role may be lacking. Professional development leaders external to schools often operate independently and/or within other organisations, and again their activities include a range of roles, some of which are highly formalised and others less so. In schools there may also be less explicit leadership of PD through informal mentoring or subject leadership roles. Across all system levels, roles such as networker and broker are unlikely to be recognised in any formal role descriptions, but demonstrate how PD leaders transfer information between people and organisations, and navigate and build connections with other organisations and practitioners.

Whether formalised or not, these leadership roles all play essential parts in the successful implementation of professional development. We also found that a sense of shared purpose, such as in the building of a subject or whole-school community, between professional development leaders at different system levels is important,

supporting teachers' engagement and understanding of the intended outcomes of PD. Practitioners with professional development leadership roles might usefully consider which forms of leadership they engage in more or less frequently, and which they might need additional support for, whether this is in the form of time, financial resource or PD of their own, and consider whether and how that shared purpose is made explicit to teachers and other stakeholders.

The PD leadership dimensions reflect the complex interactions between roles, functions and activities of those leading professional development. In this study, we found aspects of each of the functions of complexity leadership: administrative, adaptive and enabling leadership (Uhl-Bien et al., 2007). We also explored complementary dimensions including trusting leadership, engaged leadership and learning leadership. These point towards new conceptualisations of PD leadership, and perhaps leadership more generally, and offer ways of thinking about how PD leaders might adapt their practices to improve its implementation.

We identified aspects of trusting leadership in the successful implementation of PD at school level, through shared responsibility for PD planning and leadership, and also at national and area or regional level whereby policy makers can delegate at least partial responsibility for PD implementation to the leads of professional development initiatives. Learning leadership indicates how professional development leaders, in all roles and at all system levels, should learn alongside with other practitioners and feed that learning back into the system. Engaged leadership demonstrates the value of leaders of professional development prioritising time, space and financial resource for professional development, and again this occurs at multiple system levels from policy to school.

The complexity of the interactions between PD leadership roles and dimensions suggest that it may be challenging to identify actions which might improve the implementation of professional development. Nevertheless, in the following sections, we offer some exemplifications of how school leaders and policy makers can make decisions which support the implementation of professional development.

## Professional development leadership involves balancing acts

We found that decision-making in the implementation of professional development requires the navigation of some tricky balancing acts (Figure 3). These balances are not intended to be binary choices nor opposite ends of a spectrum; rather, they are propositions to support decision-making. The categories overlap, demonstrating the complexity of PD leadership, and some may apply as much, or more, to overall leadership roles as to the leadership of professional development specifically.

*Figure 3. Examples of PD leadership balancing acts*

| | | |
|---|---|---|
| Direction | - | Autonomy |
| Whole school | - | Subject or age-phase-specific |
| Collective | - | Individual |
| Directing | - | Trusting |
| Risk averse | - | Risk supportive |
| Shared responsibility | - | Leadership responsibility |
| Centralised | - | Distributed |
| Prioritising | - | Deferring |
| External expertise | - | In-school expertise |

These balancing acts show how implementation of professional development requires consideration of both the collective and the individual. For example, as we describe in the next section, school leaders may provide an overall direction to the professional development on offer to their teachers so that it aligns with their knowledge of the schools' improvement needs. However, this needs to be balanced with opportunities for teachers to achieve autonomy in at least some choices relating to their professional development.

Throughout our study we identified the importance of collaboration in the implementation of professional development. Again, though, the provision of opportunities for collaboration must be balanced with PD which addresses individual teachers' needs. Similarly, school leaders may feel that whole-school professional development is the most appropriate mode of delivery to move in their chosen direction, but this should be set alongside opportunities for individualised, subject and/or age-phase-specific professional development.

These balances also demonstrate the ways in which professional development leaders might distribute or retain responsibility in their decision-making. We have shown that shared responsibility for PD is important in enabling teachers to feel part of the decision-making process. However, school leaders retain responsibility for issues such as the allocation of resources, and this can limit the opportunities available for consultation or distributed leadership. Further, school and PD leaders play essential roles in determining the most appropriate, and resource-efficient, sources of expertise. Some expertise may be available from teachers and other staff in school, but sometimes, it may be appropriate to look externally.

