



REVIEW

June 2005

The impact of collaborative continuing professional development (CPD) on classroom teaching and learning

Review: How do collaborative and sustained CPD and sustained but not collaborative CPD affect teaching and learning?

Review conducted by the CPD Review Group

The EPPI-Centre is part of the Social Science Research Unit, Institute of Education, University of London



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CONFLICTS OF INTEREST

The review has been conducted in a consistently transparent manner, working within EPPI-Centre guidelines, methodology and quality-assurance procedures. At present, there are no known potential conflicts of interests of authors, Review Group members and Advisory Group members. Many of our academic colleagues and the NUT are themselves providers of continuing professional development (CPD) who have a keen interest in the results of the review but no direct pecuniary interest likely to be affected by its conduct. CUREE can, however, record our keen interest in the outcomes of the review and acknowledge that this may have influenced the review in ways which are not apparent to us. For example, CUREE is contributing actively to the development of the Government's programme for capacity building for CPD in schools. The findings from the first EPPI-Centre review have already contributed to this programme.

LIST OF ABBREVIATIONS

AERA	American Educational Research Association
AAER	Association for the Advancement of Educational Research
ACER	Australian Council for Educational Research
BD	Biblioscape Database
BEI	British Education Index
BERA	British Educational Research Association
CERUK	Current Educational Research in the UK
CfBT	Centre for British Teachers
CGI	Cognitively guided instructional [theory]
CPD	Continuing professional development
CUREE	Centre for the Use of Research and Evidence in Education
DfES	Department for Education and Skills
EBD	Emotional and behavioural difficulties
EPPI-Centre	Evidence for Policy and Practice Information and Co-ordinating Centre
ERA	Education Research Abstracts
ERIC	Educational Resources Information Centre (USA)
ESL	English as a second language
ESRG	Electronic Systems Research Group
FE	Further education
GTC	General Teaching Council
HE	Higher education
HEI	Higher education institution
IoE	Institute of Education, University of London
IPDA	International Professional Development Association
ITT	Initial teacher training
LEA	Local education authority
LSA	Learning support assistant
NC	National Curriculum
NCSL	National College for School Leadership
NERF	National Educational Research Forum
NFER	National Foundation for Educational Research
NLC	Networked learning communities
NTRP	National Teacher Research Panel
NUT	National Union of Teachers
OCLC	Online Computer Library Centre

OFSTED	Office for Standards in Education
PNS	Primary National Strategy
QCA	Qualifications and Curriculum Authority
REEL	Research Evidence in Education Library
SCRE	Scottish Research in Education Centre
SENCO	Special needs co-ordinator
SIM	Strategies instructional model
TTA	Teacher Training Agency
UCET	Universities Council for the Education of Teachers
WoE	Weight of evidence

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TABLE OF CONTENTS

- SUMMARY 1
- Background..... 1
- Aims 1
- Definitions 2
- Review questions..... 2
- Methods 3
- Results..... 4
- Conclusions 5
- Strengths and limitations of the review 9
- Implications for policy 10
- Implications for practice 13
- Implications for research..... 15
- 1. BACKGROUND 17
 - 1.1 Aims and rationale for current review 17
 - 1.2 Definitional and conceptual issues 18
 - 1.3 Policy and practice background 20
 - 1.4 Research background..... 21
 - 1.5 Authors, funders and other users of the review 23
 - 1.6 Review questions..... 24
- 2. METHODS USED IN THE REVIEW 25
 - 2.1 User-involvement..... 25
 - 2.2 Identifying and describing studies..... 26
 - 2.3 In-depth review 31
- 3. IDENTIFYING AND DESCRIBING STUDIES: RESULTS 35
 - 3.1 Studies included from searching and screening 35
 - 3.2 Characteristics of the included studies 36
 - 3.3 Identifying and describing studies: quality-assurance results 43
- 4. IN-DEPTH REVIEW: RESULTS 44
 - 4.1 Selecting studies for the in-depth review 44
 - 4.2 Comparing the studies selected for the in-depth review with the total studies in the systematic map 45
 - 4.3 Further details of studies included in the in-depth review 48
 - 4.4 Synthesis of evidence 63
 - 4.5 In-depth review: quality-assurance results 77
 - 4.6 Nature of actual involvement of users in the review and its impact 78
- 5. FINDINGS AND IMPLICATIONS..... 79
 - 5.1 Summary of principal findings..... 79
 - Outcomes 80
 - CPD processes and characteristics 81
 - Findings about the nature of collaboration..... 82
 - 5.2 Strengths and limitations of this systematic review 83

5.3 Implications.....	84
6. REFERENCES	90
6.1 Studies included in map and synthesis.....	90
6.2 Other references used in the text of the report	96
Appendix 1.1: Advisory Group membership	100
Review Group membership	100
Advisory Group membership	100
EPPI-Centre support.....	100
Appendix 2.1: Inclusion and exclusion criteria.....	101
Appendix 2.2: Search strategy for electronic databases	102
Appendix 2.3: Journals handsearched	106
Appendix 2.4: EPPI-Centre keyword sheet, including review-specific keywords	107
Type(s) of intervention	109
Appendix 4.1: Features of the studies in the in-depth review	112
Appendix 4.2: Use of research literature to inform the studies	114
Appendix 4.3: Aims, designs and findings of the studies in the in-depth review	117
Appendix 4.4: Details of interventions in the studies in the in-depth review	131
Appendix 4.5: Methods of data collection	135
Appendix 4.6: Methods of data collection and analysis	136
Appendix 4.7: Weight of evidence (WoE) judgements	141
Appendix 4.8: Nature of the collaboration (collaborative studies only)	143

SUMMARY

This summary briefly sets out the background, rationale and methods used to conduct this systematic review. The results are outlined in relation to the design, content, methodology and context of the studies involved. The summary then outlines the findings in relation to the review questions and concludes with implications for practitioners and policy-makers.

Background

Our concern as a Review Group is to help inform practical choices made by those who choose continuing professional development (CPD) activities and those who plan them. This review, comparing the impact of collaborative and individually oriented CPD, builds upon an initial review which only explored the impact of collaborative CPD on teaching and learning. We have been encouraged by the evidence of connections between sustained, collaborative CPD and positive benefits for teachers and pupils, and by the extensive interest in the first review from national and local agencies concerned with providing or facilitating CPD for teachers. We aimed in the second review to see if non-collaborative (individually oriented) CPD was capable of similar impact to collaborative CPD. By updating the searches for studies of collaborative CPD, the second review also created an opportunity to test and amend the first review findings.

The second review has been supported by the Department for Education and Skills (DfES) in two ways: through the national CPD strategy and via registration with the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre), based at the Institute of Education, University of London. The General Teaching Council (GTC), in accordance with the Council's CPD policies and strategy, also supports the Group, as does the National Union of Teachers (NUT). As with the first EPPI-Centre review, CUREE has also made a significant financial contribution.

Aims

Our aim was systematically to review the literature on CPD in order to discover evidence about the impact on teaching and learning of individually oriented and sustained CPD interventions and to compare this with evidence about the impact on teaching and learning of sustained, collaborative CPD (based on the findings of the first review). We also aimed to apply the findings of the first review to any further studies of collaborative CPD identified in the updated searches to explore the nature of collaboration further.

Definitions

For the purposes of this review, 'collaborative CPD' refers to programmes where there were specific plans to encourage and enable shared learning and support between *at least two* teacher colleagues on a sustained basis. 'Individually oriented CPD' refers to programmes where there were no explicit plans for the use of collaboration as a significant learning strategy and/or no activities explicitly designed to support/sustain such collaboration. 'Sustained CPD' refers to programmes that were designed to continue for at least twelve weeks or one term. The review includes those studies of CPD which report evidence of impact, either positive or negative, on teaching *and* learning.

Review questions

The over-arching question for the review is as follows:

How do (1) collaborative and sustained CPD and (2) sustained but not collaborative CPD affect teaching and learning?

This is followed by the sub-question:

(3) How do the findings from (1) and (2) compare?

Our first CPD review addressed the first component of the over-arching question considering the impact of collaborative and sustained CPD. This second review focused on the second component of the main question. It aimed to identify studies that have investigated sustained but not collaborative CPD and to compare the findings from the first and second reviews. The searches of the first review were also updated and additional collaborative studies were identified. Therefore the findings of the first review were applied to any other recent studies identified in the second review to explore further the nature of collaboration.

Rationale

Like the first review, this second review grew out of a genuine interest on the part of the Review Group, driven by practitioner concerns and shaped within a policy context of continued devolution of CPD resources to teachers and schools. Much of the literature relating to teaching as a research and evidence-informed profession (Cordingley and Bell, 2002) emphasises the professional development benefits of sustained professional dialogue between teachers and of experimenting with and adapting new approaches – as does the theoretical and analytical literature about CPD. For example, Joyce and Showers (1988; 2001) give considerable emphasis to experimentation and coaching over time. Our approach also drew on the teacher development literature, including Hargreaves' (1993) model of the way in which teachers are able to extend aspects of practice cumulatively and Rich's (1993) work on the learning of beginning and expert teachers.

The literature on CPD outcomes (including Harland and Kinder (1997), Joyce and Showers (1988, 2001) and Day (1999)) convinced us that the question would

identify studies likely to produce findings of interest to practitioners and policy-makers.

For the second review, we felt it important to examine CPD from an individually oriented perspective in order to consider the distinctive contributions and/or advantages of both collaborative and individually oriented CPD. In addition to this comparative exploration of the relative impacts of collaborative and individually oriented CPD, by updating the searches for collaborative CPD and applying the findings of the first review to any additional collaborative studies identified, this review was also able to build on the findings from the first review which linked collaborative (and sustained) CPD interventions with positive changes in teacher attitudes and behaviours, and with beneficial pupil outcomes. We wanted to develop the evidence base for our knowledge and understanding of CPD processes, and their impact on teaching and learning.

We were also keen to explore the nature and relative importance of collaboration more systematically. Our intention, by the time a third review is complete, is to have begun to develop a more detailed understanding of the constituents of effective collaboration, based on the evidence from the studies in the three reviews.

Methods

Identifying, describing and appraising studies

For practical reasons, this review focused on studies published after 1991 that were reported in English, although no geographical limits were set. We wanted to engage the interest of both primary and secondary practitioners, so the review included studies that involved teachers of the 5–16 age group. While this excluded further education (FE) and sixth-form college practitioners, it did not exclude those who teach within the 11–18 age range. The studies had to have a focus on teaching and learning and outline the explicit learning objectives of the CPD.

Methods of identifying studies for the systematic map and in-depth review comprised:

- *a systematic search of the literature, using electronic databases, handsearching key journals, word of mouth, citations and websites*
- *the application of a set of initial inclusion criteria to the titles and abstracts thus uncovered*
- *retrieval of full reports, to which the criteria were re-applied to see if they were suitable for inclusion in the mapping stage of the review*
- *keywording all the included reports with EPPI-Centre core keywords, such as type of study, type of setting, age, curriculum focus, as well as a number of review-specific keywords to distinguish finer detail between types of intervention, teachers and processes*
- *the application of a second, narrower set of inclusion criteria to the keyworded reports, to ensure that only studies which contain data about the impact of the CPD on pupils were retained for in-depth review*

- *using EPPI-Centre tools and data-extraction software to extract data from the studies and to assess the weight of evidence they helped to provide for answering the review specific question*

Results

The process of identifying studies for the second review revealed a number of studies of collaborative CPD that had not been identified in the first review, most of which had been published since the completion of the first review. These studies were included in the systematic map and, where applicable, in the in-depth review, thus enabling us to build on the findings of the first review.

Mapping of all included studies

We sifted 5,505 titles and abstracts systematically, reviewed 223 full text reports, identified 81 studies as relevant to the review and keyworded them in order to create a systematic map of the literature. Of these, 26 studies were considered to focus on individually oriented CPD, while 55 studies focused on collaborative CPD. These 55 studies were in addition to 72 studies that were identified in the systematic map of the first review.

In-depth review process

Seventeen studies met a second set of inclusion criteria and were data extracted. Fourteen of these were studies of collaborative CPD and three were studies of individually oriented CPD. The 14 studies of collaborative CPD are in addition to those (N = 17) identified in the first review.

In-depth review findings

As in the first review, the majority of studies reviewed came from the USA (N = 10). Three were from Canada and one from New Zealand. One study took place in each of the UK, Taiwan and China. The educational settings in which the studies took place were predominantly primary (N = 13) followed by secondary (N = 8). Many of the studies took place in more than one educational setting. In terms of curriculum context, cross-curricular studies featured the most strongly (N = 5), with literacy – first languages the next most common (N = 3), followed by mathematics (N = 2).

Of the 17 data-extracted studies, 14 were coded as collaborative and three as individual. Eleven studies were researcher-manipulated evaluations (nine collaborative and two individual), and six studies were coded as evaluations of naturally occurring interventions (five collaborative and one individual).

Weight of evidence

Of the 17 studies that met the inclusion criteria for the in-depth review, two were judged to have low/medium weight of evidence (WoE) A in relation to whether the study findings could be trusted in answering the study questions and one study was judged to have low weight of evidence C in relation to its relevance to the review question. Therefore three studies were data-extracted, but as a

consequence of their low WoE, were not included in the synthesis. Two studies were found to have high WOE and the rest were assessed as medium.

Overall, there was a varying amount of detail about the sample in some of the studies, and a disappointing lack of detail, in some cases, about the CPD processes. The study results should be considered in the light of this and of the small number of studies which were retrieved, and the fact that a number of these were small scale.

Conclusions

Individual and collaborative CPD

Overall, the findings are consistent with those from the studies in the first review in relation to the effectiveness of *collaborative CPD* in bringing about changes in teaching and learning. By contrast, the studies of *individually oriented CPD* – both in number (only three) and in the relatively low degree of pupil impact (two) – offer only weak evidence of their capacity to influence teacher or pupil change. There is also a suggestion in one of the individually oriented studies, based on their discussion of the literature, that it was, specifically, the absence of applied peer collaboration in the CPD design which was the critical factor in the failure of the programme to achieve its stated aims. When discussing the findings of the collaborative studies, it is the findings of the studies identified in the second review that are described below. The text highlights where these are similar or different from the findings in the first review.

The findings are discussed in more detail below.

Outcomes from studies of individually oriented CPD

Pupils

Two of the three individual studies found some evidence of modest impact as a result of the CPD intervention. This was focused on behaviours and attitudes, rather than learning outcomes. None of the three studies attempted to measure gains in pupil achievement as a result of the attitudinal and behaviour changes they found.

Teachers

While two studies found some evidence of changes in teachers' practice and beliefs, one found minimal impact on teacher efficacy, either personal or general.

Outcomes from studies of collaborative CPD

Pupils

Ten of the 11 collaborative studies were reported to have found some evidence of improvement in pupil learning, accompanied in seven cases by positive changes in either pupil behaviour or their attitudes or both. This is consistent with the patterns of impact in the first review.

Teachers

All the studies found links between the CPD and changes in teacher practice, attitudes or beliefs. As in the first review, there was evidence (in six studies) that changes in teachers' classroom behaviours were accompanied by positive changes in attitude to their professional development.

CPD processes and characteristics

Part of the intention of this review was to explore in more detail the characteristics of CPD for which there is medium to high evidence of positive teaching and learning outcomes. The themes and clusters below were identified in the first review and were applied to the collaborative and individually oriented studies identified in the second review.

Themes and clusters

The studies included in the synthesis focused on CPD interventions which displayed similar patterns of activity to those in the first review of collaborative CPD:

- the use of external expertise linked to school-based activity
- observation and reflection (often based on observation)
- an emphasis on peer support, acknowledging individual teachers' starting points and factoring in processes to encourage, extend and structure professional dialogue
- scope for teacher participants to identify their own CPD focus
- processes for sustaining the CPD over time to enable teachers to embed the practices in their own classroom settings (see section entitled 'How long did it last?' under 'Nature of the collaboration', p 8)

The use of external expertise linked to school-based activity

Individually oriented CPD

All three included studies of individually oriented CPD involved inputs from specialists (the researchers themselves).

Collaborative CPD

As in the included studies in the first review, the extent and nature of the partnerships between 'experts' and teachers varied. All the interventions involved the use of specialist expertise initially. This ranged from an initial two-week 'instructional institute' to a two-and-a-half day in-service session. Following these intense initial inputs, the external/expert input was also sustained throughout the life of the intervention in all but one of the collaborative studies. We had wondered whether a comparison of individual CPD and collaborative CPD might show how far collaboration is able to promote an effective, cheaper, more accessible and closer-to-school alternative to external input. In the event, we found little evidence that the inputs from the external experts were any less intensive or sustained in the collaborative than the individually oriented CPD. However, we do not have enough studies of individually oriented CPD to make comparisons about the

relative detailed external inputs meaningful. On the evidence from the collaborative studies alone, as in the first review, it appears to be a combination of external expertise and peer support which delivers the desired outcomes of the collaborative CPD. However, in the absence of a detailed comparison of the individual interventions, it is not possible to assess the relative weight of any of these characteristics in isolation.

Observation and reflection

Individually oriented CPD

Only one of the studies of individually oriented CPD involved observing teachers in their classrooms as they attempted to put new knowledge and skills to work.

Collaborative

Like the studies in the first review, observation featured in all the collaborative second review studies. Observation (together with a range of other methods) was the principal means of data collection across the collaborative studies. It was unclear, in three of the studies, whether observation was purely for data-collection purposes or not. In two of the studies, video was used as the principal means of observation. In ten of the studies, it was evident that the observations were used formatively (followed by feedback and discussion), mostly in combination with data collection. In one study, the researchers used observation purely for data-collection purposes.

An emphasis on peer support

Collaborative only

In all the collaborative studies, peer support was a feature of the effective CPD and, in seven of these, peer collaboration was the principal vehicle for professional development. Eight studies, including one of the high WoE studies, were explicit that peer support involved peer observation. This follows the pattern established in the first review.

Since our definition of collaborative CPD specified collaboration between teachers, but not necessarily teachers in the same schools, two studies were included which used CPD peer-support models involving previously trained teachers. In one high WoE study, some teachers were supported within their own schools and some were supported by teachers from other schools. This led the researcher to question whether there was a direct link between the teacher effects he found and the extent and nature of the peer-support teachers enjoyed during the course of the intervention. Three of the nine teachers in the experimental group did not progress as well as the others. Two of these had little or no contact with their peer support teachers. The teachers who made the strongest progress were either peer taught by department heads or had peer (i.e. previously trained) teachers in their own schools. Hence the extent of peer support experienced by the participating teachers, and whether it was in their own schools or not, may have been directly linked to the variations in impact on teacher behaviours. Another study suggested that the *absence* of peer collaboration amongst teachers

might have been a weakness in the CPD design which helped to explain the disappointing results.

Scope for teacher participants to identify their own CPD focus

Individual

The three individual studies were aimed variously at using SMILE (Science and Math Integrated with Literary Experiences) to develop mathematics learning, changing teacher beliefs about democracy and developing teacher efficacy beliefs. Hence the precise focus of the intervention was determined prior to the start of the CPD which did not allow scope for teachers to focus on a curriculum area or issue of their own selection.

Collaborative

Of the 11 collaborative studies, as in the first review, the majority (seven) were constructed to give teachers choice within a broad area of curriculum or pedagogy.

Nature of the collaboration

In this review, we wanted to explore the nature of collaboration in CPD more closely than we had been able to do in the first review. As an initial framework, we identified a number of further facets of collaboration which appeared to us from the evidence in the data-extracted studies to be worthy of closer exploration. We used these to ask the following questions of the collaborative studies.

Was the collaboration between teachers and between teachers and experts off-site or in the teachers' own classrooms?

We were interested to note that nine of the collaborative studies in this review associated with positive teaching and learning outcomes involved CPD activities which took place either exclusively in the teachers' own classrooms or in combination with off-site meetings or in-service sessions. In the individual studies, two of the CPD programmes took place off-site and it is unclear from the descriptions in the third the extent of off-site and within-school activities. It appears that CPD based in the learning teachers' classrooms may be linked to positive pupil and teacher outcomes.

Did the collaboration involve experimenting with and adapting/improving different teaching approaches or was it purely reflective/discursive or a combination of both?

In seven studies, including the high WoE study, the collaboration involved experimenting with new approaches. Although only two of the studies were specifically keyworded as action-research based, the majority of the collaborative studies were, in fact, focused on collaborative activities that involved experimenting with new approaches. Teachers were supported in building on what's known, refining approaches, reflecting on evidence of impact, and refining their plans in the light of this.

How long did it last?

All the studies had to involve CPD which was sustained over at least 12 weeks or one term. We could find no clear links between any additional length of time for which the CPD was sustained and the degree of impact in relation to teaching and learning. When the intervention was sustained for longer than one term, this did not necessarily mean more impact. This suggests that, even where CPD is sustained over time, it may be the nature of the collaboration between the participating teachers which is critical to the degree of impact on teaching and learning. This is a proposition which we will explore in a third review.

Did it involve groups of teachers, pairs of teachers or other combinations?

In six of the collaborative studies, teachers worked in pairs, although there were opportunities to work in larger groups. It may be that paired or small group work is a more effective model of collaboration than larger discussion groups.

Was it voluntary?

In all but three of the collaborative studies, teachers were voluntary participants in the collaboration. In the large scale QUILT project (Appalachia, 1994) involving 1,178 teachers from 42 schools in 13 districts, participation was mandatory. This study found that the experimental group, where peers coached each other over a year (compared with two other groups which received initial training but no peer support) changed its practice significantly with demonstrable improvements in pupil learning. The researchers suggested that the long term 'opportunities for demonstration, practice and feedback' were the key to changing their 'deeply entrenched behaviours'. Hence, although the majority of participation was voluntary, it appears that effective collaboration and peer support may be a powerful way of achieving 'buy-in' from participating teachers.

The answers to these questions have led us to some tentative propositions which will be further tested in the third review. These are as follows:

- Within school, classroom-based CPD may be more effective than off-site CPD even if the latter involves teachers working together.
- Collaboration between teachers which is focused around active experimentation may be more effective in changing practice than reflection and discussion about practice.
- Collaboration may be an effective vehicle for securing teacher commitment and ownership of CPD in cases where it is not possible for the teachers to select a CPD focus of their choice.
- Paired or small group collaboration may have a greater impact on CPD outcomes than larger groups.

Strengths and limitations of the review**Strengths**

A strength of this review, as with the first, is the involvement of a number of user groups in setting and refining the questions, and interpreting and disseminating the findings.

The CPD Review Group believes that it can build on both the findings and experiences of the first and second reviews, specifically as follows:

- The Review Group is at a stage where it can move towards developing a taxonomy of collaboration and make this meaningful and applicable to practitioners and policy-makers.
- The reviews provide the basis from which to continue to unpack the specific processes involved in the CPD intervention and identify those which appear to influence change in teacher practice.
- Due to the significant number of studies which did not pass the criterion of having student impact data, we now intend to look at studies with robust teacher impact data only (i.e. no student data) as the basis for the third review.
- The Review Group is interested in the effect and influence which external and specialist expertise brings to the design and impact of CPD processes.

Limitations

Although we had designed a set of review-specific keywords to enable us to typify and quantify the processes and activities involved in the CPD interventions, we found, with hindsight, that they were unworkable. Consequently, we had to return to the studies themselves to extract these data and we have not mapped them.

The limitations of the studies themselves followed a similar pattern to that which we found in the first review. In particular, we noted the following:

- a varying amount of detail about the sample in some of the studies, with some reviewers noting that they would have liked to have been given more detail about the sample background(s) in order to make the connections between contexts
- a lack of detail, and in some cases, clarity, of the different aims and foci of the studies
- with the overwhelming majority of studies being conducted in the USA, an uncertainty about whether the findings could also apply in other countries
- the possibility of additional fruitful data in a number of PhD theses and other studies not retrieved within our timescale, containing unexplored data
- a relative lack of detail, in some cases, about the CPD processes
- a lack of discussion, in some studies, of the effect on the evidence of using the researchers as part of the CPD intervention
- the small number of studies which were retrieved and the fact that a number of these were small scale

Implications for policy

The Review Group consulted different policy stakeholders in the UK to help identify the main issues highlighted by the review which had implications for policy-makers involved in the following:

- *school leadership*
- *local and national government*
- *supporting teacher professional development*

- *professional and subject representation*

Consultation centred on a seminar at which participants' discussions were based on a detailed summary of the review process and findings together with the implications identified from a similar collaboration for the first CPD review. The Review Group was concerned to recognise that policy-makers themselves were best placed to identify the implications for policy making. Since there are few policy-makers on the Review Group, we have used the points made at the seminar and, as far as possible, the voice of other policy-makers consulted, to report on the implications for this group.

The organisations represented in this process were as follows:

- Department for Education and Skills (DfES)
- Teacher Training Agency (TTA)
- Qualifications and Curriculum Authority (QCA)
- Centre for British Teachers (CfBT)
- General Teaching Council (GTC)
- Specialist Schools Trust
- National Educational Research Forum (NERF)

Individually oriented CPD

Policy-makers were struck by the following:

- the paucity of the evidence about the impact of individually oriented CPD
- the weak evidence of impact uncovered by studies that did address this type of CPD
- the comparison between this evidence and the strength of evidence about collaborative CPD that has been uncovered

They suggested that policy-makers involved with learning and teaching and/or planning CPD opportunities should encourage and/or require providers and facilitators to consider:

- *whether collaboration or structured peer support can be built into development strategies; or*
- *how to encourage and enable schools and/or teachers to develop collaborative opportunities/structured peer support to complement and help embed the contribution from specialist expertise.*

The focus of professional learning

Policy-makers noted the importance of identifying a focus for professional learning that addresses teachers' concerns about their pupils' learning, and their current interests. They also noted that this was refined and interpreted through peer support, resulting in teacher ownership, whether or not participation was voluntary. The implications of this for policy-makers include a need to:

- *recognise that debates about whether CPD should be voluntary are over-polarised and that ownership can emerge from collaborative interpretation of externally framed needs over time; and*
- *ensure that the diagnostic contribution of performance management to identifying learning needs is introduced in ways that enable teachers to work*

together to refine and select potential development strategies and contexts. CPD participants also need the capacity to further develop the learning focus in the light of:

- pupils' responses; and
- sustained professional dialogue about both the strategies and pupils' responses.

Specialist expertise

The consistency was noted between the findings in the first and second reviews about the importance of specialist, external input in relation to the following:

- an aspect of pedagogy
- supporting adult learning
- working flexibly in response to the imperatives of school life

Policy-makers were concerned that, where schools have experienced poor specialist support in one or more of these respects, there is a risk that all such support will be dismissed as unreliable or too costly.

There are a number of current policy initiatives that incorporate specialist expertise closely related to this model, including the following:

- the consultant leaders programme (Primary National Strategy (PNS) and the National College for School Leadership (NCSL))
- the development of the role of Advanced Skills Teachers (ASTs)
- the work of the consultants for the PNS and the Key Stage 3 strategy

The need for specialist input and its relation to peer support is relevant to these and other policy programmes. *The review findings could be used to reinforce and/or refine the forms of support used in such programmes.*

There was concern that schools could find it difficult to identify appropriate external expertise. Specialists in turn may find it difficult to identify cost-effective ways of working flexibly with individual schools. The changes in local education authority (LEA) and higher education institution (HEI) funding and roles are also thought to be making it more difficult to access and organise such resources and to manage succession planning.

Policy-makers are urged to consider the nature of specialist input needed, the potential sources of such expertise and the ways in which access can be facilitated and sustained.

Alternative forms of accountability

Looking across the two reviews, policy-makers were impressed by the extent to which participating teachers expressed a desire not to let each other or their students down. While recognising that the participating teachers were motivated more by improving their practice than by accreditation, policy-makers were keen to draw attention to the possibility of taking such approaches into account within existing and developing accreditation schemes for CPD.

Policy-makers are urged to consider building teachers' reciprocal accountability for professional learning and the links between professional learning and

concerns about specific students or groups of students into evaluations of the effectiveness of CPD and systems for recognising and/or accrediting such work.

Time

Policy-makers noted the findings in relation to time. Collaborative CPD with a positive impact lasted at least one term but further extensions of the work did not necessarily result in benefits. *The Review Group is therefore urged to explore, in future reviews, how this relates to the scale of the learning goal and the stage of development of participants.*

In the meantime, policy-makers and CPD providers working in areas where extended programmes are the norm are encouraged to review progress at the end of a first term to ensure that goals are refined so that they remain sufficiently challenging to justify the cost and opportunity costs involved of continued process.

The nature of collaboration

Policy-makers were also interested in the additional practical detail about the nature of collaboration and the importance of issues featured in the first and second review in relation to the roles of questions, structured dialogue, surfacing beliefs, experimentation, and building shared interpretations.

Policy-makers working across the range of national education strategies are encouraged to consider how far programmes plan for, provoke and support such dialogue between professional learners on a sustained basis. They should consider using this framework to provide a more detailed scaffolding to the well established 'plan work with evidence and review' cycles. The importance of ensuring that all sustained CPD involves an element of planned experimentation and planned collaboration connected directly to the teachers' own classroom should also be taken into account in designing initiatives targeted at developing learning and teaching.

Implications for practice

For practitioners we used a different approach to identifying implications. This was partly on account of the practicalities involved and partly because recently retired practitioners had been active in the review process and were involved in identifying implications. In addition to working with these colleagues, CUREE was also involved in a range of consultation exercises and seminars in England relating to CPD during September and October 2004 which enabled the development of a detailed and up-to-date picture of current CPD practice in schools and LEAs. This discussion was used to identify potential hot spots where the review evidence was likely to connect with, or inform, practitioner concerns. Part of the consultations and seminars involved discussion with the participants about the implications from both this review and the first review of CPD. Participants noted that the picture is a complex one and is often dependent on the organisational and working contexts of the CPD interventions and programmes.

Impact

There is evidence that collaborative CPD of the kinds identified in these research reports is effective in bringing about development in teaching and learning.

CPD co-ordinators: You should consider whether CPD programmes involve regular, structured opportunities for collaboration.

Teachers: You should consider seeking more opportunities to collaborate.

Combined expertise

Combining external expertise with peer support appears to be a consistent feature in delivering the desired outcomes of collaborative CPD.

Both teachers and CPD co-ordinators: You should consider how you can integrate learning from external specialist expertise with in-school learning.

Collaboration

Peer support is a key feature of effective collaborative CPD and peer collaboration often acts as the principal vehicle for professional development. It is possible that lack of collaboration might be a significant factor in CPD programmes that do not have long term impact.

Teachers: If CPD is oriented towards participants as individuals, you may want to maximise your opportunities for peer support by developing partnerships with other teachers and setting time aside for shared planning or talking together about shared experiences. You could also consider how you can follow up individually oriented CPD by acting as a coach for other teachers.

CPD co-ordinators: You may want to consider how best to develop a critical mass of coaching skills amongst school practitioners.

Securing commitment

Collaboration may be an effective vehicle for securing teacher commitment and ownership of CPD where the agenda has been set by others.

Teachers: On those occasions when you are participating in CPD where the agenda is imposed, you could consider taking time with a colleague to interpret the CPD framework and themes explored in the CPD in the context of your own pupils, knowledge and skills. Think too about how you could integrate generic themes with your own concerns. For example, you could explore an emphasis on assessment in the context of the needs of a specific group of pupils or a specific subject; alternatively, you could take forward CPD activities with a very specific focus, on, for example, improving mathematics through a more generic teaching and learning focus, such as thinking skills.

Locating CPD in classrooms

CPD based in the learning teachers' classrooms may be linked to positive pupil and teacher outcomes.

CPD co-ordinators: You might consider how to use teachers' classrooms as a base for CPD activities and this might be timetabled so that a range of classes

and settings are used. You need to consider building time and other resources into the CPD programme, rather than adding to teachers' existing workload.

Experimentation

Collaboration between teachers, based on active experimenting, may be more effective in changing practice than reflection and discussion about existing practice.

CPD co-ordinators: You could encourage groups of teachers to choose a shared focus for experimentation in their classrooms. In this way, they could offer each other support and reflect together on their experiences, and include colleagues who may not have attended conferences where ideas were first presented.

Peer support/peer coaching

Peer support/peer coaching may be a cost-effective way of extending the reach of external specialists into day to day school life. Coaching is emphasised and supported in many national programmes, such as the primary and Key Stage 3 strategies.

Teachers: You should consider seeking opportunities to participate in peer-coaching programmes to acquire generic coaching skills while at the same time pursuing personal CPD priorities as agreed, for example, through performance management or individual CPD planning.

Pairs and groups

Paired or small group collaboration may have a greater impact on CPD outcomes than larger groups.

Small groups may be able to meet more regularly to reflect on their CPD than a larger group would be able to.

Teachers: You could discuss with CPD co-ordinators and/or course providers the possibility of working in smaller groups or pairs when finding yourselves in large groups. You should also consider asking whether you could work with a colleague whenever they are offered CPD opportunities.

CPD co-ordinators: You could consider initially setting up small groups or pairs to undertake the CPD together.

Implications for research

Our priority has been to work on implications for practitioners and policy-makers. The 'implications for research' below were developed following presentation at the British Education Research Association Conference (September 2004) and in consultation with our academic colleagues on the Review Group.

- *Researchers need to report, at least in brief, information about the context and process of the CPD intervention including the sample characteristics, recruitment strategies and details of the methodology.*
- *Research on different forms of CPD is a fertile area of study, more so given the current policy direction and the work within the Strategies in England and the*

broad international consensus of the importance of collaboration and networking.

- *Research is needed that looks at individually oriented forms of CPD.*
- *People engaging in research about CPD, who wish their work to be considered in systematic reviews, need to consider ways in which their reporting facilitates or inhibits inclusion in systematic reviews, within their own research models and frameworks.*
- *There is a need for much greater clarity in providing clear titles and abstracts for studies that accurately reflect the content of the papers in order to enable search enquiries to identify relevant materials.*
- *Researchers need to explore the organisational context(s) including, for example, the contribution of school and CPD leaders, when reporting studies of the impact of CPD, in order for others to make connections.*
- *When reporting research, researchers should consider both the CPD processes and outcomes to ensure that practitioners know both whether and how an intervention is effective.*
- *Researchers need to explore the literature about both the pedagogic interventions they are targeting and the literature about CPD in securing an evidence base for their research. We found that most studies tended to include a literature review on only one area rather than both.*
- *Researchers are professional learners too and need to consider working collaboratively with other researchers and with practitioners in schools in terms of designing and implementing the research, and developing a sense of ownership in the research by practitioners.*
- *Journal editors need to consider all these issues when selecting articles for inclusion, while continuing to work within their own frameworks and models.*

1. BACKGROUND

1.1 Aims and rationale for current review

This review aimed to test and build upon the first CPD review (Cordingley *et al.*, 2003a).

