ePPi

The impact of collaborative CPD on classroom teaching and learning

Review: What do teacher impact data tell us about collaborative CPD?

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

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LIST OF ABBREVIATIONS

AERA	American Educational Research Association
AAER	Association for the Advancement of Educational Research
ACER	Australian Council for Educational Research
ANOVA	Analysis of variance
APD	Authentic professional development
BEI	British Education Index
BERA	British Educational Research Association
CAME	Cognitive acceleration in mathematics education
CASE	Cognitive acceleration in science education
CERUK	Current Educational Research in the UK
CGI	Cognitively guided instruction
CLES	Constructivist Learning Environment Survey
CPD	Continuing professional development
CSMS	Concepts of secondary mathematics and science
CUREE	Centre for the Use of Research and Evidence in Education
DfES	Department for Education and Skills
EBD	Emotional or behavioural disorders
EMES	Enhancing mathematics in the elementary school
EPPI-Centre	Evidence for Policy and Practice Information and Co-ordinating Centre, Institute of Education, University of London
ERIC	Educational Resources Information Centre (USA)
FE	Further education
GTC	General Teaching Council
HE	Higher education
HEI	Higher education institution
ICT	Information and communication technology
IEA	International Association for the Evaluation of Educational Achievement
IIA	Integrated instructed approach
INSET	In-service education and training
IoE	Institute of Education, University of London
IMA	Integrated mathematics assessment
ITT	Initial teacher training
LEA	Local education authority
MANCOVA	Multivariate analysis of covariance
MRPA	Mississippi Riverside Performance Assessment
NC	National Curriculum
NCSL	National College for School Leadership
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

PBL	Problem-based learning
PD	Professional development
QUILT	Questioning and understanding to improve learning and thinking
SCRE	Scottish Council for Research in Education
SEN	Special educational needs
SEPAL	Support and Empower your PAL
SSI	Ohio Statewide Systematic Initiative
START	Student Trainers as Resource Technologists
SUPP	Support Programme
TEQ	Training evaluation questionnaire
TRAD	Traditional classrooms
TTA	Teacher Training Agency
UCET	Universities Council for the Education of Teachers
WoE	Weight of evidence

The opinions expressed in this publication are not necessarily those of the EPPI-Centre or the funders. Responsibility for the views expressed remains solely with the authors.

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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 presents the findings of the review and concludes with implications for practitioners and policy-makers.

Background

This review – What do teacher impact data tell us about collaborative CPD? – aimed to test and build upon the first (Cordingley *et al.*, 2003b) and second (Cordingley *et al.*, 2005) CPD reviews and, in doing so, to explore the methodological issues related to studies that evaluate the impact on pupils *and* teachers, as compared with those which only evaluate the impact on teachers.

In the first review, we sought to identify processes involved in collaborative CPD interventions that have a positive impact on teaching and learning. In the second review, we systematically reviewed and synthesised the data from studies of individually oriented CPD, before comparing individually orientated CPD with collaborative CPD. In doing this, the searches for the first review were updated and the findings from the studies of collaborative CPD in the first review were applied to any additional studies of collaborative CPD identified in the second review. This enabled us to refine and build on definitions of collaboration established in the first review and to analyse, in detail, the nature and relative importance of collaboration as there had been a significant growth in both activity and research in this field since the first review. Indeed, in the UK this seems to have been partly as a result of the first review.

The aim of this third review was to identify those studies of collaborative CPD which focused on teachers across the 5–16 age range, but which only provided data about teacher outcomes, to enable us to identify the impact and specific characteristics of teacher-focused studies. In a second stage of the analysis, we compared the processes and outcomes of the CPD described in them with those from the teacher-and-pupil focused studies that were investigated in our first and second reviews. We were interested in reviewing studies that explored teacher impact only to see what additional light they might throw on the first two reviews, in relation to aims, CPD processes, methods and findings.

Aims

In summary, our aim was to systematically review the literature investigating the impact of collaborative CPD that measured teacher-only impact, and then to compare two distinct clusters of CPD – studies that include evidence of the impact of the CPD on teachers and pupils (reviewed in the first and second reviews by this group), and CPD that focused only on teacher impact.

