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How educational leaders can maximise the social capital benefits of inter-school networks: findings from a systematic review

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Conflict of Interest

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Abstract

Educators need to engage in continuous learning to ensure that their knowledge and practice responds to the changing needs of society and students. Collaborative approaches in which social capital resource (e.g. knowledge, resource and support) is exchanged with colleagues can serve as an effective way of facilitating such learning. Analyses of the benefits of social capital networks have primarily focused on intra-school communities of teachers from individual schools. However, inter-school networks are potentially richer sources of social capital, since they offer access to resources beyond that already available. With this systematic review, we seek to identify: 1) what inter-school networks are available internationally; 2) the features and activities present within them; and 3) evidence of impact. Our findings derive from 111 research outputs and highlight: the diverse range of different inter-school networks that exist, their myriad purposes and how these networks are enacted. Simultaneously, however, our review only identifies limited reliable evidence of the impact of inter-school social capital networks. We conclude by identifying what research is needed in future to improve our understanding of inter-school social capital networks.

Keywords

inter-school networks; professional learning networks; school leadership; social capital

Introduction

As we enter the second quarter of the 21st century, economies and societies find themselves needing to respond urgently to new technologies: such Artificial Intelligence and automation, new modes of using and creating information - such as the wizardry of ChatGPT- as well as to coping with other 'emergencies' such as climate change, the rise of populism, health crises, and so on (Brown and Luzmore, 2021). Arguably, education systems should actively help tackle such challenges by equipping future citizens with the skills, aptitudes and dispositions required to respond effectively to these, and future, issues (Wagner, 2014). As a consequence, educators themselves must be able to model the behaviours and dispositions needed to successfully navigate a volatile and uncertain world (Brown, 2019; Brown and Poortman, 2018; Lindley, 2023). Schleicher (2012: 11) summarises this exigency by arguing that 21st century schools should be staffed by teachers and school leaders who are "high-level knowledge workers", that is, educators who constantly and collaboratively advance their own knowledge and skills to negotiate and deal with change effectively. Therefore, teachers and school leaders need to engage in acts of continuous, collegial learning to ensure their knowledge and practice adapts and evolves over time and continues to benefit their students (Wagner, 2014).

Examples of continuous, collegial learning can be found in collaborative modes of teacher professional development and learning (PDL), particularly those involving activities such as: knowledge sharing; knowledge creation; sharing practices and resources; developing new practices and resources; and jointly trialling and refining practices and resources (Brennan, et al., 2021; Darling-Hammond et al., 2017; Khokhotva & Albizuri, 2020; Mo et al., 2021; Van Veen, et al., 2010). Common to these PDLs is the use of collaborative activities that enable teachers to access, utilize, and augment the social capital within their networks and communities. It would seem that future-

proofing the education workforce is thus coupled to how school leaders realise the potential of the social capital (i.e., relational resources) present in educator networks, especially beyond the confines of individual schools (Demir, 2021). With this paper, we therefore consider what is meant by social capital both generally, and within the specific context of education, before presenting the findings of a systematic literature review, which explores the types of inter-school social capital network opportunities available to schools and the impact such networks have on improving school, teaching and students' learning outcomes. We finish by detailing the implications of our findings for school and school system leaders.

Social capital

The concept of social capital has a rich history that centres around the idea of shared norms and values and the trust and mutual benefits these engender in social groups. Bourdieu considered social capital to be "the sum of the actual or potential resources that are linked to…membership in a group" (1986: 248), emphasising the ways in which social networks can provide members with specific opportunities and advantages. Coleman (1988) likewise positioned social capital as a source of useful information and resources which can facilitate certain kinds of actions, including the creation of human capital. This conceptualisation also suggests that social networks between actors enables individuals to access social capital, with the nature of one's networks determining one's chances of success in a given endeavour. Beyond these more individually centred notions of social capital, Putnam (2000) points out that generalised reciprocity is also important because of the trust and good-will such reciprocity engenders amongst a given community. Building on Putnam's analysis, Bottery (2003) further argues that within social networks, repeated interactions enable interpersonal bonds which move individuals beyond *calculative* forms of trust, where a judgement is made about whether a network actor will act in a way beneficial to us, to that of *practice* trust, where actors co-construct an ethical and affective system within which they operate. These forms of

trust may be further enhanced if conditions are put in place by the structures or organisations within which the social network resides to formalise such ethical commitments; allowing actors to move to a position of mutually intuitive trust. Therefore, in its most positive iteration, generalised reciprocity benefits all members of a community or network and creates expectations about how members should behave: people continually and actively contributing to the good of the community, knowing their fellow community/network members will, in turn, contribute in similar ways to the ultimate benefit of all (Putnam, 2000).

In education, notions of teacher social capital networks and communities mirror the above definitions. On one hand, teacher social capital networks are thought to enable the exchange of both 'instrumental' and 'expressive' resources. Instrumental exchanges are exemplified by interactions involving information-sharing, advice-giving, assistance with problem-solving, and by providing concrete support to achieve specific goals. Expressive exchanges are typified by support and encouragement that lead to increased trust between members (Christakis & Fowler, 2010; Daly, 2010; Puccia *et al.,* 2021). Both types of exchange are part of the notion of 'practitioner-based social capital' (PBSC), which represents the "resources, information and support for effective teaching available through a teacher's network" (Baker-Doyle & Yoon, 2010: 118) and that can be "mobilised when an actor wishes to increase the likelihood of success in purposive action" (Finnigan & Daly, 2010: 180). Thus, PBSC is consistent with the idea that a teachers' capacity to become a high-level knowledge worker increases as their access to ideas, teaching methods and teaching materials grows. Furthermore, Putnam's (2000) emphasis on reciprocity and Boggert's (2003) notion of practice trust is then evident in certain professional communities. For instance, Stoll *et al* (2006) suggest the key characteristics of effective Professional Learning Communities (PLCs) include: members of PLCs taking collective responsibility for all student learning, not just those in their class; and PLC participants going beyond superficial collaboration to deeply collaborative forms of 'joint

work' such as joint review and feedback that helps to strengthen shared purpose, norms of interdependence and collective responsibility (Warren Little, 1990).

What are the impacts of social capital formation for teachers and students?

Previous research suggests that teachers' access to social capital can lead to beneficial teacher outcomes, both in terms of their own and their students' learning. For example, Demir's (2021) systematic review positively associates social capital utilisation with five benefits: 1) improved teacher professional development (PD); 2) improving teachers' ability to implement change; 3) providing more effective induction of new teachers into organisations; 4) increased teacher retention and job satisfaction; and 5) improved student academic achievements. Other systematic reviews and meta-analyses have similarly explored the effects of, and success factors involved in, educators learning collaboratively in PLCs, and their promising outcomes for both teachers and students (e.g., Doğan & Adams, 2018; Gast et al., 2017; Vangrieken, et al., 2017).

Extant literature also identifies key features associated with teacher networks or communities, which are instrumental to how effectively social capital is utilised. For instance, while social capital is present in teacher networks, how it is distributed and who benefits depends on the specific characteristics of those networks (Brown, 2019; Brown, 2021). As such, teachers' 'informal' access to social capital will depend on three properties: 1) how many colleagues they connect with; 2) how centrally positioned teachers are within their network; and 3) how densely interconnected teachers want their social ties to be (Christakis & Fowler, 2010; Jackson, 2019; Moolenaar & Sleegers, 2010). In this sense, informal access to social capital is at once serendipitous and dependent on individuals' cultivation of network ties. However, when it comes to formal access to social capital, i.e. access to social capital facilitated by formal PDL, other factors come into play. In particular, network attributes such as: 1) which actors are situated within the network combined with their particular knowledge

and expertise (Sebba at al., 2012); as well as 2) which approaches are employed to enable social capital to be identified and accessed e.g., eligibility to participate, frequency of contact, credibility of the network etc. (Husbands & Pearce, 2009; Stoll et al., 2006) become instrumental in the likely success of such efforts to achieve their desired goals.

Similarly, when teacher communities are formally adopted as vehicles for PDL, myriad features will affect whether more reciprocal forms of social capital materialise. For instance, how community members are positioned or identified by others, or even how community members identify themselves will both affect social capital formation. For example, whether community members are divided into 'expert' practitioners and 'novices', or whether stark power differentials exist between participants in terms of their position within a hierarchy can limit flows of social capital. Furthermore, the explicit goals of the community will be paramount in determining how teachers perceive the purpose of such communities (e.g., is mutual development and learning identified as a community goal?). The presence, or not, of such factors can result in one-way transfers on knowledge or resources, rather than reciprocal arrangements where all parties contribute to each other's ongoing development and growth (Sebba at al., 2012). Conversely, communities which are characterised by trust, open dialogue, as well as ongoing joint support between community members, all serve to encourage self-reinforcing contributions towards the good of the community (Sebba at al., 2012; Stoll et al., 2006).

From intra to inter-school networks

Analyses of the benefits of social capital networks have primarily focused on intra-school communities like PLCs where participating teachers are from the same 'community of practice' (Brown & Poortman, 2018; Wenger, 1998). However, inter-school networks are potentially a richer source of social capital, since they offer access to a greater range of knowledge, expertise and

resources beyond that already available within individual schools (Demir, 2021). This is especially the case when inter-school networks involve researchers and/or other stakeholders in addition to bringing together educators from different schools, expanding the nature and mix of social capital potentially available (Brown, 2020; Datnow & Park 2018). Increasingly, policies in many Western countries focus on inter-school networking, pivoting dramatically towards *bottom-up* approaches to school improvement (in other words, approaches to school improvement initiated by teachers, schools and groups of schools, rather than by central or middle tier authorities). As a result, there has been a rapid shift away from the forms of government imposed educational change that typified much education policy witnessed during the 1990s and 2000s, towards more decentralized approaches based on principles of school "autonomy" and school 'self-improvement' (Hopkins, 2022). This is evident in the England, for instance, where the 2010 Education White Paper *The Importance of Teaching* is acknowledged as initiating a seismic shift in the education system, through promoting inter-school networks as a driver to system improvement (Department for Education, 2010).