The first component of this review question was answered in the first CPD review, and the Review Group used the findings and the experiences from the first review to shape and define the aims, rationale and conceptual basis for this the second review. The Review Group had three aims when undertaking this second review. Firstly, the review identified non-collaborative (individually oriented) studies and synthesised the data from these. Secondly, the review updated the searches used to identify studies of collaborative CPD, so as to apply the findings of the first review to any other recent studies, enabling the review to explore the nature of collaboration further. Thirdly, the review compared the findings from the first and second reviews. In doing this we aimed to compare collaborative and sustained CPD with sustained but not collaborative CPD (i.e. CPD that was individually oriented) while retaining the consistency of focus on teacher *and* student impact data in the in-depth review (see Appendix 2.5 for definitions).

Findings from the data-extracted reports in the first review linked collaborative (and sustained) CPD interventions with positive changes in teacher attitudes and behaviours and with beneficial student outcomes. We believe that this represented a step forward in our knowledge and understanding of CPD processes and their outcomes, particularly student outcomes, because such links have been difficult to identify in many CPD studies. Our aim in the second review was to continue to unpack the processes involved in CPD interventions that have a positive impact on teaching and learning.

Therefore we decided also to take the opportunity to explore the findings of the first review more deeply in this review. We were interested in exploring, in particular, the nature and relative importance of collaboration. Since all the studies had to be collaborative and sustained in order to be included in the first review, we did not have evidence about the distinctive contribution of collaboration or of plans for sustaining activities. The majority of studies identified in the first review compared CPD with *no CPD* – either through ‘before and after’ designs or by comparing sample groups; a few compared different CPD inputs but they were all collaborative in nature and design.

Exploring individually oriented, non-collaborative or non-sustained CPD is problematic because individual teachers might choose to sustain activity on their return to the classroom or to work with colleagues even if this was not planned by CPD providers. Our concern as a Review Group is to help inform practical choices made by those who choose CPD activities and those who plan them. We have therefore chosen to concentrate upon whether collaboration and sustained learning were *designed* into the programme from the start, or whether the programme was *designed* as an individually oriented and sustained intervention.

We remained keen to reflect the emphasis in the literature on the importance of opportunities for teachers to embed the new strategies in their classroom practice. The first review protocol reflected this as follows:

Collaborative CPD includes teachers working together: teachers working with LEA or HEI or other professional colleagues. It does not include individual teachers working on their own. By specifying CPD on a 'sustained basis' we are deliberately excluding one-off, one-day or short residential courses with no planned classroom activities as a follow up and/or no plans for building systematically upon existing practice. It means that we are looking for studies where there is evidence about planned opportunities for teachers' learning prior to, during and/or after specific interventions to enable teachers to relate inputs to existing and future practice. However we do not believe it would be productive to anticipate research outputs about CPD by specifying an exact minimum period for the CPD activity. We believe the continuing nature of professional development will be an important factor in creating evidence about impact. (Cordingley et al., 2003a, p 1)

By undertaking systematic reviews of the literature on CPD, the Review Group hopes to make some of this evidence available to practitioners in an accessible and meaningful way, and to highlight the areas in which further research would make a valuable contribution to CPD strategies.

1.2 Definitional and conceptual issues

Continuing professional development (CPD)

For consistency, we continued to use the definition of CPD we adopted for the first review.

Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school and which contribute through these, to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purposes of teaching; and by which they acquire and develop critically the knowledge, skills and emotional intelligence essential to good professional thinking, planning and practice with children, young people and colleagues through each phase of their teaching lives. (Day, 1999, p 4)

CPD is fundamentally a third-order activity: that is, CPD is supported and undertaken in order to improve or enhance teaching that is itself undertaken to enhance students' learning. In this review, we have concentrated on studies which reported on both teacher and student impact data.

Sustained CPD

All the studies in the review that met all our criteria were designed to span at least 12 weeks or one term. This was because none of the studies which met all the criteria for inclusion in the first review was of shorter duration than a term. From

this point on, for reasons of brevity, when we refer to CPD (collaborative or individually oriented) in this report, we are always referring to sustained CPD.

Collaborative CPD

In the review, we included studies in which CPD interventions were designed to be collaborative – that is, where there were specific plans to encourage and enable shared learning and support between *at least two* teacher colleagues on a sustained basis.

Our definition of collaborative CPD built upon the findings of the first review. For example, in the first review our criteria included collaboration between teachers and a range of professionals. Thirteen of the 15 studies included in the first review synthesis and linked to positive outcomes involved collaboration between teachers; the other two studies reported on collaboration between teachers and other professionals. For this reason, we limited the second review to studies in which *at least two* teacher colleagues collaborated, and where specific and explicit arrangements for collaboration were built in to the CPD as part of the learning strategy.

We also noted in our first review that, while teachers mostly volunteered to participate and were thus collaborating voluntarily, some were ‘volunteered’ by colleagues and, in the early stages, could perhaps have been described as engaging in co-operative rather than collaborative CPD. However, the extensive work on trust building and creating opportunities for teachers to build on their own needs and starting points reassured us that all the CPD could accurately be described in its explanation as collaborative. For this review, we did not exclude programmes where teachers were not volunteers but aimed to monitor carefully the boundaries between co-operation and collaboration. Low collaboration could be described as akin to co-operation.

Not collaborative CPD

From the definition of collaborative CPD, it followed that our definition of ‘not collaborative’ CPD would include CPD which was *individually oriented*. By this we mean CPD where there were no explicit plans for the use of collaboration as a significant learning strategy and/or no activities explicitly designed to support and/or sustain such collaboration.

CPD interventions

At the outset of the review, we did not go into any more detail than the above descriptions about what processes and interventions constituted collaborative or individually oriented CPD. We began by searching and classifying generically but, as the process developed, it became clear that there is a range of collaborative types of CPD. A range of strategies was used throughout the process – including cross-moderation and contact with the authors – to define research studies as either collaborative or individually oriented.

Definitions of the review-specific processes and activities and characteristics are detailed and defined in Appendix 2.5. These include peer coaching; peer support; observation; joint planning; internal, external and specialist expertise; and mentoring and modelling.

Conceptual and theoretical issues

While empirical studies in complex fields such as education inevitably select a specific focus in order to make research feasible, theory about CPD can and does address the issue holistically, taking due account of its complexity (Doyle, 1979; Fullan, 1991; Guskey and Huberman, 1995; Hargreaves, 1993). This modelling and scholarship is able to draw on a rather more restricted empirical evidence base than is the case for, say, student learning. These bodies of work, however, inform this review.

The process of checking our analysis of the data was also informed by models of less tangible aspects of teacher development, including teacher beliefs, knowledge and understanding. For example, in the first review, Askew's (1997) development of Shulman's (1986) typology of teacher knowledge helped us to explore connections between CPD and teachers' subject knowledge; their pedagogic knowledge and skills; and their pedagogic content knowledge and students' responses to changes in teaching and learning activities. Similarly, our analysis of the CPD activities was informed by the earlier work on CPD outcomes of Harland and Kinder (1997) and other typologies, such as those put forward by Joyce and Showers (1988), and Day (1999).

These bodies of work, along with the literature discussed in section 1.4, continued to inform the second review as they did the first review.

1.3 Policy and practice background

Teachers' CPD continues to be regarded as a national priority for England by the Government. The 2001 Government Strategy Document *Learning and Teaching: A Strategy for Professional Development* (DfEE, 2001) committed resources to CPD, focusing on the needs and development priorities of individual schools and teachers. Currently, the DfES is undergoing consultations with the teaching community to conceptualise, map and develop a coherent national CPD strategy in the context of fully developed funding for schools and of the New Relationship with schools. The Government priorities for education have been set out in the five-year strategy, in which CPD features as one of the key strands. Some of the specific issues related to CPD in this plan, such as the emphasis on coaching, are directly related to the findings of the first review carried out by this Review Group. Current national efforts to develop support frameworks and materials for CPD leaders – such as, for example, the Key Stage 3 and Primary National Strategies – in fact make explicit reference to evidence from the first review.

Other significant initiatives which emphasise the importance of collaboration and networking in teacher development include the Networked Learning Communities (NLCs), Leading Edge Partnerships, Design Collaboratives, the Primary National Strategy Learning Networks, the Federations scheme and the Leadership Improvement Grant Initiative.

Teachers' CPD also continues to be regarded as a national priority by other key agencies, such as the General Teaching Council (GTC), the National College for School Leadership (NCSL), the Teacher Training Agency (TTA) and professional associations, such as the National Union of Teachers (NUT). There is a keen interest in the question amongst policy-makers and practitioner communities. In

addition, the GTC has published a 'Teachers' Professional Learning Framework' and created a Teachers' Learning Academy to support progression and accreditation which directly draw on the first review.

The review has also informed the following:

- an online DfES consultation within the NCSLTalk2Learn community using the review findings as a basis for professional discussion about capacity building
- the Primary National Strategy (PNS) using the review to inform and re-conceptualise models of learning and models of consultancy that are currently offered
- the DfES Innovation Unit which has used the evidence from the first review to inform its particular interests

Throughout discussions with policy-makers and programme managers, we have been at pains to point out that, although we had evidence about links between collaborative CPD and positive teacher and student outcomes, we did not have evidence that other forms of CPD could not be linked with such outcomes. There is therefore active and extensive interest amongst policy-makers, providers and practitioners in the results of the second review, and, we hope, further information to guide policy-making, practice and the associated allocation of resources.

1.4 Research background

The second review relates closely to the first since it represents an attempt to build on the initial findings about collaborative CPD and to create a linked resource in relation to not collaborative, or *individually oriented* CPD. As the first review points out, CPD is a third-order activity and research in this field has to encompass an extended chain of dynamically interacting variables. The CPD research field is extensive, but has focused predominantly upon CPD interventions rather than teacher learning or impact upon students (Bolam, 2003).

Parallel teacher-effectiveness literature explores the impact of CPD upon teachers and students in more detail, but only occasionally explores teacher learning, development processes and the interventions that support these. The literature related to teacher research or enquiry provides some evidence, but the problems in tracking the number of complex intervening variables mean that very few teacher-research studies (which are inevitably small scale) explore the impact of CPD upon teaching and on learning. We responded to these challenges, for both reviews, by casting a wide net in our preliminary searching strategy in order to ensure that we explored the full range of relevant literature in the first review and continued with this strategy in the second. The fact that we found 17 studies for data extraction with both teacher and student data in the second review came as a pleasant surprise.

There is a growing theoretical discussion about teacher learning and professional development. Over a longer timescale, we hope that these reviews will also encourage researchers and research funders to start to fund and design studies that explore the impact of CPD in more depth.

Our starting point for the second review in 2003 was to revisit the literature used in the first review, on account of the nature and subject of the review, and to update the conceptual and theoretical base.

We drew on a large body of literature, including that around teaching as a research and evidence-informed profession (Cordingley and Bell, 2002) which helped us refine our question to a focus on sustained CPD. The review looked closely at evidence about the importance of a combination of teacher experimentation, feedback and coaching over time (Joyce and Showers, 1988) and Joyce's (2002) subsequent reframing of the concept of coaching to emphasise the role of 'watching' and 'reading' teaching practice as a form of coaching. There is also evidence from the implementation of large-scale initiatives, such as Cognitive Acceleration through Science Education (CASE) (Adey and Shayer, 1994) and Cognitive Acceleration through Mathematics Education (CAME) (Shayer *et al.*, 1999), and from the implementation of the national literacy and numeracy strategies about the effectiveness of coaching activities, such as modelling and professional dialogue. The review also drew on the work of various authors about the stages of teacher development, such as Hargreaves' (1993) modelling of the way in which teachers are able to cumulatively extend aspects of practice and Rich's (1993) work on the learning of beginning and expert teachers. Similarly, Desforges' (1995) reflections on the tendency of classrooms to return to the status quo – and hence the difficulties of effecting lasting change – was influential in identifying the likelihood of sustained CPD being effective, as, of course, was the extensive literature about teacher enquiry and its benefits for teacher learning (Elliott, 1991; Stenhouse, 1980).

The literature also helped us to see the limitations of the studies in this review and of our first review question. For example, as Day's (1999) analysis of teachers' personal and organisational environments and their career cycles illustrates, CPD is located in the context of complex school communities. It is a context-specific endeavour that takes place across personal, professional, individual, collective, organisational and cultural boundaries. For this review, we have therefore also explored the literature about the transfer of good practice (Fielding *et al.*, 2005) and about support for professional learning by school leaders (Cordingley *et al.*, 2003b; NCSL, 2004).

This mining of the literature reinforced our view that theoretical scholarship and review materials exceeded, by a long way, empirical studies and that the research project currently in progress on professional learning communities (Wallace *et al.*, in progress) is much needed. In the meantime, it was difficult to relate the wide-ranging issues and interconnection that the scholarly literature was able to pursue with the finely detailed studies of impact that answered questions about the connections between CPD and teachers' and students' learning other than on a generic level.

For example, while the work of researchers who explore teacher biographies may have helped us explore the affective aspects of teachers' personal contexts, we found no studies from this field that tackled our specific concerns with collaborative and sustained CPD, and its impact upon teachers and students. Similarly, while the work of activity theorists, such as Engestrom *et al.* (1999), and the growing literature about professional learning communities helped us to understand the relationship between teacher development and dynamic and complex community forces within schools, we found no core studies that addressed such issues directly. It was as though there are just so many variables

that researchers can pursue within the funding and timescale parameters that exist. If research energy is focused on following CPD through to students, its antecedent connections with school leaders seem to dip out of focus.

1.5 Authors, funders and other users of the review

The first review grew out of established National Union of Teachers (NUT) initiatives related to teachers' CPD in England. Following that review, and encouraged by the findings, the Review and Advisory Groups continue to be even more interested in effective CPD and passionately committed to supporting the development of research and evidence-informed CPD.

The Review Group believes that a continued systematic approach to research in CPD is timely, especially with the current national interest in CPD strategies and intervention. The Review Group believes that the second review question flows naturally from the first and that this represents a timely opportunity to test and extend the findings of the first review, and secure the sustainability of the review. The active external interest in the first review amongst the policy community has revealed considerable enthusiasm for further exploration of the issues arising from the first review and, in particular, to examine the relationship between collaborative and non-collaborative CPD, if there is one. Certainly the dialogue around the findings from the first review has often sought to explore the extent to which collaboration and sustained effort were key to positive outcomes for teachers involved in CPD.

The publication of the first review has encouraged a number of HEI-based CPD providers to volunteer to participate in the review as a means of developing their personal knowledge of the field and associated research literature.

The core team for the second review comprised the following:

- CUREE colleagues
- retired and former teachers
- CPD academics from HEIs
- members of the Review and Advisory Groups

Additional information regarding the users can be found in section 2.1.2; details of members of the Review and Advisory Groups can be found in Appendix 1.1.

This review has been supported by the Department for Education and Skills (DfES) through direct funding and also via registration with the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre), based at the Institute of Education, University of London. The General Teaching Council (GTC), in accordance with the Council's CPD policies and strategy, also support the Group as do the National Union of Teachers (NUT).

1.6 Review questions

Initial review research question

The over-arching question for the second review is as follows:

How do (1) collaborative and sustained CPD and (2) sustained but not collaborative CPD affect teaching and learning?

This is followed by:

(3) How do the findings from (1) and (2) compare?

The first component of this review question (i.e. the effect of collaborative and sustained CPD) was the focus of the first review. This second review identifies the effect of sustained but not collaborative CPD, before comparing the findings of the first review with the second review. It also updates the searches for the first review so as to identify recent evidence and apply the findings of the first review to any further studies. Doing this enables the Review Group also to consider in more depth the nature of collaboration.

The aim of the review is to identify those studies which focused on teachers across the 5–16 age range and provide data about teacher and student outcomes. We explored the review questions in relation to (i) whether there is an impact and (ii) the nature of the processes associated with that impact.

2. METHODS USED IN THE REVIEW

This chapter describes the methods used in completing the review. Initially it describes the approach and methods of involving users; it then considers the detail of each of the steps of the review process.

2.1 User-involvement

2.1.1 Approach and rationale

In this report, the term 'users' is defined as groups to whom the review findings are of potential interest and/or use. This includes teachers, policy-makers directly concerned in planning CPD resource allocation and strategies, headteachers, CPD co-ordinators and other 'practitioners' concerned with identifying effective CPD in relation to desired outcomes. This also includes academics, governors, local authorities and providers of CPD.

We adopted a number of methods to encourage a wide and inclusive base of user involvement. We further built upon our links with the National Teacher Research Panel (NTRP) and the NUT; DfES and GTC networks were used to encourage input from practitioners, parents and governors. For example, we advertised for practitioners to become involved in the review through placing text in *The Teacher* and via CUREE exhibition stands at events such as the NTRP Conference. The Universities Council for the Education of Teachers (UCET) CPD Group kindly advertised the review on our behalf, and the fact that we had more active participation in the second review from the academic community is unsurprising due to the considerable interest in the findings from the first review.

2.1.2 Methods used

Policy-makers, academics, teachers, ITT practitioners and providers were all represented on the Review Group and contributed to selecting the topic of focus, deciding and refining the review question, and developing the protocol. Some members of the Review Group and a small number of academics also made suggestions as to the initial search process, participated in keywording and helped with data extraction.

In the first review, the focus on sustained and collaborative CPD was strongly influenced by teacher input, teacher feedback and discussions, involving meetings and consultations with members of the Advisory and Review Groups, consultation with teachers and informal contact with specialists in the field of CPD. When we consulted these groups to define the focus for the second review, it was felt to be timely, useful and appropriate to build upon the first review in order to test the sustainability of the findings.

We offered training in EPPI-Centre methods via day-long training sessions and workshops on inclusion criteria, keywording and data-extracting as refresher

courses for those members of the Review and Advisory Groups who wanted them, and as introductory courses for new members of the Groups and other interested users. These proved to be productive sessions and the opportunities were generally taken up by academic user groups whose support was invaluable throughout the review.

2.2 Identifying and describing studies

2.2.1 Defining relevant studies: inclusion and exclusion criteria

For practical reasons, we needed to restrict the parameters of our search. This section details the rationale behind the inclusion and exclusion criteria. The criteria in the second review were the same as those in the first review for purposes of consistency. However, a small number were refined and re-prioritised as a result of lessons learned from the first review. For example, some of the criteria were moved to the Stage 1 inclusion criteria in order to save time and resources by filtering studies out earlier. A decision was taken that any studies included in the first review would not also be included in the second review. Therefore any collaborative studies included in the second review are additional to those included in the first review.

The protocol defined collaborative CPD as including teachers working together, and individually oriented CPD as having no explicit plans for the use of collaboration as a major learning strategy and/or no activities explicitly designed to support and/or sustain such collaboration. We defined sustained CPD as lasting at least 12 weeks or one term, and we included studies where the CPD was designed to span at least 30 hours. As such, one-off, one-day or short residential courses with no planned classroom activities as follow-up and/or no plans for building systematically upon existing practice, were excluded.

We limited the search chronologically to capture studies that had been *published* after 1991, which would include those studies *conducted* after the introduction of the National Curriculum (NC) in England which led to the development of teacher CPD and research into NC areas.

The review confined itself, for practical reasons and because we wanted to engage the interest of both primary and secondary practitioners, to teachers of the 5–16 age group. While this excluded further education (FE) and sixth-form college practitioners, it did not exclude those who teach within the 11–18 age range.

The review only included studies written in English because of translation costs but did not limit the search geographically. We accurately predicted that we would retrieve most of our studies from outside the UK, specifically from the USA. We had anticipated retrieving more Scandinavian research, but this did not happen. It is possible that research into CPD had not been conducted in these countries, or that it was not available in English.

To ensure that studies met the initial conditions for inclusion in the second review, they had to meet the following criteria:

- focus on CPD that provides explicit information about whether the CPD was designed to facilitate collaboration to support individual teachers
- focus on CPD which is designed to meet explicit, learning objectives
- focus on CPD designed to sustain learning for three months, or one term or more, or to span at least 30 hours
- have set out to measure impact on teachers and teaching and/or students and learning
- describe the methods of data collection and analysis, and the target population
- report on the aims and objectives of the research
- focus on teachers of the 5–16 age range
- are written in English
- can show how they have used what is known already (e.g. by including a literature review)
- were published after 1991

The exclusion criteria were the opposite of the inclusion criteria.

Appendix 2.1 contains the full list of criteria from both the first and second reviews.

2.2.2 Identification of potential studies: search strategy

The purpose of this review was to look for studies that investigated CPD which was *individually oriented*, and to update the previous searches that identified *collaborative* CPD. The search for *individually oriented* CPD was limited to the years 1991 to 2004 inclusive, while that for *collaborative* CPD was limited to the years 2000 to 2004 to update the previous searches (which covered studies conducted between 1988 and 2000). Although searches for studies of collaborative and non-collaborative CPD were individualised (strategies are given in Appendix 2.2), the search terms used for each area inevitably resulted in studies of both collaborative and individually oriented CPD being retrieved. As a consequence, a number of studies of collaborative CPD were found which preceded the 2000 date limiter. These studies were kept in the second review.

We conducted the searching of databases and journals between November 2003 and March 2004. The cut-off date for articles and reports brought to light by the search was 31 March 2004.

The search strategy to identify studies of both collaborative and individually oriented CPD involved a number of methods; more details are presented in Appendices 2.2 and 2.3 but in summary, the approaches to searching for titles and abstracts included the following:

- Searching electronic databases (including Educational Resources Information Centre (ERIC), the British Education Index (BEI), Current Educational Research in the UK (CERUK), Education-Online, OCLC FirstSearch and INGENTA). We chose not to search Index to Theses as we found in the first review that we spent considerable time and effort in searching for theses from overseas which could not be procured in time for the review. We retrieved some theses from our overall search strategy.
- Handsearching key journals as recommended by Review and Advisory Group members as being relevant to CPD

- Trawling websites (including the American Educational Research Association (AERA) and the Association for the Advancement of Educational Research (AAER) websites. Other websites included the Australian Council for Educational Research (ACER), the Scottish Research in Education Centre (SCRE), the National Foundation for Educational Research (NFER), the Office for Standards in Education (OFSTED), DfES, British Educational Research Association (BERA), and selected LEA and university websites.
- Reviewing those studies which had not met criteria 1 (focus on collaborative CPD) in the first review
- Following up recommendations from Review and Advisory Group members and knowledgeable researchers in the field, as well as approaching numerous overseas researchers for advice
- Following up citations in published and unpublished research

Since the search strategy was limited by resource and time constraints, databases and journals were selected according to the closeness of their aims and focus to our review question.

The terms used for searching varied from database to database as they each had their own preferred terms (due to ERIC being an American-based database and BEI being a British-based database, for example). The searches identified a relatively large number of studies relating solely or mainly to teachers in training; these were excluded. We found that, since the first CPD review, terms like 'professional development' had become much more successful in retrieving studies. However, a combination of a few broad searches ('inservice AND teach? AND learn?') and many narrow searches ('professional development AND masters degree') was a productive strategy. It is not possible to state which search string was the most productive, as many strings retrieved duplicate returns, which were not counted in the collated results. Similarly, it is difficult to say which database was the most productive as the further the search progressed, the more duplicate studies were retrieved, and hence not counted.

Most of our search strings were generic and cross-curricular. It was clear from the first review that English or literacy, and mathematics and science were particularly fruitful subject areas. However, using these as specific search terms in a review of CPD would have returned many additional, but largely irrelevant, results. It was decided that creating more specific search strings using CPD terminology would be more productive than concentrating on particular curriculum areas. In addition, the fruitful searching we conducted meant that we did not have to adopt the curriculum-based fallback position we noted in the protocol.

Search strings from the first review were repeated in each database in order to update them with research added in the years 2000–2004. Some of these searches were specifically for *collaborative* CPD, but others, such as 'inservice AND teach? AND learn?' returned results on both *collaborative* and *individually oriented* CPD. New search strings were then formulated to attempt to retrieve specifically *individually oriented* CPD, such as 'teacher AND individual development' and 'masters degree AND teach? AND learn?'. Applying the search terms supplied by the database, and therefore used by the indexers of the database themselves, produced the most productive search results.

2.2.3 Screening studies: applying inclusion and exclusion criteria

Our inclusion and exclusion criteria allowed us to screen the studies for relevance to our review question. All citations (titles and abstracts) identified in initial searches were subjected to the application of Stage 1 inclusion criteria. This stage was carried out on-screen (with the exception of the journals which were handsearched). In order to be included in the next stage of the review, by which we mean the retrieval of the full-text document, studies had to meet all the Stage 1 criteria. We excluded reports which did not meet any one of the Stage 1 inclusion criteria. As only a limited amount of information was presented in the title and abstract, to minimise the risk of relevant studies being excluded at this stage, we erred on the side of caution and adopted a policy of inclusion where there was any doubt. Once the full-text document was retrieved, which was not possible in all cases, the Stage 1 inclusion criteria were re-applied to the full reports.

The citation details for all the full reports which we retrieved were entered into a bibliographic database using Bibloscape software. Where a full report did not meet all the inclusion criteria for Stage 1, reviewers recorded at least one of the exclusion criteria. This recording was not in any specified order or hierarchy within the Stage 1 criteria, and so we coded and entered the first criterion which they did not meet. We then proceeded to keyword all the reports which met our Stage 1 criteria.

It is useful to note at this point that there were a number of issues which reviewers noted: for example, how much information was required in a study for it to pass the criterion, and definitional issues such as what constitutes a programme which is individually or collaboratively designed. Since we were hoping to explore the differences between and within types of individually oriented and collaborative CPD, we used the broad definitions as set out in section 1.2. We did not specify a typology of collaboration, nor what processes and interventions constituted definition as collaborative – or individually oriented – CPD. We began by searching and classifying generically but, as the process developed, it became clear that there was a range of collaborative CPD types. A range of strategies, including cross-moderation and contact with the authors, were used throughout the process to define and, if necessary, reassign research studies as either collaborative or individually oriented. We were also able to do this because none of the studies retrieved (for the systematic map and in-depth review) made direct comparisons between collaborative and individually oriented CPD interventions.

2.2.4 Characterising included studies

Reports meeting the Stage 1 inclusion criteria were keyworded according to both EPPI-Centre generic and CPD review-specific keywords. (Refer to Appendix 2.4 for CPD review-specific keywords and Appendix 2.5 for their definitions.) Studies were keyworded in order to provide a broad descriptive map of the topic area.

Core keywording: EPPI-Centre educational keywording system

Keywords, as defined by the EPPI-Centre, classify reports so that answers can be produced for a number of key areas, including language, country, topic, curriculum, sample population, characteristics of learners, educational settings and study type.

CPD review-specific keywords

CPD type

For the purposes of this review, we keyworded the studies as to whether the intervention focused on collaborative or individually oriented CPD (see definitions in section 1.2 of this review). Some cross-moderation of CPD type was required at this stage. We had originally classed some studies as 'both' collaborative and individually oriented CPD because it was difficult to designate and define the nature of the intervention (hence the development of a basic taxonomy of collaboration which will be extended in the third review). We also wanted to leave the option open to classify studies as 'both' individually oriented and collaborative CPD as we had hoped that we would find studies that directly compared individually oriented CPD with collaborative CPD. This did not occur. Through the process of keywording and data extraction, the reconciliation process and discussion with colleagues and authors of the research, we revisited earlier allocations in order to refine the CPD types in a way which was consistent with the development of our definitional framework.

CPD processes and outcomes

The Review Group also extended the list of review-specific keywords. The CPD specific keywords were designed to add detail about the nature of the intervention(s) and the type of practice(s) involved. This included processes such as coaching, peer support, teacher research, mentoring, modelling, external expertise and observation. We also keyworded the studies according to the outcomes of the intervention which were recorded and referred to in the study. This included terms such as teacher attitudes, teacher behaviour, staff/teacher understanding, knowledge and skills, student/pupil achievement, motivation and learning. These areas required a high level of cross-moderation to ensure consistency through the review.

2.2.5 Identifying and describing studies: quality-assurance process

During the first review, the Review Group had attended an EPPI-Centre workshop on the application of inclusion/exclusion criteria to titles, abstracts and full reports. For the second review, staff trained by the EPPI-Centre offered refresher training for the Review Group, provided training for new members, and opened the opportunity to serving and retired teachers and academics.

As the search process developed, we internally moderated the process of applying criteria to titles and abstracts by cross-sampling internally and with EPPI-Centre staff, to the ratio of one in five.

Full reports were then distributed to the Review Group to apply the Stage 1 criteria and these were cross-moderated by other Review Group members and EPPI-Centre staff. All reports were examined by two reviewers and any differences were resolved through discussion, prior to being uploaded to the database. A third reviewer was occasionally brought in to cross-moderate decisions as required.

If full reports fulfilled the Stage 1 criteria, members of the Review Group and EPPI-Centre staff keyworded the studies using EPPI-Centre guidelines (EPPI-Centre, 2002) and recorded the keywords on a cover sheet. The details were then inputted onto EPPI-Centre software (EPPI-Reviewer) which was available to members of the team for cross-moderation and reconciliation purposes. Through this and general discussion between reviewers, consistency and agreements were reached and understanding shared, resulting in a standardised approach to the review.

2.3 In-depth review

2.3.1 Moving from broad characterisation (mapping) to in-depth review

For the in-depth review, the Review Group narrowed the focus further by applying a second set of criteria. In retrospect, the criteria were a useful set of instruments which enabled us to narrow the focus of the review (see Appendix 2.1):

At Stage 2 the review included studies which:

- *provided evidence of impact on student/pupil learning in addition to the Stage 1 criteria*
- *described the processes of the CPD intervention in some detail including the nature and content of the CPD activities and classroom interventions*
- *provided evidence of attempts made to establish the reliability and validity of data analysis*

The second set of criteria aimed to filter studies which were more likely to provide the data we were targeting for the purposes of the review. This set of criteria allowed us to focus on CPD activities that explicitly set out to report on impact upon teaching and learning processes and outcomes.

In order to be included in the in-depth review, full reports had to meet all the Stage 2 criteria. At each stage, the process of selecting studies was shaped by the specific review questions through the application of selection criteria. Studies were excluded or included strictly according to their match with the review criteria. Those reports judged to meet both Stage 1 and Stage 2 inclusion criteria then went forward for data extraction and in-depth review.

2.3.2 Detailed description of studies in the in-depth review

In order to focus on the included studies consistently and in some depth, data were extracted using standardised guidelines. The EPPI-Centre Guidelines for Extracting Data and Quality Assessing Primary Studies in Educational Research (EPPI-Centre, 2003) is a set of questions enabling a reviewer to draw out details of the aims of the study, the phenomena being explored, the nature and characteristics of the sample, the methods of analysis of the study, the outcome measures, results and conclusions. The data extractions were completed using EPPI-Reviewer software.

We believed that practitioners would want to know the answer to specific questions about the nature and design of the CPD, and the Review Group was particularly interested in details of the type of intervention received, its processes and implementation. For this reason, and building on what we learnt through the process of the first review, we decided to complement the methodological rigour of the EPPI-Centre data-extraction guidelines with a set of review-specific, data-extraction questions in order to pinpoint the detail of the CPD (Appendix 2.4). Even using the additional data-extraction questions, combined with the generic information from our review-specific keywords to provide detail and texture regarding the nature of the intervention, we still found it useful to revisit the studies to mine further information and to cross-check our findings for validity and reliability.

2.3.3 Assessing quality of studies and weight of evidence for the review question

As in the first review, reviewers were required to make a judgement on the following four questions relating to the weight of evidence (WoE) as defined by the EPPI-Centre:

- WoE A: Taking account of all quality assessment issues, can the study findings be trusted in answering the study questions?
- WoE B: Appropriateness of research design and analysis for addressing the question, or sub-questions, of this specific systematic review
- WoE C: Relevance of particular focus of the study (including: conceptual focus, context, sample and measures) for addressing the question or sub-questions of this specific systematic review
- WoE D: Taking into account quality of execution, appropriateness of design and relevance of focus, what is the overall weight of evidence this study provides to answer the question of this specific systematic review?

WoE A aims to assess the quality of execution of a study for answering its own particular *study* question, as unrelated to our review question. As a prompt, reviewers were reminded of some of their previous responses, automatically highlighted as part of the EPPI-Centre online process. This process proved useful in ensuring that reviewers were able to reflect on all the relevant information which had been extracted in relation to specific questions before arriving at decisions regarding the WoE.

WoE B and C are review-specific questions, assessing the appropriateness of the research design and the relevance of focus of the study in relation to our particular *review* question.

WoE D is also a review-specific question, allowing an overall judgement of the WoE each study provides for answering the question of this systematic review. Reviewers examined their responses to WoE questions A, B and C to form an overall judgement of the study and define the WoE D during their data extraction, which they agreed with a fellow reviewer during the review reconciliation process, in accordance with guidance provided by EPPI-Centre members.

In many cases, reviewers felt it necessary and important to provide more than one answer to some of these questions, since studies may have been of high WoE in respect of impact, but low or medium WoE in relation to the CPD processes, or

vice versa. This is noted in the WoE statements. In WoE B, C and D, reviewers were also asked to give a judgement relating to 'how' and 'whether' which related to the suitability of the study in answering the review question.

The preliminary judgements about overall WoE D were therefore reviewed by a sub-group of reviewers specifically to differentiate between judgements about the WoE and review decisions as required to ensure consistency across the review.

2.3.4 Synthesis of evidence

The data-extraction process, using EPPI-Reviewer software, required the reviewers to consider the study in specific terms, identifying, for example, the aims, findings, conclusions, study rationale, study design, type of intervention, and process of data collection and analysis alongside the review-specific, data-extraction questions posed. The software tools then enabled the Review Group to run comparisons between studies according to themes that were highlighted in the data or had been identified for testing by the Advisory Group. Building on the work on outcomes of Harland and Kinder (1997) and Day (1999), keywords were applied and data were extracted from the studies for the following analytic categories.