Our study shows that it is possible to achieve these balances in the implementation of professional development, even within the challenges of complex school environments. Some decisions may align with, influence, or appear to be in conflict with other aspects of PD policy. Therefore, any efforts made to change one area of school practice may only lead to improvements if attention is paid to its intersections with other areas. These balancing acts offer a way of helping school and PD leaders to think about the interactions between the decisions they make.

## School leaders can improve the implementation of professional development

The leadership of professional development is complex and context-specific. There does not appear to be a single standard model of successful PD implementation. Nevertheless, school leaders play essential roles in the implementation of professional development and can take action to improve teachers' experiences. We have already considered the balancing acts needed to support these actions; now we summarise some of those actions, each underpinned by one or more implementation mechanisms emerging from our study (Table 18). We do not consider here any leadership hierarchies or different leadership roles within schools, but rather describe how school leaders, working with their colleagues at any level in a school system, might improve the implementation of professional development.

*Table 18. PD implementation mechanisms and example actions*

| PD implementation mechanism | Example action for school and PD leaders |
|---|---|
| Vision | Involve teachers in establishing a vision for professional development |
| Community | Distribute responsibility for professional development leadership |
| Communication | Share the challenges of decision-making |
| Agency | Give teachers choice over aspects of their professional development |
| Investment | Use financial resource to support the development of in-house expertise, including professional development leaders |
| Data | Use data to align responses to individual professional development needs with those of the whole school |
| Security | Allow teachers to trial new practices and make mistakes |
| Advocacy | Active involvement alongside teachers |

Firstly, school leaders can establish a vision describing their school's approaches to, and outcomes of, professional development. Building this vision, and then planning for its implementation, is likely to be more effective when teachers are involved. This might involve asking teachers to describe how successful learning

looks for teachers in their classroom or school, for themselves and for their pupils, or to identify how best to evaluate the impact of professional development and monitor progress towards school plans.

Involving teachers in vision-building contributes to being part of a community of professional development in which responsibility and accountability for PD go beyond school leaders to the whole school. One way of doing this is the appointment of a professional development leader, who holds this responsibility explicitly, and is supported appropriately with resources and PD of their own. Other actions which build a sense of community for and through PD include opportunities for professional learning communities, reading groups, teacher inquiry projects and other collaborative structures for pedagogical design and testing.

As we have shown, the implementation of professional development involves balancing acts which can be challenging. However, communicating the purpose, structure and intended outcomes of professional development helps teachers to understand the expectations of their engagement and which aspects of their PD needs might be prioritised over others at any given time, for example when balancing the interests of the collective against those of the individual.

Teachers can achieve agency relating to their professional development when school leaders enable some individualised choice and decision-making. This does not necessarily mean that teachers choose all aspects of their professional development, although this may be appropriate in some contexts. Instead, they can be given the power to decide specific, deliberately identified aspects of their PD. These might relate to: the focus of a professional learning community; choices of PD activities within a range of school development priorities; the timing or mode of delivery of particular activities; or the ability to opt-out of sessions where appropriate.

Resources including funding, time and space support the embedding of PD within school cultures and ensure PD plays a central role in teachers' professional lives. Financial investment is important. However, large amounts of funding are not necessarily needed, since school leaders may be able to commit resource to the development of in-school expertise, including professional development leaders, who can then design, coordinate, facilitate and broker PD for and with colleagues. Time is essential for teachers to engage before, during and after PD activities, enabling them to consider what they will gain from professional development and then to plan for implementation of change. This time can be scheduled at regular intervals, and, importantly, protected from competing priorities.

Data is an essential tool in decision-making about professional development, supporting the prioritisation of activities, goals and resources. This data includes knowledge of the PD needs of individuals, the team and the school as a whole, and its analysis supports the alignment of individual teachers' PD with the development needs of the whole school. Therefore, school leaders can adapt processes, such as those used in performance management and appraisal, to gather information about the PD needs of individuals and the strengths and weaknesses within staff groupings and across the whole school. This data can also be used to identify in-school expertise, or to recognise the need to draw in external expertise, as appropriate.