With this shift in emphasis, it is useful to recall the work of Wenger *et al*., (2011) who contend that while we can distinguish between networks and the notion of community (i.e., connections through which resources flow vs. a group with a shared identity and collective intention), there is no such things as a pure network or pure community. Rather, "a community usually involves a network of relationships. And many networks exist because participants are all committed to some type of joint enterprise or domain, even if not expressed in collective terms" (Wenger et al., 2011: 10). With this in mind, we consider our conceptual frame to be that of inter-school social capital networks where the level of community present within these networks clearly has an influence on the nature of and the approaches through which social capital becomes available to network members.

Research questions

Despite the benefits and increased focus on inter-school networks for enabling change (Mujis, 2015; Armstrong et al. 2020; Armstrong & Ainscow, 2018), we still have little understanding of how school leaders can capitalise on such opportunities in terms of identifying which inter-school networks (and their specific features) might benefit their school the most with regards to the new ideas, knowledge and resources. It is also unclear how school leaders can ensure involving teachers in inter-school networks will successfully harness new sources of social capital. Given this context we chose to explore the following three research questions:

1. What inter-school social capital network opportunities are available to teachers in primary and secondary schools internationally?
2. What network and community features and activities are present within inter-school social capital development networks?
3. What evidence is there of the impact of the inter-school social capital network approaches for improving school, teaching and students' learning outcomes? Which types of inter-school network opportunities (RQ1) and what features of inter-school networks (RQ2) appear most impactful?

Methods

To address our research questions, we employed a systematic review methodology, i.e. "a review of research literature using systematic and explicit, accountable methods" Gough *et al.,* (2013: 2). Our review comprised the five stages of the PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses: PRISMA, 2021) protocol, which are outlined further below.

Stage 1. Inclusion Criteria

Based on our research questions, our inclusion criteria for the review are based on seven categories as outlined in Table 1, below.

[insert Table 1 here]

Stage 2. Searching for research outputs

The review utilised two comprehensive databases: *Scopus* and *Web of Science* to locate relevant peer-reviewed journal articles. In addition, *Google Scholar* was employed to search for policy documents and appropriate reports and other outputs not available in academic journals. These three databases were selected due to their recognised comprehensive coverage of available outputs (Martín-Martín et al., 2018).

We developed three initial sets of search terms based on our conceptual framework for the review (as outlined above) and following an initial scoping of relevant terminology, drawing on the approach of Poortman et al. (2022). These are summarised in Table 2, with searches undertaken using the following combinations of terms:

Combination 1. Set 1 ONLY

Combination 2. Set 1 AND Set 2.

Combination 3. Set 1 AND Set 3.

[insert Table 2 here]

Using these terms in conjunction with our inclusion criteria led to the identification of 1,221 outputs.

Stage 3. Screening, assessing eligibility, and extracting data

The screening process involved assessing which of the outputs returned by the literature searches met the inclusion criteria detailed in Table 1, ensuring that only relevant material from the 1,221 documents identified were utilised (Gough *et al.,* 2013). This took place in two steps. First, the team undertook double screening (i.e., screening by two reviewers) of the titles, abstracts, and keywords of the outputs resulting from Stage 2. Here, only publications meeting all seven criteria were retained. This eliminated 1,043 outputs, leaving 178 to be retrieved as full texts, of which 29 could not be retrieved. The second step involved a full text review of the 149 screened outputs. A further 38 publications were found to not be relevant to the study per Criterion 6 of the inclusion criteria and were subsequently excluded. This resulted in a final sample of 111 documents (see Figure 1 below), 81 of which were peer reviewed articles, 26 book chapters or books, and four were national or local government reviews. Geographically, 25 were focussed on the USA, 16 were international, 17 from England, seven from Canada, five from Israel, four from Singapore, four from Netherlands, four from Spain, three from South Africa, three from New Zealand, three from Australia, and the remainders from India, China, Austria, Taiwan, Thailand, Turkey, Belgium, Denmark, Germany, Malta, Portugal, Sweden and Wales. The methodological designs of these studies included 71 case studies or qualitative and design descriptive studies, 18 mixed methods, 12 theoretical or instrument reports, four analysis of publicly available data, 3 literature reviews, one survey, one experimental design, one randomised control trial with four other studies including a social network analysis as part of their results.

Figure 1. Flow chart of the systematic review selection process based on PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses) flow diagram[1]

[insert Figure 1 here]

Stage 4. Appraising quality of research outputs

Research Question 3 (which explores evidence of impact of inter-school social capital network approaches) contains an explicit requirement to identify causal evidence that links types of networks, or individuals operating within those networks, to material improvements in teaching and learning-related outcomes (e.g., in terms of teachers' knowledge and practice, or student outcomes). As such, this question imposes a requirement to be as rigorous as possible when judging any emerging claims of *causality*, so that the characteristics of 'effective' inter-school social capital networks can be presented alongside an assessment of the trustworthiness of these claims. To meet this requirement, the nature and quality of studies relating to Research Question 3 were evaluated. To begin with, we used the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018a; 2018b), which enables researchers to categorise studies according to five different study designs: 1) qualitative; 2) quantitative randomised controlled trials; 3) quantitative non-randomised; 4) quantitative descriptive; and 5) mixed methods. Each study design has separate evaluation criteria outlined in Hong et al. (2018b) for grading. Each criterion is marked with Y(Yes), N (No) and CT (cannot tell) (Hong et al., 2018a). Given the RQ3 emphasis on causality, the most appropriate method to study this question is Randomised Control Trials (RCT), with less rigorous designs such as quantitative non-randomised designs or quasi-experimental studies providing useful, but less

[1] Retrieved from: http://www.prisma-statement.org/PRISMAStatement/FlowDiagram

compelling, evidence. What is clear is that only one of the identified studies used the RCT method, which – in itself - only met three of the five MMAT evaluation criteria (see Table 3 below).

[insert Table 3 here]

We further assessed the quality of this one RCT study using the research quality assessment framework (sieve) developed by Gorard *et al.* (2019). The sieve framework provides additional criteria with which to judge research studies, as set out in Table 4 below. These are used to identify whether key information is provided which can be used to gauge the confidence one can have in the findings (Gorard *et al.,* 2019). Disappointingly, in this case the RCT study only scored 12 out of a possible 25 on the sieve score, suggesting that it is not as robust as might be hoped for, and claims to causality must be viewed in this light.

[insert Table 4 here]

Stage 5. Synthesising findings

Given the exploratory nature of this review, we adopted a configurative approach where synthesis is primarily concerned with organising (configuring) findings from literatures to address questions of an investigative nature (Gough *et al.,* 2013; Gough, 2021). The findings from our review are presented below by addressing each of the four research questions.

Results

RQ1: What inter-school social capital network opportunities are available to teachers in primary and secondary schools internationally?

Findings from the review indicate that a number of inter-school social capital network opportunities are available to educators, with the focus of these networks including, but not limited to:

- curriculum implementation;
- pedagogical approaches;
- student behaviour interventions;
- resource sharing;
- supporting those working with students with Special Education Needs and Disabilities (SEND);
- peer reviews of provision and school effectiveness;
- inquiry networks; and
- data networks.

Network opportunities available to schools included various central government policy initiatives that utilized collaborative networks to promote access to social capital. For instance, recent curriculum reform in the Australian state of New South Wales used Teacher Engagement Networks (TENs) to support the roll out of a new curriculum. The aims of the TENs are to provide feedback, input and advice to inform the development of curriculum support materials and PD priorities, while also supporting the implementation of curriculum reforms in the schools and regions (Poortman & Brown, 2023). Similarly, Ontario's Teacher Learning and Leadership Program (TLLP) represents an approach to teacher development centred on teachers working together to lead their own professional learning (Campbell *et al.* 2016; Ontario Ministry of Education, n.d). Here teacher teams self-identify and investigate an area of practice, or an issue of interest, which has the potential to benefit other students and/or schools more widely (Campbell *et al.,* 2016). To help disseminate

learnings from these projects, school districts can also seek funding for release time and travel to enable TLLP teacher leaders to share their knowledge and practices with other teachers, schools, and school districts across Ontario (Campbell *et al.,* 2016).

Various 'bottom-up' examples of educators driving continuous collaborative learning and improvement through social capital networks were also identified. For instance, the Virtual Professional Learning Networks in Calgary was intended to support teachers to develop ways to alleviate the effects of Covid-19 disruptions on students with learning difficulties given their disproportionate experience of adverse effects arising from the loss of structure and stability during the pandemic (Braunberger & Hamilton, 2022). A number of collaborative networks in England were also found, including the work of charities such as the Education Development Trust working with some 2,000 schools to strengthen collaborative school improvement using peer review (Cameron & Farrar, 2022) and the Church of England's Foundation for Educational Leadership which supports senior leaders in small rural schools (Greany & Wolfe, 2022). The Scottish Islands School Network is another network of leadership teams working predominantly online with schools across the rural Scottish isles (Dick & Peat, 2022) to provide a 'flourishing space' where members can share social capital such as professional knowledge, experiences, and resources with others in similar contexts, facing similar challenges.

A full list of the inter-school social capital networks that emerged from the review is presented in Table 5.

[insert table 5 about here]

RQ2: What network and community features and activities are present within inter-school social capital development networks?