Outcomes of CPD

Effects of CPD on teachers and teaching, including any or all of the following:

- teacher attitudes, beliefs, commitment, self-efficacy, job satisfaction, morale
- teacher knowledge
- teacher approaches to learning
- teacher behaviours

Effects of CPD on students and learning, including any or all of the following:

- student attitudes and motivation
- student achievement, including attainment in nationally accredited assessments
- student behaviour
- student learning strategies, including their organisation of their learning

CPD processes and characteristics

The characteristics of the CPD which led to those effects:

- What were the processes involved in the effective CPD?
- Is it possible to establish relationships between these characteristics of professional development and the effects on teachers and/or students?
- What processes were linked to the conversion of cooperative CPD into collaborative CPD?

In considering the CPD processes and characteristics, the themes identified from the findings of the studies in the first review were applied to the studies identified for inclusion in the second review. Similarities and differences between the findings are drawn on, both in terms of individually oriented CPD compared with collaborative CPD, and in terms of comparing the studies of collaborative CPD identified in the first review with those in the second review.

Nature of the collaboration

Based on the findings of both the first review and the studies of collaborative CPD in this review, the nature of collaboration was explored in greater detail to create a series of hypotheses to be further tested.

For the analysis, we used a range of measures to explore the relative impact across these analytic categories and link across to the relative presence or absence of the various activities/CPD processes. The EPPI-Reviewer software allowed reviewers to interrogate the data from the extracted studies according to the range of questions posed in the generic data extraction and review-specific, data-extraction questions set. However, we found that in many cases we had to return to the primary source to collate additional information.

2.3.5 In-depth review: quality-assurance process

Training was provided for all reviewers who were working on data extraction, and a common study was used for the training day which could be compared and discussed in order to deepen understanding and develop a consensus about dealing with studies. Each member of the group completed data extraction on between two and six studies. Each data extraction and assessment of the WoE was conducted by pairs of reviewers, working first independently and then comparing and reconciling their decisions before the study was made available for the synthesis. Members of the EPPI-Centre also assisted in applying criteria, keywording and data extracting studies for a sample of papers as part of the quality-assurance process.

3. IDENTIFYING AND DESCRIBING STUDIES: RESULTS

This section of the report presents the results of the search, the application of the two sets of inclusion criteria (see Appendix 2.1) and a preliminary description of the characteristics of the studies included in this review. Throughout Chapter 3, we refer solely to the studies that were identified in the process of carrying out this second review rather than the first review, and all studies in this review are additional to those in the first review. For comparative purposes, to enable readers to see the total number of studies reporting collaborative CPD, the numbers relating to studies in the first review are provided in the descriptive tables, but the full details and results of the first review can be found in the report 'The impact of collaborative CPD on classroom teaching and learning' (Cordingley *et al.*, 2003a).

As shown in Table 3.1, a total of 5,505 titles, abstracts and reports were identified in the preliminary searches for the second review. Screening by title and abstract using Stage 1 inclusion criteria narrowed this down to 258, of which 223 full reports were retrieved for application of the criteria for inclusion. Of these 223 studies, the number meeting all Stage 1 criteria was 81, and those passing Stage 2 criteria to go forward to the in-depth review numbered 17.

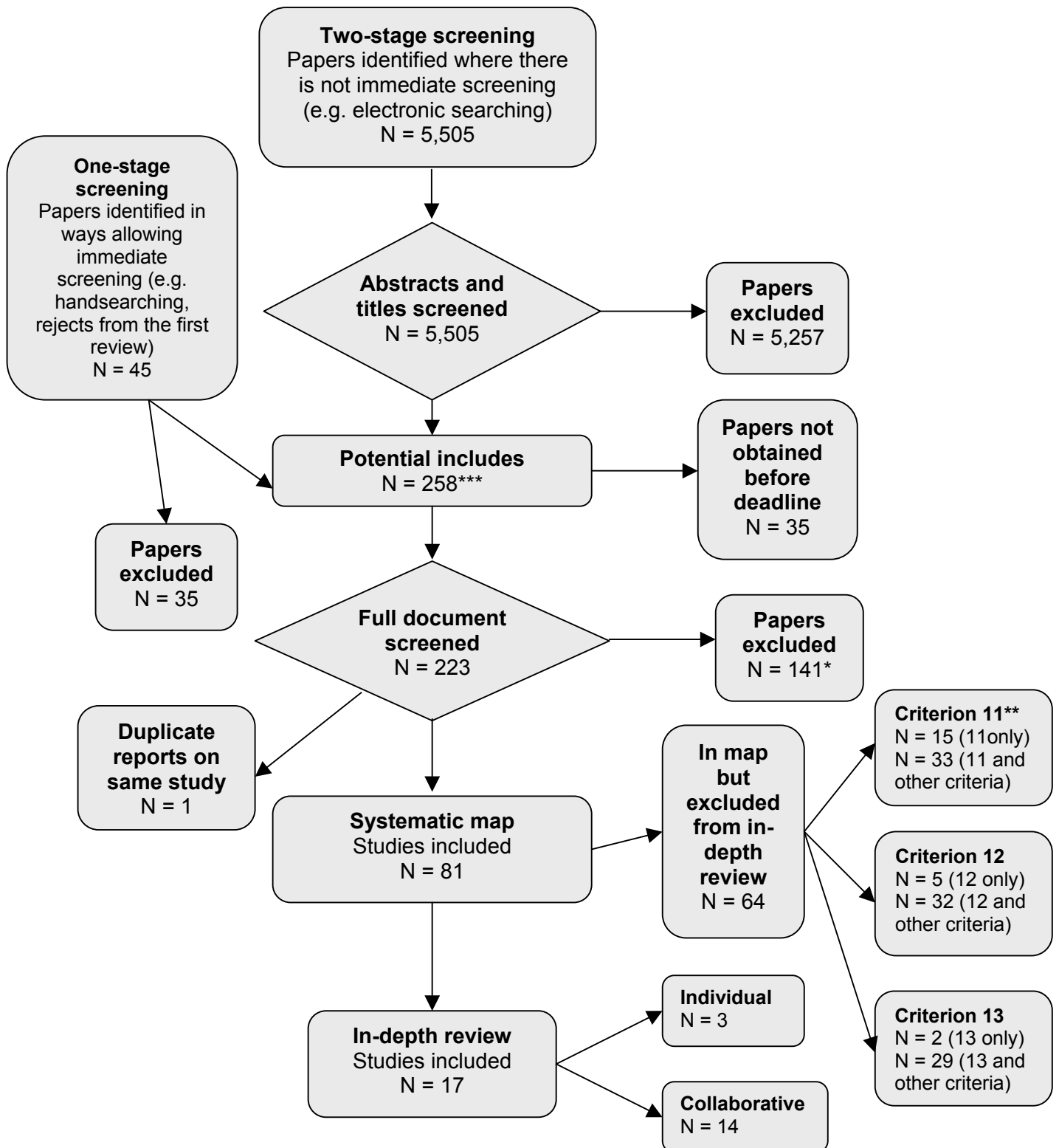
3.1 Studies included from searching and screening

Table 3.1: Studies included from searching and screening for the first and second reviews

Studies	Identified in the first review	Identified in the second review
Total number of titles, abstracts and reports identified	13,458	5,505
Number of abstracts meeting final inclusion criteria	299	258
Number of full reports retrieved by the cut-off date	266	223
Number of full reports meeting all ten Stage 1 inclusion criteria and therefore keyworded	72	81
Number of studies meeting all 13 Stage 1 and Stage 2 inclusion criteria and going on for in-depth review	17	17

The flowchart provided in Figure 3.1 enables the reader to track the process of searching through to inclusion and exclusion of studies for this second review.

Figure 3.1: Studies included from searching and screening



NB Criteria 11–13 are not mutually exclusive.

* Studies could be excluded on the basis of more than one of the criteria but were excluded immediately if they did not meet any criterion in Stage 1. We have not included detail of the specific criterion which they did not meet for this reason.

** A selection of studies which did not meet criterion 11 only will be included in the third review.

*** This includes studies found via hand searching and one-stage screening (N=10).

Details of the numbers of studies included and excluded in the first review can be found in the full report of the first review.

3.2 Characteristics of the included studies

Section 3.2 reports on the detailed characteristics of the 81 studies included at Stage 1 of this review to form a systematic map. Details are included in the tables within this section of the report. Throughout this section, the text descriptions refer solely to the studies in the second review. However, because studies of collaborative CPD were identified in both the first and second reviews, figures from the first review are also presented in the tables by way of comparison. Full details and results of the studies in the first review can be found in Cordingley *et al.* (2003a). Figures are presented in tables as 'Identified for E1' (i.e. studies of collaborative CPD identified in the first review) and 'Identified for E2' (i.e. additional studies of collaborative CPD identified in the second review). The third column (labelled 'Total (E1 + E2)') shows the combined total of studies that have investigated collaborative CPD. The second review also looked at studies of individually oriented CPD and this figure is presented separately (in the column headed 'Identified only for E2'). Therefore the numerical data in the tables is based on a total of 153 studies (72 from the first review and 81 from the second review) while the detailed narrative next is based only on the 81 studies identified in the second review.

The majority of reports judged to meet the Stage 1 inclusion criteria were found by searching electronic databases (N = 71), the most productive of which was ERIC. However, as ERIC was the first database used in the searching process, subsequent databases retrieved duplicate studies which were not counted in the collated results. It is difficult to say if ERIC was the most productive database to use in a search of this type (CPD) as the further the search progressed, the more duplicate studies were retrieved, and hence not recorded as the source database. Table 3.4 notes that most studies retrieved were from the USA, as is ERIC, which helps to explain the success of this database for this review.

Table 3.2: Numbers of studies identified by different databases

Database	Collaborative			Individual
	Identified for E1 (N=51)	Identified for E2 (N=51)	Total (E1 + E2)	Identified only for E2 (N=20)
BEI	5	2	7	1
ERIC	33	43	76	19
Firstsearch	0	2	2	0
Ingenta	13	4	17	0

Note: Not all studies were identified through electronic databases, so totals do not add up to the total numbers of studies included.

A further ten studies were identified from a combination of handsearching journals, personal contacts, citations, and articles rejected on criterion 1 ('focus on CPD which involves more than one teacher') from the first CPD review because this, the second review, included studies of individually oriented CPD.

There are a number of reasons why we retrieved some earlier published studies relating to collaborative CPD. In fact, most of the studies retrieved in this second review (67%) were collaborative. Many studies which had appeared as individually oriented CPD from their abstracts were found to be collaborative when the full study was retrieved. This illustrates the problem of using titles and

abstracts to identify studies suitable for this review. As Cordingley *et al.* (2002) demonstrate, the titles and abstracts of studies are frequently misleading or inadequate. As there is so little research which specifically targets collaborative or individually oriented CPD, keywording and abstracts do not necessarily take these characteristics into account. Although some studies include both individually oriented and collaborative aspects of CPD, our classification was based on the design and intention of the CPD programme. This helped to classify the studies more precisely, and explains why some individually oriented studies incorporate collaborative processes, and vice versa.

The definitions of collaborative and individually oriented CPD are given in Chapter 1. Although some studies set out to explore CPD that had an individual orientation and where there were no planned opportunities to use collaboration as a learning strategy, some participants asked for and/or established such strategies part-way through the process. In other cases, participants set up collaborative activities spontaneously in their school. In all cases, the CPD was being offered to groups of teachers who discussed their learning with one another during seminars. Hence the definition of what constituted individually oriented and collaborative CPD was problematic (see discussion in section 4.4). We have therefore started to develop a taxonomy of approaches to collaboration which we intend to pursue further in the third review.

Table 3.3 outlines the number of studies of individually oriented and collaborative CPD which were included in the systematic map.

Table 3.3: Types of CPD

Collaborative		Individual	
Identified for E1 (N=72)	Identified for E2 (N=55)	Total (E1 + E2)	Identified only for E2 (N=26)
72	55	127	26

Countries in which the studies were conducted

Of the 81 studies in the systematic map, the majority of studies (N = 59) were carried out in the USA. A total of six studies (7%) came from the UK, of which four were from England. Canada, New Zealand and Australia are the countries of origin of four, two and one studies respectively.

Table 3.4: The countries in which the studies were conducted

Country	Collaborative			Individual
	Identified for E1 (N=72)	Identified for E2 (N=55)	Total (E1 + E2)	Identified only for E2 (N=26)
USA	40	42	82	17
UK: England	9	3	12	1
Canada	2	3	5	1
Taiwan	2	2	4	1
Israel	0	1	1	2
New Zealand	6	1	7	1
The Netherlands	1	1	2	1
UK: Scotland	1	1	2	1
Italy	0	1	1	0
Costa Rica	0	0	0	1
Australia	4	1	5	0
China	1	1	2	0
Singapore	1	0	1	1
Brazil	1	0	1	0
Namibia	1	0	1	0
Pakistan	1	0	1	0
South Africa	1	0	1	0
Countries of the West Indies	1	0	1	0

Note: Some studies were set in more than one country.

Educational settings of the studies

Some studies were carried out in more than one educational setting. Over half (45) of the 81 studies took place in a primary setting, of which 27 (60%) were studies of collaborative CPD and 18 (40%) were of individually oriented CPD. A further third (29) took place in a secondary setting, of which 21 (72%) were studies of collaborative CPD and 8 (28%) were of individually oriented CPD. Some of these studies were set in both educational settings. Special needs schools were recorded as a setting in five studies. Of the 21 'other educational settings' recorded, 14 were middle schools, of which 10 were studies of collaborative CPD and 4 were of individually oriented CPD; two were intermediate schools (New Zealand), of which one was a study of collaborative CPD and one was of individually oriented CPD, and two were professional development schools, both of which were studies of collaborative CPD.

Table 3.5: Educational setting of the studies

Educational setting	Collaborative		Total (E1 + E2)	Individual
	Identified for E1 (N=72)	Identified for E2 (N=55)		Identified only for E2 (N=26)
Primary school	37	27	64	18
Secondary school	38	21	59	8
Other educational setting	2	14	16	7
HEI	12	8	20	1
Special needs school	0	5	5	0
Nursery school	1	2	3	2
Independent school	2	2	4	0
Residential school	0	1	1	0
Local education institution	1	0	1	0

Note: Some studies had more than one educational setting.

Topic focus/foci

Given our focus on the impact of CPD on teaching and learning, all studies related to teacher careers. While student outcomes were of high importance to the review, we recognised the difficulties of pursuing the impact of CPD on students in terms of the length of time over which studies must collect data and the number and complexity of intervening variables. Thirty-one reports (of which 22 were studies of collaborative CPD and 9 were studies of individually oriented CPD) did provide these data (i.e. those that passed all of Stage 1 and Criterion 11 of Stage 2). Table 3.6 shows four different student learning foci which were represented in the map. Development in a specific curriculum area also emerged as a significant component of 52 (64%) studies.

Table 3.6: The topic focus of the studies

Topic focus	Collaborative		Total (E1 + E2)	Individual
	Identified for E1 (N=72)	Identified for E2 (N=55)		Identified only for E2 (N=26)
<i>EPPI-Centre generic topic foci</i>				
Teacher careers**	20	55	75	26
Teaching and learning	47	48	95	23
Curriculum	30	33	63	19
Equal opportunities	4	11	15	3
Classroom management	6	3	9	1
Methodology	7	1	8	1
Assessment	9	0	9	1
Other	2	0	2	1
Organisation and management	3	0	3	0
<i>Review-specific topic foci*</i>				
Student/pupil achievement	Not coded	13	13	5
Student/pupil learning	Not coded	14	14	3
Student/pupil motivation	Not coded	8	8	4
Student/pupil self-esteem	Not coded	8	8	1

Note: Many studies had more than one focus.

* All the CPD review-specific keywords and their definitions are presented in Appendix 2.4 and Appendix 2.5 respectively.

** In the second review, all studies were coded as 'Teacher careers' as they related to CPD.

The topic foci of the studies included both those which were classified using EPPI-Centre generic keywords and those which were classified using our CPD review-specific keywords. For the 52 studies with a focus on curriculum (of which 33 were collaborative and 19 were individually oriented), the specific curriculum areas are presented in Table 3.7. Mathematics and science are the predominant subjects in studies in this review and featured in 12 and 15 studies, respectively. Of the studies which focused on mathematics, 9 (56%) were collaborative and 7 (44%) were individually oriented, and of those which focused on science, 10 (63%) were collaborative and 6 (37%) were individually oriented. The next highest group of studies focused on literacy – first language, of which 6 (67%) were collaborative and 3 (33%) were individually oriented. It is noteworthy that in this review one significant group of studies was classified as cross-curricular – the focus of eight studies, of which 6 (75%) were collaborative and 2 (25%) were individually oriented – while only one study focused on cross-curricular studies in the first review.

Table 3.7: Curriculum focus of the studies

Curriculum area	Collaborative			Individual
	Identified for E1 (N=30)	Identified for E2 (N=33)	Total (E1 + E2)	Identified only for E2 (N=19)
Mathematics	12	9	21	7
Science	15	10	25	6
Literacy – first language	5	6	11	3
Cross-curricular	1	6	7	2
Literacy – further language	3	3	6	0
ICT	5	2	7	0
PSE	0	0	0	2
Other	1	2	3	2
Literature	0	1	1	0
Physical education	0	0	0	1
History	1	0	1	1
General	0	1	1	0
Design and technology	2	0	2	0
Hidden	1	0	1	0

Note: Some studies focus on more than one curriculum area.

Types of study

As might be expected, since the review was aimed at uncovering CPD which had an impact on teaching and learning, in most of the 81 studies the researchers sought to describe and evaluate the effects of specific CPD interventions on teachers and, in some cases, students. Of the 81 studies, 47 were evaluations of naturally occurring interventions, of which 32 were studies of collaborative CPD and 15 were studies of individually oriented CPD. A further 32 were recorded as evaluations of researcher-manipulated interventions, of which 21 were studies of collaborative CPD and 11 were studies of individually oriented CPD.

‘Researcher-manipulated’ is defined by the EPPI-Centre as ‘where there is an attempt on the part of the researcher(s) to change people’s experience and as a consequence have control over which groups of people are “introduced” or “exposed” to the experience’ (EPPI-Centre, 2003).

Table 3.8: Description of the type of study

Type of study	Collaborative			Individual
	Identified for E1 (N=72)	Identified for E2 (N=55)	Total (E1 + E2)	Identified only for E2 (N=26)
Evaluation – naturally occurring	10	32	42	15
Evaluation – researcher-manipulated	50	21	71	11
Description	11	2	13	0
Development of methodology	4	0	4	0
Exploration of relationships	2	0	2	0
Systematic review	1	0	1	0
Other review	2	0	2	0

Types of intervention

In this review, we introduced a detailed and extensive set of review-specific keywords relating to the type of intervention used in the studies of CPD. We aimed to use the keywording to refine our analysis of the CPD interventions and to be able to include these in the map. However, in retrospect, we had tried to be too inclusive with the keywords. The keywording was no substitute for the detailed data-extraction analysis together with revisiting the original studies to clarify and check details. The types of intervention are not therefore mapped but are examined in Chapter 4, in the in-depth review section, in relation only to the studies which were data extracted.

3.3 Identifying and describing studies: quality-assurance results

The quality-assurance processes resulted in the clarification of a number of ambiguities, most notably as to which groups constituted the 'learners' in the studies. It was decided to include both teachers and student groups in this category. Hence student ages were taken into account and the 'over 21' option was also keyworded with regard to the teachers. CPD is a learning process and teachers involved in CPD were therefore classed as learners. Other areas that required clarification at the keywording stage were the individually oriented and collaborative nature of the CPD processes and the study type. Owing to the nature of the definitional queries and because we wanted to assure quality, all the studies in the map were keyworded by at least two different reviewers. EPPI-Centre staff also keyworded 14 studies. Differences were then reconciled and, once agreed, were uploaded to the database.

4. IN-DEPTH REVIEW: RESULTS

This chapter focuses on the characteristics of the studies which were reviewed in-depth and the results of the synthesis. The chapter presents descriptive information relating to the studies which met all the criteria for the in-depth review. Throughout sections 4.1, 4.2 and 4.3, descriptions refer solely to the studies that were identified in carrying out this second review, and all studies referred to are additional to the studies included in the first review. For comparative purposes, in order to see the total number of studies investigating collaborative CPD, the numbers relating to studies in the first review are provided in the tables of numerical data, but the full details and results of the first review can be found in the report 'The impact of collaborative CPD on classroom teaching and learning' (Cordingley *et al.*, 2003a).

The review process retrieved studies that focused on aspects of teaching and learning, the impact of either individually oriented or collaborative CPD on teaching and learning, and an evaluation of the CPD involved. Data relating to the CPD review question are reported in tables and described in the text, under separate subheadings. This chapter then discusses the characteristics of the studies in more depth, reports a synthesis of the main findings, and explores the implications of the synthesis.

4.1 Selecting studies for the in-depth review

The textual detail presented in this chapter relates to the 17 studies data extracted during the process of this, the second review. Since studies of collaborative CPD were identified in both the first and second reviews, figures from the first in-depth review are presented in the tables in sections 4.2 and 4.3 by way of comparison. Figures are presented in tables as 'Identified for E1' (i.e. studies of collaborative CPD identified in the first review) and 'Identified for E2' (i.e. studies of collaborative CPD identified in the second review). The column headed 'Total collaborative (E1 + E2)' provides the combined total for the studies of collaborative CPD identified in both the first and second review. In both reviews, 17 studies were selected for data extraction (and this is indicated by N=17 for both reviews), so the numerical data in these tables is based on 34 studies. The criteria for inclusion can be found in Appendix 2.1. The first and second reviews both looked at studies of collaborative CPD and, in addition, the second review examined studies of individually oriented CPD. The figures relating to studies of individually oriented CPD are presented separately in the tables by way of comparison (in the column headed 'Individual identified only for E2'). This comparison is limited in nature and scope as only three studies of individually oriented CPD were included in the in-depth stage of the second review (Mink and Fraser, 2002; Ross, 1994; Shechtman and Or, 1996). The implications of this will be discussed in section 4.4.

Table 4.1: Studies included from searching and screening

Studies	Total number of studies included in the first review	Total number of studies included in the second review
Number of full reports meeting all Stage 1 inclusion criteria and therefore keyworded	72	81
Number of studies meeting all Stage 1 and Stage 2 inclusion criteria and going on for in-depth review (E1 = 15 criteria in total, E2 = 13 criteria in total)	17	17
Number of studies included in the synthesis	15	14

Appendix 4.1 provides a list of the 17 studies which were data extracted for this review and notes whether the CPD was judged to be collaborative or individually oriented in design. These judgements make no claim to an exact science. We report the definitional issues involved in Chapter 3 and they are discussed in the synthesis (section 4.4).

Details of the 17 studies which were data extracted in the first review can be found in Cordingley *et al.* (2003).

4.2 Comparing the studies selected for the in-depth review with the total studies in the systematic map

Tables reporting detailed features of the studies reviewed in-depth are provided in section 4.3 and in Appendix 4.1. The bibliographic details are provided in Chapter 6. We have made comparisons between the number of studies identified for this review in the in-depth review and the systematic map. We have also included numbers relating to the first review in the tables; full details of the studies and the findings of the first review can be found in Cordingley *et al.*, 2003a.

Types of CPD

The first review focused purely on studies of collaborative CPD. This second review retrieved further studies of collaborative CPD and also studies which report individually oriented CPD interventions (see section 1.1 for definitions of collaborative and individually oriented CPD).

For this review, we would have expected the number of individually oriented CPD studies retrieved to be higher than it was, as the search strategy covered studies published from 1991 to 2004. However, more collaborative studies were retrieved than expected – in spite of the fact that the search strategy had been designed merely to update the first review (i.e. 2000-2004 only). This suggests that more evaluations are carried out of sustained, collaborative CPD programmes than of individually oriented CPD programmes. The reason for this, we now suspect, may be that fewer individually oriented CPD programmes are sustained over time (i.e. most are short training interventions, including one-day in-service training) and hence did not meet the requirement to be sustained over a minimum of one term.

In the systematic map, of the 81 studies identified in the second review as meeting Stage 1 criteria, there are 55 collaborative and 26 individually oriented studies of CPD (66% and 34% respectively). At the in-depth review stage, the field was narrowed to include 14 studies of collaborative CPD and three involving individually oriented CPD interventions (82% and 18% respectively); see Table 4.2. This represents a shift in the balance from Stage 1 to the in-depth stage of the review towards including more collaborative studies, mainly because fewer individually oriented studies met the student impact criterion.

Table 4.2: Description of the type of CPD (codes mutually exclusive)

Type of CPD	Collaborative		Total collaborative (E1 + E2)	Individual
	Identified for E1* (N=17)	Identified for E2 (N=14)		Identified only for E2 (N=3)
Collaborative	17	14	31	0
Individually oriented	0	0	0	3

*The first review only examined studies of collaborative CPD.

Study types

As the specific review question concerned the outcomes and impact of CPD on classroom teaching and learning, most studies which were included in the in-depth second review were evaluations. This unsurprising pattern mirrors the findings from the first review. Studies were further classified as evaluations of naturally occurring interventions (six studies), or evaluations of researcher-manipulated interventions (11 studies). In this review, of the 11 studies defined as evaluations of researcher-manipulated interventions, two were individually oriented CPD interventions (Ross, 1994; Shechtman and Or, 1996) and nine were studies of collaborative CPD interventions (Anderson, 1992; Appalachia, 1994; Boudah *et al.*, 2003; Fine, 2002; Lin, 2002; Martin *et al.*, 2001; McCutchen *et al.*, 2002; Shapiro *et al.*, 1999; Zetlin *et al.*, 1998). Of the six naturally occurring evaluations in this review, one was a study of individually oriented CPD (Mink and Fraser, 2002) and five were studies of collaborative CPD interventions (Britt *et al.*, 1993; Jacobsen, 2001; Pedroza *et al.*, 1998; Sandholtz, 2001; Schmitz, 1994).

Table 4.3: Description of the type of study in the in-depth review

Type of study	Collaborative		Individual	
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
Evaluation: researcher-manipulated	14	9	23	2
Evaluation: naturally occurring	4	5	9	1
Description	0	0	0	0
Development of methodology	0	0	0	0
Exploration of relationships	0	0	0	0
Systematic review	0	0	0	0
Total	18*	14	32*	3

Note: * In the first review, some research combines more than one type of study.

The figures relating to study type are comparable with those identified in the systematic map for this review in that evaluations are consistently the dominant study type. Only one study in the systematic map was classified as description. Other study types – namely, ‘methodology’, ‘exploration of relationships’ and ‘systematic review’ – do not feature amongst the studies identified in the second review in either the systematic map or the in-depth review.

In this review, a substantially higher number of the studies at the in-depth review stage were evaluations of researcher-manipulated interventions than in the systematic map. The frequency of occurrence for the evaluation studies is reversed from the systematic map stage to the in-depth review. Evaluations of naturally occurring interventions are predominant in the systematic map (N=47, or 58%) compared with the numbers for evaluations of researcher manipulated interventions (N=32, or 40%). At the in-depth review stage, this frequency is reversed – six evaluations of naturally occurring intervention studies (35%) compared with 11 studies (65%) which were recorded as evaluations of researcher manipulated interventions.

Countries of included studies

The majority of studies in the systematic map (N=59, or 73%) came from the USA and this is reflected in the in-depth review. Ten studies (or 59%) came from the USA, of which nine were studies of collaborative CPD and one was a study of individually oriented CPD. In this review, only one study (Martin *et al.*, 2001) to reach the in-depth stage was based in the UK (and China).

Table 4.4: Countries in which the studies in the in-depth review were conducted

Country	Collaborative		Individual	
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
USA	9	9	18	1
Canada	2	2	4	1
UK: England	2	1	3	0
New Zealand	2	1	3	0
Namibia	1	0	1	0
South Africa	1	0	1	0
Taiwan	0	1	1	0
China	0	1	1	0
Israel	0	0	0	1

Note: Some studies were set in more than one country.

4.3 Further details of studies included in the in-depth review

Section 4.3 looks in more detail at the 17 studies data extracted in the process of carrying out this the second review (of which 14 are studies of collaborative CPD and three are studies of individually oriented CPD). For comparative purposes (as described in the introduction to section 4.1), the numbers relating to studies in the first review are provided in the tables where they are available, but the full details and results of the first review can be found in Cordingley *et al.* (2003).

Building on existing knowledge: use of research literature to inform the studies

As part of the screening process, all the studies included at the in-depth review stage had to demonstrate that: ‘they have used what is known already’ (e.g. by including a literature review). Appendix 4.2 details the use of research literature to inform the studies.

Seven reports made specific reference to the theoretical and empirical literature on CPD as part of the background and literature review to their studies. These studies also make reference to the research literature relating to instructional and pedagogical strategies (Appalachia, 1994; Boudah *et al.*, 2003; Britt *et al.*, 1993; Fine, 2002; Ross, 1994; Shechtman and Or, 1996; Zetlin *et al.*, 1998). Of the seven studies, five are studies of collaborative CPD and two are studies of individually oriented CPD.

Specifically:

- Appalachia (1994) discuss the foundations of the QUILT (Questioning and Understanding to Improve Learning and Thinking) programme, including the CPD framework.

- Boudah *et al.* (2003) refer to the research literature on instructional strategies, the poor match between teacher needs and in-service topics, and instructional formats and the Authentic Professional Development (ADP) model.
- Britt *et al.* (1993) refer to the research literature about features of effective CPD and also examined the research developing effective teaching and strategies to improve student performance in mathematics.
- Fine (2002) refer to literature relating to instructional strategies which can facilitate teacher change and development.
- Ross (1994) refer to studies of in-service programmes which were designed to improve teacher efficacy. The actual CPD was designed around Bandura's (1977) theory of self-efficacy that might be available to teachers engaged in a professional development programme.
- Shechtman and Or (1996) explore the literature about CPD models and their capacity to change and influence teacher attitudes.
- Zetlin *et al.* (1998) refer to the literature on approaches to CPD and ongoing collegial support.

Ten studies examined research literature on specific instructional and pedagogical interventions but do not appear to locate their CPD models in any specific theoretical context (Anderson, 1992; Jacobsen, 2001; Lin, 2002; Martin *et al.*, 2001; McCutchen *et al.*, 2002; Mink and Fraser, 2002; Pedroza *et al.*, 1998; Sandholtz, 2001; Schmitz, 1994; Shapiro *et al.*, 1999). Of these ten studies, nine were studies of collaborative CPD and one was a study of individually oriented CPD (Mink and Fraser, 2002).

Specifically:

- Anderson (1992) looked at research into instructional and pedagogical strategies to promote reading-disabled adolescents' learning.
- Jacobsen (2001) explored the research literature detailing ICT professional development and barriers relating to the integration of ICT in teaching.
- Lin (2002) looked at the literature on student learning and teaching strategies in science and based his intervention on a teaching format called the 5E model. (using engagement – exploration – explanation – elaboration – evaluation to help teachers identify their own and student behaviours that supported or contradicted the various phases of the instructional model).
- Martin *et al.*'s (2001) study built on previous research studying cognitive performance in deaf people and learning styles; in particular, it drew on the effects of instrumental enrichment as a learner strategy.
- McCutchen *et al.* (2002) drew on the literature on promoting literacy.
- Mink and Fraser's (2002) study referred to literature about teaching strategies which encourage students to participate actively in learning activities.
- Pedroza *et al.*'s (1998) study was influenced by research which explored practitioner-centred action research approaches to teaching special education students.
- Sandholtz's (2001) study was informed by previous research about how technology use is acquired and transmitted among teachers, and how technology could be integrated into teaching.
- Schmitz (1994) notes previous research which focused on cognitively guided instruction, social constructivism and curriculum planning and development.
- Shapiro *et al.* (1999) draw on the literature relating to teaching students with emotional or behavioural disorders (EBD) and integrating them into general education settings.

Study aims and rationale

The aims of the studies (as opposed to the aims of the CPD itself) in both the reviews fell broadly into five main categories: the impact of a specific teacher development model/programme; the impact on teaching and learning of introducing specific pedagogic strategies; the impact of CPD which aimed to develop teachers' knowledge, understanding or skills; changes in students' performance; and changes in teacher beliefs/attitudes. The aims of the studies in the in-depth review are shown in Table 4.8.

Table 4.8: Aims of the studies in the in-depth review

Area to explore/test	Collaborative	Individual
<i>Impact of a specific teacher development model/programme</i>	Appalachia (1994), Boudah <i>et al.</i> (2003), Britt <i>et al.</i> (1993), Fine (2002), Jacobsen (2001), Lin (2002), Sandholtz (2001), Schmitz (1994), Shapiro <i>et al.</i> (1999)	Ross (1994), Shechtman and Or (1996)
<i>Impact on teaching and learning of introducing specific pedagogic strategies</i>	Anderson (1992), Appalachia (1994), Boudah <i>et al.</i> (2003), Fine (2002), Martin <i>et al.</i> (2001), McCutchen <i>et al.</i> (2002), Sandholtz (2001), Schmitz (1994), Zetlin <i>et al.</i> (1998)	Mink and Fraser (2002)
<i>Impact of CPD which aimed to develop teachers' knowledge, understanding or skills</i>	Britt <i>et al.</i> (1993), Jacobsen (2001), Lin (2002)	
<i>Changes in students' performance, either formal (i.e. assessment) or informal (i.e. behaviour)</i>	Anderson (1992), Appalachia (1994), Boudah <i>et al.</i> (2003), Britt <i>et al.</i> (1993), Fine (2002), Jacobsen (2001), Lin (2002), Martin <i>et al.</i> (2001), McCutchen <i>et al.</i> (2002), Pedroza <i>et al.</i> (1998), Shapiro <i>et al.</i> (1999), Zetlin <i>et al.</i> (1998)	Mink and Fraser (2002), Ross (1994), Shechtman and Or (1996)
<i>Changes in teacher beliefs/attitudes</i>	Boudah <i>et al.</i> (2003), Zetlin <i>et al.</i> (1998)	Ross (1994), Shechtman and Or (1996)

Note: Some studies had more than one aim stated. This table combines primary and secondary aims.