Teachers need to feel secure so that they are able to express their professional development needs without fear or judgement. School leaders can build a safe environment for PD by explicitly supporting teachers to share their practice, experiment, take risks, make mistakes, be vulnerable and learn together. These cultures give teachers confidence to express their views about PD, and be open about their development needs, without any potential sense of blame.

Finally, and related to this need for a safe environment, school leaders are essential advocates for professional development, acting as role models for teachers in describing its intended benefits. They support the implementation of PD by being actively involved and open about their own development needs, describing explicitly what they gain from participation. They can model the values and behaviours of engaging in PD by participating alongside teachers, taking risks in changing their practice, and sharing their learning.

## Policy makers can improve the implementation of professional development

The actions we have identified so far consider what can be done within schools, by school leaders. We hope that policy makers will recognise within these actions ways in which they too can support the implementation of professional development. For example, while policy makers may not be able to release any additional funding for professional development, they can support school leaders in the prioritisation of resources for PD. This might include advocating for the important role of PD leader in schools, which should be of equal status to other leadership roles, such as those for curriculum areas, pupil age groups and similar. Guidance and support should be offered to those in PD leadership roles, and the school leaders who support them, so that they are able to learn how they can carry out their roles effectively. Meanwhile, while we have not focussed on the roles of school governors, trustees or directors of Multi-Academy Trusts, policy makers could helpfully raise the status of PD as an integral part of school cultures by advocating for a PD leadership specialist in school governance roles, again equivalent to those with oversight of resourcing, curriculum and similar.

In England, the specialist National Professional Qualification Leading Teacher Development (Department for Education, 2023) is a welcome development, providing support for teachers in professional development leadership roles. Our findings suggest that policy makers could review and revise the content of this qualification to better reflect the multiple roles and dimensions of professional development leadership which operate within the education system, and thereby drive the implementation of PD through these essential leadership roles.

In Strand 2 of this study, we investigated two Hub models of professional development: the Maths Hubs and Science Learning Partnerships. Our final recommendations here draw from our findings in relation to the implementation of these initiatives. Firstly, these initiatives are led by national organisations which have, and are able to draw on, considerable subject-specific expertise. We found that this affords them credibility throughout the system, and supports their convening power to work with other organisations, in the provision of professional development which is seen as appropriate, high quality and meaningful. In the establishment of new Hub models of professional development, it is important that the organisations which lead them at national

and regional levels have appropriate levels of subject-specific expertise, so that they are credible with practitioners.

Secondly, agency and adaptation enable leaders of professional development to implement PD which meets local school and individual teachers' needs. Where professional development is offered from a centralised organisation, whether a nationally-driven Hub model or more localised provision from a Multi-Academy Trust or other school group, we recommend that those initiatives and programmes are designed so that professional development leaders are able to adapt PD activities as necessary. This adaptation leads to greater accessibility, engagement and sustainability, and builds stronger links throughout system levels, via visible feedback loops from participants to leaders to professional development activities.

# Considerations for further research

This study makes a contribution to addressing the gap in understanding the implementation of professional development, particularly within the school environment. In this section, we consider what further research might complement and build on this study, particularly in relation to the complexity of interactions between different system levels and between different factors within system levels.

Throughout our study, we have highlighted the importance of school leaders and professional development leaders' roles and responsibilities in the implementation of professional development. Our evidence review showed that, across a range of reported professional development activities, teacher outcomes and perspectives are much more commonly reported than those of pupils or school leaders. This raises the possibility of studies which draw on the perspectives of other members of the school community in addition to teachers, in order to understand their role in, and experiences of, professional development. In particular, we recommend that further studies explore the experiences of school leaders, including professional development leaders, in relation to both leading and participating in professional development.