Findings from the review suggest a myriad of features and activities can be found amongst inter-school social capital development networks. We identified six substantive headings to help classify them:

1. *Who participated in the PLN*: Participation directly determines what social capital can be accessed within networks. Our review found participants ranged across practitioners (teachers), school leaders, administrators (having responsibility for a collection of local schools), teacher educators, curriculum specialists, researchers, business leaders, those from for-profit and not-for-profit organisations, parents, students and policy-makers.
2. *Activities undertaken within the network:* These mainly included instrumental social capital-related activities such as knowledge and idea sharing, curriculum resource development, lesson planning, lesson study, video analysis of teaching, coaching, reflection, site visits, joint PD days, workshops, online resource banks, joint assessment and peer review. There were very few mentions of 'expressive' activities which built trust within the network (such as team bonding activities), so while we might safely assume such activities took place, we have little evidence to confirm this.
3. *Genesis of the network*: The majority of studies reviewed were initiated by local administrations, universities or government departments. While present, relatively few were initiated by teachers or school leaders, but this may reflect that these types of networks may be less likely to be evaluated.
4. *Mode of operation:* Networks met face-to-face, online through commercially available platforms (such as Teams or Zoom), through bespoke platforms or a mix of these.

5. *Frequency of operation:* Frequency varied considerably, ranging from regular intensive workshops in the early stages of the network, through to weekly, fortnightly, or monthly network-related sessions.
6. *Lifespan of the network:* Networks varied in duration from less than a year to three years and some which are ongoing.

A summary of the features and activities associated with inter-school social capital development networks emerging from the review is presented in Table 6.

[insert table 6 about here]

Further, more general reporting on network and community features and activities associated with inter-school social capital development networks was also present in the review literature. These additional aspects include:

Approaches for accessing social capital: The approaches used to harness social capital within the network fell into two broad categories: 1) where networks explicitly utilized activities to challenge and support participants, such as reciprocal coaching, peer lesson observation/lesson study (Sebba et al., 2012); and 2) where networks incorporated external expertise, including access to research and academic experts (Sebba et al., 2012). Twenty of the studies in Table 6 make specific mention of external coaches or facilitators and this role is implied for other studies, though not specifically mentioned.

Academic performance of participating schools: Two contrasting perspectives emerged in terms of whether partnerships should involve schools with similar features and contextual factors (e.g., Bremm & Drucks, 2018), one based on homogenous networks which are thought to develop trust

and release social capital quickly, and the other where networks comprise a mix of high and low achieving schools in order for the latter to benefit from engaging with the former (Chapman & Muijs, 2014; Howland, 2015; Muijs, 2015).

Networks based on new or existing initiatives: Drawing on established relationships and historical collaborations provides a strong basis for developing new inter-school networks (Briscoe *et al.,* 2015; Sebba et al., 2012), with shared geography often providing a network with common history and understanding (Howland, 2015). Conversely, some networks were newly established with a focus on achieving a particular goal. For example, networks formed to support teachers in rural communities were common (e.g., Washington & O'Connor, 2020; Carpenter & Munshower, 2020, Roland & Ross-Hekkel. 2022). Here, collaboration was key to not only supporting teacher practice, but also sharing delivery of curriculum to remote students (Stevens, 2011). Alternatively, networks may be set up from a centrally driven initiative to implement changes in the national curriculum (Armstrong et al., 2020; Edwards, 2021; Brandes et al. 2020; Poortman & Brown 2023), a particular type of pedagogy (Washington & O'Connor, 2020; Kassab et al. 2023), or to address issues of current concern (Kelly & Cherkowski, 2015; Braunberger & Hamilton, 2022). In a handful of the studies networks involved schools who were forced to collaborate either due to reasons of underperformance or under mandate from local government (Cutajar & Bezzina, 2013; Kelly & Cherkowski, 2015; Gu et al. 2015).

Governance: The governance of networks can be formal and contracted or informal and involuntary (Armstrong, et al., 2021; Ehren & Godfrey, 2017). Formal, contracted networks are typically goal-directed and will benefit from having more stable patterns of social relations, deliberate schedules, interactions, and structures by virtue of explicit organizational arrangements and rules. There is little evidence to indicate whether formal or informal networks have more or less impact on teaching and learning outcomes, with most relevant studies investigating the impact of formalised networks (e.g., Bremm & Drucks, 2018; Chapman & Muijs, 2014; Muijs, 2015). In a similar vein, the leadership and

governance of networks can vary from non-brokered, shared, participant-led governance through to being highly brokered by one external organization (Ehren and Godfrey, 2017).

Leadership: Facilitation of a network is distinct from its leadership (Brown & Flood, 2019; Hubers & Poortman, 2018). In the first instance, leadership is required *of* the networks themselves to ensure that they function effectively and so enable social capital to be accessed (Briscoe *et al.*, 2015; Dowling, 2016; Muijs, 2015). Second, it is also the role of school leaders to ensure that there is meaningful participation by their teachers in network activities and that this participation makes a meaningful contribution to their school. This second aspect is covered in detail elsewhere (e.g., Brown, 2020; Brown & Flood, 2021), so is not covered within this review.

RQ3: What evidence is there of the impact of the inter-school social capital network approaches for improving school, teaching and students' learning outcomes? Which of type of inter-school network opportunity (RQ1)/what features of inter-school networks (RQ2) appear most impactful?

Of the outputs emerging from the review, 68 studies explored the impact of inter-school social capital networks on school, principal, teacher, teaching and students' learning outcomes. The research design categories mirror the five broad categories of designs in the MMAT (Hong et al., 2018b). Category 1 (qualitative studies) consists of case studies, studies with qualitative data collection and analysis (such as interviews or focus groups). Randomised controlled trials (RCTs) belong to Category 2, with quantitative non-randomised studies sitting in the Category 3, studies with no comparison group and surveys in Category 4 and mixed methods studies situated in Category 5 (Hong et al., 2018b). Applying this MMAT categorisation to our outputs for Research Question 3 resulted in identifying 50 Category 1 studies, only one RCT study in Category 2, no Category 3 studies, three Category 4 studies, and 14 studies in Category 5. See Table 7 for a

summary of these categorisations. Note that some studies had more than one method attributed to them.

[insert Table 7 here]

It is clear that of the studies investigating the impact of inter-school social capital networks, the majority are dominated by qualitative methods. While this design is appropriate for exploring issues in-depth, experimental and quasi-experimental designs are acknowledged as being better suited to establishing causal relationships between an intervention and its impact, through their use of controls as counterfactuals to capture what happens without the intervention (Shadish et al., 2002). As Table 5 illustrates, there is thus a gap in the evidence base in terms of establishing causal links between engaging in inter-school social capital networks and beneficial impacts for school, teaching and students' learning outcomes. The single RCT study (Diaconu, *et al*., 2012) is also shown as only having some aspects of an appropriate research design per the MMAT analysis. While randomization is appropriate, baseline data is available, and assessors are blinded; information is missing about the scale of the study relative to the size of the population it is applicable to, and there is incomplete information on how teachers adhered to the intervention. Nor is it clear whether those who have written the study are those who also designed the intervention. That notwithstanding, the study did examine the impact of a PD model on participants of an inter-school professional learning community and found the treatment group significantly improved their subject knowledge, and some cohorts improved their use of inquiry-based practices compared to the control groups. Unfortunately, though, having just one study relevant to RQ3 means we cannot meaningfully 'circle back' to Table 4 and suggest possible links between the features of this specific networks and network efficacy more generally. In other words, determine what aspects of inter-school social capital networks lead to social capital being accessed in a beneficial way for teachers and students

Discussion

The purpose of this systematic review was to identify: the inter-school networks available internationally; the features and activities present within them and their relation to teacher social capital; and highlight any evidence of impact. Our findings clearly illustrates that inter-school social capital networks are now a feature of the global educational landscape, with more than 80 examples of such networks, covering North and South America, Europe, Australasia, Asia, Africa and the Middle East evident in the 111 English language papers we surveyed. Further, approximately half of the papers detailing these networks were written in the ten-year period of 2010 to 2019 with approximately half written in only the four-year period 2020 to 2023. This suggests a growing interest in inter-school social capital networks by researchers and others.

Yet, while each network examined had a central aim of supporting educators to improve their knowledge and skills, so as to improve teaching and learning within schools, this goal was approached quite differently based on specific foci and network membership. In particular, while inter-school social capital networks can emerge as a bottom-up response to a need within a particular community of schools or teachers, the majority of those discovered in the review were enacted as part of a state or jurisdiction's approach to school improvement. We know that it is likely that a number of these 'bottom up' networks exist, for example those formed in England as a defensive move to address 'quasi-market' system structures within which they operate (Greany & Highham, 2018), but unless these organic networks are researched and discussed formally, they risk being overlooked.

Approaches to leverage social capital within the networks discovered were varied and included a range of approaches, from aspects of joint practice development such as lesson study to forms of teacher-led action research, to the use an ad hoc mixture of tools and techniques alongside external facilitation. Given this plurality of approaches, it was not possible to identify emergent patterns in

terms of effective features, ideal network membership, or optimal frequency or intensity of network activity. Finally, how we, as researchers, come to understand networks has also been varied, and as demonstrated in Table 7, the investigation of networks to date, has predominantly been through the use of case studies and qualitative analyses, with only one RCT being identified, highlighting that there is little substantive evidence about the impact of inter-school social capital networks. Further, while networks can expose teachers to diverse, multi-faceted, forms of social capital, we must be cautious as seeing them as a panacea: inclusion in a network inevitably means exclusion for others; power imbalances within a network may lead to inequity of benefits for those present (Greany & Higham, 2018). As such, we are unable to make any claims about whether any systemic benefits of networks and the durability of these benefits over time.

Conclusion

Networks are, in theory, effective ways to create and provide access to the knowledge workers that schools and school systems now need, due to their ability of such networks to expose teachers to diverse, muti-faceted, forms of social capital. Their intuitive capacity for this has led governments, districts, jurisdictions, and groups of educators around the world to adopt inter-school networks as a means to improve teaching and learning. However, while plausible, we do not know with any certainty whether this promise plays out in reality. There are several risks of adopting untried educational interventions, including the opportunity cost of failing to implement more effective strategies, but of greater concern is the lack of evidence that they will not cause harm (Brown, 2019). Given the exigency around schools using limited resources to be more effective for more students, having an effective measure of the impact of inter-school social capital networks is vital. Correspondingly we argue that there is a need for a future programme of research to be more

rigorous in evaluating the impacts educators derive from engaging in inter-school social capital networks.