Appendix 4.3 reports on the aims, designs and findings of the studies in this review.

Connections with teaching and learning

All the studies in the review focused on teaching and learning, as this was built into the Stage 2 criteria. Where there was a curriculum focus, it tended to be subsidiary to the main aims of the study, acting as a vehicle for the CPD. The most common curriculum context in this review is cross-curricular (N = 5, of which four are studies of collaborative CPD and one a study of individually oriented CPD). The next most common is literacy – first language (N = 3, all of which are studies of collaborative CPD), and mathematics (N = 2, of which one is a study of collaborative CPD and one is a study of individually oriented CPD).

Attitudes and beliefs

We had explicitly targeted data on attitudes and beliefs, so we looked for and found reported changes in attitudes and beliefs in many of the data-extracted studies. However, most of the CPD interventions in these studies did not explicitly target teachers' attitudes and beliefs, or at least not in the aims of the studies as they are reported. Only four of the 17 studies – the studies of collaborative CPD by Boudah *et al.* (2003) and Zetlin *et al.* (1998), and the studies of individually oriented CPD by Shechtman and Or (1996) and Ross (1994) – *explicitly* state that examining teachers' attitudes and beliefs was a *significant aim* of the research. However, the analysis of the *outcomes* of the CPD interventions found evidence of impact on teacher morale, attitudes and beliefs in eight studies of collaborative CPD (Boudah *et al.*, 2003; Fine, 2002; Lin, 2002; Pedroza *et al.*, 1998; Sandholtz, 2001; Schmitz, 1994; Shapiro *et al.*, 1999; Zetlin *et al.*, 1998) and three studies of individually oriented CPD (Mink and Fraser, 2002; Ross, 1994; Shechtman and Or, 1996).

Description of types of intervention

Due to its practitioner focus and the aim to provide CPD co-ordinators and leaders with details of effective CPD programmes to enable them to make informed choices, the Review Group was interested in the details of the CPD processes. These were described in varying levels of detail in the studies in the in-depth review. The broader patterns are summarised in the section below, specifically in terms of the types of interventions, the activities, the location of the CPD intervention, the length of the intervention, and the context. The characteristics which emerged from this process are commented on in greater detail in section 4.4 and fuller details of the interventions in the review are provided in Appendix 4.4.

Types of CPD intervention

In this review, we introduced a detailed and extensive set of review-specific keywords (at the keywording stage) relating to the types of intervention used in the studies of collaborative and individually oriented CPD. We aimed to use the keywording to refine our analysis of the CPD interventions. However, in retrospect, we had tried to be too inclusive with the keywords. These proved to be no substitute for the data-extraction analysis and for going back to the original studies to clarify and check details.

In the 17 studies included in the in-depth review, we found the following:

- All the studies include some form of learning ‘activity’ – in other words, teachers were introduced to the techniques or strategies by outside experts. Due to the sustained nature of the CPD, this initial training was followed up with other types of external support, such as observation, modelling, mentoring, counselling and regular informal meetings, workshops and discussions.
- All the studies involved the initial use of specialist expertise to varying degrees.
- All but one of the studies in the in-depth review used workshops and/or seminars. One study of individually oriented CPD used two specific college-based training courses (Shechtman and Or, 1996).
- All the studies of collaborative CPD used peer support and/or coaching.
- All the studies of collaborative CPD involved teachers in structured discussion about their practice.
- All but one study of collaborative CPD (and no studies of individually oriented CPD) used modelling and/or observation (often using video as the medium) (Anderson, 1992; Appalachia, 1994; Boudah *et al.*, 2003; Britt *et al.*, 1993; Fine and Kossak, 2002; Jacobsen, 2001; Lin, 2002; Martin *et al.*, 2001; McCutchen *et al.*, 2002; Sandholtz, 2001; Schmitz, 1994; Shapiro *et al.*, 1999; Zetlin *et al.*, 1998).
- Action research is explicitly described as a feature of the CPD intervention, in three studies of collaborative CPD where teachers and researchers co-operated in action research studies within the teachers’ own schools (Britt *et al.*, 1993; Fine and Kossak, 2002; Pedroza *et al.*, 1998). However, a number of other studies that did not explicitly mention action research actually report many similar or overlapping processes. For example, this includes studies where teaching staff were involved in the student-based data collection and/or the administration of the student tests (Anderson, 1992; Appalachia, 1994; Boudah *et al.*, 2003; Mink and Fraser, 2002; Ross, 1994; Sandholtz, 2001; Shapiro *et al.*, 1999; Shechtman and Or, 1996 – of which five are studies of collaborative CPD and three are studies of individually oriented CPD).
- In 12 studies, evidence from the data-extractions indicates (either implicitly or explicitly) that there were opportunities for the participants to learn from research and/or explore theory (ten are studies of collaborative CPD and two studies of individual CPD).
- Ten studies used named existing models or programmes of CPD in their evaluations (Appalachia, 1994; Boudah *et al.*, 2003; Britt *et al.*, 1993; Fine and Kossak, 2002; Jacobsen, 2001; Lin, 2002; Mink and Fraser, 2002; Sandholtz, 2001; Schmitz, 1994; Shechtman and Or, 1996). Two further studies (Ross, 1994; Shapiro *et al.*, 1999) evaluated ‘unnamed’ professional development programmes. Of these 12 studies, nine are studies of collaborative CPD and three studies of individually oriented CPD.
- Two studies made use of role play (Fine and Kossak, 2002; Schmitz, 1994).
- Three studies specifically used mentors (Jacobsen, 2001; Sandholtz, 2001; Zetlin *et al.*, 1998).
- One study used counselling as the basis of the CPD intervention (Shechtman and Or, 1996).

Table 4.9: Types of interventions (N = 17)

Type of intervention	Collaborative	Individual
The use of expert/specialist expertise	14	3
Modelling/Observation	13	0
Peer support	14	0
Action research (as an explicit feature)	3	0
Counselling	0	1
Workshops and seminars	14	2
College-based course	0	1
Structured discussion	14	0
Role play	2	0
Mentors	3	0
Opportunities to learn from research and/or explore theory	10	2

Note: Studies could include more than one type of intervention.

Further details of the CPD interventions are provided in Appendix 4.4.

Length of intervention

All the studies in the review that met all our criteria looked at CPD which was designed to span at least 12 weeks or one term as a minimum definition for what constituted sustained CPD, based on the findings of the first review. In the event, we included a 10-week (30-hour) intervention on the basis that not all terms are 12 weeks long; this applied to one individually oriented study (Mink and Fraser, 2002).

Table 4.10: Length of the CPD intervention in the studies in this review (N = 17)

Length of the intervention	Collaborative	Individual
3 months/1 term	6 (Anderson, 1992; Boudah <i>et al.</i> , 2003; Fine and Kossak, 2002; Jacobsen, 2001; Pedroza <i>et al.</i> , 1998; Shapiro <i>et al.</i> , 1999)	1 (Mink and Fraser, 2002)
5–6 months	2 (Martin <i>et al.</i> , 2001; Schmitz, 1994)	
8 months		1 (Ross, 1994)
1 year	5 (Appalachia, 1994; Lin, 2002; McCutchen <i>et al.</i> , 2002; Sandholtz, 2001; Zetlin <i>et al.</i> , 1998)	1 (Shechtman and Or, 1996)
2 years	1 (Britt <i>et al.</i> , 1993)	

Notes: Codes are mutually exclusive.

Location of the activity

We were interested in where the CPD took place. The location of the CPD was explicitly or implicitly stated in most of the studies. Table 4.11 shows where the activities took place.

Table 4.11: Location of the CPD intervention (N = 17)

Location of CPD	Collaborative	Individual
In own school	7 (Anderson, 1992; Appalachia, 1994; Boudah <i>et al.</i> , 2003; Fine and Kossak, 2002; Jacobsen, 2001; Lin, 2002; Schmitz, 1994)	
In own school and off-site	3 (Britt <i>et al.</i> , 1993, Martin <i>et al.</i> , 2001, McCutchen <i>et al.</i> , 2002)	
In own school but not in own class	1 (Sandholtz, 2001)	
In own school, another school, or both	2 (Shapiro <i>et al.</i> , 1999, Zetlin <i>et al.</i> , 1998)	1 (Mink and Fraser, 2002)
Off-site (Teacher Training College)		1 (Shechtman and Or, 1996)
Unclear	1 (Pedroza <i>et al.</i> , 1998)	1 (Ross, 1994)

Note: Codes are mutually exclusive.

Consultation with teachers

The degree to which the CPD and the research were customised to take account of the contexts, starting points and interests of the teachers varied. There was some evidence of the adaptation of 'pre-packaged' training during consultation with teachers (for example, SMILE in the study of individually oriented CPD by Mink and Fraser, 2002). Such studies sought to measure the impact of a particular intervention on teaching and learning, but the intervention was evolved in consultation with the researchers and teachers.

In 11 studies, the teachers appeared to have been consulted to varying degrees about the research design and/or implementation. Of the 11 studies, 10 were studies of collaborative CPD and one was a study of individually oriented CPD. Researchers sometimes took teachers' needs and concerns as a starting point through consultation and interviews (for example, Jacobsen, 2001). In other studies, teachers were consulted about the following:

- the programme implementation (but not the design) (for example, Fine and Kossak, 2002)
- the students who were to be involved in the study (for example, Shapiro *et al.*, 1999)
- their interests and goals from participation in the process (for example, Britt *et al.*, 1993)

In two studies, teachers sat on executive committees and planning groups for the CPD programmes (Ross, 1994; Sandholtz, 2001). Of the 12 studies where teachers were consulted in working out the aims or issues to be addressed in the study, only one was a study of individually oriented CPD (Ross, 1994).

While teachers were consulted about the research study design and/or implementation in 12 studies, fewer enabled the teachers to be actively involved in determining the pace and scope of their CPD. Six studies (all studies of collaborative CPD) ranged from very limited teacher involvement (Anderson, 1992; Boudah *et al.*, 2003; Jacobsen, 2001) to appearing to offer full control to the

teachers over the pace and scope to teachers (Lin, 2002; Sandholtz, 2001; Zetlin *et al.*, 1998). The extent of teacher influence in defining the pace and scope of the CPD was not clear in the reports of a further 11 studies (of which three are studies of individually oriented CPD and eight are of collaborative CPD).

Voluntarism

We were interested to find out whether or not teachers participated voluntarily in the studies. Teachers volunteered to take part in the CPD in 14 studies (Anderson, 1992; Boudah *et al.*, 2003; Fine and Kossak, 2002; Jacobsen, 2001; Lin, 2002; Martin *et al.*, 2001; McCutchen *et al.*, 2002; Mink and Fraser, 2002; Pedroza *et al.*, 1998; Ross, 1994; Sandholtz, 2001; Schmitz, 1994; Shapiro *et al.*, 1999; Zetlin *et al.*, 1998). Participation was mandatory in one collaborative CPD programme (Appalachia, 1994). Two studies explored a mixture of voluntary and mandatory participation. In Sandholtz's (2001) study of collaborative CPD, participation on the ACOT programme was through choice, but the attendance on the school district programme was mandatory. In Shechtman and Or's (1996) study (a study of individually oriented CPD), some teachers willingly joined the training programme and others were compelled to do so. The nature of the participation was unclear in one collaborative study (Britt *et al.*, 1993), although it could be inferred from the reporting that the participation was both voluntary and mandatory.

Table 4.12: Nature of the participation

	Collaborative		Individual	
	Identified for E1* (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
Voluntary	10	12	22	2
Mandatory	1	1	2	0
Mixed (voluntary and mandatory)	0	1	1	1
Unknown (information not given)	6	0	6	0

Note: Codes are mutually exclusive.

Range of samples

All studies provided numerical information in relation to the teacher samples, which ranged from small scale samples involving three teachers (Lin, 2002) to large scale programmes involving 1,178 teachers (Appalachia, 1994). Numerical information about the size of the student samples was explicitly supplied in 10 studies. They range from around 40 (Jacobsen, 2001; Shapiro *et al.*, 1999) up to 1,228 (Ross, 1994). In all the studies, significantly more background information about the teacher sample than the student sample was provided. This is largely due to the fact that CPD is a third-order activity. In order for there to be an impact on student learning, there first has to be an impact on teachers and teaching. Hence in all the studies, teachers are the 'primary' sample, even where the primary *goal* of the CPD is to influence student learning in a particular area, school or district.

As our review question was looking at the impact of CPD interventions on both teaching and learning, the studies in the in-depth review invariably consisted of both teacher and student samples. We included both groups in the information about the sample, even though teachers were recruited to the sample (either voluntarily or not – see Table 4.12) but generally students were automatically part of the sample because their teachers were involved in the study. In most of the studies, it would appear that students had no choice about taking part in the study. In all but one of the studies, no information was given about parental consent being requested and/or given; only Mink and Fraser (2002) noted that parental consent was obtained prior to the interviews with students.

An early decision made by the Review Group in relation to the fact that CPD is a 'third-order intervention' was to record both teachers and students as learners in both the keywording and data-extraction stages of the review. As the review looked at both teacher and student outcomes, all the studies were classed as 21 and over, reflecting the teachers in the role of learners involved in CPD. They were further coded with the relevant age range of the students involved. Table 4.13 provides data on the age ranges of the sample in the studies in the in-depth review.

Table 4.13: Ages of participants in the studies in the in-depth review

Age of the study participants	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
0 to 4	1	0	1	0
5 to 10	9	11	20	2
11 to 16	14	11	25	1
17 to 20	3	2	5	0
21 and over	17	14	31	3

Note: Some of the studies involved participants in more than one age group.

All the study participants are 21 and over since the teachers are classed as learners.

Study design of the studies in the in-depth review

Appendix 4.6 provides information on which studies conducted pre- and post-test comparisons on teachers and/or pupils and whether the CPD was collaborative or individual in design. Information on whether each study was an evaluation that was researcher-manipulated or naturally occurring is also given. In summary, 12 studies used some kind of pre- and post-testing of teachers and/or students (Anderson, 1992; Appalachia, 1994; Britt *et al.*, 1993; Fine and Kossak, 2002; Martin *et al.*, 2001; McCutcheon, 2002; Mink and Fraser, 2002; Ross, 1994; Schmitz, 1994; Shapiro *et al.*, 1999; Shechtman and Or, 1996; Zetlin *et al.*, 1998) of which nine were collaborative and three were individually oriented. A further two studies (Pedroza *et al.*, 1998; Sandholtz, 2001) make brief reference to pre- and post-testing. Both were collaborative studies and were removed from the synthesis in section 4.4 as they had a low WoE (A and C) respectively. Boudah *et al.* (2003) collected post-intervention data from both the experimental and control

groups. Jacobsen (2001) and Lin (2002) collected data during and after the intervention period.

A number of studies (N = 8) included the use of control groups in their design; this is also noted in Appendix 4.6. In summary, four studies used a randomly allocated control group (Anderson, 1992; Appalachia, 1994; Shapiro *et al.*, 1999; Shechtman and Or, 1996). Three studies (Boudah *et al.*, 2003; Fine and Kossak, 2002; Martin *et al.*, 2001) used non-randomly generated control groups and one other (McCutcheon, 2002) used a quasi-random method of allocation. All these studies were evaluations of researcher-manipulated interventions, as would be expected.

The other studies in the in-depth review (N = 9) did not have control groups and either only used one group for the study (Lin, 2002; Mink and Fraser, 2002; Ross, 1994; Schmitz, 1994; Zetlin *et al.*, 1998), or used pre-existing differences to create comparison groups (Britt *et al.*, 1993; Jacobsen, 2001; Pedroza *et al.*, 1998; Sandholtz, 2001).

Methods of data collection and analysis

In all the studies in the in-depth review, there is evidence of more than one method of data collection used. This ranged from a minimum of two types of data-collection method to as many as six different methods of collection. Details are provided in Appendix 4.5, with further information on specific studies provided in Appendix 4.6.

Table 4.14: The four most frequently cited methods of data collection

Data collection	Collaborative		Total collaborative (E1 + E2)	Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)		Identified only for E2 (N=3)
Observation	12	11	23	3
Self-completion questionnaire	11	8	19	3
One-to-one interview	11	7	18	2
Report/diary	10	7	17	1

Note: In some studies, more than one method of data collection was used.

It should be noted, however, that the CPD intervention itself may have involved direct classroom observation or other forms of data collection even if it were not built directly into the research design or explicitly stated in the study. The range of methods used to collect the data were both qualitative and quantitative, but with more emphasis on qualitative methods. This emphasis is illustrated in Table 4.14, which shows that three of the four most common methods of data collection were qualitative – observation, the use of reports and diaries, and interviews (although we do not always know how tightly the interviews were structured). Researchers attempted to validate qualitative data, for example, through triangulation. Some also conducted statistical analysis of qualitative data and subjected their analysis to reliability tests.

Funding of the studies

Support for the research studies in terms of funding was explicitly documented in 12 of the studies in the in-depth review, implied in one study (Mink and Fraser, 2002) and not stated in four others (Boudah *et al.*, 2003; Lin, 2002; Martin *et al.*, 2001; Pedroza *et al.*, 1998). In the 12 studies where the source of funding was acknowledged, the authors explicitly state the following:

- Five studies received a single source of funding from a Government department.
- Two studies received a single source of funding from an HEI or other research grant.
- One study received funding from a Government department plus funding from an HEI or other research grant.
- One study received funding from a Government department combined with funding from the local school districts/LEAs.
- One study received funding from a Government department combined with a research grant and money from the local school districts/LEAs.
- One study received funding directly from the participating schools combined with funding from an HEI or other research grant, and a Government department.
- One study combined funding from an HEI or other research grant, the local school districts/LEAs, participating schools and a commercial company.

Table 4.15: Funding sources of studies in this review (N = 17)

Funding source	Collaborative	Individual
Government department	7 (Anderson, 1992; Appalachia, 1994; Britt <i>et al.</i> , 1993; Fine and Kossak, 2002; Schmitz, 1994; Shapiro <i>et al.</i> , 1999; Zetlin <i>et al.</i> , 1998)	2 (Shechtman and Or, 1996; Ross, 1994)
HEI or other research grant (non-Governmental)	5 (Britt <i>et al.</i> , 1993; Jacobsen, 2001; McCutchen <i>et al.</i> , 2002; Sandholtz, 2001; Zetlin <i>et al.</i> , 1998)	1 (Ross, 1994)
Not stated	4 (Boudah <i>et al.</i> , 2003; Lin, 2002; Martin <i>et al.</i> , 2001; Pedroza <i>et al.</i> , 1998)	
Participating schools	2 (Britt <i>et al.</i> , 1993; Sandholtz, 2001)	
Local school districts/LEAs	2 (Appalachia, 1994; Sandholtz, 2001)	1 (Ross, 1994)
Commercial	1 (Sandholtz, 2001)	
Unclear/Not explicitly stated	0	1 (Mink and Fraser, 2002)

Note: Some studies had more than one funding source.

Quality of the reporting

In the review, most of the studies are clear about the aims, rationale, broad contexts and theoretical underpinning for the research. For a small number of studies, the reviewers felt that there was not sufficient information about the detailed characteristics of the sample – for example, the length of teachers' service or students' background – for practitioners to be able to make direct connections between the sample populations and their own circumstances. The studies in the in-depth review provide varying degrees of information about the intervention. The studies vary considerably in the extent to which they report on data collection and analysis. However, all the studies included in the synthesis provide sufficient information for reviewers to have confidence in their WoE judgements.

Weight of evidence (WoE)

Reviewers were required to make a series of judgements about the trustworthiness of each study for answering its own study questions (WoE A), and for the purposes of answering this review question (WoE B, C and D). Details of the WoE questions and guidance, plus a table illustrating each study in the in-depth review and the associated WoE judgements (A, B, C and D) can be found in Appendix 4.7.

Table 4.16: WoE (A) – the trustworthiness of each study for answering its own study questions

Weight of evidence (A)	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
High	0	2	2	0
Medium/High	2	1	3	0
Medium	12	8	20	3
Medium/Low (where the medium is prioritised)	2	1	3	0
Low/Medium or Low	1	2	3	0

In this review, the majority of the studies (N = 12) were judged by the reviewers to provide 'medium/high' or 'medium' quality WoE. Two collaborative studies were rated as 'high' for WoE A (Anderson, 1992 and McCutchen *et al.*, 2002). All three studies of individually oriented CPD were rated 'medium' for WoE A (Mink and Fraser, 2002; Ross, 1994; Shechtman and Or, 1996).

Two studies of collaborative CPD were rated as having a 'low/medium' WoE A. Due to the 'low' WoE A judgement, these two studies (Pedroza *et al.*, 1998; Schmitz, 1994) were not used to generate the synthesis.

Review-specific WoE

Our review question specifically addressed the nature of the impact of the CPD on both teachers and students. We wanted to know how or in what ways the CPD affected them. We therefore had two questions: *Did the CPD affect the teachers and their students* and *In what ways did it do so?* Although all the studies explore

both questions to varying degrees, some are stronger in their approach to ‘whether’ than ‘how’, and vice versa. For each study in the review, we have allocated ‘how’ and ‘whether’ judgements to each study. The following tables detail the WoE judgements and are divided into separate tables for ‘whether’ and ‘how’ for WoE B, C and D.

Weight of evidence B

The first review-specific WoE judgement (WoE B) concerns the *appropriateness of the research design and analysis* for addressing the questions and sub-questions of our review. The reviewers’ responses to this question are given in Tables 4.17 and 4.18.

Table 4.17: Weight of evidence (B) – ‘whether’ aspect

Weight of evidence (B) ‘Whether’	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
High	1	2	3	1
High/medium	0	0	0	0
Medium/high	1	1	2	1
Medium	7	7	14	1
Medium/low	3	1	4	0
Low/medium	1	0	1	0
Low	4	3	7	0

Table 4.18: Weight of evidence (B) – ‘how’ aspect

Weight of evidence (B) ‘How’	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
High	2	1	3	1
High/medium	1	0	1	0
Medium/high	0	2	2	1
Medium	13	11	24	1
Medium/low	0	0	0	0
Low/medium	0	0	0	0
Low	1	0	1	0

Studies judged to be appropriate in design and analysis for answering both elements of the review-specific questions included details of the intervention processes, data collection and analysis, and evidence of student outcomes. In this review, three studies were classed as ‘high’ in terms of ‘whether’ (Anderson, 1992; McCutchen *et al.*, 2002; Ross, 1994) and two were ‘high’ in terms of ‘how’ (McCutchen *et al.*, 2002; Ross, 1994). Ross’s (1994) study was of individually oriented CPD whereas all the other highly rated studies were of collaborative CPD.

Weight of evidence C

The next WoE question asks for a judgement of the *relevance* of the particular focus of the study, (including conceptual focus, context, sample and measures), for addressing the specific review question. The responses are given in Tables 4.19 and 4.20.

Table 4.19: Weight of evidence (C) – ‘whether’ aspect

Weight of evidence (C) ‘Whether’	Collaborative		Total collaborative (E1 + E2)	Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)		Identified only for E2 (N=3)
High	3	4	7	0
High/medium	1	0	1	0
Medium/high	0	1	1	1
Medium	10	7	17	1
Medium/low	0	1	1	1
Low/medium	1	0	1	0
Low	2	1	3	0

Table 4.20: Weight of evidence (C) – ‘how’ aspect

Weight of evidence (C) ‘How’	Collaborative		Total collaborative (E1 + E2)	Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)		Identified only for E2 (N=3)
High	5	3	8	0
High/medium	0	0	0	0
Medium/high	0	2	2	1
Medium	10	8	18	1
Medium/low	0	0	0	1
Low/medium	0	0	0	0
Low	2	1	3	0

In addressing the WoE C for ‘whether’, four studies of collaborative CPD interventions were all recorded as ‘high’ (Anderson, 1992; Britt *et al.*, 1993; McCutchen *et al.*, 2002; Zetlin *et al.*, 1998). With the exception of Anderson (1992), who was judged as ‘medium’ for ‘how’, the same studies were classed as ‘high’ for ‘how’.

Weight of evidence D

Finally, the reviewers were asked to consider the overall weight of evidence that the studies provide in answering the specific review question, considering trustworthiness of the study, the appropriateness of research design, and the relevance of the study focus. Reviewers examined their responses to WoE questions A, B and C to inform their overall judgement of the study, WoE D. The findings are given in the Tables 4.21 and 4.22.

Table 4.21: Weight of evidence (D) – ‘whether’ aspect

Weight of evidence (D) ‘Whether’	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
High	0	2	2	0
High/medium	0	0	0	0
Medium/high	1	2	3	1
Medium	10	6	16	2
Medium/low	3	2	5	0
Low/medium	1	1	2	0
Low	2	1	3	0

Table 4.22: Weight of evidence (D) – ‘how’ aspect

Weight of evidence (D) ‘How’	Collaborative			Individual
	Identified for E1 (N=17)	Identified for E2 (N=14)	Total collaborative (E1 + E2)	Identified only for E2 (N=3)
High	1	1	2	0
High/medium	1	0	1	0
Medium/high	0	4	4	1
Medium	13	8	21	2
Medium/low	0	1	1	0
Low/medium	1	0	1	0
Low	1	0	1	0

In addressing the WoE D for ‘whether’, two studies of collaborative CPD interventions were recorded as ‘high’ (Anderson, 1992; McCutchen *et al.*, 2002), a further two studies were recorded as ‘medium/high’ (Britt *et al.*, 1993; Zetlin *et al.*, 1998). None of the studies of individually oriented CPD were recorded as higher than ‘medium/high’. In addressing the WoE D for ‘how’, one study of a collaborative CPD intervention was recorded as ‘high’ (McCutchen *et al.*, 2002). Three studies of collaborative CPD were rated as ‘medium/high’ (Britt *et al.*, 1993; Jacobsen, 2001; Zetlin *et al.*, 1998) as was one study of individually oriented CPD (Ross, 1994). Overall the majority of studies were recorded as ‘medium’.

Of the 17 studies that met the inclusion criteria for the in-depth review and were data extracted, two studies were judged to have low/medium WoE A (Pedroza *et al.*, 1998; Schmitz, 1994). This WoE judgement related to whether the ‘study findings could be trusted in answering the study questions’ (referring to the researchers’ own study, rather than our review question). A further study was judged to have low WoE in relation to its relevance to the review question (WoE C) due to negligible student impact data (Sandholtz, 2001). As a consequence, the three studies were included in the in-depth review, but were removed from the synthesis (N = 14). This is a similar situation to the first review where two studies were data extracted but not included in the synthesis.

4.4 Synthesis of evidence

Once data extraction had been completed and WoE assessed, we synthesised information from the included studies using reports and cross tabulations generated by EPPI-Reviewer software, and by cutting and pasting additional details about the interventions into tables. Since the first two reviews are intended to build cumulative evidence about collaborative, individually oriented and sustained CPD and its impact on teaching and learning, the synthesis used the patterns established from the findings from the first CPD review (see below) and applied these to those studies identified in the second review to test for similarities and differences in the current review.

We also looked for more precise evidence about the nature of the collaboration in the collaborative studies and for evidence about the distinctive characteristics of more individually oriented CPD.

4.4.1 Summary of synthesis of findings from the first review

For a detailed report of the findings and synthesis of the review on collaborative CPD, see Cordingley *et al.* (2003) Overall, the first review found that collaborative CPD was linked with improvements in both teaching and learning.

Teacher outcomes

Changes in teacher behaviours included greater confidence, enhanced beliefs amongst teachers of their power to make a difference to their pupils' learning (self-efficacy), the development of enthusiasm for collaborative working, (notwithstanding initial anxieties about being observed and receiving feedback), a greater commitment to changing practice and a willingness to try new things.

There were initial periods of relative discomfort in trying out new approaches; things often got worse before they got better. Collaboration was important in sustaining change. Time for discussion, planning and feedback, and access to suitable resources were a common concern in many of the studies. Collaborative CPD was embedded in many studies in the development of collaborative practice such as joint planning and team teaching.

In the first review the focus of the interventions was broadly related to:

- developing teachers' knowledge, understanding or skills (often in relation to a specific curriculum area)
- developing teachers' beliefs, behaviours and/or attitudes, usually aimed at increasing dynamic learning and teaching exchanges with pupils

Pupil outcomes

In the first review, the positive outcomes for pupils concentrated on measured improvements in pupil performance or specifically assessed learning approaches, including:

- demonstrable enhancement of pupil motivation
- improvements in performance, such as improved test results, greater ability in decoding and enhanced reading fluency

- more positive responses to specific subjects
- better organisation of work
- increased sophistication in response to questions
- development of a wider range of learning activities in class and strategies for pupils

There were some unanticipated pupil outcomes reported in relation to changes in attitudes and beliefs, including increased satisfaction with their work, enhanced motivation, increased confidence and increasingly active participation. There was some evidence that, where CPD aimed to increase collaborative working amongst pupils, the collaboration amongst teacher participants acted as a model.

CPD processes

Disappointingly, if understandably, given the complexity of the variables involved, studies in the first review tended to report in detail on either the outcomes or the CPD processes, rarely both. Nonetheless there were sufficient data from the synthesis across the studies to enable us to identify a number of core features of the CPD which were linked, in combination, to positive outcomes including:

- the use of external expertise linked to school-based activity
- observation
- feedback (usually based on observation)
- an emphasis on peer support rather than leadership by supervisors
- scope for teacher participants to identify their own CPD focus
- processes to encourage, extend and structure professional dialogue
- processes for sustaining the CPD over time to enable teachers to embed the practices in their own classroom settings
- recognition of individual teachers' starting points

Eleven studies report specific arrangements for enabling teacher time to be dedicated to sustained development, for example, by providing negotiated non-contact time, including collaborative lesson planning within workshops and team teaching. There is also evidence in many studies on how the interventions were designed to take account of what teachers knew and could do already.

Interesting, but less widespread, findings about processes in the first review include the following:

- Action research was used as the vehicle for CPD in five of the studies.
- Research literature was used as a springboard for dialogue/ experimentation in six of the studies.
- Providing paid or negotiated non-contract time for participating teachers was a feature in five studies.
- Explicit and self-conscious modelling within CPD of the learning support/facilitation practices that the programme aimed to enable amongst pupils featured in three studies.

4.4.2 Second review: synthesis of findings

Individually oriented and collaborative CPD

At the outset of the review, we determined that we would define collaborative CPD as studies of CPD that made specific and explicit arrangements for collaboration as a learning strategy. Our definition of non-collaborative (individually oriented) CPD focused upon studies of CPD where there were no explicit plans for collaboration between teacher participants and/or no activities explicitly designed to support/sustain such collaboration. The review found significantly fewer studies of CPD that was individually oriented (N = 26 in the systematic map). Proportionately fewer still (only three) met the criterion requiring pupil impact data, which meant that only three studies of individually oriented CPD were included in the synthesis. Of the 14 collaborative studies included in data extraction in the second review, two were excluded from synthesis on account of low WoE assessments and one was excluded through the weak quality student impact data.

Due to the tiny cluster of individually oriented studies, detailed comparisons between the two groups of studies would not have been productive. We decided that it would be most useful to compare the overall findings of the two reviews and to set any distinctions in that context. We therefore also decided to present the findings from the second review in similar clusters to those we used for the synthesis in the first review so that we could make any observations about their similarities and differences. In all categories, we have included the individually oriented studies, but reported on them separately.

4.4.2.1 Aims and outcomes of the studies in the second review

AIMS: STUDIES OF INDIVIDUALLY ORIENTED CPD

Of the three individually oriented studies in the synthesis, one specifically aimed to measure the effects of the CPD on clearly identified teaching and learning foci:

- Mink and Fraser (2002) looked at the effects of using SMILE (teaching mathematics through children's literature) on the classroom environment and *pupil attitudes* towards reading, writing and mathematics.

Two were aimed at more generic outcomes:

- Ross (1994) explored the impact of co-operative learning techniques on *pupil attitudes*, coupled with the effects of the CPD on experienced teachers' general and self-efficacy.
- Shechtman and Or (1996) examined affective educational intervention aimed at challenging *teacher beliefs* about democracy and influencing pupil *behaviour* in the context of classroom diversity and mainstreaming.

OUTCOMES: STUDIES OF INDIVIDUALLY ORIENTED CPD

Pupil outcomes: Two of the three individually oriented studies found some positive evidence of impact as a result of the CPD intervention. This was focused on behaviours and attitudes rather than learning outcomes. None of the studies attempted to measure gains in pupil achievement as a result of the attitudinal and behaviour changes they found. In the case of one study (Ross, 1994), the programme had only a 'modest' impact on pupils' attitudes. This was ascribed by

the author, both on the basis of the experience of the programme and of the research literature to the lack of opportunities for collaboration amongst the teachers in trying out the strategies together in their classrooms.

Teacher outcomes: While Mink and Fraser (2002) and Shechtman and Or (1996) found some evidence of changes in teachers' practice and beliefs respectively, Ross (1994) found only minimal impact on teacher efficacy, either personal or general.

AIMS: STUDIES OF COLLABORATIVE CPD

CPD Models and programmes: Of the 11 studies of collaborative CPD in the synthesis, 10 set out to examine the effectiveness of the development programmes explored by the research. Although most were also aiming to improve specific or generic areas of teaching and learning, they were focused on the delivery and implementation of the CPD as a means to those ends. For example:

- Boudah *et al.* (2003) tested the effects of the Authentic Professional Development (APD) model on teacher implementation and perceived pupil performance.
- Jacobsen (2001) examined the professional development methods of the Galileo programme.
- Lin (2002) used the 5E model of CPD to investigate the factors which influenced teacher change.
- Appalachia (1994) measured the effectiveness of the QUILT CPD programme.
- Shapiro *et al.* (1999) compared an intensive experiential in-service programme with the same programme combined with on-site consultative follow-up from staff and compared both these with no training.
- Fine and Kossak (2002) explored professional learning conversations using rubrics within cognitive peer coaching.

Possibly as a result of this strong focus on models of CPD (in the first review five studies out of the 17 explicitly set out to test particular models of CPD), there was more overall detail in the data-extracted reports about the processes and activities involved in the interventions. These are detailed later in this section.