Staying with a focus on PD leadership, it would be beneficial to understand how these leadership roles interact with other school leadership roles, and how professional development leadership interacts with other organisational features, structures and styles of leadership, such as when making decisions about resourcing or curriculum. These studies could also provide further understanding of the knowledge and skills needed to carry out professional development leadership roles in schools.

Teachers' professional development experiences and needs also interact with their contexts and environments. Further research is needed to understand how these interactions influence teacher PD, how these contexts and interactions are influenced by national and school-level policies and practices, and how individual learning needs can be balanced against organisational and contextual priorities. Through this, we may be able to identify further ways of supporting school leaders and teachers themselves to determine professional development priorities.

In strand 2, we focussed on a particular professional development initiative and on two subject areas: mathematics and science. However, in common with the other strands, we did not explore variations between models of professional development, age phases or subject areas, beyond the structural differences of the initiatives. Therefore, further comparison of the implementation of different professional development models, such as considering the similarities and differences between, for example, mentoring and teacher inquiry models, and/or looking at different subject areas and age phases, would offer further insight into the ways in which the implementation of professional development might vary between contexts.

Finally, we recommend further study to investigate the implementation of professional development in the post-Covid school environment. While one of the drivers for this study was a lack of evidence relating to sustained

change relating to professional development, we have found examples throughout this study of the successful implementation of PD. Further research is needed to gain more information about these and other examples of success to understand their outcomes and impacts. Other studies could usefully explore the relative importance of some of our emerging themes over others, such as the value of collaboration in relation to the value of addressing teachers' individual needs, how particular actions and behaviours might be devolved from school leaders to professional development leaders in schools and how any of our emerging themes might change in a landscape of increased online professional development activity. In particular, attention should be paid to the support and professional development needs of school and PD leaders themselves in order to gain the expertise needed to use our findings to better implement professional development.

# Concluding remarks

In this study, we set out to investigate the implementation of teacher professional development, aiming to develop greater understanding of how to make change relating to teacher professional development happen.

The leadership of professional development emerged as an essential repeating theme throughout the study, operating across multiple system levels. We found a complex network of relationships between varying professional development leadership roles, from the leadership of policy-driven, subject-focussed professional development initiatives, through the distributed leadership of PD within the school environment, to the leadership of professional development activities themselves. Running across system levels, a sense of shared purpose between professional development leaders operating in different parts of the system helped to drive professional development engagement and build connections between system levels.

Professional development leadership roles can be more or less formal, and more or less explicit in professional role descriptions. More formalised roles include the coordination, design and facilitation of professional development. Less formalised roles are equally important, such as innovator, networker and broker, where PD leadership operates across system boundaries to promote and sustain teachers' engagement. We also identified complementary and overlapping dimensions of leadership such as learning leadership and engaged leadership, which help to describe how professional development leaders can take action to support the implementation of PD within their varying roles.

We found that the successful implementation of professional development requires continual navigation of interacting decisions, such as the need to address whole school priorities while enabling opportunities for collaboration and also supporting individualised professional development. Within this complexity we identified actions which can be taken by school leaders to build a culture where professional development is embedded in teachers' professional lives. These include distributing leadership to teachers, so that some decision-making and responsibility is shared, prioritising resources, including time, for professional development, and school leaders acting as role models for participation in PD, engaging alongside teachers and sharing their learning.

Policy makers can offer ongoing support to school leaders and others in professional development leadership roles, by helping them to prioritise resources, build supportive cultures and identify individual and whole-school professional development needs. We have also found that credibility for organisations which offer professional development derives, at least in part, from their subject expertise, which, for policy makers, points to an important factor in the successful procurement and implementation of professional development initiatives linked to policy-driven priorities.

Throughout this study, we encountered school leaders and professional development leaders within schools and other organisations who have overcome barriers to the effective implementation of professional development. We hope that all those involved in teacher professional development will find useful examples in our study of its successful implementation to help them change their practice to improve teachers' engagement with, and learning from, professional development.

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**Wellcome Trust, 215 Euston Road, London NW1 2BE, United Kingdom**
**T: +44 (0)20 7611 8888, E: contact@wellcome.org, W: wellcome.org**