Specifically, in line with other practices regarding evaluation of complex interventions, we suggest future research attend to the following four features of network engagement: a) **causality** - establishing causal links between outcomes and educators' engagement in inter-school networks using methods such as randomised control trial, matched comparison areas, longitudinal data, and statistical analyses to rule out confounding factors; b) **attribution** - identifying the presence of other initiatives which may influence whether a particular networks has achieved its goals; c) **educator mobility -** accounting for workforce flows into and out of a network over time; and, d) **cost-effectiveness -** assessing the costs associated with network initiatives and being clear about any long-term benefits that may relate to overall cost-effectiveness (e.g. Raffo *et al.* 2014). Given the diverse nature of inter-school social capital networks, we also suggest researchers adopt the principal of *realist evaluation* where researchers' explanatory theories address "What works for whom, in what circumstances, in what respects, and how?" (Pawson and Tilley, 1997: 2). In particular, such theories should account for how *Outcomes* result from *Approaches (or machanisms)* triggered in specific *Contexts* (Pawson and Tilley, 1997). This approach can enable later research to undertake *realist syntheses* that aggregate the findings of such evaluations (Rycroft Malone et al., 2012), and effectively corralling the myriad characteristics of networks into specific mechanism 'types' that operate within given situations to deliver specific types of network goals.

As the science fiction writer, William Gibson, is reported to have observed: "The future is already here. It's just not evenly distributed yet" (Garner, 2012: website). We believe this perspective is equally applicable to the notion of inter-school social capital, which is already present within education systems, but not equally accessed by all. Resolving this situation could, in theory, lead to improvements in education systems that help educators and education systems ensure citizens are

able to meet the challenges presented by the 21st century. But before we pursue this path based on a premise that is grounded more in hope than certainty, we owe it to policy-makers, educators, and students to ensure the outcomes we expect to come from teachers' access to inter-school social capital networks are grounded in reality and based on well understood approaches.

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Table 1. Inclusion criteria for the proposed review

Inclusion criteria	Elaboration of criteria
1. Time frame	This review focused on research outputs published between 2010 and 2023. The year 2010 was selected since, for England at least, it marks the publication of the aforementioned Education White Paper: *The Importance of Teaching,* which initiated a shift in policy direction towards inter-school social capital networks (Department for Education, 2010); a commitment described elsewhere as the move towards a 'self-improving school system' (Dowling, 2016; Greany, 2017). Further a scan of literature in this area reveals a marked increase in focus on educational networks after this date.
2. Language	This review included English language research outputs only.
3. Geographical locus	The review has an international focus and so includes all outputs drawn from research or grey literature in any country or nation.
4. Type of research	Given the nature of our research questions, we include both empirical, studies as well as "grey" literature (e.g., policy documents or non-empirical reports), to ensure we are able to provide as comprehensive a picture of the inter-school social capital network opportunities available to educators as possible (RQ1).
5. Type of publications	Published or online peer-refereed journal articles, book chapters, books, reports and policy documents.
6. Content	Research outputs are included if they centrally discuss or report on 1) types of inter-school social capital networks; OR 2) the deployment or use of inter-school social capital networks (generally or specifically); OR 3) features of inter-school social capital networks (generally or specifically); OR 4) impacts associated with inter-school social capital networks (generally or specifically); OR 5) individuals who provide links or bridges between inter-school social capital networks and their 'home school'.
7. Research settings	Outputs cover K-12 settings only (primary and (lower and upper) secondary schools).

Table 2. Search terms used for the systematic review

Set 1: Inter-school social capital network	Set 2: Impact	Set 3: Individuals
Inter-school social capital	Teacher knowledge	Change agents
Inter-school networks	Teacher skills	*Brokers
Networked Professional Learning Communities	Teacher practice	*Mobilisers
Internationally Networked Professional Learning Communit*	Teacher collaboration	Teacher leaders
Networked Learning Communit*	Children's outcomes	Distributed leaders
Professional Learning Network*	Student outcomes	
	Pupil outcomes	

Table 3. MMAT evaluation of RCT

	Question	Response
Screening	Are there clear research questions?	Yes
	Do the collected data allow to address the research questions?	Yes
RCT specific criteria	Is randomization appropriately performed?	Yes
	Are the groups comparable at baseline?	Yes
	Are there complete outcome data?	CT
	Are outcomes assessors blinded to the intervention provided?	Yes
	Did the participants adhere to the assigned intervention?	CT

Table 4. Research Quality according to Gorard, et al. (2019)'s sieve

Criteria	Level of quality	Rating 0 – 5)
Design	Good design for research question	4
Scale	Scale is unclear	0
Missing data	Missing data not reported	0
Measurement quality	Standardised, pre-specified, independent, valid	5
Threats	Evidence of potential imbalance	3
	Total (out of 25)	12

Table 5. The inter-school social capital networks that emerged from the review

Name of inter-school social capital network	Outputs detailing the network	Purpose of PLN
1. Teacher Expert Networks (New South Wales)	Poortman & Brown (2023)	A network to support the roll out of new curriculum in New South Wales.
2. Teacher Learning and Leadership Program (Ontario)	a. Campbell et al. (2016) b. Ontario Ministry of Education (n.d)	The Teacher Learning and Leadership Program (TLLP) creates opportunities for experienced teachers to enhance their skills, extend their learning and share their expertise with others.
3. Virtual Professional Learning Networks (Calgary)	Braunberger & Hamilton (2022)	An informal network which grew organically to support educators who work with students with learning difficulties in Calgary.
4. The Education Development Trust (England)	Cameron & Farrar (2022)	A charity working with schools in England to strengthen collaborative school improvement through peer review across organised networks.
5. Church of England Foundation for Educational Leadership (England)	Greany & Wolfe (2022)	A network which supports senior leaders of small rural Church of England schools in England.
6. Ministry of Education PLNs (NL)	a. Prenger et al. (2019) b. Prenger et al. (2021)	A project to support collaboration between teachers set up by the Dutch Ministry of Education.
7. datateam® (Netherlands)	Schildkamp et al. (2016)	Datateams consist of an expert from the University of Twente who train a team of 4-6 teachers and 1-2 school leaders to use data to solve an educational problem within their school.

8. Developing Potential – Empowering schools (Germany)	a. Brown (2020) b. Liegmann et al. (2022)	A project funded by the Mercator Foundation and delivered by the University of Duisburg-Essen and TU Dortmund to bring about improvements for 36 secondary schools in socially deprived areas in lower Rhine-Ruhr region.
9. The Communities of Schools Programme - Kāhui Ako (New Zealand)	a. Greany & Kamp (2022) b. Whalley & Barbour (2020) c. Dibben & Youngs (2022)	A collaboration of schools and early childhood education providers working together to 'enhance equity and excellence for students'.
10. The School Improvement Partnership Programme (SIPP) (Scotland)	a. Chapman et al. (2016) b. Neary et al. (2022)	A networked approach to school improvement focused on improving attainment of children from socio-economically disadvantaged backgrounds in Scotland.
11. Network of Social and Educational Equity (Scotland)	a. Chapman et al. (2016) b. Neary et al. (2022)	Local authorities and schools involved in a University-led network for school improvement purposes.
12. NORCAN (Norway-Canada)	Campbell (2022)	A network of schools across Norway and Canada looking to improve student's mathematical learning.
13. School Improvement Networks (Chile)	Pino-Yancovic et al. (2019)	School Improvement Networks (SINs) is a Chilean Ministry of Education strategy for school principals and curriculum coordinators to work as peers to share practice.
14. Collaborative inquiry networks (Chile)	Pino-Yancovic & Ahumada (2020)	The Collaborative Inquiry Network was set up in an education district in Chile including 22 schools represented by their headteachers and curriculum coordinators.
15. Shared Education (N. Ireland)	Gallagher et al. (2022)	Practice shared between schools and teachers.
16. Networks for Change (Spain)	Díaz-Gibson et al. (2022)	Networks of schools across Barcelona to seek deep system change and transform schools.
17. Teaching School Alliances (England)	a. Gu et al. (2015) b. Greany & Armstrong (2022) c. Greany & Higham (2018)	Teaching Schools provided teacher training and school improvement to underperforming schools and were required to form a network with other Teaching Schools.
18. Elementary curriculum (Sweden)	Nordholm (2016)	School-to-school collaboration to support national curriculum implementation in a Swedish municipality involving elementary teachers.
19. Computer Science curriculum (Israel)	Brandes, Ben-David Kolikant & Beeri (2020)	A network formed to share knowledge and address pedagogical issues regarding new Computer Science curriculum.
20. STEM PBL PLC Urban High Schools (USA)	Capraro et al. (2016)	Implementation of STEM Project Based Learning in secondary urban schools.
21. Weizmann Institute Department of Science Teaching: Middle school STEM PLC (Israel)	Eylon, Scherz & Bagno (2020)	A national PLC of STEM teachers to improve provision for students in high school.
22. Weizmann Institute Department of Science Teaching: Physics PLC (Israel)	a.Eylon, Scherz & Bagno (2020) b. Levy et al. (2018) c. Levy et al. (2020)	Regional PLCs of high school physics teachers that have been operation since 2012.