CPD focus: Like the studies in the first review, the CPD was explored within three broad aspects of change and improvement:

- CPD aimed at developing specific instructional strategies.
- developing teachers' knowledge, understanding or skills (often in relation to a specific curriculum area)
- developing teachers' beliefs, behaviours and/or attitudes targeted usually at increasing dynamic learning and teaching exchanges with pupils

The following studies explored the impact of specific instructional strategies:

- Anderson (1992) looked at collaborative transactional strategies for both teachers and pupils for helping severely reading-delayed adolescents.
- Appalachia (1994) explored the development of the use of classroom questioning techniques by teachers and their effects on pupil learning.
- Boudah *et al.* (2003) focused on the use of the unit organiser routine as a teaching strategy.

- Martin *et al.* (2001) compared the effects of systematic cognitive strategy instruction across a sample of deaf learners from two countries.
- McCutcheon (2002) examined the impact on teaching and learning of introducing specific pedagogic strategies to promote literacy instruction and learning.
- Shapiro *et al.* (1999) examined the acquisition and application of specific strategies for EBD inclusion by school personnel and the impact on EBD pupils.
- Fine and Kossak (2002) wanted to explore reading and comprehension strategies in the context of how teachers can renew knowledge and perfect practice.

The following studies involved CPD which aimed to develop teachers' knowledge, understanding or skills (often in relation to a specific curriculum area):

- Britt *et al.* (1993) examined the application of teachers' knowledge, skills and understanding across a range of mathematical areas through a two-year CPD programme in mathematics on changes in teachers' classroom strategies across a range of mathematical areas and on changes in pupil performance and attitude.
- Jacobsen's (2001) focus was on supporting teachers to take up effective technology integration and exploring the impact on pupil learning when teachers learn to take advantage of technology for their teaching tasks.
- Lin (2002) focused on elementary science teachers' classroom teaching and improving pupil learning.

Two studies aimed to develop teachers' beliefs, behaviours and/or attitudes:

- Boudah *et al.* (2003) set out to investigate the impact of the CPD on teacher performance and 'satisfaction'.
- Zetlin *et al.* (1998) investigated whether a comprehensive and collegial approach to professional development would result in increased adoption of teaching practices and behaviours which enhance literacy development in ESL pupils.

Of note in comparison with the first review was the number of studies where the CPD had a cross-curricular focus (N = 5). In the first review, there was only one cross-curricular study. This may also be attributable to the greater number of studies which were testing models of CPD in the second review.

OUTCOMES: STUDIES OF COLLABORATIVE CPD

Pupil outcomes: Ten of the eleven collaborative studies were reported to have found some evidence of improvement in pupil learning, accompanied in seven cases by positive changes in either pupil behaviour or their attitudes or both. This is consistent with the patterns of impact in the first review. One of the ten (Lin, 2002) referred to a number of measures (observation, checklist, discussion, journal writing and worksheets) to monitor student achievement, attention, involvement or understanding during the trial. However the extent of any changes is not clear from the report. One study (Shapiro *et al.*, 1999) found strong (statistically significant) evidence of changes in pupil behaviour in relation to self-management, but weak (i.e. not statistically significant) evidence about changes in other behavioural strategies such as co-operative learning and peer tutoring.

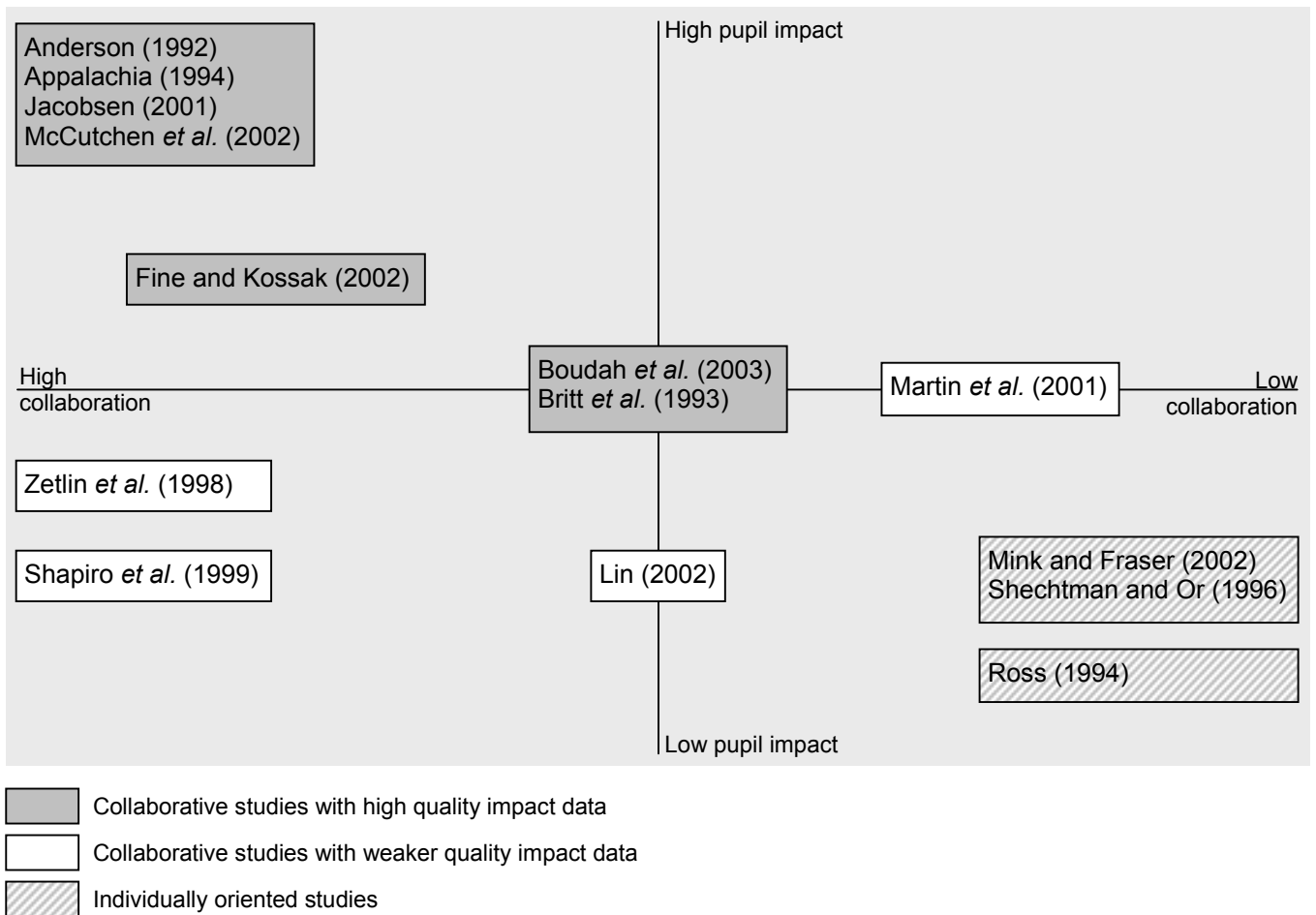
Teacher outcomes: As in the first review, there is evidence (in six studies) that changes in teachers' classroom behaviours were accompanied by changes in attitude to their professional development. One study (Boudah *et al.*, 2003) found that teachers were supportive of their engagement as active learners in the real-world environment of the classroom, addressing actual instructional issues. Fine and Kossak (2002) found that teachers experienced a 'growth of trust in peer assessment' (p 34). Similarly, there is some evidence (Fine and Kossak, 2002; Lin, 2002; Zetlin *et al.*, 1998) that teachers experienced initial difficulties in opening up their practice to their peers. However, Fine and Kossak (2002), for example, report that teachers 'were able to learn more once the barriers were down' (p 34). Teachers in Jacobsen's (2001) study enjoyed 'a sense of renewal about their professional careers' (p 14). Zetlin *et al.* (1998) found that teachers emphasised the increase in collegial interaction and formation of peer teams 'specifically the development of relationships with other teachers who provided support for their change efforts' (p 13).

OVERALL OUTCOME IN RELATION TO WHETHER COLLABORATIVE AND SUSTAINED CPD AND INDIVIDUALLY ORIENTED AND SUSTAINED CPD AFFECTED TEACHING AND LEARNING

Despite the small number of individually oriented studies, we have included them in the synthesis using a graduated scale of collaboration. This helped us to analyse in more detail the extent of the collaboration within the collaborative studies and to begin to understand the broad spectrum of collaborative activities in the studies. For the purposes of the synthesis, we have created a spectrum between two benchmark positions – 'high' collaboration and 'low' collaboration – to illustrate the degree of collaboration of the CPD in each study in relation to its impact on teaching and learning (see below). High collaboration, for example, starts with CPD involving group workshops, teachers working together, in school, on the actual activity; planning together, observing and coaching one another. In the middle of the spectrum, CPD involved lesser levels of collaboration and consisted, for example, of initial small-group working followed by regular, off-site opportunities for discussion and sharing experiences with a tutor. At the lower end of the spectrum, the CPD involved initial and ongoing study by teachers in group settings and on a one-to-one basis with tutors but with no plans for structuring settings in groups for collaboration as a learning strategy.

The scale indicating pupil impact starts with independently measured positive change in pupil attainment, achievement, attitudes, behaviour or skills specifically related to the goal of the CPD. Lower pupil impact means that the changes were assessed only by self-report from the teachers or pupils, or related only to a single, affective, aspect of change such as pupil attitude. For example, in one study of individually oriented CPD, the pupil impact data related solely to pupils' perceptions about their experiences of inclusion and not to the impact of this on their motivation to learn, their self-esteem or their attainment.

Fig 4.1: Overview of collaboration and impact outcomes



For definitions of collaboration, refer to section 1.2.

We have produced this heuristic simply to gain an overview of the comparative outcomes of the individually oriented and the collaborative studies. However, it is interesting just to note that all three of the studies of individually oriented CPD cluster in the bottom right-hand corner. While studies of individually oriented CPD would by definition have been on the right-hand side of the diagram, they may have been either above or below the horizontal line. Two of these (Mink and Fraser, 2002; Shechtman and Or, 1996) have been categorised as medium-low on pupil impact in terms of our framework because they each focused on one aspect of pupil change: pupil attitudes and pupil behaviour respectively. The collaborative studies which appear below the midline on impact are there on account of the relative weakness of their impact data, not because they have strong evidence of weak impact. One collaborative study (Martin *et al.*, 2001) appears on the low side of the collaborative midline because the collaboration was considerably less extensive than that involved in the rest of the collaborative studies.

Compared with the collaborative studies, the evidence that individually oriented CPD is an effective vehicle for changing teacher practice is weak because we

simply did not find either enough studies which passed the inclusion criteria or provided enough evidence of impact.

4.4.2.2 CPD processes and characteristics

Part of the intention of this review was to explore in more detail the characteristics of CPD for which there is at least medium evidence of positive teaching and learning outcomes. The themes and clusters below were identified in the first review and were applied to the findings of the studies identified in the second review. Individually oriented and collaborative CPD processes and characteristics are reported separately, except where these do not feature in the individually oriented studies (for example, peer support).

THEMES AND CLUSTERS

The studies included in the synthesis reflect similar patterns to those in the first review of collaborative CPD. We have therefore commented on these in similar clusters as those used for the first review:

- the use of external expertise linked to school-based activity
- observation and reflection
- an emphasis on peer support rather than leadership by supervisors, accommodating the need to recognise individual teachers' starting points, and processes to encourage, extend and structure professional dialogue
- scope for teacher participants to identify their own CPD focus
- processes for sustaining the CPD over time to enable teachers to embed the practices in their own classroom settings (see section 'How long did it last?')

We have indicated where the findings of the first and second review were similar or different.

The use of external expertise linked to school-based activity: All the studies of individually oriented CPD involved inputs from specialists (often the researchers themselves). Mink and Fraser's (2002) study involved five days training over a ten-week period. In Shechtman and Or's (1996) study, external expertise was provided through two college masters courses, and through extensive and formative diagnostic interventions made by the researcher. The courses involved the delivery of a weekly, six-hour programme over the course of a year, conducted by four instructors. Ross's (1994) programme involved the researchers in joint planning with practitioners from an early stage, three two-and-a-half hour plenary sessions, and monthly local two-hour planning meetings in each district for eight months. Despite the extensive inputs from the academics, the CPD did not achieve its aims in relation to teacher efficacy. The author of this study suggests that the absence of collaborative opportunities for the teachers was a weakness in the CPD and could account for the lack of impact. He concludes that 'in-service programs that make greater use of school culture variables, particularly those which simultaneously strengthen collaboration among teachers while introducing new teaching ideas, are more likely to affect teacher efficacy' (p 391).

As in the first review, the extent and nature of the partnerships between 'experts' and teachers in collaborative CPD interventions varied. All the studies initially involved the use of specialist expertise. This ranged from an initial two-week 'instructional institute' to a two-and-a-half day in-service session. This was consistent with the findings in the first review. Specialists used these initial

sessions to introduce teachers to, or immerse them in, the strategies, usually through a combination of instruction, modelling and discussion.

Following these intense initial inputs, some external/expert input was also sustained throughout the life of the intervention in all but one of the collaborative studies (Martin *et al.*, 2001). McCutchen *et al.*'s (2002) initial instructional institute was followed up with regular classroom visits where the researchers observed and discussed teachers' implementation of the teaching strategies and this reflects the pattern across most of the programmes. The researchers shared assessment information about their pupils, and consulted with the teachers from the experimental group about their implementation of the recommended strategies. Specialists also provided three further training sessions over the course of an academic year. In Zetlin *et al.*'s (1998) study, the peer collaboration was supported by ongoing mentoring of the peer teams by the university faculty for a full academic year. Similarly, Shapiro *et al.* (1999) report on a programme involving teams of three peers (general educator, special educator, support professional, such as a school psychologist) plus an outside expert consultant. This study was explicitly designed to produce findings which could offer some evidence about the relative importance of such expertise:

In general, the large majority of districts assigned to the ET-DC [Experiential Training-Delayed Consultation, in contrast to those receiving immediate consultation] conditions were not successful in designing, implementing or evaluating interventions learned through the in-service program without consultative support. Once consultative support was provided the majority of these teams were highly successful. (p 92)

In Jacobsen's (2001) study, the Galileo teachers combined the roles of experts and peer supporters, first modelling the pedagogical methods, then working alongside the teachers who were new to using the methods. The Galileo teachers also led professional conversations to build and extend teachers' understanding of the teaching and learning issues. In this study, the specialist expertise was provided by both the researchers and the specialist peers.

In the majority of studies, observation involved external expertise as well as peer interaction. This is returned to later. As in the first review, there is a link between studies providing good evidence about positive impact and the provision of a mix of teacher to teacher plus expert input and support.

Observation and reflection: Only one of the studies of individually oriented CPD (Mink and Fraser, 2002) involved observing teachers in their classrooms as they attempted to put new knowledge and skills to work. It is not clear whether the observation (by the researchers, who were also the specialists) was used formatively, but the data collected during the observations were subsequently analysed and used to produce qualitative support for the quantitative evidence.

Like the studies in the first review, observation featured in all the collaborative second review studies, although it is unclear in three of the studies whether this was purely for data collection purposes or not. In two of the studies, video was used as the principal means of observation. In ten of the studies, it is evident that the observations were used formatively (followed by feedback and discussion), mostly in combination with data collection. In one study (Martin *et al.*, 2001), the researchers used observation purely for data-collection purposes. Observation

(together with a range of other methods) was the principal means of data collection across the collaborative studies.

An emphasis on peer support: In all the collaborative studies, peer support was a feature of effective CPD. Eight studies, including one of the highly rated studies, are explicit that peer support involved peer observation. This follows the pattern established in the first review which found that peer support is a key ingredient of 13 of the studies where CPD was linked to positive pupil and teacher outcomes.

Since our definition of collaborative CPD specifies collaboration between teachers, but not necessarily teachers in the same schools, two studies were included (Anderson, 1992; Jacobsen, 2001) which used CPD peer support models involving previously trained teachers. In Anderson's (1992) study, some teachers were supported within their own schools and some were supported by teachers from other schools. This led him to hypothesise that there was a direct link between the teacher effects he found and the extent and nature of the peer support teachers enjoyed during the course of the intervention. Three of the nine teachers in the experimental group did not make as good progress as the others. Two of these had little or no contact with their peer-support teachers. The teachers who made the strongest progress were either peer taught by department heads or worked with peer (i.e. previously trained) teachers in their own schools. The variation in teacher behaviours may be partly explained by the extent of peer support they received and whether or not this was in their own schools. For example, Ross (1994) concludes that the *absence* of peer collaboration amongst teachers might have been a weakness in the CPD design which helped to explain the disappointing results.

Scope for teacher participants to identify their own CPD focus: The three individually oriented studies were aimed variously at using SMILE to developing mathematics learning, changing teacher beliefs about democracy and developing teacher efficacy beliefs. The focus of the intervention was determined prior to the start of the CPD and did not allow scope for teachers to focus on a curriculum area or issue of their own selection.

Of the 11 collaborative studies, as in the first review, the majority (N = 7) were carefully constructed to give teachers choice within a broad area of curriculum or pedagogy. At least two of the studies developed explicit conclusions from their findings about the importance of teacher choice. One study, Martin *et al.* (2001), used an evaluation model which did not allow for variations in the forms of the CPD. This study compared the impact of highly structured cognitive strategy instruction training for deaf children on teachers and pupils in the UK and China. Teachers in McCutchen *et al.*'s (2002) study were voluntary participants in the CPD on phonological awareness, which implies that they bought in to the focus from the beginning.

DISCUSSION: CPD PROCESSES AND CHARACTERISTICS

Overall, the findings of the collaborative studies in the second review reinforce and extend those for the first review in relation to the collaborative CPD. They are consistent with those of the first review in relation to the effectiveness of *collaborative CPD* in developing teaching and learning. On the other hand, the studies of *individually oriented CPD*, both in number (only three) and in the relatively low degree of pupil impact offer only weak evidence of their capacity to influence teacher or pupil change. There is also a suggestion – in one of the

individually oriented studies, Ross (1994) – that it was, specifically, the absence of applied peer collaboration in the CPD design which was the critical factor in the failure of the programme to achieve its stated aims. Furthermore, by including the individually oriented studies in our synthesis, we have been able to start exploring the relative degrees of collaboration.

Deciding whether the CPD was collaborative or individually oriented was not straightforward and required several layers of cross-moderation. We now know, from our two reviews so far, that collaboration is linked to effective CPD, but we do not yet have a detailed taxonomy of the nature of effective collaboration. The definition of collaborative, with which the Review Group started out, sought to explore rather than specify detailed characteristics of what activities could be constituted as collaborative or individually oriented. One aim of the synthesis, therefore, is to typify collaboration between teachers as part of CPD programmes as far as possible. We wanted to develop a finer grained understanding of the broad pattern of activities that support collaboration – to identify, for example, where it took place (off-site, within school); what kind of activities were involved, (trying things out,¹ discussion or planning); and in what configurations (paired, group or small-group). The nature of the collaboration in the studies in this review is detailed in Appendix 4.8. The ‘typology’ set out in this synthesis will be further tested and developed during the course of the third review.

We were also interested in exploring further the findings related to cost effectiveness and peer coaching. This generated much interest in the first review. One study in that review suggests that lead teachers and peer coaching represent a less expensive substitute for some inputs traditionally made by external specialists. We wondered whether a comparison of individually oriented CPD and collaborative CPD might show how far collaboration is able to promote an effective, cheaper, more accessible and closer to school alternative to external input. Conversely, we also wondered whether the sustained nature of the individually oriented CPD, supported extensively by external specialists, could in some way ‘substitute’ for the peer support which was evident in the collaborative studies? If this is the case, we hypothesised, one implication of this review might be that peer support is a cost-effective means of supporting the development of practice particularly if:

- the processes involved are consistent with those in the first review; and
- the nature of collaboration is more precisely understood.

In the event, we found little evidence that the inputs from the external experts were any less intensive or sustained in the collaborative than the individually oriented CPD. Conversely, individually oriented CPD was reported in the studies as being rather less successful. It may well be that the less successful individually oriented CPD involved specialists in making more extensive inputs in order to replicate the beliefs discussed in the collaborative CPD for peer support. As it is, we do not have enough studies of individually oriented CPD to make such comparisons about the relative external inputs meaningful. On the evidence from the collaborative studies alone, as in the first review, it appears to be a

¹ One new way of categorising collaboration, which emerged from the literature discussed by Ross (1994) and from the study itself, is in terms of whether it is application-based or discursive/reflective. He suggests that collaboration is more effective when it is focused on teachers collaboratively trying out the strategies rather than just talking about their experiences of them; and when this is accompanied by peer support and feedback.

combination of external expertise and peer support which delivers the desired outcomes of the collaborative CPD.

WHAT DISTINGUISHES INDIVIDUALLY ORIENTED AND COLLABORATIVE CPD?

Our protocol specified that collaboration meant two or more teachers working together. Opportunities for collaboration also had to be designed in to the CPD as a learning strategy. Identifying whether programmes were individually oriented or collaborative was not always easy. Sometimes there was insufficient detail in the paper; sometimes the teacher participants negotiated a change in the design.

One (high WoE) study (McCutchen *et al.*, 2002) illustrates the difficulties of deciding whether, in terms of our definition, the CPD was collaborative or individually oriented. The researchers explicitly state that they recognise the difficulty of sustaining teacher change when teachers work in isolation: 'we gave preference in the experimental condition to schools from which we had a team of teachers – either multiple classroom teachers or classroom teachers and their primary special education colleagues' (p 73). In the event, '18 of the 24 experimental group teachers worked with at least one colleague...who had attended the institute with them and they reported frequent interactions with their colleagues' (p 74). The CPD programme also began with an intensive two-week residential workshop for all participants. Clearly the programme involved a high degree of collaboration, although to what extent this was a 'natural' process and to what extent it was explicitly promoted by the researchers was difficult to discern. Our eventual conclusion was to assign this to the collaborative group since the majority of participants were involved in collaborative learning by design.

In one of the studies of individually oriented CPD (Ross, 1994), the results of an elaborately-crafted, research-based, eight-month CPD intervention, which aimed at increasing both general and personal teacher efficacy, showed only modest impact on pupils. The intervention also fell short of its aims because, although general teacher efficacy increased, personal efficacy did not. The authors conclude that the absence of opportunities for application activities and for feedback on those activities was a major weakness of the implementation design. They cite Little (1984) who found that in-service programmes were more successful when they used workshop time for application activities rather than discussion, and Yeany and Padilla (1986), who reviewed 24 studies of the effects of science in-service and found that programmes that arranged for peer or supervisory feedback were three times as effective as those which did not. They also refer to other research which has found that reciprocal feedback among teachers has a substantial impact on implementation.

Both the principal studies referred to were outside the scope of this review, which looked only at studies published after 1990. However, Ross's study has usefully underlined the importance of extending our understanding of the nature of effective collaboration by beginning to develop a typology of characteristics.

4.4.2.3 Nature of the collaboration (collaborative CPD studies only)

We wanted to explore the nature of collaboration in CPD more closely than we had been able to do in the first review and we intend to pursue this exploration in the third review. As an initial framework, we identified a number of further facets of collaboration which appeared to us from the evidence in the data-extracted studies to be worthy of closer exploration. We used these to ask the following questions of the collaborative studies:

- Was the collaboration between teachers and between teachers and experts off-site or in the teachers' own classrooms?
- Did the collaboration involve experimenting with and adapting/improving different teaching approaches or was it purely reflective/discursive, or a combination of both?
- How long did it last?
- Did it involve groups of teachers, pairs of teachers or other combinations?
- Was it voluntary?

OFF-SITE OR CLASSROOM BASED?

It was interesting to note that nine of the collaborative studies in this review associated with positive teaching and learning outcomes involved CPD activities which took place either exclusively in the teachers' own classrooms or in combination with off-site meetings or in-service sessions. In one study (Fine and Kossak, 2002), the mix was unclear. In another (Britt *et al.*, 1993), where there was medium pupil impact, all the meetings between teachers over the two years of the project took place off-site, although researcher observation and feedback was classroom-based. In the individually oriented studies, two of the CPD programmes (Ross, 1994; Shechtman and Or, 1996) took place off-site and it is unclear from the descriptions in the third (Mink and Fraser, 2002) the extent of off-site and within-school activities.

It appears that CPD based in the learning teachers' classroom may be linked to positive pupil and teacher outcomes. We propose to test this further in the third review in relation to teacher-only outcomes.

EXPERIMENTAL, REFLECTIVE OR BOTH?

In seven studies, including the high WoE study, the collaboration involved experimenting with new approaches. That is, teachers collaborated in trying out the strategies to which they had been introduced and discussing their progress. In one study (McCutchen *et al.*, 2002), it is not clear whether teachers were actively collaborating in the classroom but they did share lesson plans and teach lessons developed by other teachers in the experimental group. In another (Zetlin *et al.*, 1998), peer support operated on each of five school sites. Weekly meetings provided a forum for discussion and teachers worked in pairs with ongoing university support – which often took the form of observation and feedback and demonstration lessons.

In all the collaborative studies, peer support was a feature of the effective CPD. Only two of the studies were specifically characterised in the data extractions as action-research based. The majority of the collaborative studies were focused on collaborative activities that involved: experimenting with new approaches; supporting teachers in building on what's known; refining approaches; and reflecting on evidence of impact and refining their plans in the light of this – that is, the collaborative CPD might well be described in other words. While different studies and programmes used different labels to describe the form of 'peer support' and development, the activities were very similar. We have tended to use the term peer support but we are anxious that this should be seen as encompassing sustained, structured activity. We have avoided the terms 'coaching' and 'research' for now on account of the strength of debate that exists around particular forms of coaching, and the complex arguments about the importance of publication that surround action research.

HOW LONG DID IT LAST?

All the studies had to involve CPD which was sustained over at least one term. This was based on our experience of the first review where a term was the minimum length of time for interventions where pupil impact was assessed. The individually oriented studies ranged from 10 weeks to one year; the collaborative studies ranged from one term/semester to two years. Processes for sustaining the CPD over time to enable teachers to embed the practices in their own classroom settings include dedicated time for observation and reflection, and regular seminars and workshops to enable discussion and reflection on progress.

We could find no clear links between the length of time for which the CPD was sustained *beyond* one term and the degree of impact in relation to teaching and learning. More time than one term spent on the intervention did not necessarily mean more impact. For example, Britt *et al.*'s (1993) collaborative study of a two-year intervention had only moderate impact in terms of outcomes. Hence there appears to be tentative evidence that, while the CPD needs to be sustained over time, it may be that particular aspects of the collaboration between the participating teachers, including the quality of time spent within the term, are critical in terms of the degree of impact on teaching and learning. This could relate to any one or combination of the range of characteristics identified in both reviews and which we will explore further in the third review.

GROUPS, PAIRS OR OTHER COMBINATIONS?

In six of the collaborative studies, teachers worked in pairs, although there were also opportunities for group discussion and reflection. In one study (Shapiro *et al.*, 1999), peers were grouped into teams of three: general educator, special educator and a support professional (e.g. school psychologist). There may be some tentative evidence here that paired or small group work may be a more effective model of collaboration than larger discussion groups. It may be possible to explore this further in the third review.

WAS IT VOLUNTARY?

In all but two of the collaborative studies, teachers were voluntary participants in the collaboration. In the large scale QUILT project (Appalachia, 1994), involving 1,178 teachers from 42 schools in 13 districts, participation was mandatory. The study found that the experimental group, where peers coached each other over a year (compared with two other groups which received initial training but no peer support) changed their practice significantly with demonstrable improvements in pupil learning. The researchers suggest that the 'long term opportunities for demonstration, practice and feedback' were the key to changing their 'deeply entrenched behaviours' (p 13). Hence, although the majority of participation was voluntary, it appears that effective collaboration was a powerful means of developing subsequent buy-in for teachers. This certainly emerged as a phenomenon in those studies in the first review that involved an element of compulsion.

Of course, some of these factors may be confounded. Without closer analysis and comparison of CPDs with and without these factors, it is difficult to ascertain which factors make the impact and how much of it. We propose to develop this further in the third review.

Summary of findings about the nature of collaboration

The findings from the second review broadly confirm and strengthen the conclusions drawn from the findings in the first review about the capacity of sustained and collaborative CPD to develop teacher knowledge, skills, attitudes and behaviours and improve pupil learning. There is now therefore a significantly greater body of evidence about the effectiveness of sustained and collaborative CPD in relation to positive teaching and learning outcomes. We also know that the evidence for the impact of individually oriented CPD is much weaker. This relates both to the relative paucity of individually oriented studies, compared with collaborative studies and to their relatively modest impact.

The contribution to the CPD of external experts and specialist expertise coupled with peer support were the principal features of effective CPD in the second review. We have also begun to develop some conclusions from the initial findings about the nature of collaboration which have led us to some tentative propositions which will be further tested in the third review. These are as follows:

- Within school, classroom-rooted CPD may be more effective than off-site CPD, even if the latter involves teachers working together.
- Collaboration between teachers, which is focused around active experimentation, may be more effective in changing practice than reflection and discussion about existing practice.
- Collaboration may be an effective vehicle for securing teacher commitment and ownership of CPD in cases where it is not possible for the teachers to select a CPD focus of their choice.
- Paired or small group collaboration may have a greater impact on CPD outcomes than larger groups.

Based on what we found in the first review, we defined 'sustained' to mean a minimum of one term/semester or 12 weeks, although we subsequently included a study of 10 weeks duration because 12 weeks or more did not always equate to a term or a semester. We did not specify a minimum time in the first review where we excluded 'one-off' or one-day training but we found no studies where the CPD was linked to positive impact on teaching and learning which took less than a term. For this reason, we specified a minimum of a term in the second review. However, we found no evidence in either review that a longer elapsed time than this is linked with greater impact on changing practice and influencing pupil learning. On the other hand, we have found *some* evidence that the nature of the collaboration may be more important in achieving the desired outcomes of the CPD than extending the timeframe beyond this one term minimum. We will return to this issue in more detail in the third review when we will look, in particular, at the amount of time spent within the programme and the relative distance to be travelled by participants in the timeframe in so far as the evidence allows this.

4.5 In-depth review: quality-assurance results

Following initial moderation of the data-extracted studies, most differences between reviewers (including EPPI-Centre reviewers) were of a relatively straightforward nature and easy to resolve. The most common occurrence was when reviewers selected 'no' based on their judgement, as opposed to 'not stated' or 'implicit'. This was especially relevant in the review-specific, data-extraction questions. There were occasional differences in judgement between reviewers,

for example, when assigning the WoE. There were often differences between reviewers about the outcomes of the intervention and reconciling these decisions with the reconciled keywords which also recorded the intervention outcomes. This was related to the number of options it was possible to select. As with the quality assurance for the keywording, all the differences were reconciled by discussion, involving a third person where necessary. When decisions had been reconciled, the details supplied by the different reviewers were combined thereby producing the final data extraction for each study. For consistency purposes, CUREE staff cross-checked particular aspects of the data extraction and keywording to ensure that the information was correct across all parts of the process, and made changes in agreement with the reviewers as required. The reviewers then agreed that the collated version was an accurate representation of their discussion before it was uploaded.

4.6 Nature of actual involvement of users in the review and its impact

As it was in the first review, involving users (defined in section 2.1) in the complex and time-consuming data-extraction process was problematic as well as beneficial. Teacher participation at this level is expensive and all training has to be duplicated and expenses met. We were unable to tap fully into the expertise of those practitioners who had assisted in the first review due to time constraints and the commitment which they were able and willing to give to the project. Other teachers felt that the detailed review processes were complex and time-consuming and we were unable to maintain high levels of hands-on participation throughout the review.

The Review Group agreed that it would be beneficial for teacher practitioners to be involved in the initial and final stages of a review, but that data extraction might be too difficult in terms of time and the nature of understanding statistical terms and techniques. But, because we recognised the importance of a user perspective in the in-depth section of the review, we used CUREE staff who had been recently practising primary and secondary teachers, or had experience in other education-related fields, to assist in the data extraction. We also had the help of our first review Chair, Janet Sturgis, a retired and occasional supply teacher, with recent research experience. This served to ensure that we had practitioner perspectives on the project at all times. In addition, members of the Review and Advisory Groups – including teachers, ex-teachers, ITT practitioners, policy-makers, academics and representatives of large teacher organisations (GTC and NUT) – contributed to the progress of the review at regular Review and Advisory Group meetings. As in the first review, the combination of the practitioner perspective, information scientists and experienced academic researchers, including the EPPI-Centre support staff, contributed to the balance and rigour of the review process as they all brought different viewpoints, skills and experience to the table.

5. FINDINGS AND IMPLICATIONS

5.1 Summary of principal findings

5.1.1 Identification of studies

Methods of identifying studies for the systematic map and in-depth review comprised the following:

- a systematic search of the literature, using electronic databases, handsearching key journals, word-of-mouth recommendations, citations, reviewing studies which had not met criteria 1 (focus on collaborative CPD) in the first review and by searching on pre-identified websites
- the application of a set of initial inclusion criteria to the titles and abstracts retrieved (often on-screen)
- the retrieval of full reports, to which the criteria were reapplied to see if they were suitable for inclusion in the systematic mapping stage of the review
- keywording all the included reports, using EPPI-Centre core keywords (such as type of study, type of setting, age, curriculum focus) and review-specific keywords (such as CPD process and intervention, type and outcomes)
- the application of a second, narrower set of inclusion criteria to the keyworded reports, to ensure that only studies which contained data about the impact of the CPD on students and which demonstrated reliability and validity and provided details of the CPD processes were retained for in-depth review
- the data extraction of the studies which met the Stage 2 criteria, using the EPPI-Centre software
- using EPPI-Centre software to extract data from the studies and to assess the weight of evidence they provided for answering the review-specific question

5.1.2 Mapping of all included studies

The application of the Stage 1 inclusion criteria to the studies retrieved targeted those which appeared to contain enough contextual and methodological data to be a source of potential evidence for our review question. For the second review, we sifted systematically 5,505 titles and abstracts, reviewed 223 full studies, identified 81 studies as relevant to the review and keyworded them in order to create a systematic map of the literature. As this review extends the first review (in terms of collaborative CPD), it is worth noting that for the first review we sifted 13,479 titles and abstracts, reviewed 266 full studies and identified 72 studies (further to those identified in the second review) for the systematic map.