	d. Levy et al. (2021a) e. Levy et al. (2021b)	
23. Special educator cultural awareness PLC (USA)	Moore (2018)	A PLC with the aim of supporting teachers to further develop their cultural awareness.
24. QUEST Science Teachers (Denmark)	Nielsen (2015)	A CPD-project involving 42 schools from 5 municipalities in Denmark to develop a sustainable model for CPD.
25. Regional New Zealand curriculum implementation PLC (New Zealand)	Edwards (2012)	A PLC to support the implementation of revised curriculum.
26. Leading Learning for School Effectiveness (Wales)	Harris & Jones (2010)	A PLC in pilot phase of work to generate local improvement capacity linked to the 'School Effectiveness Framework'.
27. Induction and mentor online learning community (USA)	Hutchison & Colwell (2012)	A school district designed online learning community for teachers responsible for mentoring and inducting new teachers.
28. Learning Studios (Netherlands)	Imants et al. (2020)	A collaboration of hybrid learning environments where trainee and in-service teachers from schools and universities connect practice, theory and research to improve teaching practices.
29. Learning technology network (Singapore)	Hung & Lim (2022)	A project to implement new learning technology in a network of schools.
30. Challenge Partners – middle leaders (England)	Stoll et al. (2017)	A collaborative group of schools who work via hubs to learn from one another. The network of middle leaders was designed to support their capacity to support teacher colleagues.
31. St Mary's County Public Schools music and arts online PLC (USA)	Battersby & Verdi (2015)	An online PLC for music and arts teachers in a school district.
32. Teaching supervisors PLC (Canada)	Bouchamma & Michaud (2014)	A PLC for school leaders who had new responsibilities for supervising teaching.
33. Social, Emotional and Mental Health PLC (USA)	Brake & Kelly (2019)	A PLC for school mental health professionals in Chicago to develop interventions and strengthen professional capacities.
34. Project Alianza (USA)	Brooks et al. (2010)	A project designed to increase the capacity of university and public-school faculty to serve the growing number of English Language Learner students.
35. Escuela Nueva (Colombia)	Washington & O'Connor (2020)	A network of educators from rural schools in Colombia with a shared pedagogical approach.
36. New Haven School District Critical Friend Group (USA)	Burke, Marx & Berry (2010)	A Critical Friend Group was introduced by administrations to engage educators in sharing and improving practice.
37. vPLC for rural educators (USA & Dominican Republic)	Carpenter & Munshower (2020)	Virtual PLCs for educators in rural communities were established to reduce geographic isolation and foster collaboration.
38. Cross-contextual inquiry science PLC (Singapore)	Cheah, Chai, & Toh (2019)	A network where teachers co-designed lessons for cross-contextual science learning.

39. Secondary school leaders' professional learning and well-being PLC (Belgium)	Coenen et al. (2021)	A long-term networked PLCs for Flemish secondary school leaders organised by municipalities with a focus on professional learning and well-being.
40. Teacher Design Teams for financial literacy education (Belgium)	Compen & Schelfhout (2021)	A collaboration where teacher design teams produce materials to deliver financial literacy learning.
41. SPLASH (USA)	Courtade et al. (2017)	A PD program focusing on training and supporting educators in rural areas who teach students with moderate and severe intellectual disabilities.
42. Rice Elementary Model Science Lab PLC (USA)	Diaconu et al. (2012)	A project where scientists and teacher educators worked with elementary teachers to provide science content and improve science pedagogy.
43. School principal collaboration for School Behaviour Support Programme (Australia)	Foggett et al. (2021)	A network of school principals managing resources to promote positive behaviour and address problem behaviour.
44. Alberta maths curriculum online PLC	Francis & Jacobsen (2013)	An online PLC for geographically dispersed teachers with a focus on implementing a new maths curriculum.
45. Vertical Science teacher PLC (USA)	Gunning et al. (2020)	A PLC of K-12 teachers to develop science teaching and curriculum.
46. Principal professional learning communities (USA)	Honig & Rainey (2014)	A PLC for school principals in an urban district to encourage instructional leadership.
47. Canada-China Partnership (Canada & China)	Huang (2017)	Pairs of internationally networked schools collaborating on teaching practices.
48. Karnataka Open Educational Resource project (India)	Kasinathan & Ranganathan (2017)	A collaboration between teachers and teacher educators to create, adapt and share supplementary digital resources for revised textbooks.
49. MOSAIC PLC (USA)	Kassab et al. (2023)	A teacher implemented classroom behaviour intervention where the PLC was used to disseminate learnings to teachers not part of the original trial and training and support their use of the strategies.
50. Changing Results for You Readers in British Colombia (Canada)	Kelly & Cherkowski (2015)	A district mandated PLC for teachers in a rural school district to support an initiative to improve literacy grades.
51. OPAL collaboration module (Singapore)	a. Lee et al. (2023) b. Judy et al. (2018)	One Portal All Learner (OPAL) is a learning and content management system available to all Singaporean Ministry of Education staff to support Networked Learning Communities.
52. Expanding Capacity in Environmental Education project (EECapacity) (USA)	Li & Krasny (2020)	A national PD programme for environmental educators in non-formal settings.
53. STEM PLC Pennsylvania (USA)	Liu & Yoon (2011)	A curriculum PD project to increase opportunities for STEM in underserved schools.
54. PBL virtual PLC Michigan (USA)	McConnell et al. (2013)	K-12 teachers implementing inquiry-based science lessons.

55. Leadership for Learning Programme (South Africa)	Naiker & Mestry (2015)	A university-led programme designed to improve the leadership capacity of principals and district officials.
56. SMILES (South Africa)	Ndlovu (2011)	The Science and Mathematics Initiative for Learners and Educators (SMILES) is a school-based teacher PD project.
57. Learning Community under Leadership for Learning (Taiwan)	Pan & Chen (2023)	A pilot of learning communities set up by the Ministry of Education.
58. Urban Ecology Practitioner Inquiry Community (USA)	Piazza & McNeill (2013)	A non-profit environmental organisation supporting secondary science teachers to receive training, resources, and engage in collaboration.
59. Languages and Education PLC (Portugal)	Pinho & Simões (2012)	A PLC for language teachers, teacher educators, and researchers.
60. PD for 3D science (USA)	Reiser et al. (2017)	A state PD program for peer-facilitated teacher study groups in relation to the science standards and framework.
61. Number Talk (USA)	Reisman et al. (2020)	A network of early-career elementary teachers collaborating and improving practice through an online community based on a pedagogical routine called 'Number Talk'.
62. Linpilcare (International)	Rigney et al. (2021)	A pan-European project undertaken by schools and universities that delivered practitioner inquiry projects and PLCs in home countries.
63. Mathematics PLN Southern California (USA)	Rodway et al. (2021)	A longitudinal study of school districts concerned with improving mathematics instruction and, in partnership with a local university, engaged in a PLN.
64. Comprehensive Musicianship through Performance Virtual PLC for rural music teachers (USA)	Rolandson & Ross-Hekkel (2022)	A virtual PLC for rural music teachers.
65. Partners for Possibility (South Africa)	Romanowski (2022)	A program which partners school principals and business leaders to develop collaboration, networking and PLCs.
66. Online EFL teacher Lesson Study (Turkey)	Songül et al. (2018)	English Foreign Language teachers in an online lesson study project.
67. HeadsUP (International)	Strand & Emstad (2020)	School principals and universities from EU countries with the aim of developing principal expertise in instruction leadership and structuring school PLCs.
68. Networked Improvement Communities to improve science education for emergent bilingual students (USA)	Thompson et al. (2019)	A networked improvement community of PLCs including science teachers, science and bilingual coaches and researchers.
69. The Autism Network for Educators (England)	Van Themaat (2019)	A local practitioner led network for those who teach students with Autism.
70. Four Pines rural school district PLC. (USA)	Woodland & Mazur (2019)	A district wide teacher collaboration aimed at the improvement of instructional practice which would lead to improved student experience and outcomes.
71. Master Teacher Studio (China)	Zheng & Ye (2022)	A PD program in which a group of teachers participated in a Master Teacher Studio.

72. STEMCrAfT framework for rural educator (Australia)	Kilpatrick & Fraser (2019)	The project aimed to build the capacity of STEM teachers in rural and regional schools.
73. The SUCCESS Alliance (England)	Greany (2022)	A network of primary schools based in one town to offer support to one another.
74. 'A Estrada': collaborative inquiries into inclusive education (Spain)	Parrilla et al. (2015)	Development of collaborative inquiries at intra-school, inter-school and local levels in a local area with the belief that education and community development must be considered as interconnected.
75. Colleges of schools (Malta)	Cutajar & Bezzina (2013)	A national initiative to move all primary and secondary schools into a collaborative way of working to reduce teacher isolation.
76. Multilateral cooperation for small-size schools (Thailand)	Suwan et al. (2015)	A community network to offer support small schools to keep them open when government had been seeking to close down or amalgamate them.
77. Cantatech network (New Zealand)	Stevens (2011)	New Zealand rural school network to support delivery of curriculum through shared teaching online.
78. Vista School district (Canada)	Stevens (2011)	As above in Canada.
79. Cantabria SELFIE digital technology network (Spain)	Jariego et al. (2023)	A pilot project of a diagnostic tool from the European Commission, to support teachers to develop digital capacity.
80. Michigan K-8 mathematics NLC (USA)	Evert & Stein (2022)	A mathematics program designed to increase teachers' knowledge of K-8 mathematics and design rich mathematical tasks and discussions.
81. Modellregion Bildung Zillertal (Austria)	Jesacher-Roessler & Agostini (2022)	A network of PLNs based on the premise that 'the best possible education is not only the task of individual schools, but must go further through enhanced networking of all of those involved in the education of the region's students'.
82. New Forest Research Learning Network (England)	Brown & Flood (2020)	A Research Learning Network formed of primary schools.
83. Transitional North (Canada)	Washington & O'Connor (2020)	A multidisciplinary team supporting educators who worked with pupils with Foetal Alcohol Spectrum Disorder.
84. Learning Links	Greany & Higham (2018)	A network of nine primary schools aiming to improve student progress through teaching and leadership. Membership built over time through invitation.

Table 6. Key network and community features and activities associated with inter-school social capital development networks (NS = not stated)

Name of inter-school social capital network	PLN participants	Activities undertaken by the PLN	Who initiated PLN?	Modes of enactment	Frequency of PLN participant interaction	Duration of PLN
1. Teacher Engagement Networks (New South Wales)	Practitioners	Provide feedback, input and advice to inform the development of curriculum support materials and PD priorities	Government	NS	NS	NS
2. Teacher Learning and Leadership Program (Ontario)	Practitioners	Projects vary in size from a team of 1 – 60. Projects typically last 18 months and tend to be run in school, but 88% of projects are shared with other schools, communities, districts and across Ontario through events and opportunities organised for professional learning, online communication, local newspapers, journals and books.	Teachers supported by district	NS	NS	NS
3. Virtual Professional Learning Networks (Calgary)	Practitioners, researchers, school leaders, PD coordinators, psychologists	Problem solving of issues related to Covid-19 such as developing literacy teaching when modes of delivery were shifting online. MA programme development and research partnership to look at self-regulation in online learning.	School leaders	NS	NS	NS
4. Education Development Trust (England)	School leaders and teachers	Schools systematically review and address weaknesses sharing effective practice. Process includes self-review; peer review; follow up improvement workshop and school to school support.	Member organisation	Virtual during pandemic, face-to-face in non-Covid times	NS	NS
5. Church of England Foundation for Educational Leadership (England)	School leaders and organisation	Initially designed to focus on school improvement the network adapted to provide theologically informed strategic reflection on leadership during Covid-19. Facilitators provided for networks and sub-groups met in self-facilitated groups.	Organisation	Online & face-to-face	NS	NS
6. Dutch Ministry of Education PLNs (NL)	Practitioners & teacher educators	PLC activities included: input on topics, coaching & reflection (facilitated by teacher	University	Face-to-face	Once a month	1 year +

		educator); lesson study; development of lesson material.				
7. datateam® (Netherlands)	Researchers, practitioners & school leaders	Activities included: problem identification, formulating hypotheses, data collection, data quality check, data analysis, interpretation and conclusions, implementing improvement measures & finally evaluation.	University	Face-to-face	Once a month	2 years
8. Developing Potential – Empowering schools (Germany)	researchers, practitioners, non-profit foundation, state	6-7 schools were organised into networks based on existing data. Assigned teachers participated in network meetings, site visits, training in schools, feedback to groups and gained additional qualifications.	Government	Face-to-face	Teachers and leaders met 4 times a year	5 years
9. The Communities of Schools Programme (New Zealand)	School leaders, practitioners, administrators	NS	Government	NS	NS	NS
10. The School Improvement Partnership Programme (Scotland)	Practitioners, researchers, administrators	Collaborative inquiry using a cyclical framework: understanding context and deciding on inquiry, looking at available evidence (inc data collection, internal and external knowledge) and testing change. Facilitated by university staff. Lesson study and instructional rounds used.	University and Government	Face-to-face and online	Unclear	3 years
11. Network of Social and Educational Equity (Scotland)	Practitioners, researchers, administrators, educational psychologists, third-sector organisations	Collaborative inquiry using a cyclical framework used to guide the project: understanding the context and deciding on an inquiry, looking at available evidence (including data collection, internal and external knowledge) and testing change. Facilitated by university staff.	University and Local government and/or local school groups	NS	NS	Ongoing
12. NORCAN (Norway-Canada)	School leaders, practitioners and students	School visits & joint student activities	Unions and Local Government	Face-to-face & online	NS	4 years

13. School Improvement Networks (Chile)	School leaders, curriculum leader, government supervisor	NS	Government	NS	NS	NS
14. Collaborative inquiry networks (Chile)	School leaders, curriculum leaders and researchers	Cyclical phases of collaborative inquiry: acknowledging challenges for practice, inquiry and action or intervention, monitoring and reflection on impact.	Local government	Face-to-face	2 workshops; 4 meetings	1 year
15. Shared Education (N. Ireland)	Practitioners, students, parents, local community members.	No set format for the partnerships. PD activities.	Unclear	NS	NS	NS
16. Networks for Change (Spain)	Practitioners, administrators	3-10 teachers from each school attend the network facilitated by district leader. Activities NS.	Local Government	NS	NS	Since 2017 and ongoing
17. Teaching School Alliances (England)	School leaders, practitioners	Staff from Teaching Schools lead school improvement activities e.g. leading PD days, curriculum development etc in underperforming schools. Some activities may be considered collaborative but others hierarchical in nature.	Government	Unclear	Unclear	Unclear
85. Elementary curriculum (Sweden)	Practitioners, school leaders & administrators	NS	Local Government	NS	90 minutes every 1-2 weeks in Term 1 Year 1. 90 minutes every 2 weeks for rest of Year 1. Year 2 half day every six weeks.	2 years
19. Computer Science curriculum (Israel)	Practitioners, curriculum designers & researchers	Curriculum design including conceptual understanding; dissemination of knowledge and associated pedagogical issues; designing workshops to disseminate to other teachers.	Government	Face-to-face	Nine 6-hour long meetings & 5 workshops for with peer teachers	1 year

20. STEM PBL PLC Urban High Schools (USA)	Practitioners & researchers	PD was designed to cover: STEM Project Based Learning (PBL) structure; PBL facilitation; student participation; resources; and STEM classroom learning environment Instruments were developed to assess the fidelity to the PD learning when observing PBL lessons. PLCs were in place for teachers to discuss practice.	Local government	Face-to-face	10 set days (60 hr per year, for a total of 180 hr over the course of the study using a fixed set of PD providers.	3 years
21. Weizmann Institute Department of Science Teaching: Middle school STEM PLC (Israel)	Practitioners & academics	Network building event; content-knowledge session, relating to science content-knowledge and/or STEM education; a PLC session, pertaining to defining, developing, and implementing PLCs like sharing experiences, collaborative learning, leadership strategies, psycho-pedagogy; and a closing session, aimed at summing up and reflection. Included sharing lesson/assessment findings.	University	Face-to-face and Whatsapp groups	15 X 4 hours in Year 1	4 years
22. Weizmann Institute Department of Science Teaching: Physics PLC (Israel)	Practitioners & academics	Sharing recent lessons & resources; in-depth analysis of learning process aimed at more 'learner-centred' physics teaching such as analysis of student answers, implementation, designing diagnostic questioning, collaborative reflection & meta-cognitive view of learning experience.	University	Face-to-face	Twice a month for 4 hours	Ongoing
23. Special educator cultural awareness PLC (USA)	Practitioners & academics	Discussion of assigned reading; sharing personal experiences; challenging each other to set goals for making positive changes in their own schools; and writing self-reflections.	University	Face-to-face	1 hour daily	4 weeks
24. QUEST Science Teachers (Denmark)	Practitioners & local science curriculum team	Implementation phase: teachers participated in one or more of four modules around science teaching, building up to the development of PLCs. Institutionalisation phase: fading external support so PLCs are sustainable.	Unclear	Face-to-face	1 day a term for course in phase 1. Unclear on PLC	3 years

25. Regional New Zealand curriculum implementation PLC (New Zealand)	Practitioners, school leaders and curriculum designers	Collaboration and joint planning with input from sector specialists; reflective report-back sessions; and joint planning of teacher only PD day for all schools.	Government	Face-to-face	Twice a term, 3-hour sessions	1 year
26. Leading Learning for School Effectiveness (Wales)	Practitioners, Academics, Policy Makers	PLC around inquiry cycle with each school collecting data/evidence; developing an innovation; implementing the innovation. Areas for inquiry included thinking skills, the integrated curriculum and pupil engagement.	Government	Face-to-face	NS	1 year
27. Induction and mentor online learning community (USA)	Practitioners & administrators	Teachers responsible for inducting early career teachers: engaged with monthly materials; contributed to collaborative discussion space through posts and threads. Participants assigned a mentor teacher who engaged with their activities.	Local government	Online	Monthly activities to engage in with online forum for general support and advice.	1 year
28. Learning Studios (Netherlands)	Practitioners, student teachers & academics	Developed, tested and discussed new pedagogical methods. Session had a coach attending, but leadership is shared by all participants and autonomy/agency are encouraged.	University	Face-to-face	NS	NS
29. Learning technology network (Singapore)	Practitioners, administrators, school leaders	Planning committee consisting of leaders from each school who looked at resource allocation, shared vision and goals, planning protected time and school needs. School based project teams made sense of the frameworks, co-designed lessons, engaged in professional dialogue and fed back to leadership team.	Government	Face-to-face and online	Unclear	4-year project
30. Challenge Partners Middle Leaders (England)	Practitioners & researchers	Middle leaders explored the best ways to support colleagues in improving their practice through workshops, trialling ideas in their schools and tracking impact using a tracking model.	Organisation	Face-to-face	Unclear	1 year
31. St Mary's County Public Schools music	Practitioners and administrators	Fine Arts Support Team created software to make PLCs accessible to teachers unable to	Local Government	Online	Weekly basis online	Ongoing

and arts online PLC (USA)		engage in school face-to-face due to across school and after hours teaching commitments. Curriculum and lesson planning sharing was key part of PLC. Voluntary involvement at first but became embedded in the PD process.				
32. Teaching supervisors PLC (Canada)	School leaders & researchers	Share practice and materials; present a teaching supervision case for study, discuss development of evaluation grids; develop common resources.	Local Government	Face-to-face	Unclear	2 years
33. Social, Emotional and Mental Health PLC (USA)	Practitioners & researchers	Workshops facilitated by researchers focused on evidence-informed practices in SEMH, data-driven decision-making, and creating a sustained community of School Mental Health Practitioners. Groups focused on enhancing one of the following areas of SEMH policy and practice in their respective schools: 1) strengthening SEMH referral systems, 2) enhancing schoolwide restorative practices and social and emotional learning initiatives, 3) promoting data-driven decision-making for SEMH services, and 4) strengthening student executive functioning skills. Participants presented findings and lessons-learned from at an annual PD conference for SMHP hosted by the Project's lead host university.	Unclear	Online video conferencing for workshops Face-to-face for mentor groups	Monthly 90-minute workshops Monthly mentor meetings	2 years
34. Project Alianza (USA)	Practitioners, researchers and school leaders	Structured conversations; designing and implementing school and instructional change projects.	University	NS	NS	NS
35. Escuela Nueva (Colombia)	Practitioners and school leaders	Rural teachers with principals working across a cluster of schools with a particular pedagogical approach. Interrelated activities: training workshops; micro-centres where pedagogy was demonstrated and networking between the micro-centres.	Teachers and School Leaders	Face-to-face	NS	NS