5.1.3 Nature of studies selected for in-depth review

At Stage 2, we narrowed the focus further by restricting the review to studies of CPD activities that explicitly set out to investigate impact upon teaching and learning processes, that detailed the CPD processes and that included attempts to establish reliability and validity. When in doubt, the decision was made to include rather than exclude studies. Seventeen studies met the second set of

inclusion criteria and went forward to be data extracted. The majority of studies reviewed in-depth came from the USA. The educational settings in which the studies took place were predominately primary (N = 13, of which ten were studies of collaborative CPD and three were studies of individually oriented CPD) and the next most frequent was secondary (N = 9, of which eight were studies of collaborative CPD and one was a study of individually oriented CPD). Many of the studies in the in-depth review took place in more than one educational setting (N = 10). In terms of curriculum context of studies in the in-depth review, cross-curricular studies featured the most strongly (N = 5, of which one was a study of individually oriented CPD and four were collaborative CPD studies), with literacy – first languages the next most common (N = 3, all collaborative CPD studies), followed by mathematics (two, of which one was a study of collaborative CPD and one other was a study of individually oriented CPD).

5.1.4 Synthesis of findings from studies in in-depth review

The findings from the second review broadly confirm and strengthen the conclusions drawn from the findings in the first review about the capacity of sustained and collaborative CPD to change teacher knowledge, skills, attitudes and behaviours, and improve pupil learning. There is now a significantly greater body of evidence about the effectiveness of sustained and collaborative CPD in relation to positive teaching and learning outcomes. We know too that the evidence about individually oriented CPD is much weaker. This relates both to the relative paucity of individually oriented studies and to their relatively modest impact.

Outcomes

Pupils

Two of the three individual studies found some evidence of modest impact as a result of the CPD intervention. This was focused on behaviours and attitudes rather than learning outcomes. None of the three studies attempted to measure gains in pupil achievement as a result of the attitudinal and behaviour changes they found. Ten of the eleven collaborative studies are reported to have found some evidence of improvement in pupil learning, accompanied in seven cases by positive changes in either pupil behaviour or their attitudes or both. This is consistent with the patterns of impact in the first review.

Teachers

While two individually-oriented studies found some evidence of changes in teachers' practice and beliefs, one found minimal impact on teacher efficacy, either personal or general. All the collaborative studies found links between the CPD and changes in teacher practice, attitudes or beliefs. As in the first review, there is evidence (in six studies) that changes in teachers' classroom behaviours were accompanied by positive changes in attitude to their professional development.

CPD processes and characteristics

The studies included in the synthesis focused on CPD interventions which displayed similar patterns of activity to those in the first review of collaborative CPD:

- the use of external expertise linked to school-based activity
- observation and reflection (often based on observation)
- an emphasis on peer support, acknowledging individual teachers' starting points and factoring in processes to encourage, extend and structure professional dialogue
- scope for teacher participants to identify their own CPD focus
- processes for sustaining the CPD over time to enable teachers to embed the practices in their own classroom settings (see the section 'Findings about the nature of collaboration')

The use of external expertise linked to school-based activity

All three studies of individually oriented CPD involved inputs from specialists (the researchers themselves). In collaborative studies, the extent and nature of the partnerships between 'experts' and teachers varied. All the studies involved the use of specialist expertise initially. This ranged from an initial two-week 'instructional institute' to a two-and-a-half day in-service session. Following these intense initial inputs, the external/expert input was also sustained throughout the life of the intervention in all but one of the collaborative studies. We found little evidence that the inputs from the external experts were any less intensive or sustained in the collaborative than the individually oriented CPD. However, we do not have enough studies of individually oriented CPD to make comparisons about the relative detailed external inputs meaningful. On the evidence from the collaborative studies alone, as in the first review, it appears to be a combination of external expertise and peer support which is an important element in delivering the desired outcomes of the collaborative CPD. However, in the absence of a detailed comparison of the individual interventions, it is not possible to assess the relative weight of any of these characteristics in isolation.

Observation and reflection

Only one of the studies of individually oriented CPD involved observing teachers in their classrooms as they attempted to put new knowledge and skills to work. Like the studies in the first review, observation featured in all the collaborative second review studies. In ten of the studies, it was evident that the observations were used formatively (followed by feedback and discussion), mostly in combination with data collection. In one study, the researchers used observation purely for data-collection purposes.

An emphasis on peer support

In all the collaborative studies, peer support was a feature of the effective CPD and, in seven of these, peer collaboration was the principal vehicle for professional development. Eight studies, including one of the high WoE studies,

were explicit that peer support involved peer observation. This follows the pattern established in the first review.

Scope for teacher participants to identify their own CPD focus

The three individual studies were aimed variously at using SMILE (Science and Math Integrated with Literary Experiences) to develop mathematics learning, change teacher beliefs about democracy and develop teacher efficacy beliefs. Hence the precise focus of the intervention was determined prior to the start of the CPD which did not allow scope for teachers to focus on a curriculum area or issue of their own selection. Of the 11 collaborative studies, as in the first review, the majority (seven) were constructed to give teachers choice within a broad range of frameworks.

Findings about the nature of collaboration

The contribution to the CPD of external experts and specialist expertise coupled with peer support were the principal features of effective CPD in the second review. Observation featured in one of the individually oriented studies and in all the collaborative studies, and reflection was often based on observation. We have also begun to develop some conclusions from the initial findings about the nature of collaboration which have led us to some tentative propositions which will be further tested in the third review. These are as follows:

- Within school, classroom-based CPD may be more effective than off-site CPD, even if the latter involves teachers working together.
- Collaboration between teachers, which is focused around active experimentation, may be more effective in changing practice than reflection and discussion about practice.
- Collaboration may be an effective vehicle for securing teacher commitment and ownership of CPD in cases where it is not possible for the teachers to select a CPD focus of their choice.
- Paired or small group collaboration may have a greater impact on CPD outcomes than larger groups.

Based on the evidence from the first review, we defined 'sustained' to mean a minimum of one term/semester or 12 weeks (although we subsequently included a study of 10 weeks duration because 12 weeks or more did not always equate to a term or a semester). It seems from the studies we have included in both reviews that this was the minimum time over which the studies were conducted. However, we found no evidence in either review that longer time than this is linked with greater impact on changing practice and influencing pupil learning. On the other hand, we have found *some* evidence that the nature of the collaboration may be more important in achieving the desired outcomes of the CPD than extending the timeframe beyond this one term minimum.

5.2 Strengths and limitations of this systematic review

Strengths

A strength of this review, as with the first review, is the involvement of a number of user groups in setting and refining the questions, and interpreting and disseminating the findings. It is a systematic review involving comprehensive searching.

The CPD Review Group believes that it can build on both the findings and experiences of the first and second systematic reviews. In particular:

- We are at a stage where we can move towards developing a taxonomy of collaboration, making this meaningful and applicable to practitioners and policy-makers.
- The reviews provide the basis from which to continue to unpack the specific processes involved in the CPD intervention and identify those which appear to influence change in teacher practice.
- Due to the significant number of studies which did not pass the criterion of having student impact data, we now intend to look at studies with robust teacher impact data only (i.e. no student data) as the basis for the third review.
- We are interested in the effect and influence which external and specialist expertise brings to design and impact of CPD processes.

Limitations

We were conscious throughout of the limitations of the data provided in the studies we retrieved in regard to answering our review question. None of the studies was designed to answer our review question directly. In particular, we noted:

- a varying amount of detail about the sample in some of the studies, with some reviewers noting that they would have liked to have been given more detail about the sample background(s) in order to make the connections between contexts
- a lack of detail, and in some cases, clarity, of the different aims and foci of the studies
- with the overwhelming majority of studies being conducted in the USA, an uncertainty about whether the findings could also apply in other countries
- the possibility of additional fruitful data in a number of PhDs and other studies not retrieved within our timescale, containing unexplored data
- a lack of detail, in some cases, about the CPD processes
- a lack of discussion, in some studies, of the effect on the evidence of using the researchers as part of the CPD intervention
- the small number of studies included in the in-depth analysis, of which a number were small-scale projects

5.3 Implications

5.3.1 Policy

The Review Group consulted different policy stakeholders in the UK to help identify the main issues highlighted by the review which had implications for policy-makers involved in:

- *school leadership*
- *local and national government*
- *supporting teacher professional development*
- *professional and subject representation*

Consultation centred on a seminar where participants' discussions were based on a detailed summary of the review process and findings together with the implications identified from a similar collaboration for the first CPD Review. The Review Group was concerned to recognise that policy-makers themselves were best placed to identify the implications for policy making. Since there are few policy-makers on the Review Group, we have used the points made at the seminar and, as far as possible, the voice of policy-makers to report on the implications for this group.

The organisations represented in this process are as follows:

- Department for Education and Skills (DfES)
- Teacher Training Agency (TTA)
- Qualifications and Curriculum Authority (QCA)
- Centre for British Teachers (CfBT)
- General Teaching Council (GTC)
- Specialist Schools Trust
- National Educational Research Forum (NERF)

Individually oriented CPD

Policy-makers were struck by the following:

- the paucity of the evidence about the impact of individually oriented CPD
- the weak evidence of impact uncovered by studies that did address this type of CPD
- the comparison between this evidence and the strength of evidence about collaborative CPD that has been uncovered

They suggested that policy-makers involved with learning and teaching and/or planning CPD opportunities should encourage and/or require providers and facilitators to consider:

- *whether collaboration or structured peer support can be built into development strategies; or*
- *how to encourage and enable schools and/or teachers to develop collaborative opportunities/structured peer support to complement and help embed the contribution from specialist expertise.*

The focus of professional learning

Policy-makers noted the importance of identifying a focus for professional learning that addresses teachers' concerns about their pupils' learning, and their current interests. They also noted that this was refined and interpreted through peer support, resulting in teacher ownership, whether or not participation was voluntary. The implications of this for policy-makers include a need to:

- *recognise that debates about whether CPD should be voluntary are over-polarised and that ownership can emerge from collaborative interpretation of externally framed needs over time; and*
- *ensure that the diagnostic contribution of performance management to identifying learning needs is introduced in ways that enable teachers to work together to refine and select potential development strategies and contexts. CPD participants also need the capacity to further develop the learning focus in the light of:*
 - *pupils' responses; and*
 - *sustained professional dialogue about both the strategies and pupils' responses.*

Specialist expertise

Consistency was noted between the findings in the first and second reviews about the importance of specialist, external input in relation to:

- an aspect of pedagogy;
- supporting adult learning; and
- working flexibly in response to the imperatives of school life.

Policy-makers were concerned that, where schools have experienced poor specialist support in one or more of these respects, there is a risk that all such support will be dismissed as unreliable or too costly.

There are a number of current policy initiatives that incorporate specialist expertise closely related to this model, including the following:

- the consultant leaders programme – the Primary National Strategy (PNS) and the National College for School Leadership (NCSL)
- the development of the role of Advanced Skills Teachers (ASTs)
- the work of the consultants for the PNS and the Key Stage 3 strategy

The need for specialist input and its relation to peer support is relevant to these and other policy programmes. *The review findings could be used to reinforce and/or refine the forms of support used in such programmes.*

There was concern that schools could find it difficult to identify appropriate external expertise. Specialists in turn may find it difficult to identify cost effective ways of working flexibly with individual schools. The changes in LEA and HEI funding and roles are also thought to be making it more difficult to access and organise such resources and to manage succession planning.

Policy-makers are urged to consider the nature of specialist input needed, the potential sources of such expertise and the ways in which access can be facilitated and sustained.

Accountability

Policy-makers were impressed by the degree of accountability in both this review and the first review that existed between participating teachers in the form of a desire not to let each other down. They were impressed too by the degree to which teachers experienced their professional development as accountability to their students. Current steps to recognise and accredit embedded professional learning of this kind are welcomed. While recognising that the participating teachers were motivated more by improving their practice than by accreditation, there was general recognition among policy-makers that such work should receive appropriate professional recognition within the current English policy climate.

Policy-makers are urged to consider building teachers' reciprocal accountability for professional learning and the links between professional learning and concerns about specific students or groups of students into evaluations of the effectiveness of CPD and systems for recognising and/or accrediting such work.

Time

Policy-makers noted the findings about length of time. Collaborative CPD with a positive impact lasted at least one term but further extensions of the work did not necessarily result in benefits. *The Review Group is therefore urged to explore, in future reviews, how this relates to the scale of the learning goal and the stage of development of participants.*

In the meantime policy-makers and CPD providers working in areas where extended programmes are the norm are encouraged to review progress at the end of a first term to ensure that goals are refined so that they remain sufficiently challenging to justify the cost and opportunity costs of continuation.

The nature of collaboration

Policy-makers were also interested in the additional practical detail about the nature of collaboration and the importance of issues featured in the first and second reviews in relation to the roles of questions, structured dialogue, surfacing beliefs, experimentation, and building shared interpretations.

Policy-makers working across a range of education strategies related to teachers and learning are encouraged to consider how far programmes plan for, provoke and support such dialogue between professional learners on a sustained basis. They should consider using this framework to provide a more detailed scaffolding to the well established 'plan work with evidence and review' cycles. The importance of ensuring that all sustained CPD involves an element of planned experimentation and planned collaboration connected directly to the teachers' own classroom should also be taken into account in designing initiatives targeted at developing learning and teaching.

5.3.2 Practice

For practitioners, we used a different approach to identifying implications. This was partly on account of the practicalities involved and partly because recently retired practitioners had been active in the review process and were involved in

identifying implications. In addition to working with these colleagues, CUREE was involved in a range of consultation exercises and seminars in England relating to CPD during September and October 2004 which enabled the development of a detailed and up-to-date picture of current CPD practice in schools and LEAs. This discussion was used to identify potential hot spots where the review evidence was likely to connect with, or inform, practitioner concerns. Part of the consultations and seminars involved discussion with the participants about the implications from both this review and the first review of CPD. Participants noted that the picture is complex and is often dependent on the organisational and working contexts of the CPD interventions and programmes.

Impact

There is evidence that collaborative CPD of the kinds identified in these research reports is effective in bringing about development in teaching and learning.

CPD co-ordinators: You should consider whether CPD programmes involve regular, structured opportunities for collaboration.

Teachers: You should consider seeking more opportunities to collaborate.

Combined expertise

Combining external expertise with peer support appears to be a successful method of delivering the desired outcomes of collaborative CPD.

Both teachers and CPD co-ordinators: You should consider how you can integrate learning from external specialist expertise with in-school learning.

Collaboration

Peer support is a key feature of effective collaborative CPD and peer collaboration often acts as the principal vehicle for professional development. There is some evidence that lack of collaboration might be a significant factor in CPD programmes that do not have long term impact.

Teachers: If CPD is oriented towards participants as individuals, you may want to maximise your opportunities for peer support by developing partnerships with other teachers and setting time aside for shared planning or talking together about shared experiences. You could also consider how you can follow up individually oriented CPD by acting as a coach for other teachers.

CPD co-ordinators: You may want to consider how best to develop a critical mass of coaching skills amongst school practitioners.

Securing commitment

Collaboration may be an effective vehicle for securing teacher commitment and ownership of CPD where the agenda has been set by others.

Teachers: On those occasions when you are participating in CPD where the agenda is imposed, you could consider taking time with a colleague to interpret the CPD framework and themes explored in the CPD in the context of your own pupils, knowledge and skills. Think too about how you could integrate generic themes with your own concerns. For example, you could explore an emphasis on

assessment in the context of the needs of a specific group of pupils or a specific subject; alternatively, you could take forward CPD activities with a very specific focus, on, for example, improving mathematics through a more generic teaching and learning focus, such as on thinking skills.

Locating CPD in classrooms

CPD based in the learning teachers' classrooms may be linked to positive pupil and teacher outcomes.

CPD co-ordinators: You might consider how to use teachers' classrooms as a base for CPD activities and this might be timetabled so that a range of classes and settings are used. You need to consider building time and other resources into the CPD programme, rather than adding to teachers' existing workload.

Experimentation

Collaboration between teachers, based on active experimentation, may be more effective in changing practice than reflection and discussion about existing practice.

CPD co-ordinators: You could encourage groups of teachers to choose a shared focus for experimentation in their classrooms. In this way, they could offer each other support and reflect together on their experiences, and include colleagues who may not have attended conferences where ideas were first presented.

Peer support/peer coaching

Peer support/peer coaching may be a cost-effective way of extending the reach of external specialists into day to day school life. Coaching is emphasised and supported in many national programmes, such as the primary and Key Stage 3 strategies.

Teachers: You should consider seeking opportunities to participate in peer-coaching programmes to acquire generic coaching skills while at the same time pursuing personal CPD priorities as agreed, for example, through performance management or individual CPD planning.

Pairs and groups

Paired or small group collaboration may have a greater impact on CPD outcomes than larger groups.

Small groups may be able to meet more regularly to reflect on their CPD than a larger group would be able to. Teachers: You could discuss with CPD co-ordinators and/or course providers the possibility of working in smaller groups or pairs when finding yourselves in large groups. You should also consider asking whether you could work with a colleague whenever they are offered CPD opportunities.

CPD co-ordinators: You could consider initially setting up small groups or pairs to undertake the CPD together.

5.3.3 Research

Our priority has been to work on implications for practitioners and policy-makers. The 'implications for research' below were developed following presentation at the British Education Research Association Conference (September 2004) and in consultation with our academic colleagues on the Review Group.

- *Researchers need to report, at least in brief, information about the context and process of the CPD intervention including the sample characteristics, recruitment strategies and details of the methodology.*
- *Research on different forms of CPD is a fertile area of study, more so given the current policy direction and the work within the Strategies in England and the broad international consensus of the importance of collaboration and networking.*
- *Research is needed that looks at individually oriented forms of CPD.*
- *People engaging in research about CPD, who wish their work to be considered in systematic reviews, need to consider ways in which their reporting facilitates or inhibits inclusion in systematic reviews, within their own research models and frameworks.*
- *There is a need for much greater clarity in providing clear titles and abstracts for studies that accurately reflect the content of the papers in order to enable search enquiries to identify relevant materials.*
- *Researchers need to explore the organisational context(s) including, for example, the contribution of school and CPD leaders, when reporting studies of the impact of CPD, in order for others to make connections.*
- *When reporting research, researchers should consider both the CPD processes and outcomes to ensure that practitioners know both whether and how an intervention is effective.*
- *Researchers need to explore the literature about both the pedagogic interventions they are targeting and the literature about CPD in securing an evidence base for their research. We found that most studies tend to include a literature review on only one area rather than both.*
- *Researchers are professional learners too and need to consider working collaboratively with other researchers and with practitioners in schools in terms of designing and implementing the research, and developing a sense of ownership in the research by practitioners.*
- *Journal editors need to consider all these issues when selecting articles for inclusion, while continuing to work within their own frameworks and models.*

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Appendix 1.1: Review and Advisory Group membership

Review Group membership

Philippa Cordingley	CUREE, Chair
John Bangs	NUT Education and Equal Opportunities Secretary
Miranda Bell	CUREE
Hazel Hagger	University of Oxford
Karen Robinson	National Union of Teachers (NUT)
Lesley Saunders	General Teaching Council (GTC)
Richard Stainton	National Union of Teachers (NUT)
Janet Sturgis	National Union of Teachers (NUT)
Sarah Thomason	CUREE

Advisory Group membership

Professor Jill Bourne	University of Southampton
Professor Chris Day	University of Nottingham
Janet Draper	University of Exeter
Richard Harrison	Department for Education and Skills (DfES), CPD Team
Dr Norbert Pachler	Institute of Education, University of London (IoE)
Julie Temperley	National College for School Leadership (NCSL)
Ray Waterhouse	Teacher

EPPI-Centre support

Zoe Garrett
Professor Diana Elbourne
James Thomas

Appendix 2.1: Inclusion and exclusion criteria

This review extends and adds a comparative element (individual CPD) to the first review.

The inclusion and exclusion criteria for the first and second reviews are listed here.

<i>EPPI 1</i>	<i>EPPI 2</i>
Stage 1 criteria	
1 Focus on CPD which involves more than one teacher	Focus on CPD that provides explicit information about whether CPD was designed to facilitate collaboration or to support individual teachers
2 Have set out to measure impact on teaching and/or learning	Have set out to measure impact on teachers and teaching and/or pupils and learning
3 Continue over a period of time	Focus on CPD designed to sustain learning for three months, one term or more
4 Clearly describe the methods of data collection and analysis	Describe the methods of data collection and analysis
5 Have clearly defined learning objectives	Focus on CPD which is designed to meet explicit learning objectives
6 Focus on teachers of pupils aged 5–16	Focus on teachers of the 5–16 age range
7 Have been conducted after 1988	Were published after 1991
8 –	Are written in English
Criteria that were Stage 2 in EPPI 1 but Stage 1 in EPPI 2	
9 Clearly identified learning objectives for teachers	Focus on CPD which is designed to meet explicit learning objectives
10 Clearly stated aims and objectives	Report on the aims and objectives for the research
11 Studies showing how they have used what is known already	Can show how they have used what is known already
Stage 2 criteria	
12 Information either positive or negative about student learning gain	Provide evidence of impact on student learning in addition to the Stage 1 criterion
13 Clear description of methods including approaches to data collection and data analysis	–
14 Clear description of context	Describe the processes of the CPD intervention in some detail including the nature and content of the CPD activities and classroom interventions
15 Evidence of attempts made to establish the reliability and validity of data analysis	Provide attempts made to establish the reliability and validity of data analysis
16 Evidence of impact on teacher practice (i.e. teacher knowledge/behaviours/understanding/skills/attitudes)	–

Appendix 2.2: Search strategy for electronic databases

The following databases were searched for potential studies:

BEI
 CERUK
 ERIC
 Ingenta
 OCLC Firstsearch

CPD

professional development
 teacher research
 continuing professional
 development
 continuing education
 inservice education
 professional education
 teamwork
 knowledge
 learning
 individual development
 reflective practice
 masters degree

Collaborative techniques

collegiality
 collaboration/ive
 coaching
 peer coaching
 networks

Setting

school
 primary school
 secondary school
 curriculum
 middle school
 elementary school
 high school

Format

report
 research

Processes

teach
 learn

People

teacher(s)
 mentors
 science teachers

Searches, which were specifically for collaborative CPD studies, were limited to the years 2001–2003 inclusive. Searches specifically for individual CPD studies and those which could have retrieved studies of both types of CPD were limited to the years 1992–2003 inclusive. Most of our search strings did not concentrate on curriculum. Although we had found from the first review that English or literacy and mathematics and science appeared particularly regularly in retrieved titles, these areas were not specifically searched as they would appear anyway if they were related to CPD.

Updated searches from the first review, plus general searches

Database	Search strategy	Time period of search	No. of hits
BEI	Teacher research	2001–2003	7
BEI	School teachers professional development	2001–2003	2
BEI	Coaching AND primary school teachers	2001–2003	1
BEI	Secondary school teachers AND professional development	2001–2003	17
BEI	Collegiality AND teacher collaboration	2001–2003	0
BEI	Teachers professional development	2001–2003	12
ERIC	Collegiality AND teacher AND collaboration	2001–2003	29
ERIC	Teachers AND collaborative AND professional AND development	2001–2003	170
ERIC	Continuing AND professional AND development AND teachers (Note: not used in the first review - did by mistake)	2001–2003	50
ERIC	Teachers continuing professional development AND continuing education	2001–2003	15
ERIC	Collegiality AND teacher collaboration	2001–2003	29
ERIC	Teachers...collaborative... professional...development (proximity indicators)	2001–2003	2
ERIC	Teachers collaborative professional development	2001–2003	1
ERIC	Mentors AND professional development	2001–2003	166
ERIC	Primary AND school AND teachers AND professional AND development	2001–2003	87
ERIC	Collegiality AND professional development	2001–2003	42
ERIC	Inservice education AND collegiality	2001–2003	0
ERIC	Peer coaching AND teacher research	2001–2003	0
ERIC	Professional education AND science teachers	2001–2003	0
ERIC	Collaborative professional development AND curriculum	2001–2003	2
ERIC	Professional development AND (teacher collaboration OR teamwork)	2001–2003	156
ERIC	Professional development AND secondary school teachers	1992–2003	336
Ingenta	Continuing AND professional AND development AND teachers	1992–2003	43
Ingenta	Professional AND development AND collaborative AND teachers	2001–2003	33
Ingenta	Collaborative professional development AND schools	2001–2003	21
Ingenta	Teachers AND peer coaching	2001–2003	8
Ingenta	Teachers AND mentors	2001–2003	51
Ingenta	Professional AND teachers AND networks	2001–2003	16
Ingenta	Professional AND teachers AND knowledge	1992–2003	242
Ingenta	Professional AND teachers AND learning	1992–2003	255

Search specific for individual studies

Database	Search strategy	Time period of search	No. of hits
BEI	Teacher AND individual development	1992–2003	37
CERUK	Professional development	End year between 1992 and 2003	124
ERIC	Inservice AND teach? AND learn?	1992–2003	2427
ERIC	Teach? AND learn? AND (research OR report) AND (primary school OR middle school OR elementary school OR secondary school OR high school) AND (professional education OR continuing education OR professional continuing education OR professional development)	1992–2003	620
ERIC	Reflective practice AND teachers AND (primary school OR middle school OR elementary school OR secondary school OR high school)	1992–2003	55
ERIC	Professional development AND masters degree	1992–2003	7
ERIC	Masters degree AND teach? AND learn?	1992–2003	20
OCLC Firstsearch	Professional development AND teach? AND school?	1992–2003	422

Sample searches to illustrate search strategy

The following comprises a small representative selection of the 38 searches conducted by the Review Group.

SEARCH 1

ERIC, CIJE & RIE 1990 – June 2004

Searched via Dialog

S1: 78657 records: 3 term(s): Publication year=("2001" OR "2002" OR "2003")

S2: 1843 records: COLLEGIALITY

S3: 2219 records: TEACHER COLLABORATION

S4: 29 records: TEACHER COLLABORATION AND COLLEGIALITY AND 3 term(s): Publication year=("2001" OR "2002" OR "2003")

(DISPLAY)

SEARCH 2

British Education Index 1976 - March 2004

Searched via Dialog

S1: 14961 records: 3 term(s): Publication year=("2001" OR "2002" OR "2003")

S2: 827 records: SECONDARY SCHOOL TEACHERS

S3: 1126 records: PROFESSIONAL DEVELOPMENT

S4: 17 records: PROFESSIONAL DEVELOPMENT AND SECONDARY SCHOOL TEACHERS AND 3 term(s): Publication year=("2001" OR "2002" OR "2003")

(DISPLAY)

SEARCH 3

ERIC, CIJE & RIE 1990 – June 2004

Searched via Dialog

S1: 368168 records: 12 term(s): Publication year=("1992" OR "1993" OR "1994" OR "1995" OR "1996" OR "1997" OR "1998" OR "1999" OR "2000" OR "2001" OR "2002" OR "2003")

S2: 91 records: MASTERS DEGREE

S3: 170523 records: TEACH?

S4: 131778 records: LEARN?

S5: 20 records: LEARN? AND TEACH? AND MASTERS DEGREE AND 12 term(s): Publication year=("1992" OR "1993" OR "1994" OR "1995" OR "1996" OR "1997" OR "1998" OR "1999" OR "2000" OR "2001" OR "2002" OR "2003")

(DISPLAY)

SEARCH 4

Ingenta

Search for: professional AND teachers AND knowledge

In: online articles

Title, keyword and abstract

Year: from 1992 to 2003

Search.

242 titles and abstracts retrieved

(DISPLAY)

Appendix 2.3: Journals handsearched

The following journals were handsearched at the University of Warwick, University of Oxford and the NUT library as they regularly cover CPD research but are not available to search electronically.

British Educational Research Journal	1992–2003
Education Action Research Journal	1993–2003
European Journal of Teacher Education	1992–2003
Harvard Educational Review	1992–2003
Journal of Education for Teaching	1992–2003
Journal of In–Service Education	1992–2003
Journal of Teacher Education	1992–2003
Teacher College Record	1992–2003
Teacher Development: An International Journal of Teachers' Professional Development	1997–2003
Teachers and Teaching: Theory and Practice	1995–2003
Teaching and Teacher Education	1992–2003

Appendix 2.4: EPPI-Centre keyword sheet, including review-specific keywords

V0.9.7 Bibliographic details and/or unique identifier

EPPI CENTRE CPD REVIEW KEYWORD RECORD SHEET AND REVIEW SPECIFIC KEYWORDS													
Title: _____ _____													
Author(s): _____													
Journal: _____													
Date: _____	Volume: _____	Number: _____											
		Pages: _____											
Stage 1 criteria met? Yes <input type="checkbox"/>	No <input type="checkbox"/>	If no, state rejected criteria _____											
Stage 2 criteria met? Yes <input type="checkbox"/>	No <input type="checkbox"/>	If no, state rejected criteria _____											
<p>1. Identification of Report Citation Contact Hand search Unknown Electronic database <i>(please specify)</i></p> <p>2. Status Published In press Unpublished</p> <p>3. Linked Reports Is this report linked to one or more reports in such a way that they also report on the same study? Not linked Linked <i>(please provide bibliographical details and/or unique identifier)</i></p> <p>4. Language <i>(please specify)</i></p> <p>5. In which country/countries was the study carried out?</p>	<p>7. *Curriculum Art Business Studies Citizenship Cross-curricular Design and technology Environment General Geography Hidden History ICT Literacy - first language Literacy - further languages</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr><td>Literature</td></tr> <tr><td>Maths</td></tr> <tr><td>Music</td></tr> <tr><td>PSE</td></tr> <tr><td>Phys. Ed.</td></tr> <tr><td>Religious Ed.</td></tr> <tr><td>Science</td></tr> <tr><td>Vocational</td></tr> <tr><td>Other <i>(please specify)</i></td></tr> <tr><td>.....</td></tr> <tr><td>The material does not focus on curriculum issues</td></tr> </table>	Literature	Maths	Music	PSE	Phys. Ed.	Religious Ed.	Science	Vocational	Other <i>(please specify)</i>	The material does not focus on curriculum issues	<p>8. Programme name <i>(please specify)</i></p> <p>9. What is/are the population focus/foci of the study? Learners* Senior Management Teaching Staff Non-teaching staff Other education practitioners Government Local education authority officers Parents Governors</p>
Literature													
Maths													
Music													
PSE													
Phys. Ed.													
Religious Ed.													
Science													
Vocational													
Other <i>(please specify)</i>													
.....													
The material does not focus on curriculum issues													

<p>12. What is/are the educational setting(s) of the study? Community centre Correctional institution Government department Higher education institution Home Independent school Local education authority Middle school Nursery school Post-compulsory education institution Primary school Pupil referral unit Residential school Secondary school Special needs school Workplace Other educational setting (<i>please specify</i>)</p> <p>.....</p> <p>13. Which type(s) of study does this report describe? A: Description B: Exploration of Relationships C: Evaluation a. Naturally occurring b. Researcher-manipulated* D: Methodology E: Review a. Systematic review b. Other review</p> <p>* 14. To assist with the development of a trials register please state if a researcher-manipulated evaluation is one of the following: Controlled trial (non-randomised) Randomised controlled trial (RCT)</p> <p>**Is the CPD a. Individual (i.e. the CPD was designed to support individual teachers) b. Collaborative (i.e. the CPD was designed to facilitate collaboration)</p> <p>** Refers to Review Specific keywords</p>	<p>**Type(s) of practice/intervention Action learning sets Action research Coaching Collaboration Counselling Curriculum design/development External expertise Internal expertise INSET Lesson analysis Mentoring Modelling Networks Observation Online courses Peer coaching Peer observation Peer support Planning schemes of work Post graduate education Role play Seminar Sharing practice Specialist expertise Study groups Teacher research Team teaching Training Workshops Other (<i>please specify</i>)</p> <p>.....</p> <p>**Outcomes Staff/teacher knowledge Staff/teacher morale Staff/teacher motivation Staff/teacher skills Staff/teacher understanding Student/pupil achievement Student/pupil learning Student/pupil motivation Student/pupil self-esteem Subject knowledge Teacher attitudes Teacher beliefs Teachers Teaching Teaching strategies</p> <p>15. Please state here if keywords have not been applied for any particular category and the reason why (e.g. no information provided in the text)</p> <p>.....</p> <p>.....</p>
<p><small>(NB Do not complete this form without referring to the guidance)</small></p>	
<p>Keyworded by Date</p>	

APPENDIX 2.5: Definitions of CPD review-specific keywords

Type(s) of intervention

Definitions for review specific CPD processes and characteristics

Action learning sets

Use this keyword for an approach to learning in groups (developed by Reg Revans to solve practical problems) based on an assumption that problem holders are the best people to resolve issues they face, that good questions focused on the problem holder's learning will help them do this, that time needs to be shared equally and that a structured process of active listening helps everyone develop skills and solutions.

Coaching

Use this keyword if the intervention involves the provision of structured support and information by colleagues that is focused upon specific aspects of teaching and learning that have been agreed between the coach and coachee. The coach's job is to provide specific information that the coachee would not have access to if working alone, that is geared to agreed learning intentions and that sits within an agreed framework of specialist expertise. Coaching, according to the findings of the first review, also involves providing a working context:

- where mutual professional trust enables colleagues to admit and learn from mistakes;
- that structures and sustains experimenting, and reviewing or refining practice towards goals over time.

Counselling

Use this keyword if the intervention involves advice or support on a personal basis by someone who has been trained to provide that support.

Curriculum design

Use this keyword if the intervention involves planned and detailed arrangement of the component parts of a curriculum.

External expertise

Use this keyword if the intervention involves the use of individuals or groups from outside of the school context to inform professional development activities with specialist knowledge or skills and programmes.

Internal expertise

Use this keyword if the intervention involves the use of specialist knowledge or skills from individuals or groups from inside of the school context to inform professional development activities and programmes.

Lesson analysis

Use this keyword if the intervention involves a reflection by the individual, or group, on the teaching of a lesson, in order to support professional learning.

Mentoring

Use this keyword if the intervention involves the sustained support of a teacher in developing their practice by a more experienced and expert colleague. Usually includes observation and feedback/briefing, providing advice and information about new ideas across a broad spectrum of teaching and learning issues, plus providing learning support.