36. New Haven School District Critical Friend Group (USA)	School leaders, practitioners & administrators	Training programmes & monthly meetings for school leaders linked to district improvement programmes which are then enacted by teacher leaders in schools.	Local government	Face-to-face	Monthly meetings and assigned time in school PD days.	2 years +
37. vPLC for rural educators (USA & Dominican Republic)	Practitioners	In person summer PD sessions on virtual PC strategies and lesson study process. Teachers: established needs and goals; constructed lesson plans; peer reviewed work; trialled teacher led lessons & video recorded these for feedback. Peer review was used to refine lesson plans and discuss improvement. Back in school, monthly videos of lessons were sent to peer reviewers and online meetings of small groups of teachers were used to plan lessons, reflect on video capture and set goals from student data.	NS	Face-to-face and online	In person three-week session then online monthly meetings	One year
38. Cross-contextual inquiry science PLC (Singapore)	Practitioners	Co-designing cross contextual inquiry science lessons with teachers from six affiliated schools with expert facilitators.	School Leaders	Face-to-face and shared online resources	Monthly	1 year
39. Secondary school leader's professional learning and well-being PLC (Belgium)	School leaders	Principal groups were facilitated by an external coach or one of the principals and pedagogical counsellors. Principals discussed and exchanged policy approaches to distributed leadership at their schools.	Local government	Face-to-face	Two hours every three months	1 year +
40. Teacher Design Teams for financial literacy education (Belgium)	Practitioners and curriculum designer	Teachers were tasked with designing teaching materials to prepare teaching colleagues for curriculum reform. Facilitated by coach.	Unclear	Face-to-face	Four three-hour sessions	5 months
41. SPLASH (USA)	Practitioners, administrators and coaches	Primarily a PD programme but with elements of school collaboration through PLCs. Teachers are required to attend monthly virtual PLC and annual in person training. They complete monthly coaching sessions. PLC sessions are facilitated by trainers in	Local government	Face-to-face and online	Monthly virtual PLC and yearly face-to-face	3 years

		Year 1 of the course, but in Year 2 and 3 are facilitated by the teachers themselves.				
42. Rice Elementary Model Science Lab PLC (USA)	Practitioners & academics	PLC days covered science curriculum knowledge content and pedagogical training including reflecting on classroom practice. Use of electronic reflective portfolios/journals to document growth, leadership and mastery of curriculum. Included uploading videos of teaching experiences.	University	Face-to-face	Full day weekly	1 year
43. School principals collaboration for School Behaviour Support Programme (Australia)	School Leaders	Leaders from different sectors worked collegiately. Regular meetings included: discussion on distributing funds; transitions between primary and high school; creating a common language for discussing with students and community behavioural expectation; addressing local community specific issues. Has developed into joint work outside this brief with CPD between primary and high schools and other joint PD sessions	Local Government	Face-to-face	Regular meetings as well as email and pone contact	Ongoing
44. Alberta maths curriculum online PLC	Practitioners, curriculum specialists	Lesson study where educators worked through maths inquiry activities.	Local Government	Online live sessions	5 sessions	NS
45. Vertical Science teacher PLC (USA)	Practitioners	PLC used Vertical Collaborative Coaching and Learning in Science approach requiring each group to consist of teachers representing elementary, middle and high school grades. In these groups, teacher plans lesson for their grade, while exploring what related science content would look like across grade bands. Teachers share video recordings of lessons linked to the team topic of study to engage in self-reflection.	Local Government and University	Face-to-face	Monthly	Two years
46. Principal professional learning communities (USA)	School leaders & administrators	All principals were required to participate in a PLC facilitated by local administrators. Activities for some PLCs included: analysing	Local Government	Face-to-face	Twice monthly	Ongoing

		school data; developing strategies to accelerate student achievement; writing PD plans; looking at specific pedagogical issues (e.g., classroom observation protocols)				
47. Canada-China Partnership (Canada & China)	Practitioners, school leaders and students	Each pair carried out two to six activities involving school leaders, teachers and students. Video conferences organised for establishing links. Sharing teaching resources and adapting teaching materials as a result seemed most common activity. Facilitated by university researchers.	Researchers	Online	NS	2 years
48. Karnataka Open Educational Resource project (India)	Practitioners and teacher educators	Workshops and training in digital literacy facilitated by teacher educators, focus group discussions and online interactions between teachers: shared resources, video clips from teacher, assessment tools and emails.	Local Government	Face-to-face for workshops Online	19 workshops Online shared resource bank	18 months
49. MOSAIC PLC (USA)	Practitioners	Trained teachers in MOSAIC strategy & hosted PLC meetings with agendas and scripts derived from the project coordinators.	Unclear	Face-to-face workshops	5 workshops	1 year (though Covid closed it early)
50. Changing Results for You Readers in British Colombia (Canada)	Practitioners and administrators, literacy specialists	PLC consisted of sharing research on literacy instruction, requesting support, reflections on classroom practice. District funded release time for teachers & a provincial facilitator was present for most workshops.	Local Government	Face-to-face workshops	7 full days	1 year
51. OPAL collaboration module (Singapore)	Practitioners	Tools in OPAL: blog; chat; forum; pod/vodcast; surveys; webinars; wiki and then others use Google doc etc to share resources around critical inquiries into work.	Government	Online plus additional face-to-face meetings	NS	4 months
52. Expanding Capacity in Environmental Education project (EECapacity) (USA)	Nature centres, state agencies, schools, parks, community development organisations,	Face-to-face meetings to build connections and receive input on PD. Facebook groups set up for interaction. Included collaboration on writing, sharing other project ideas and resources.	University	Online and face-to-face	NS	5 years

	professional associations					
53. STEM PLC Pennsylvania (USA)	Practitioners & researchers	Teachers had a three-week PD workshop including: in-service modules; collaboratively writing curriculum units; piloting teaching in small groups. Online community was set up for professional learning communication and embedded during the three-week session with participants uploading materials, answering questions online, creating profile pages to support ongoing collaboration after workshops ended.	University	Online and face-to-face	Daily for input and then ongoing	3 weeks+
54. PBL virtual PLC Michigan (USA)	Practitioners and administrators	Initial 7-day professional working conference (looking at science content, developing unit plans and teaching strategies) and a further 3-day focus on practice conference (looking at teaching dilemmas and developing the PLC) before the commencement of the PLC. During PLC teachers implemented unit plans and evaluated their success by sharing practice. A facilitator from the district guided discussion and collaboration.	Local Government	Face-to-face and then online through virtual PLC	Monthly meetings	1 year
55. Leadership for Learning Programme (South Africa)	Academics, school leaders, administrators	Sessions held in university covered instructional leadership; effective communication; leadership values and collaboration & data wise & instructional rounds. Some mention of PLCs and network formation at between sessions.	University	Face-to-face	Four weeklong contact sessions. In-between the sessions.	3 years
56. SMILES (South Africa)	Practitioners & academics	Workshops; school visits; supply of learning resources; ICT skills training; common assessments to share data; transition projects; museum visits to see local learning resources.	University	Face-to-face	Unclear	3 years
57. Learning Community under Leadership for	Practitioners	Joint lesson planning; lesson study; external professional advice and resources.	Government	NS	NS	NS

Learning pilot (Taiwan)						
58. Urban Ecology Practitioner Inquiry Community (USA)	Teachers and experts from non-profit organisation	Four-week institute to provide intensive training and collaborating to design and implement urban field investigation. Subsequent weekly sessions gave additional content knowledge and opportunity to share student work and pedagogy.	Non-profit Organisation	Face-to-face	16-day kick off workshops then every 6 weeks	1 year
59. Languages and Education PLC (Portugal)	Teachers, language teachers, teacher educators and researchers.	PLC included: presentations of the work undertaken; attending conferences; debates on topics of interest to the community. Working groups were focused on reading, writing, and plurilingual and intercultural education.	University	Face-to-face Online (Moodle)	7 sessions	1 year
60. PD for 3D science (USA)	Practitioners	Assigned study groups with distributed expertise to support collaboration across science disciplines and grade bands. Single subject matter looked at by all grade bands. Structured programme with units to complete including viewing and analysing classroom videos & student work (case studies); set tasks to perform; developing testing and refining explanation models. Between sessions reading assigned and tasks to complete in classroom.	Government	Face-to-face with online resources	7 units (45 hours in total) for teachers with additional time for lead facilitators and peer facilitators to be trained.	3 years
61. Number Talk (USA)	Practitioners	Teachers in inquiry groups. Interactions online. Teachers uploaded videos of their Number Talks, posed reflective questions and engaged in dialogue, adapting practice over a cycle of inquiry.	University	Online	NS	NS
62. Linpilcare (International)	Practitioners, academics, teacher leaders.	Consortiums were working sessions to develop a conceptual framework for the project and to deepen knowledge about practitioner inquiry and PLCs. PLCs in home countries with two conferences to share results of practitioner inquiry. One week PD	University	Face-to-face	Consortium meetings 3 - 5 days long 6 times a year.	2 years

		courses across Europe designed to end project.			NS for PLCs in home countries	
63. Mathematics PLN Southern California (USA)	Practitioners, school leaders, instructional coaches, academics	Seek advice, learn new ideas and develop materials.	University & Local Government	NS	NS	2 years
64. Comprehensive Musicianship through Performance Virtual PLC for rural music teachers (USA)	Practitioners and academics	PLC included: discussions of assigned readings; analysis of student work; peer feedback on teaching observations; and rapport building.	Teachers	Virtual meetings	Bi-weekly	7 months
65. Partners for Possibility (South Africa)	Business leaders and school principals	The majority of learning took place within the school community, along with learning through networking, collaboration, and developmental relationships and formal training coursework. Group facilitated by a professional coach.	Unclear	Face-to-face and individual study.	15 hours a month	1 year
66. Online EFL teacher Lesson Study (Turkey)	Practitioners & researchers	Lesson study: teachers worked online collaboratively to set goals for student learning and co-planned research lessons that target these goals. Recordings of lessons were posted online and during a meeting, reflections on videos & other data used to improve the lesson and revised teaching. Resources were shared online. Webinars with topics related to language teaching and Web2.0 tools were attended.	University	Online	Weekly	13 weeks
67. HeadsUP (International)	School leaders and academics	Transnational meetings introduced principals to PLC and how to structure these. Details of PLC NS.	University	Face-to-face	Varies	Ongoing
68. Networked Improvement Communities to improve science education for	Practitioners, leaders, academics and administrators & district funded coaches	PD opportunities included: science teachers working across schools; Critical Friends Group protocols; sharing video and classroom artifacts around similar launch teaching practices; and co-designing tools	Local Government	Face-to-face and online	NS – multi-level work	4-year project with school-to-school networks

emergent bilingual students (USA)		and exit tickets. District science coaches co-designed and co-led network convenings. District coaches extended the model to include summer "boot camps" to support teachers new to the district in learning about district teaching practices, partnering with teachers to co-lead boot camps.				coming in from Year 2
69. The Autism Network for Educators (England)	Practitioners	Spirals of inquiry including engagement with research, reflection on practice and peer support.	Teachers	Face-to-face	NS	3 years + (ongoing)
70. Four Pines rural school district PLC (USA)	Practitioners, school leaders & administrators	NS.	Local Government	Face-to-face	NS	3 years +
71. Master Teacher Studio (China)	Practitioners	Selection of applicants to the Master Teacher Studio (MTS) has a high standard. Attendance at MTS is voluntary and teachers can apply to switch MTS if the relationships do not fit - shared values and specific goals essential. Activities include: structuring of rules and collaboration: reading, writing and monthly reporting. Support and challenge in the group is provided and network bonding is encouraged through social activities e.g. meals, mountain climbing, tours of museums. The Master teacher introduces teachers to a wider network of experts from the Master Teacher.	Government	Face-to-face	Bi-weekly meetings	3 years
72. STEMCrAfT framework for rural educator (Australia)	Practitioners, academics, teacher educators	Phase 1: Workshops to draft framework, Phase 2: Involving more teachers to refine framework Then implementation and contribution to an online Community of Practice to provide feedback, share resources, seek advice and expertise.	Government	Face-to-face and online	Phase 1: 3-day workshop Phase 2: 1-day workshop Subsequent not structured.	Unclear
73. The SUCCESS Alliance (England)	School leaders & practitioners	Formalised partnership from a loose informal network and developed a range of	School Leaders	Face-to-face	NS	Ongoing

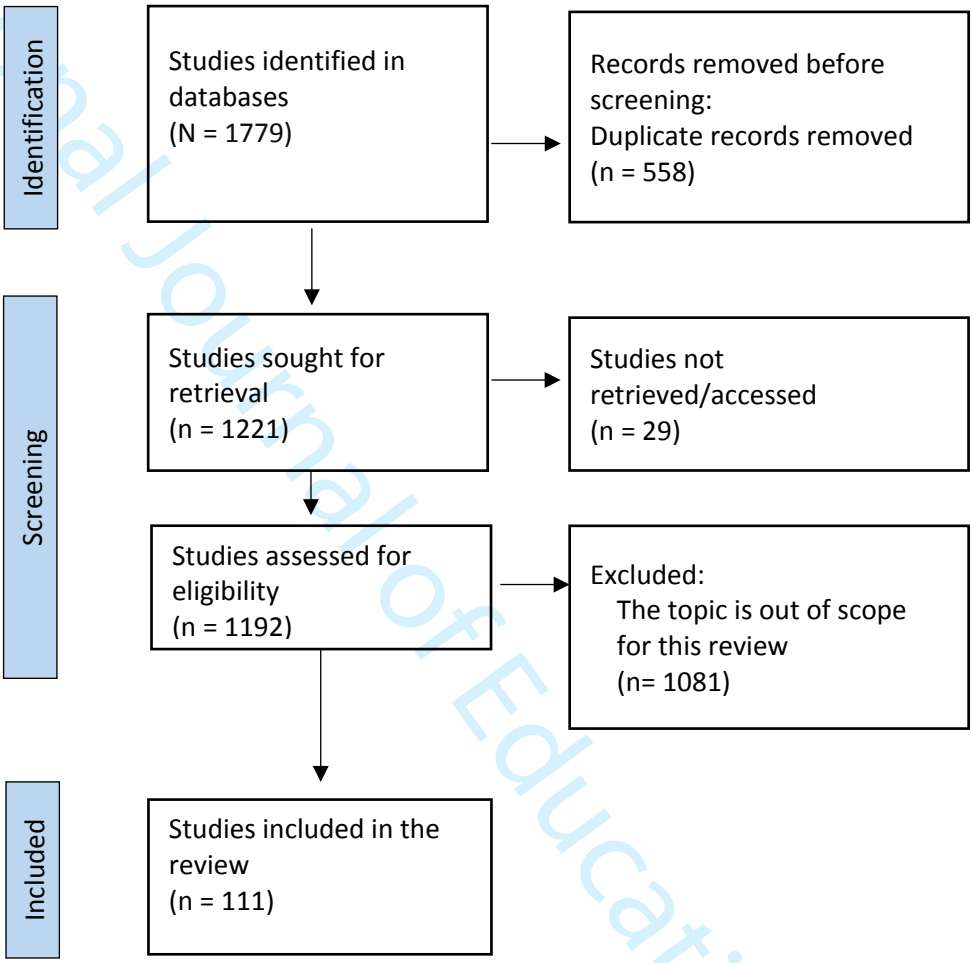
		collaborative practices, such as subject networks for teachers in different curriculum areas, and jointly run professional and leadership development programmes for staff.				
74. A Estrada: collaborative inquiries into inclusive education (Spain)	School leaders, practitioners and academics	Creation of an inter-school network around a workgroup and committees made up of members of the nine schools, who analyse and develop actions to improve and respond to the mutual inter-school needs.	University	Face-to-face	Quarterly meetings with events in between (unspecified in amount)	5 years
75. Colleges of schools (Malta)	Administrators, School leaders, practitioners	Council of Heads (network of Principals) from the different colleges established and teacher collaboration at early stages. Specific activities NS.	Government	NS	NS	NS
76. Multi-lateral cooperation for small-size schools (Thailand)	School leaders, practitioners, academics, community, public sector, government	Observing successful schools; workshops for different subject (delivered by experts); budget issues e.g. negotiated discounted teaching resources & IT infrastructure; student collaboration activities.	University	Face-to-face and unclear	NS	NS
77. Cantatech network (New Zealand)	School leaders, practitioners, administrators	Sharing of teaching and learning resources therefore being able to offer students in schools wider curriculum offer through online teaching.	Local Government	Online	NS	Ongoing
78. Vista School district (Canada)	School leaders, practitioners, administrators	Students registered to different schools were taught by teachers based at different schools within the district to deliver STEM; coordination of timetables; training on instruction for online teacher; increased visibility in teaching practice	Local Government	Online	NS	Ongoing
79. Cantabria SELFIE digital technology network (Spain)	practitioners, school leaders	Research was around creation of a network rather than a network functioning. Some evidence was given for exchanging experiences and social support with teachers from other schools and that these are the subject curriculum leads.	Local Government	Online. Unclear if also face-to-face.	NS	NS

80. Michigan K-8 mathematics NLC (USA)	Practitioners	Teachers had attended a two-week 80-hour summer course led by a university. The participants then became an ongoing network focused on planning and teaching mathematical tasks and book study.	Local Government	Face-to-face	Monthly X 9	1 year
81. Modellregion Bildung Zillertal (Austria)	Practitioners (primarily) with involvement from school leaders, administrators and academics	Teachers have choice over what topics are explored in their PLNs (though this may be influenced by other factors and stakeholders). Facilitators are used to support PLNs.	Local Government	NS	NS	NS
82. New Forest Research Learning Network (England)	Practitioners and school leaders	Research Learning Network (RLN) where activities were linked to the schools' improvement priorities. These included: identification of issues to address through RLN; engaging with research; developing intervention and assessing impact. Participants supported staff not engaged with the RLN to understand practices being developed. Participants attended after school PD sessions and worked in-between sessions on project.	NS	NS	Four after school sessions. Time in-between sessions varied depending on school	1 year
83. Transitional North (Canada)	Practitioners, school leaders, administrators, community service providers	Sharing experiences and strategies with school administrators acting as facilitators.	Local Government	NS	Three hours every six weeks	Ongoing
84. Learning Links (England)	Practitioners and school leaders	CPD and new teacher training; principal conferences; peer evaluation; shared governance reports; moderation of student work and data; sharing of School Improvement Partner	School Leaders	Face to face	NS	8 years +

Table 7. Research design of reviewed studies

MMAT Research Design Categories	Number	School outcomes	Teacher/ Principal outcomes	Student Outcomes
1. Case study or qualitative design and descriptive studies	50	8	45	7
2. Randomised controlled trial	1		1	
3. Quantitative non-randomised studies	0			
4. Survey or quantitative studies with no comparison group	3		3	
5. Mixed methods studies	14	1	14	3
Total Number of Studies	**68**	**9**	**63**	**10**

Figure 1. Flow chart of the systematic review selection process based on PRISMA (Preferred Reporting Items for Systematic Reviews and MetaAnalyses) flow diagram[1]



[1] Retrieved from: http://www.prisma-statement.org/PRISMAStatement/FlowDiagram