Modelling

Use this keyword if the intervention involves a process in which behaviours are presented to the participant by another individual to support them in acquiring such characteristics, thereby enabling them to become familiar with the potential of the intervention and to give first-hand experience of active participation.

Networks

Use this keyword for an extended group of people with similar interests or concerns who interact and remain in formal or informal contact for mutual assistance or support.

Online courses

Use this keyword if the intervention involves participation in an electronically supported distance learning programme of activities which can include 'mixed-mode' and/or 'blended' provision.

Peer coaching

Use this keyword if the intervention involves coaching as defined above, undertaken between teachers who agree to develop their professional learning through a mutual process of support and challenge.

Peer support

Use this keyword if the intervention involves the provision of mutual assistance by pairs or groups of teachers involved in professional learning.

Planning schemes of work

Use this keyword where teachers are involved in medium- and long-term development of curriculum materials, learning activities and/or learning objectives. They help schools implement the National Curriculum programmes of study. Schemes of work are made up of units that together cover the programmes of study and non-statutory guidelines for Key Stages 1, 2 and 3 in all subjects except English and mathematics. Each unit sets out learning objectives (which are based on the programme of study), suggests teaching activities to meet these objectives, and defines outcomes of pupils' learning. The units also promote learning across the curriculum.

Postgraduate education

Use this keyword if the intervention involves having received a postgraduate qualification, including qualifications at Honours and Masters level.

Role play

Use this keyword if the intervention involves the type of simulation activities to focus attention on the interaction of people with one another. It emphasises the functions performed by different people under various circumstances.

Sharing practice

Use this keyword if the intervention involves presenting information about practice in order to enable teachers to benefit from someone else's experiences, ideas and resources in a reciprocal manner.

Specialist expertise

Use this keyword for individuals or groups with deep and/or extensive knowledge of a given area, including:

- the aspect of teaching, learning or the curriculum or skills in being explored;
- working on a consultancy basis with teachers; and
- supporting professional learning.

Study groups

Use this keyword if the intervention involves a small group of professionals who work together as learners on a regular basis on a specific topic of interest. The purpose of forming a study group is to cultivate collegiality and expand the knowledge and expertise of the members.

Team teaching

Use this keyword if the intervention involves a system whereby two or more teachers pool their skills, knowledge, etc., jointly to develop, plan and teach combined classes.

Training

Use this keyword if the intervention involves provision of information or materials on specific aspects of teaching/learning.

Appendix 4.1: Features of the studies in the in-depth review

Item	Nature of the CPD	Curriculum	Topic focus/foci of the study	Educational setting(s) of the study	Country/countries in which the study was carried out	Type(s) of study
Anderson (1992)	Collaborative	Literacy – first language	Curriculum Equal opportunities Teacher careers Teaching and learning	Secondary school	Canada	Evaluation: Researcher-manipulated
Appalachia Educational Laboratory (1994)	Collaborative	The material does not focus on curriculum issues	Teacher careers Teaching and learning	Primary school Secondary school Other educational setting Middle school	USA	Evaluation: Researcher-manipulated
Boudah <i>et al.</i> (2003)	Collaborative	Cross-curricular	Curriculum Equal opportunities Teacher careers Teaching and learning	Primary school Secondary school	USA	Evaluation: Researcher-manipulated
Britt <i>et al.</i> (1993)	Collaborative	Mathematics	Curriculum Teacher careers Teaching and learning	Secondary school Other educational setting Intermediate schools (aged 11–12)	New Zealand	Evaluation: Naturally occurring
Fine and Kossak (2002)	Collaborative	Literacy – first language	Curriculum Teacher careers Teaching and learning	Primary school Secondary school	USA	Evaluation: Researcher-manipulated
Jacobsen (2001)	Collaborative	Cross-curricular ICT	Curriculum Teacher careers Teaching and learning	Primary school	Canada	Evaluation: Naturally occurring
Lin (2002)	Collaborative	Science	Classroom management Curriculum Teacher careers Teaching and learning	Primary school	Taiwan	Evaluation: Researcher-manipulated
Martin <i>et al.</i> (2001)	Collaborative	The material does not focus on curriculum issues	Equal opportunities Teacher careers Teaching and learning	Primary school Special needs school	England; China	Evaluation: Researcher-manipulated

Item	Nature of the CPD	Curriculum	Topic focus/foci of the study	Educational setting(s) of the study	Country/countries in which the study was carried out	Type(s) of study
McCutchen <i>et al.</i> (2002)	Collaborative	Literacy – first language	Curriculum Teacher careers Teaching and learning	Higher education institution Independent school Primary school	USA	Evaluation: Researcher-manipulated
Mink and Fraser (2002)	Individual	Mathematics	Curriculum Teacher careers Teaching and learning	Primary school	USA	Evaluation: Naturally occurring
Pedroza <i>et al.</i> (1998)	Collaborative	Cross-curricular	Classroom management Curriculum Equal opportunities Teacher careers Teaching and learning	Secondary school	USA	Evaluation: Naturally occurring
Ross (1994)	Individual	Cross-curricular	Curriculum Teacher careers Teaching and learning	Primary school Secondary school Other educational setting	Canada	Evaluation: Researcher-manipulated
Sandholtz (2001)	Collaborative	General	Curriculum Teacher careers Teaching and learning	Primary school Secondary school	USA	Evaluation: Naturally occurring
Schmitz (1994)	Collaborative	Cross-curricular	Curriculum Teacher careers Teaching and learning	Other educational setting Middle school	USA	Evaluation: Naturally occurring
Shapiro <i>et al.</i> (1999)	Collaborative	The material does not focus on curriculum issues	Classroom management Equal opportunities Teacher careers Teaching and learning	Primary school Secondary school	USA	Evaluation: Researcher-manipulated
Shechtman and Or (1996)	Individual	The material does not focus on curriculum issues	Classroom management Equal opportunities Teacher careers Teaching and learning	Higher education institution Primary school	Israel	Evaluation: Researcher-manipulated
Zetlin <i>et al.</i> (1998)	Collaborative	Literacy further languages	Curriculum Equal opportunities Teacher careers Teaching and learning	Primary school	USA	Evaluation: Researcher-manipulated

Appendix 4.2: Use of research literature to inform the studies

Note: Tables are based on edited extracts from the data-extractions on the EPPI-reviewer and are intended to convey a picture of the activities/processes/methods; they are not comprehensive.

Item	Nature of the CPD	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Anderson (1992)	Collaborative	The project was influenced by research on reciprocal teaching (Palinscar and Brown, 1984), strategy explanation (Duffy <i>et al.</i> , 1987), student self-questioning (Wong, 1985), and expert reading strategies (Johnston and Afflerbach, 1985). More directly, however, it grows out of an ongoing research programme on text processing and intentional learning (Bereiter and Scardamalia, 1989).
Appalachia Educational Laboratory (1994)	Collaborative	The paper explicitly lays out the foundations of the QUILT programme including the questioning framework and the CPD framework.
Boudah <i>et al.</i> (2003)	Collaborative	The authors constructed their research on what is known about: <ol style="list-style-type: none"> 1. content enhancement instructional strategies (Boudah, Lenz, Bulgren, Schumake and Deshler) 2. critical barriers to accessing teacher friendly research reports (Fullan, Merriam) 3. poor match between teacher needs and in-service topics and instructional formats (Boudah and Mitchell, Guskey, Joyce and Showers)
Britt <i>et al.</i> (1993)	Collaborative	Four reports published in the 1980s highlighted that Form 3 students performed poorly in four areas of the mathematics curriculum, whereas Form 4 students performed better (International Association for the Evaluation of Educational Achievement (IEA) report and study). Problem-solving as a part of effective mathematics teaching was regarded as important and that change was needed in eight areas of mathematics education (Cockroft and NCTM Agenda for Action). The study was informed by research about problem-solving for improving mathematics learning. The researchers also highlighted research which informed the CPD element of the study.
Fine and Kossak (2002)	Collaborative	This study was informed by research which suggests that interaction is critical to understanding because people understand and remember ideas better when they have to transform those ideas from one form to another. Pearson and Fielding (1980) note that in this process ideas become one's own, rendering them more memorable. Darling-Hammond (1998) suggests that critical elements of instructional strategies can facilitate teacher change and development as well. Cognitive coaching (Costa and Garmston, 1994) has proven a positive process in encouraging such analytical reflection.
Jacobsen (2001)	Collaborative	The study was informed by provincial politics including legislation passed surrounding the study of computer technology and teaching quality standard. It is also influenced by technological and educational reform, and factors that limit technology integration, and provides an overview of approaches to ICT professional development and innovations research. The study is situated in research about the diffusions of innovations (Rogers, 1995).

Item	Nature of the CPD	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Lin (2002)	Collaborative	<p>The study was informed by research into aspects of constructivism, which provided clear directions for teachers. Bybee <i>et al.</i> (1989) propose a teaching format called the 5E model. This model suggests a teaching sequence which is engagement – exploration – explanation – elaboration – evaluation. It provides charts that would help teachers identify their own and students' behaviour that supported or contradicted the various phases of the instructional model (IMPACT, 1994).</p> <p>Theoretical perspectives: Individuals construct their personal knowledge through social interaction and experiences with the physical environment (Tobin <i>et al.</i>, 1993; Tobin and Tippins, 1993). Individuals' existing conceptions influence the meanings that they construct in a given situation, and what is learned results from an interaction between the learner's existing conceptions and the various linguistic and sensory experiences provided. This perspective confers on the learners both the power and responsibility to take control of their own learning (Hewson <i>et al.</i>, 1998)</p>
Martin <i>et al.</i> (2001)	Collaborative	<p>The study builds on previous research studying learning styles and cognitive performance in deaf people. In particular, it draws on the effects of instrumental enrichment as a learner strategy. The study developed from a body of research on deaf learners. The literature review includes early 20th century research which suggests that deaf children have inferior intelligence, through to later research that found that deaf children performed as well as hearing pupils in a variety of tasks. In 1986, one of the authors conducted a study in the USA on the effects of intervention using materials adapted from the Instrumental Enrichment programme for deaf students. The present study, in both its design and its results, provides a replication of this study reported by Martin and Jonas (1986) and extends the research in the area of spatial and reading skills.</p>
McCutchen <i>et al.</i> (2002)	Collaborative	<p>The researcher refers to the evidence indicating that early assessments of phonological awareness are highly predictive of children's later reading and spelling: for example, Bell (1993) and Mann (1993). McCutchen <i>et al.</i> also note that some researchers estimate that literacy difficulties affect as many as 20% of all children in the USA (Lyon, 1995; Shaywitz, Fletcher and Shaywitz, 1994).</p>
Mink and Fraser (2002)	Individual	<p>The authors cite the following literature in terms of programme design and classroom-based research: exemplary teachers using strategies which encourage students to participate actively in learning activities (Fraser and Walberg, 1991); research into learning environments with its long standing tradition of administering established questionnaires to obtain quantitative information on students' perceptions of their classroom learning environment (Fraser 1998b); collection of qualitative information based on observations and interviews and the interpretive techniques suggested by Erikson (1998), Tobin and Fraser (1998); and the application of classroom environment assessments involving using classroom environment dimensions as dependent variables in evaluating educational innovations (Dryden and Fraser, 1998; Maor and Fraser, 1996).</p> <p>The study builds on, and adds to, the small number of recent learning environment studies that focused on the school subject of mathematics (e.g. Goh <i>et al.</i>, 1995; Majeed <i>et al.</i>, 2001).</p>
Pedroza <i>et al.</i> (1998)	Collaborative	<p>The research was influenced by the practitioner-centred action research approach described by King (1995). Participatory research is described as a learning system designed to foster locally applied research and enhance social discourse about school-based issues. The report refers to earlier research, including the over-representation of ethnolinguistically diverse students receiving special education services (Laosa, 1977; Ortiz and Maldonado-Colon, 1986).</p>

Item	Nature of the CPD	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Ross (1994)	Individual	Theoretical: The actual CPD intervention was designed around Bandura's (1977) theory which identifies three sources of information about self-efficacy that might be available to teachers engaged in a professional development programme. Empirical: The study drew on a number of studies including Ross's (1993) review of 64 studies of teacher efficacy; Hoy and Woolfolk's (1990) research with pre-service teachers; Stein and Wang's study, which found that teachers' efficacy beliefs increased in response to an in-service programme; and Beady and Hansell's (1981) cross-sectional studies on the stability of teacher efficacy over time.
Sandholtz (2001)	Collaborative	The study resulted directly from the earlier studies which highlight opportunities and obstacles of technology use in US schools, of which the three common barriers were access, training and support. The study was informed by previous research by NCATE and others about how technology use is acquired and transmitted among teachers. It notes that, even when student teachers learn the latest technology uses in their teacher education programmes, they are unlikely to integrate technology into their own teaching if they fail to observe effective technology practices in the schools.
Schmitz (1994)	Collaborative	In a detailed literature review, the author considers brain-based learning, cognitively guided instruction and social constructivism. She also details curriculum planning approaches and thinking logs. This includes research by Brooks (1987), and Caine and Caine (1990).
Shapiro <i>et al.</i> (1999)	Collaborative	The study draws on a vast body of research into the integration of students identified as having emotional or behavioural disorders (EBD) into general education settings, including Knitzer <i>et al.</i> (1990), Grosenick <i>et al.</i> (1991), IDEA; U.S. Department of Education (1996) and LD; and U.S. Department of Education (1997). The study also draws on literature relating to teaching students with EBD, on their preparedness, need for training, self-perceptions of competence, and knowledge and skills needed. Strategies that have been field-tested and advocated as potential methods for delivering instruction to and integrating learners with diverse needs are also included in the literature review.
Shechtman and Or (1996)	Individual	The author reports that recent research on teacher effectiveness reflects a renewed focus on teacher beliefs (Pajares, 1992) and proposes that beliefs are the best indicator of the decisions individuals make and of their behaviour (Clark and Peterson, 1986; Nespor, 1987; Rokeach, 1968). Research on teacher beliefs indicates that a particular set of beliefs on a specific educational issue is always functionally connected to a more generalised belief system, which is highly meaningful in creating change (Pajares, 1992; Rokeach, 1968). The literature on teacher resistance to mainstreaming clearly indicates barriers that are routed in emotions, such as dissatisfaction with policies imposed on them (Hawthorne, 1986; Myles and Simpson, 1989); sense of inefficacy and fear of failure, in particular with discipline problems and communication with emotionally disturbed children (Center and Ward, 1987); experimenting with new teaching strategies for SEN children, which can be anxiety evoking (Hawthorne, 1986); coping with their own irrational perceptions of an exceptional student (Fabre and Walker, 1987); beliefs surrounded by an emotional aura which influences cognition (Rokeach, 1968); emotional stressors that accompany mainstreaming seem to be largely ignored by policy-makers, who respond to teacher difficulties by the provision of knowledge, skills, and practical assistance rather than attending to their implicit needs and emotional inhibitions (Gans, 1987); and teacher beliefs seldom weakening even through intervention (Brown, 1992; Coates, 1989; Guskey, 1986).
Zetlin <i>et al.</i> (1998)	Collaborative	The report is accompanied by a short literature review that considers approaches to staff CPD, including specifically ongoing collegial support. It also examines teachers' theories and beliefs about student learning, and the creation of collaborations between universities and schools.

Appendix 4.3: Aims, designs and findings of the studies in the in-depth review

Note: Tables are based on edited extracts from the data-extractions on EPPI-Reviewer and are intended to convey a picture of the activities/processes/methods; they are not comprehensive.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Anderson (1992)	A primary purpose of the study was to investigate whether and how changes in teaching that indicated a more transactional teaching atmosphere resulted in related changes in students' performance during reading instruction.	Explicit instruction for a group of experimental teachers and their students was compared with a more conventional instructional approach for a group of control teachers and their students. The study aimed to measure any difference in effect on teachers and students receiving training and peer support to those that didn't receive any intervention. It was not possible to measure the effect of the peer support directly.	Experimental teachers and their students changed substantially from pre- to post-test, while control teachers and students remained stable. – Experimental teachers showed an increase in problem-solving incidents, whereas controls overall showed a loss. – There was a significant increase in student talk, and a decrease in teacher talk. – Increased student participation seemed to increase teachers' tendencies towards overly exuberant praise and repetition of student responses. – Only the reading comprehension subtest showed that significantly more experimental students made gains than the control group. The strongest teachers were peer taught either by heads or by teachers in their own schools. Teachers who were weaker had done substantially fewer sessions than any of the experimental or control teachers due to staffing and time constraints, or had no peer support and little administrative support.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Appalachia Educational Laboratory (1994)	<p>The aims of the QUILT programme are explicitly stated:</p> <p>to promote teachers' use of classroom questioning techniques and procedures that produce higher levels of student learning and thinking</p> <p>The aims of the study are implicit that it seeks to assess the effectiveness of the programme in meeting these goals.</p>	<p>Questionnaire on effective classroom questioning designed to measure knowledge, understanding and application of selected concepts related to effective classroom questioning</p>	<p>Teachers in all three conditions significantly increased their knowledge and understanding of the research base regarding effective classroom questioning, although the effect size for Condition A was greater than for those in Conditions B and C.</p> <p>Condition A teachers showed significant positive changes to their use of these behaviours:</p> <ul style="list-style-type: none"> – decreased the number of questions asked – significantly increased their use of wait time – increased the number of questions posed at cognitive levels above recall – increased the use of one question to more than one student – increased their use of the student designated after question procedure - significantly decreased their repetitions of student responses. <p>Almost 10% more student answers to condition A trained teachers' questions were at a higher cognitive level following the intervention.</p>
Boudah <i>et al.</i> (2003)	<p>The purpose of this project was threefold: to develop and implement a successful alternative in-service professional development model for teachers, to facilitate the use of research-based instructional strategies in classroom practice by using the model, and to measure the impact on teacher performance and satisfaction as well as student academic outcomes.</p>	<p>The experimental group received APD training and the control group received traditional training.</p> <p>The traditional training comprised off-site, one-day staff development, consisting of a description of the instructional strategy and how it can be used, teacher practice with observation, feedback or follow up. All teachers in both groups learned the same SIM (strategies instructional model) procedures– the unit organiser routine.</p>	<p>Most teachers who participated in the APD training implemented the unit organiser routine in which they had been trained, whereas not all teachers who participated in traditional in-service training did so.</p> <p>Overall, student engagement rates and in-class assignments had improved as a result of using the unit organiser routine. Some teachers thought that overall test scores had been affected by use of the strategy. Most responses to the training evaluation questionnaire were positive and supportive of the APD model. Teachers were enthusiastic about the opportunity to observe classroom modelling of unit organiser implementation as a part of the training. The hands-on involvement of the trainer in classrooms was cited most often as an APD model asset. In addition, teachers liked the convenience of participating in the training during the school day and not having the burden of preparing for a substitute teacher.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Britt <i>et al.</i> (1993)	This research project aimed to examine the effectiveness of a teacher development programme in mathematics which took place over a two-year period.	Teachers were encouraged to develop in ways most appropriate to their own needs. Therefore, it would not be meaningful to scale them on a single dimension of change. The researchers used quantitative and qualitative methods to measure: <ul style="list-style-type: none"> – changes in teachers’ methods – changes in teachers’ ideas – changes in teachers’ beliefs – extent to which teachers adopted constructivist practices – rate of student progress as measured by changes in achievement 	Teachers indicated that they had changed their approach to teaching mathematics during the time of the project. They had been using some of the ideas and practices explored in the project in mathematics lessons. <p>Teachers had changed towards a more constructivist approach to teaching mathematics. In particular, they placed greater emphasis on students exploring mathematical ideas amongst themselves and less emphasis on teacher-centred instruction. The results suggest that those most likely to benefit from this project were secondary teachers, and experienced teachers.</p> <p>Overall, the mean attitudes of students in project classes were higher than the means for the attitudes of Form 3 students in the International Association for the Evaluation of Educational Achievement (IEA) sample (original respondents of the questionnaire).</p>
Fine and Kossak (2002)	How can teachers renew their knowledge and perfect their practice on an ongoing basis as they teach into their fifth, tenth, twentieth year? Can professional learning conversations facilitate this renewal? Will using rubrics within cognitive coaching to explore lesson structure, student reaction, and alternative applications capitalise on Pearson’s transformation? Will such discussions about practice move teachers away from surface conversations about strategy to create more deliberate, focused analysis and reflection?	Data were collected as a means of gauging the effect of teaching a variety of strategies and targeted cognitive peer coach on teacher perception of the process and student comprehension.	It would appear that the use of rubric-embedded cognitive coaching can initiate insightful change and professional development in college classrooms. The key appears to be teacher ownership of the process and immediate, practical application of the process in their classrooms. Colleague-to-colleague cognitive coaching using rubrics, encouraging feedback relative to student gains, and guided self-reflection can cause significant change in teachers’ dispositions toward professional development. <p>The combination of teaching a variety of expository text strategies, while repeatedly teaching a single strategy in depth, was linked to significant increases in students’ comprehension and changes in teachers’ attitudes. When professional transformations are made transparent through collegial discussions, Cognitive Peer Coaching with rubrics paired with an objective assessment of the effects of their applications on student performance (DRP), teachers’ beliefs about their empowerment to improve instruction and student performance can be dramatically altered.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Jacobsen (2001)	<p>The investigation aimed:</p> <p>(a) to examine what effective technology integration looks like</p> <p>(b) to find out the extent to which children can be engaged in authentic learning tasks with ICT</p> <p>(c) to explore how professional development can effectively support teachers to integrate technology into teaching and learning</p> <p>(d) to explore the resulting impacts on student learning when teachers take advantage of technology for their teaching tasks</p>	<p>Whether a particular form of CPD was effective in helping to achieve technology integration and whether this integration had an impact on student learning.</p> <p>The work of the Galileo Educational Network was measured, using interviews and observational data, and analysed using the published checklists of 26 indicators of engaged learning and 22 indicators of high technology performance.</p> <p>This framework for measuring effective learning with technology is organised into eight categories of learning and instruction: vision of learning, tasks, assessment, instruction, learning context, grouping, teacher roles, and student roles.</p>	<p>Instead of controlling and dispensing information by using a stand-and-deliver lecture format based on information transfer, the teacher became more of a facilitator, guide and co-learner and co-investigator.</p> <p>Tasks were designed to be authentic and engaging, and built on students' interests, ideas and active questioning rather than dispensed as photocopied sets of present questions for students to fill in.</p> <p>When presented with opportunities to explore and enquire into essential questions and enduring ideas that were meaningful to them, students' work exceeded expectations for level and quality of scholarship. Student engagement was sustained and at higher levels of thinking and reasoning.</p> <p>Teachers implemented both fundamentally different teaching and learning strategies, and also integrated new technologies with the support of the Galileo Network teachers. Many teachers admitted that they would not have pushed themselves and their students as far without the onsite access to sustained professional dialogue, pedagogical and technological support and reassurance of Galileo Network teachers.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Lin (2002)	<p>The purposes of this study were to investigate changes of science teaching and to explore the factors which influenced changes of three first-grade teachers when implementing an in-service project.</p> <p>How can elementary science teachers improve the effectiveness of their teaching and increase student learning of science concepts (using constructivist)?</p>	<p>The researcher sought to explore changes in the teachers' science teaching resulting from the intervention and also factors which influenced these changes.</p> <p>Teaching strategies: Within the 5E instructional sequence, a number of different instructional strategies were used in the three first-grade teachers' classes, with each being matched to the nature of constructivism.</p>	<p>There are three groups of factors that seem to influence teacher development: personal factors, intervention factors and contextual factors. These three factors interact in a complex manner, affecting each other and in turn influencing teacher development.</p> <p>Students found science easier and more enjoyable.</p> <p>In general, the participant teachers showed positive attitudes toward the new approach. In addition, the insights offered by research provided teachers with a rationale for thinking about teaching and learning. It was the first time for the teachers since their initial teacher training that they had looked at practice from a reflective and theoretical stance. The opportunity to be involved in the experiment was valued by all interviewed students and they were able to take a more active role in the construction of the practical experiments.</p>
Martin <i>et al.</i> (2001)	<p>The primary objective of the present investigation was to determine the degree to which the positive effects of cognitive strategy instruction on deaf learners are international or cross cultural, given similar conditions of teacher training, application of methodologies, and application of specific material.</p>	<p>A series of pre-intervention and post-intervention measures were carried out as follows, with experimental and control classes:</p> <ul style="list-style-type: none"> – creative and thinking behaviours – a randomly selected group of five students in each experimental and control classroom taking Raven's Standard Progressive Matrices (1959) test to measure reasoning skills – creative skills tested by a narrative task in problem-solving 	<ul style="list-style-type: none"> – Greater use of critical and creative thinking habits was observed by teachers with a significant difference in favour of the experimental group for the critical thinking problem. – Systematic focus on thinking strategies led to improved reasoning skills. <p>Other effects:</p> <ul style="list-style-type: none"> – Chinese teachers carried out the instruction in a more sequenced and invariant approach than the English, who adapted the activities to specific children and their characteristics. – Teachers in experimental classes in both countries increased their use of higher level questioning in classroom discussions. – Student attentiveness in the classroom increased in both countries. – Experimental students began to use cognitive vocabulary on a regular basis in the classroom and appeared to take others' viewpoints during the discussions more easily than prior to the study. – Students improved their ability to explain a problem in their own words.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
McCutchen <i>et al.</i> (2002)	<p>To help teachers to understand the phonology represented in spelling patterns in English, and to be familiar with ways to help foster the development of their students' phonological awareness and word reading skills. Teachers were then to assess the effect of that knowledge on their classroom practice and their students' learning.</p>	<p>The study aimed to measure teachers' knowledge and beliefs about teaching reading, their knowledge of phonology and orthography, their role in broader literacy instruction, and their general knowledge.</p> <p>Teachers: Codes comprised four broad categories: the knowledge afforded by the instructional activity; the literacy activity in which the class was engaged; textual context; and group context.</p> <p>Students' literacy development in experimental and control classrooms was assessed many times during the school year. Measures of assessment: phonological awareness; ability to analyse spoken words for initial sounds; and orthographic fluency, listening comprehension, word-reading and word-sound/word-spelling.</p>	<p>Teachers' phonological knowledge deepened after instruction and they spent significantly more time on activities directed toward phonological awareness than control group teachers. Experimental group teachers were more explicit than control teachers in some aspects of literacy instruction. Although all teachers spent considerable time on orthographic activities, no significant differences across conditions emerged.</p> <p>Kindergarten</p> <ul style="list-style-type: none"> – Phonological awareness increased in relation to teacher's use of strategies. – The experimental group gained an average 50% more in letter production than children in control classrooms. – Listening comprehension grew, but there was no significant difference in starting point or growth between experimental and control classrooms. – Students in the experimental group did not perform statistically differently in word reading to those in the control group. <p>Year 1</p> <ul style="list-style-type: none"> – Phonological awareness increased 36% on average. – Orthographic fluency: there was no significant effect. – Reading comprehension increased 60% on average. – Reading vocabulary increased 29% on average. – Spelling increased 37% on average. – Composition fluency increased 100% on average.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Mink and Fraser (2002)	<p>The purpose of the study was to determine the extent to which the classroom implementation of project SMILE positively influenced the classroom environment and student attitudes towards reading, writing and mathematics. SMILE is a programme which involves changing the classroom environment and approaching the teaching of mathematics through children's literature.</p>	<p>The study aimed to measure the difference, if any, between students' perceptions of actual and preferred learning environments; also, students' attitudes to reading, writing and mathematics before and after the intervention.</p> <p>Case studies were used to supply qualitative data.</p>	<p>Overall, there was strong support for the effectiveness of the SMILE programme. There were significant differences in students' attitudes and perceptions of classroom environment. Attitudes to writing and mathematics improved. Attitudes towards reading did not show a significant change.</p> <p>Levels of classroom satisfaction that were actually created by the teachers were very similar to the levels preferred by the students, although they felt there was too much friction and competition, and too little cohesiveness. There were no significant associations between classroom environment and attitudes to reading, writing or mathematics. In all, cohesiveness was the strongest predictor of student satisfaction.</p> <p>The case study teacher changed her attitude towards the teaching of reading and writing. She wanted to continue to teach reading and writing through mathematics. She suggested to the principal that all of the teachers take the SMILE programme during the next year. She thought that the SMILE programme had contributed to raising school test scores from a 'C' to 'A', and that the most significant changes were in students' attitudes towards learning mathematics and the classroom environment.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Pedroza <i>et al.</i> (1998)	<p>Teachers at Miller Junior High School aimed to improve learning environments in general education classrooms as a deterrent to academic failure for its predominantly Mexican-American students during the 1995-6 academic year. The study reported on a two-year initiative to change the social arrangement and interactions of special education students and teachers in a predominantly Mexican-American, low-income, seventh-grade campus.</p>	<p>The study measured the following outcomes:</p> <ul style="list-style-type: none"> – changes in referral rates for special education testing and placement – communication of teaching and learning strategies from special education teachers to general teachers – academic performance of special education and non-special education students – time students spent out of the general classroom in support sessions <p>King (1995) also views participatory evaluation as applied social research that involves trained evaluation personnel (or research specialists) and practice-based decision makers working in partnership.</p> <p>Participation evaluation</p>	<ul style="list-style-type: none"> – Referral rates of students to special education decreased by 46% and this continued after the intervention had finished. – Helped by increasing co-teaching opportunities, increasing collaborative planning between the special education consultants and general education teachers, and increasing parent contact the failure rate of special education students, over three years decreased from an average 30% to 10%. – Over the three-year period, 80% of the students had no change in their grades or had improved their grades. This suggested that the learning opportunities of non-special education students had not been adversely affected. – Generally, teachers ‘felt it was appropriate to adjust teaching strategies or to modify instruction’ to facilitate inclusion. – Time spent in support rooms for special educational support was reduced from 15,043 minutes for the 1994-5 period to 2,707 minutes in two years. – During the implementation of the inclusion programme stage, an unintended result was the entry of 21 students receiving special education services for the mathematics section of the state test, for the first time, eight of whom passed. – 73% of the students who took the state test (above) recorded gains on the Texas Learning Index.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Ross (1994)	<p>The purpose of the research reported in this article was to explore the generalizability of the Stein and Wang findings by examining the impact of an in-service programme designed to provide teachers with the knowledge and skill to implement cooperative learning techniques.</p> <p>This study aimed to stimulate teacher efficacy by providing an in-service opportunity for teachers to increase their knowledge and skill of co-operative learning techniques and this reports the outcomes.</p>	<p>Changes in the beliefs of experienced teachers about:</p> <p>(a) self-efficacy (b) general efficacy as a result of the in-service intervention</p> <p>Also to measure any changes in student attitudes which could be attributed to changes in teacher beliefs.</p> <p>Teacher efficacy was described as the extent to which teachers believe they would be able to perform actions that promote learning. This is regarded as a key variable in predicting teacher practice and student outcomes.</p>	<p>Correlations between personal and general teaching efficacy were much higher than those reported in previous studies using the same instrument. Personal and general teaching efficacy scores of experienced teachers in this sample were quite stable. There was a slight increase for personal teaching efficacy over the three time periods. Results suggest that the in-service programme had minimal effect on teacher's confidence in responding to the challenges of restructuring.</p> <p>Evidence showed that teachers who made greater use of in-service knowledge were more likely to change their beliefs about the teachers' ability to help enable schools to overcome the handicaps of the child's home environment, although using the in-service to a greater degree did not change their expectations about their individual effectiveness any more than teachers who made less use of it. No significant relationships between changes in personal and general teaching efficacy were identified.</p> <p>All the comparisons [of student attitudes] were in the expected direction (that is, willingness to seek and give help increased, while sensitivity to the cost of help seeking and help giving decreased). However, only the change in willingness to seek help was statistically significant. This suggests that the teacher in-service programme had only a modest impact on students.</p> <p>Students of teachers who felt more efficacious became more conscious of the cost of giving and seeking help.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Sandholtz (2001)	<p>To discover a deeper understanding of what makes effective CPD programmes to promote subsequent technology use in classrooms through a comparison of two different programmes: one provided by a private computer company and the other by a local education authority.</p> <p>The abstract states, 'The research uses comparative case methodology to examine the teacher development programs of two different organizations: a private computer company and a public school district'.</p> <p>The author states that both programmes would be considered effective in the light of:</p> <ul style="list-style-type: none"> – participants' evaluations of their experiences – participants' gains in skills during the course of the programme – participants' plans for using technology in their classrooms 	<p>The following key features of the two programmes were described and compared:</p> <ul style="list-style-type: none"> – teacher input into design – teacher choice – administrator involvement – situated teacher development – participant collaboration – constructivist environment – flexibility – adequate funding <p>The outcomes of the two programmes were explored and compared in relation to:</p> <ul style="list-style-type: none"> – access to equipment – administrative support – technical support – collegial support – classroom implementation <p>Teachers at district level and in an ACOT grouping</p>	<ul style="list-style-type: none"> – Support from principals improved and they had more reasonable expectations of teachers' use of technology. The greater the degree of risk-taking accepted by principals, the more quickly teachers integrated technology into classroom use. – Lack of technical support in some instances impeded teachers' ability to put what they had learned into practice. – Participants in teams in ACOT Centres helped each other with equipment problems, shared lesson ideas and gave emotional support. These groups developed into countrywide networks. Teachers on the school district programme also formed self-help groups. Informal support became more formal and teachers engaged in peer observation, team-teaching and peer coaching. – When barriers, such as limited access to computers and lack of support were overcome, teachers did make changes to their practice involving technology. – Some students became experts and taught peers across classes. – Some became adept at using hypermedia and multimedia applications, and most teachers reported their students using technology for word-processing, researching on the internet, compiling information and making presentations. <p>The author comes to three main conclusions:</p> <ol style="list-style-type: none"> 1. The quality of teacher learning experiences is just as important as the quality of student learning experiences. Key components include teacher input into the design, participant choice, administrator involvement, situated teacher development, participant collaboration, constructivist environment, flexibility, and adequate funding. 2. Issues of access and ready support directly influence the extent to which teachers use technology in their classrooms. 3. Teacher development programmes offered by private companies can address different audiences and needs.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Schmitz (1994)	The main aim was to find out if staff development in cognitively guided instructional (CGI) theory changes teachers' mental models about teaching and learning.	<p>Outcomes to be measured:</p> <ul style="list-style-type: none"> – change in teachers' attitudes to curriculum integration – the number of cross-curricular units taught – the extent to which the new cross-curricular units were built on students' interests and input – the extent to which cognitively guided instruction techniques were used to integrate the curriculum – change in students' satisfaction – the extent to which students used cognitively-guided strategies 	<ul style="list-style-type: none"> – Five of the six groups increased the number of cross-curricular thematic units they taught from three to eight. – Teachers did not consistently incorporate CGI strategy. Knowledge improved about scaffolding, reciprocal teaching, guided cooperative learning and collaborative problem-solving techniques. Results also revealed that teachers increased their learning about social constructivism strategies which connect to new learning. – On the curriculum integration survey, 11 out of 16 outcomes improved, three remained the same and two were negatively affected over the course of the practicum. Attitudes toward administrative involvement in curricular integration, and parental awareness of curricular integration were judged to have stayed the same. Students were more interested in small group projects while learning, but they worked with the same amount of enthusiasm. Student behaviour also improved and students worked harder when there was no direct interaction with teachers. Teachers also felt that they treated students more as individuals and offered them more praise. – Dichotomous attitudes to cognitive instructional strategies and collaborative thematic teaching decreased after the intervention. – Of 19 teachers, 10 gave evidence of consistently using cognitively guided strategies – Students valued a mixture of lectures and note-taking, hands-on work and problem-solving. There was evidence of students thinking about and articulating their reasoning.

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Shapiro <i>et al.</i> (1999)	<p>The study aimed to measure the impact of an experiential in-service and consultation in facilitating the inclusion of students with emotional or behavioural disorders (EBD) into general education settings.</p> <p>The primary objective of the project was staff development, with secondary outcomes related to individual student change. Only general outcome data related to students is reported. Extensive results relating to staff development are presented.</p>	<p>The study measured the effects of an in-service training programme accompanied by (a) immediate consultation services, (b) delayed consultation services, and (c) a no-intervention control group.</p> <p>The study compared an intensive experiential in-service programme alone with the experiential in-service programme combined with on-site consultative follow-up from staff. These two methods were compared in a quasi-experimental design against a no-training condition.</p>	<p>Substantial increases over time were reported for cooperative learning, peer tutoring and social skills training. Students who experienced the self-management improved their ratings, although the procedure was found less effective when reinforcers were not motivating enough and when teachers did not have sufficient support.</p> <p>Experimental groups showed significant differences in their knowledge of the intervention strategies at post-test in comparison with the control group. Teams felt that self-management, cooperative learning, and problem-solving training was effective. Peer tutoring was considered effective by everyone.</p> <p>Teachers felt that the intervention had changed their attitudes and were more comfortable and less afraid of including students. They had a more positive view of inclusion, and were more willing to try it with EBD students.</p> <p>Follow-up data showed that many students were still included at the same or greater level of inclusion as previously. Districts reported using the interventions with other students and generally rated the intervention as effective or very effective. Transfer to teachers outside the project was reported and many districts also reported using a least one other intervention presented at the in-service training.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Shechtman and Or (1996)	The study measured the impact of an educational intervention aimed at changing teacher beliefs on a generalised beliefs construct regarding democracy vs. authoritarianism, and on teacher beliefs about mainstreaming.	Using a pre-post comparison, the study measured: 1. Teacher beliefs (democratic v authoritarian orientations about mainstreaming) 2. Student achievement and behaviour 3. Impact of the course (which relates to 1 and 2)	<p>The main effect of the intervention was a change in the general belief system. Teachers reduced their level of authoritarianism and adopted democratic values in school-related matters.</p> <p>Significant gains were also found in teacher beliefs on mainstreaming:</p> <ul style="list-style-type: none"> – effect on mainstreamed child – effect on classmates – teacher efficacy <p>Students in classes of experimental teachers showed significant gains in behaviour with regard to four (of six) scales: acting out, destructibility, immaturity, and total score. One gain was observed also for the control group (indestructibility). Only on the immaturity scale was the difference between the groups significant.</p> <p>Teachers' written feedback showed that almost all of them (94%) reported positive changes in their attitudes to students' behavioural difficulties and more efficacy in dealing with emotional problems of the special-need students.</p>

Item	What are the broad aims of the study?	Which variables or concepts, if any, does the study aim to measure or examine?	What are the results of the study as reported by authors?
Zetlin <i>et al.</i> (1998)	<p>The study aimed to investigate whether a comprehensive and collegial approach to professional development would result in changes in teachers' practice and behaviour which enhance literacy development in language minority (ESL) students.</p> <p>Sustaining the training over an extended period was a fundamental aspect of the project.</p>	<p>The study measured teachers' self-perceived changes in teaching practices, and effectiveness and additional qualitative data on the effect on teacher behaviour, impact on student achievement and barriers that impeded professional development.</p>	<p>Three emergent themes were identified: professional behaviour, student performance and barriers to professional development.</p> <p>Professional behaviour:</p> <ul style="list-style-type: none"> – Teachers emphasised the increase in collegial interaction and formation of peer teams. – More time was devoted to individualised reading and writing due to the shift to centre based activities. - There were advances in understanding of learning processes as well as a growing awareness of a variety of approaches and materials for language arts instruction. <p>Student behaviour and learning:</p> <ul style="list-style-type: none"> – Students with few skills, who were significantly behind their peers, benefited from the individual conferencing in writing and reading centres and showed tremendous growth. – Students, who were reluctant to read or write at the start of the year due to very low ability, became enthusiastic in the writing and library centres once they began experiencing success. Teachers found students enjoyed instruction and took responsibility for learning. – Students gained confidence, developed skills for relating to peers, and really blossomed as leaders in the centre-based environment. – Students, who had exhibited behaviours that would have led to retention or referral to special education in the past, thrived in the restructured classrooms. <p>Barriers to progress were identified at district, school, process, and university level.</p>

Appendix 4.4: Details of interventions in the studies in the in-depth review

Note: Tables are based on edited extracts from the data-extractions on the EPPI-Reviewer and are intended to convey a picture of the activities/processes/methods; they are not comprehensive.

Study	Type of interventions
Anderson (1992)	<p>Workshop-based training sessions, teaching videotaped, peer support, self-evaluation workshops. The training module included the following elements and techniques:</p> <ol style="list-style-type: none"> 1. Research involvement 2. Teaching shifts, videotapes and self-evaluation 3. Principles and techniques for fostering active reading 4. Peer support
Appalachia (1994)	<p>Seminars were held every four to five weeks to provide opportunities to: (1) share successes and problems; (2) review-specific content; (3) practise/apply associated skills and behaviours; (4) plan for classroom use; and (5) plan for work with a partner. 'Each collegium has a companion practicum comprised of partnering and individual school use.' Seminars included discussion opportunities to share successes and problems, review specific content, practise and apply specific skills and behaviours, plan classroom use, and plan work with a partner. In addition, a subgroup of the participants from each of the three conditions was randomly sampled to be videotaped to provide further information on their use of, and their students' responses to, the questioning strategies. Peer coaching, observation, peer support, seminars/workshops were also used.</p>
Boudah <i>et al.</i> (2003)	<p>Teachers collaboratively defined instructional problem areas and targeted one strategy for training: the unit organiser routine. They then addressed on-site scheduling and other logistics for the planned training and classroom demonstrations. Next, teachers participated in one-and-a-half to two hours of on-site training and observed the trainer demonstrating implementation of the unit organiser routine in various content-area classrooms with students. They debriefed with the trainer about what they had learned and observed. During the following week or two, teachers planned their own implementation of the unit organiser routine. The trainer then observed teachers practising the use of the instructional strategy in which they had been trained. In after-school meetings, the trainer provided group and individual feedback to teachers about their implementation.</p> <p>After several weeks, teachers met again with the trainer individually and in small groups to share successes, to troubleshoot problems and to create necessary instructional modifications. Additional follow-up meetings were held at the beginning of the following school year.</p>

Study	Type of interventions
Britt <i>et al.</i> (1993)	<p>During each session, there was an opportunity to consider various aspects of classroom teaching activities that project teachers or researchers presented. There were two main components:</p> <ol style="list-style-type: none"> 1. Classroom observations by researchers were fed back to teachers with their notes added so that a summary of the main aspects of their teaching could be written. 2. Group sessions (8 in the first year and 10 in the second) of the project provided a forum for teachers to share their experiences during the project and also for further feedback from the researchers. In the second year of the project, teachers began their personal projects to target the classroom changes they wished to make. There were also two full-day workshops on Cognitively Guided Instruction.
Fine and Kossak (2002)	<p>Simulations, planning and discussions based on the course materials containing rubric questions. The demonstrating 'teacher' specifies what was to be observed and which data or observations were to be collected. During these cognitive coaching simulations, each graduate student rotated through a series of three roles (teacher, coach, and student). They also kept reflective journals and prepared videotapes of their application of the target strategy with their students.</p>
Jacobsen (2001)	<p>Joint planning for the term ahead; however, collaboration was mostly one to one rather than workshops and seminars. The intervention was carried out in classes who:</p> <ol style="list-style-type: none"> 1. worked with teachers, both individually and in teams across all grade levels to plan instruction and to plan demonstrations for the community and the press, and to organise celebrations of student work 2. modelled pedagogical methods with children to enable the teacher to be a participant observer 3. worked with technology support staff in the school and at the district level as advocates and leaders 4. observed and worked alongside teachers, using new methods and discussed the results with them afterwards 5. worked with teachers to design appropriate assessment of student work 6. gathered, organised and shared resources with teachers and students 7. led professional conversations to build and extend teachers' understanding of fundamental teaching and learning issues 8. provided scholarly and intellectual mentorship
Lin (2002)	<p>The CPD began with activities designed to help both the researcher and participant teachers to reflect systematically on their existing practice. The teachers then worked together to generate teaching schemes and trial them in their classes.</p>
Martin <i>et al.</i> (2001)	<p>Teacher cohorts in London and Dalian were involved in cognitive skill training. Training sessions of three hours each day for each cohort occurred over a three-day period for a total of nine hours of teacher training. Training sequences began with a theoretical overview of critical and creative thinking skills, followed by a discussion of some recent theoretical topics in the field, including multiple intelligences, divergent thinking, cognitive modifiability, metacognition, and the role of the teacher as cognitive mediator. The sessions continued with the demonstration of particular critical thinking activities. Activities in the training sessions involved teachers in discussing and solving sample problems, generating classroom activity ideas, working with partners and small groups as well as individually on problem tasks, and reflecting on the metacognitive aspects of their activities.</p>
McCutchen <i>et al.</i> (2002)	<p>The researchers held a two-week training session, involving day-long interactions between teachers and a team of university researchers, which they followed up with classroom observation and three successive training sessions during the academic year of the study. They reconvened for three follow-up sessions to discuss implementation, address emergent issues, and review topics requested by teachers.</p>

Study	Type of interventions
Mink and Fraser (2002)	The teachers attended a five-day training session where the researchers presented the SMILE project. The in-service courses were for a full five days during a 10-week period. At the conclusion of each in-service day, the participants were asked to use the lessons and materials with their students and to return with samples of students' work the following time.
Pedroza <i>et al.</i> (1998)	'Brown bag' seminars were used for sharing strategies. 'Informational sessions' at which all aspects of the process, including establishing and deciding on desired outcomes, were discussed. There was also team teaching.
Ross (1994)	<ol style="list-style-type: none"> 1. Overall planning: In-service activities were jointly planned and delivered by a committee of academics and school practitioners (curriculum consultants for each of the participating school districts), who also served as site leaders. 2. Local planning: Meetings took place in each school district approximately monthly from October to May. These consisted of each group identifying specific issues (such as classroom management or evaluation of group processes) to be investigated by volunteers from the group or by the site leader. At least one teacher presentation describing successful cooperative learning teaching experiences was held in each site session. Documents distributed by teachers at their site meetings were collected. These consisted of shared lesson plans, excerpts from books and journals recommended by teachers, and materials culled from other workshops on cooperative learning. 3. Plenary sessions: Three plenary sessions were held in which teachers discussed teaching and learning strategies in small groups and gave and received feedback from the other participants. Site planning in which participants developed an organisational structure for local planning and developed a schedule to experiment with cooperative learning methods in their own classrooms also took place. Summaries of previous sessions were produced to show similarities among personal learning goals.
Sandholtz (2001)	Involved a range of activities which allowed teachers to observe expert teachers modelling instructional practices and work in classrooms with students. The report did not specifically mention workshops. However, during the practicum and summer institute components of the programmes, participants were observed and worked with teachers who were experienced in the use of technology in classrooms. Ad hoc seminars also took place for dealing with issues that arose on a daily basis.
Schmitz (1994)	The researcher presented 12 in-service modules. Some of the modules involved small group work. For example, in-service teachers were asked to form small groups for the purpose of pursuing an interactive activity on left brain/right brain. Other modules were based on whole group work.
Shapiro <i>et al.</i> (1999)	<p>Intervention strategies teaching</p> <ul style="list-style-type: none"> – Observation – Discussion and sharing practice – Lecture presentation – Videotape demonstration – Discussion and interaction with the presenter and other project staff <p>The two and a half day in-service consisted of both didactic and experiential components. Teams were instructed in four specific intervention strategies: self-management, social skills and problem-solving training, peer tutoring, and cooperative learning. Each training day was divided into two parts: during the morning, the teams were assigned to classrooms where they actively participated and observed teachers implementing the four strategies; teams then met Centennial staff to discuss and share teaching strategies.</p>
Shechtman and Or (1996)	There were no specific workshops or seminars. However, the teachers did receive training via two courses.

Study	Type of interventions
Zetlin <i>et al.</i> (1998)	<p>School and university faculty worked together over a school year to provide primary teachers of language minority students with opportunities (a) to design and implement innovative language-based curriculum and practices, and (b) to advance their knowledge, skills and understanding of teaching and learning in ways that promoted change in instructional practices.</p> <p>There were approximately 10 hours of professional development of awareness of (a) the theories underlying a developmental language arts approach and (b) effective instructional practices for implementation of a comprehensive language arts programme. Teachers were then paired, and researchers met for one to three hours with each of these teams to facilitate and support their classroom reorganisation. Collaborative discussions took place as to benefits/disadvantages of various classroom arrangements.</p> <p>Weekly professional development meetings with a researcher present were held throughout the school year. These meetings had two purposes: (1) for teachers and faculty to observe and discuss new strategies and curricula being implemented, and (2) to resolve problems as they arose. Teachers implemented elements of the programme at their own pace.</p> <p>Aspects of the CPD included:</p> <ul style="list-style-type: none"> – visits to schools where model developmental primary programmes were successfully operating, and participating classrooms were turned into demonstration sites at each school so teachers could alternate weekly meetings to observe and discuss new strategies, curricula and technologies being integrated into their instructional programmes – peer teams being developed as collegial supports to facilitate integrating new knowledge, behaviours, and materials into their daily teaching repertoires and to share knowledge and resources of comprehensive language arts programme with other teachers at their school sites - ongoing mentoring support of peer teams by the university faculty

Appendix 4.5: Methods of data collection

Method	Number
Curriculum-based assessment	6
Focus group	2
Group interview	3
One-to-one interview (face to face or by phone)	9
Observation	14
Self-completion questionnaire	11
Self-completion report or diary	8
Exams	2
Practical test	2
Psychological test	1
Hypothetical scenario including vignettes	1
School/college records (e.g. attendance records, etc.)	1
Secondary data, such as publicly available statistics	2
Other documentation	8

NB These codes are not mutually exclusive: N = 17 studies

Appendix 4.6: Methods of data collection and analysis of studies in the in-depth review

Note: Tables are based on edited extracts from the data-extractions on the EPPI-Reviewer and are intended to convey a picture of the activities/processes/methods; they are not comprehensive.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Anderson (1992)	Curriculum-based assessment Observation Practical test Other documentation	<p>Quantitative analyses of: (a) pre- and post-test teacher and student performance data related to active reading as shown in the videotape transcriptions, (b) pre- and post-test teacher and student verbal participation- as shown in the same transcriptions, and (c) pre- and post- standardised test raw scores.</p> <p>Qualitative analyses were conducted to determine (a) the nature of teacher change over the course of the intervention, (b) the differentiated effects of peer support, and (c) individual differences among experimental teachers.</p> <p>Videotaped session results in which the teacher was the primary unit of analysis. When students were judged, they were judged by group and as a group rather than individually.</p> <p>A rating scale was developed using the teacher and student changes as a base.</p> <p>Two extra analyses were conducted on the data. Each transcribed pre- and post-reading session was divided into teaching incidents. An incident is any discreet problem or question that warranted an interchange between teacher and students that went beyond simply reading the text.</p>
Appalachia Educational Laboratory (1994)	Observation Self-completion questionnaire Other documentation	<ol style="list-style-type: none"> 1. Univariate summary statistics were computed for pre-test, post-test and pre-/post-test results to find effect sizes. 2. General linear model analysis of variance was used as a mixed design with a between subjects factor and a within subjects factor. 3. The first follow-up procedure involved the comparison of pre- and post-test means within each condition. These were compared using directional dependent t-tests with alpha set at 0.05. 4. The second follow-up procedure involved the comparison of post-test means of Condition A with each of the other conditions. These were compared, using directional Dunnett t-tests with alpha set at 0.05. 5. The third follow-up procedure involved the comparison of the pre- and post-change mean of Condition A with each of the other conditions. These were compared, using directional Dunnett t-tests with alpha set at 0.05.

Boudah <i>et al.</i> (2003)	Curriculum-based assessment Observation Self-completion questionnaire Self-completion report or diary	<p>Descriptive and statistical analyses were conducted on various multiple choice (yes-no), and ranking item responses from a questionnaire. Mean implementation rates were analysed for differences between the experimental group and the control group by using analysis of variance (ANOVA) procedures employing the experimental group as the two-level independent factor. Descriptive statistics (frequencies, percentages, frequency ranges) were computed for item responses regarding extent of implementation, characteristics of teacher implementation, interest in further SIM training, and perceived changes in student performance. An independent consultant analysed responses to the Training Evaluation Questionnaire, in stages consistent with the principles of naturalistic unitising and categorising (Lincoln & Guba, 1985).</p> <p>A full listing of all written responses was created. Answers were grouped according to tentative categories or themes and by survey question number. The frequency of responses was tallied within and across the six questions. Through this process, four categories were identified. For each of the six questions, tables were created to reflect the tentative categories or themes and the responses that emerged from the initial analysis.</p> <p>The second phase began with grouping participant response statements in relation to the APD model. The frequencies of positive and negative responses by category or theme were then calculated, regardless of question number. Response percentages were also calculated when meaningful.</p>
Britt <i>et al.</i> (1993)	Curriculum-based assessment One-to-one interview (face to face or by phone) Observation Self-completion questionnaire Self-completion report or diary Secondary data such as publicly available statistics	<p>The researchers brought in an additional researcher to provide an independent analysis.</p> <ul style="list-style-type: none"> – Responses from teachers in the 1981 study using the same questionnaires were used as a comparison for teachers responses in the present study. – Changes in teaching practice were also compared with the experience of the teacher (less than five years, or five and more years of experience) and between intermediate and secondary school teachers. – Items on questionnaires were weighted to give a constructivist behaviour scale and a constructivist behaviour change scale. The same was done to get a constructivist belief scale. – The change for six teachers is explored in relation to the process of change suggested by Claxton and Carr (1991) and the Clarke-Peter (1993) model of professional growth. – Chelsea Diagnostic Tests: Results from English students (1,000 11–15 year olds, 1981) were used as a (suggestive) comparison with progress made by New Zealand students.
Fine and Kossak (2002)	Curriculum-based assessment Self-completion report or diary	<p>Student scores are analysed with ANOVA and Fisher's LSD post-hoc test, although there is no discussion or description given of the processes involved. There is also categorisation of teacher journal entries and comparison of pupil test scores.</p>

Appendix 4.6: Methods of data collection and analysis of studies in the in-depth review

Jacobsen (2001)	One-to-one interview (face to face or by phone) Observation	Observational and interview data were analysed, using published frameworks (North Central Regional Educational Laboratory) of 26 indicators of engaged learning and 22 indicators of high technology performance. This framework for measuring effective learning with technology is organised into eight categories of learning and instruction: vision of learning, tasks, assessment, instruction, learning context, grouping, teacher roles and student roles. Conversations with teachers, administrators and members of the Galileo Educational Network facilitated the development of a shared understanding and language from which to articulate the impact of professional development initiatives on technology adoption and student learning.
Lin (2002)	One to one interview (face to face or by phone) Observation Other documentation <i>Teaching plans were checked.</i>	Implicit: Grounded theory
Martin <i>et al.</i> (2001)	Focus group Observation Self-completion report or diary Psychological test	Explicit: Data were analysed, using a combination of quantitative and qualitative methods across cultures and between experimental and control groups. Observations, Ravens matrices, problem solving analysed using analysis of variance for 1. pre- and post-intervention for the two groups England and China 2. pre- and post-control and experimental for group in England No details of analysis completed for the focus group data can be inferred to be a qualitative thematic analysis. The four charts providing quantitative data indicate that the authors have used descriptive data, with an analysis of variance between pre- and post-intervention, and between control and experimental groups.
McCutchen <i>et al.</i> (2002)	Curriculum-based assessment Group interview Observation Exams	The tests were analysed quantitatively, with charts of the results provided. Qualitative observation data were coded according to pre-set categories.
Mink and Fraser (2002)	One-to-one interview (face to face or by phone) Observation Other documentation including student work samples collected by each teacher	The authors addressed the reliability through Cronbach's alpha reliability coefficient. They note that when item 5 was omitted from the attitude to reading scale, the alpha reliability coefficient rose from 0.51 to 0.64 for the pre-test and 0.42 to 0.60 for the post-test. They report the internal consistency (Cronbach's alpha reliability coefficient) and discriminant validity in table form. The authors explored students' perceptions of their classroom environment in the same class, and from class to class for each MCI scale by performing a one-way ANOVA with class membership as its main effect. Quantitative data were analysed in terms of pre- and post-tests, both for the average item mean and the average item standard deviation. Effect size was also assessed and reported. Qualitative data obtained through interview were recorded and transcribed.

Pedroza <i>et al.</i> (1998)	<p>Curriculum-based assessment One-to-one interview (face to face or by phone) Self-completion questionnaire Exams School/college records (e.g. attendance records, etc.) Other documentation <i>Students helped develop their Individualized Education Plans.</i></p>	<p>The analysis of data involved comparing numbers of students at various stages of the intervention. In some cases, the raw data were converted into percentages. The report did not mention any data-analysis processes.</p>
Ross (1994)	<p>One-to-one interview (face to face or by phone) Observation Self-completion questionnaire Self-completion report or diary Other documentation</p>	<p>- A series of exploratory factor analyses were conducted on the pre-test student attitude items. Student attitude scores for pre- and post-tests were aggregated to the class level and integrated with the teacher data. - Descriptive statistics (means, reliabilities) and correlations were compiled for all variables. - t-tests were conducted to determine if teachers or students differed by school type (elementary versus secondary). - When calculating correlations with other variables, changes in teacher efficacy scores over the duration of the programme were represented as the residual variance remaining from the regression of post-test over pre-test scores. Changes in student attitudes were represented in the same way. - The effect of the in-service on teacher efficacy was determined by observing changes in means across the three test occasions using a repeated measures analysis of variance. The effect on student attitudes was measured with t-tests. All data analyses were run on SPSS software.</p>
Sandholtz (2001)	<p>Group interview One-to-one interview (face to face or by phone) Observation Self-completion questionnaire Self-completion report or diary Other documentation</p>	<p>The report describes the methods as case-study analytic techniques, including pattern-making and explanation-building.</p>
Schmitz (1994)	<p>One-to-one interview (face to face or by phone) Observation Self-completion questionnaire Self-completion report or diary</p>	<p>A qualitative model of educational evaluation was used. Concepts from Eisner's (1985) educational connoisseurship and criticism were used to evaluate the outcomes.</p>

Appendix 4.6: Methods of data collection and analysis of studies in the in-depth review

Shapiro <i>et al.</i> (1999)	<p>Group interview Self-completion questionnaire Practical test Hypothetical scenario including vignettes Other documentation Teams were also recorded discussing the actual cases for which they were designing an intervention</p>	<p>Numerical data are presented for the outcome measures comparing across conditions, and pre- and post-intervention and follow-up. Statistical significant tests, including post hoc analyses, are completed.</p> <ul style="list-style-type: none"> – paired-sample t test – ANOVA with repeated measures – Scheffe post hoc analysis – Likert-like scales
Shechtman and Or (1996)	<p>Observation Self-completion questionnaire</p>	<p>Principal Components Analysis was employed on the composite scale. A pre-post comparison was used to measure the impact of the training programme on general and specific teacher beliefs and on student behaviour. Data analyses were based on aparametric tests due to the limited size of the sample. Wilcoxon tests were used to detect intervention effects reflected in the difference between pre- and post-scores; and a Mann-Whitney test was employed to measure between-group differences.</p>
Zetlin <i>et al.</i> (1998)	<p>Focus group One-to-one interview (face to face or by phone) Observation Self-completion questionnaire Self-completion report or diary</p>	<p>Transcriptions of interviews were coded by the researchers using established content analysis techniques. Observation notes detailing implementation of changed practice were coded and presented in tabular form.</p> <ol style="list-style-type: none"> 1. Quantitative data from pre- and post-tests were analysed and compared with a t-test. Comparison of before and after results of the observational scale were carried, using t-test. 2. Correlations were analysed between teachers' ratings and authors' ratings of teachers' effectiveness (post only) 3. Content analysis of fieldwork notes and interview data: The first and second authors independently worked through the various sources of written data and coded all relevant responses into tentative categories. All data units were then sorted into categories and the two researchers met to compare notes. If there was any disagreement regarding the coding of any data unit, it was discussed until consensus was reached. Subsequent categories are refined until all data fit into the emergent themes.

Appendix 4.7: Weight of evidence (WoE) judgements

Item	What is the nature of the CPD?	WoE A	WoE B	WoE C	WoE D
Anderson (1992)	Collaborative	High trustworthiness	How: Medium Whether: High	How: Medium Whether: High	How: Medium-high Whether: High
Appalachia (1994)	Collaborative	Medium trustworthiness	How: Medium Whether: Medium	How: Medium-high Whether: Medium-high	How: Medium Whether: Medium
Boudah <i>et al.</i> (2003)	Collaborative	Medium trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium
Britt <i>et al.</i> (1993)	Collaborative	Medium trustworthiness	How: Medium-high Whether: Medium-high	How: High Whether: High	How: Medium-high Whether: Medium-high
Fine and Kossak (2002)	Collaborative	Medium trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium
Jacobsen (2001)	Collaborative	Medium trustworthiness	How: Medium-high Whether: Medium-low	How: Medium-high Whether: Medium-low	How: Medium-high Whether: Medium-low
Lin (2002)	Collaborative	Medium trustworthiness	How: Medium Whether: Low	How: Medium Whether: Medium	How: Medium Whether: Medium-low
Martin <i>et al.</i> (2001)	Collaborative	Medium trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium
McCutchen <i>et al.</i> (2002)	Collaborative	High trustworthiness	How: High Whether: High	How: High Whether: High	How: High Whether: High
Mink and Fraser (2002)	Individual	Medium trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium
Pedroza <i>et al.</i> (1998)	Collaborative	Low-medium trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium

Ross (1994)	Individual	Medium trustworthiness	How: High Whether: High	How: Medium-high Whether: Medium-high	How: Medium-high Whether: Medium-high
Sandholtz (2001)	Collaborative	Medium-low trustworthiness	How: Medium Whether: Low	How: Low Whether: Low	How: medium-low Whether: Low
Schmitz (1994)	Collaborative	Low-medium trustworthiness	How: Medium Whether: Low	How: Medium Whether: Medium	How: Medium Whether: Medium-low
Shapiro <i>et al.</i> (1999)	Collaborative	Medium-high trustworthiness	How: Medium Whether: Medium	How: Medium Whether: Medium	How: Medium Whether: Medium
Shechtman and Or (1996)	Individual	Medium trustworthiness	How: Medium-high Whether: Medium-high	How: Medium-low Whether: Medium-low	How: Medium Whether: Medium
Zetlin <i>et al.</i> (1998)	Collaborative	Medium trustworthiness	How: Medium Whether: Medium	How: High Whether: High	How: Medium-high Whether: Medium-high

Appendix 4.8: Nature of the collaboration (collaborative studies only)

Item	Who collaborated? Peers, experts...	Number of people collaborating	For how long?	Location: off-site, in school	Discursive/ reflective?	Included observation?	Voluntary?
Anderson (1992)	Peers: Teachers were assigned a previously trained teacher for peer support.	Pairs	Teaching of reading: 20 ½ hour sessions over three months Training involved three three-hour sessions held at one month intervals.	In the teachers' own schools.	Yes	Yes.	Yes
Appalachia (1994)	Teachers and experts	An entire faculty Pairs	A full year including: three-day induction training, seven 90-minute seminars over a year. Partnering: Seven (or at least six) observations by a peer and followed by feedback	Observation is in own school. Location of collegiums and induction is not specified.	Yes	Yes Peer observation	No Mandatory involvement in the majority of cases
Boudah <i>et al.</i> (2003)	Experts with teachers and building administrators from the same school	Pairs of experts with teachers; also (unspecified) number of teachers within an institution	Three to five weeks at each site, excluding follow-ups	In the teachers' own schools	Yes	Yes – by expert of teachers	–
Britt <i>et al.</i> (1993)	Teachers and experts	18 teachers altogether, in pairs or groups of three teachers	Two full years Project teachers met eight times in 1991 and ten times in 1992.	Observations were in school; meetings were off site.	Yes	Yes	Yes, where schools in the same area expressed interest
Fine and Kossak (2002)	Peers: Teachers enrolled in masters courses. Each graduate student in the experimental group rotated through three roles: teacher, coach and student.	A total of 18 students were involved in the project.	Research period not defined, but several references to a semester	Unclear – at least some in the teachers' own classes	Yes Reflective journals Opportunities for discussion	Yes Teachers were observed teaching colleagues	Unclear The article refers to head teacher consent for the comparison group.

Item	Who collaborated? Peers, experts...	Number of people collaborating	For how long?	Location: off-site, in school	Discursive/ reflective?	Included observation?	Voluntary?
Jacobsen (2001)	Five expert educators from the Galileo Network and teachers	Pairs of experts and individual teachers Also worked with teams of teachers	The Galileo Network worked on site for approximately 80 days in each school.	In school	Yes	Yes Teachers observed, and were observed by Galileo staff.	Yes
Lin (2002)	Three first-grade teachers at the same school, one leader teacher and the researcher P 7: The teachers... '...worked cooperatively to discuss the constructivist theory of learning'.	Five	One year	In school	Yes	Yes The researcher observed and taperecorded all lessons on science topics newly designed by the teachers.	Yes
Martin <i>et al.</i> (2001)	None apart from initial training – see column 5.	None found	Initial training for nine hours over three days. Then teachers used thinking skills activities two to three times per week for 30 minutes each session over a period of six months. Post-study focus groups	Initial training – not stated, but assumed off site Individual teachers used intervention in own classrooms.	–	Yes Teachers in study observed children in their class. No teacher observation	Yes Experienced teachers who expressed an interest
McCutchen <i>et al.</i> (2002)	Teachers	Researchers worked with multiple teachers within a school. Eighteen of the 24 experimental group teachers worked with at least one colleague who had attended the institute with them.	One year Initial training: intensive two-week instructional institute Over the school year: researchers regularly visited classrooms, sharing student assessment information with teachers and consulting them about their implementation of the strategies.	Initial training off site Later work – interactions with colleagues in school	Yes	Yes	Yes Teachers were recruited by letters of invitation.

Item	Who collaborated? Peers, experts...	Number of people collaborating	For how long?	Location: off-site, in school	Discursive/ reflective?	Included observation?	Voluntary?
Sandholtz (2001)	ACOT: Teachers and experts School district programme: Teachers and experts, although the school district's lead teachers were still beginners themselves.	Small groups ACOT: teams of two to four District: teams of lead teachers and new participants	ACOT: Five, one-day practicums during the academic year and/or four-week summer institutes (teachers could attend either or both). Follow-up support continued for one year. District: A longer component in the summer with additional sessions and follow-up over the course of the school year.	Both established their programmes in a context of practice, allowing teachers to work in actual classrooms with students, but not teachers' own classrooms: ACOT sessions were on their own site; in district sessions, in which teachers worked with a student population characteristic of their individual classrooms.	Yes 'Group reflection activities allotted time for participants to think and gave them a safe place to express concerns.'	ACOT: Yes District: Yes	ACOT: Yes District: No mandatory attendance, but teachers could choose which year to take part.
Shapiro <i>et al.</i> (1999)	The three peers from each district made three-person teams: general educator, special educator, support professional (e.g. school psychologist) PLUS expert consultant from outside.	Three plus one OR Three only (control group)	Initial two and a half day in- service (didactic and experiential); plus 6–8 weeks on-site consultative services for up to 15 hours per week from project staff	Initial Inset for all was at an approved private school for pupils with EBD; follow-up consultative support was in their own school.	Yes Lots of opportunity for discussion as well as action	Yes	Limited information on selection Districts were required to self identify a three-person team.

Item	Who collaborated? Peers, experts...	Number of people collaborating	For how long?	Location: off-site, in school	Discursive/ reflective?	Included observation?	Voluntary?
Zetlin <i>et al.</i> (1998)	Schools worked in partnership with a neighbouring university. Peer support teams At the end of the training, interested teachers were paired with a team mate based on the same or sequential grade level and language of instruction.	Numbers vary according to type of collaboration: overall, 25 teachers in five schools with three staff from one university; within a school – pairs of teachers	A full year of university support. This included: providing intensive training and maintaining regular contact with a core group of volunteer primary teachers; establishing teams to serve as peer supports at the school site. Regular weekly meetings took place, rotating between the five participating schools.	Peer support operated on the five school sites. The programme included visits to all of the other school sites for weekly meetings.	Yes	Yes	Yes Principals responded to an initial invitation, then teachers were invited to take part in the project. 25 teachers agreed to take part.