As with the earlier reviews, the Review Group hopes to make some of this evidence available to practitioners in an accessible and meaningful way, to highlight the areas in which further research would make a valuable contribution to CPD strategies, and to enable evidence-informed reflections upon implications with policy-makers.

Definitions

For consistency, we continued to use the definition of CPD we adopted for the first and second reviews:

> 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)

For the purposes of this review, 'collaborative CPD' refers to programmes in which there were specific plans to encourage and enable shared learning and support between *at least two* teacher colleagues on a sustained basis. 'Sustained CPD' refers to programmes that were designed to continue for at least 12 weeks. The review includes those studies of CPD which reported evidence of impact, either positive or negative, on teaching.

Review questions

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

What can we learn from studies of sustained, collaborative CPD which set out to explore the impact on teachers and teaching but do not also consider the impact on pupils in the context of the evidence from previously data-extracted studies of collaborative CPD that consider the impact on both?

(For brevity this is sometimes shortened to: ***What do teacher impact data tell us about collaborative CPD?***)

The evidence of the impact of collaborative CPD from studies that measure both teacher and pupil outcomes is taken from the first two reviews of CPD by this Group (Cordingley *et al.* 2003b, 2005). The studies of collaborative CPD that measure teacher-only impact are identified from the searches of the first two reviews and the data are synthesised in this, the third, review. Comparisons are then made between the two clusters of studies – teacher-and-pupil focused studies and teacher-oriented studies – drawing on the syntheses in the three reviews.

Sub-questions

The first phase of the synthesis for this review (section 4.2.1) synthesises the data from studies that only measure teacher impact relating to the question:

What is the impact of sustained, collaborative CPD on teachers and teaching?

We then go on to look across studies of collaborative CPD from all three reviews and compare the nature of the studies in the two clusters – teacher-and-pupil focused studies and teacher-oriented studies. The comparison is structured around the following sub-questions:

Do the studies of the three different reviews provide evidence about different types of aims for the CPD, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Do the studies of the three different reviews provide evidence about different types of CPD processes and activities, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Do the studies from the three different reviews provide evidence about different types of outcome for the CPD, depending upon whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Finally, we explore whether studies that investigate sustained collaborative CPD use different study designs, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils.

Methods

Identifying, describing and appraising studies

For practical reasons, the review focused on studies published after 1991 that were reported in English, although no geographical limits were set. We wanted to engage both primary and secondary practitioners, so the review includes studies that involved teachers of the 5–16 age group. The studies had to have a focus on teaching and learning, and outline the explicit learning objectives of the CPD.

All the studies included in the third review were identified through the searching and screening processes of the first two reviews (Cordingley *et al*. 2003b, 2005).

The following methods were used to identify studies for the systematic map and in-depth review:

- *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*

- *application of keywords to all the included reports using 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*

- *application of a second, narrower set of inclusion criteria to the keyworded reports to identify studies that did and did not include student data*

- *use of EPPI-Centre data-extraction software to extract data from the studies and to assess the weight of evidence they provided for answering the review-specific question*

- *extraction of data and quality assessment by two people operating independently and then reconciling any difference*

- *use of the evidence from the tables from the data-extraction and quality assessment as the basis for synthesising the studies to answer the review questions*

Results

Mapping of all included studies

During our first and second reviews, we sifted 18,963 titles and abstracts systematically, and reviewed 489 full text studies, 45 of which were identified as meeting the inclusion criteria for the current review and were included in a systematic map of the literature. The 45 studies were made up of 31 studies which contained teacher and student impact data (included in the in-depth reviews of Cordingley *et al*., 2003b, 2005 (N=17 and N=14, respectively)) and 14 studies which had been excluded from the in-depth reviews of the first and second reviews because the study reported teacher-only impact data and did not examine the outcomes of the CPD in relation to students.

Characteristics of all included studies

The majority of the 45 studies in the systematic map came from the USA. The educational settings in which the studies took place were predominately primary (N=29) and secondary (N=24) schools, while some were in covered both. The vast majority of the studies (N=42) focused on teaching and learning. The next most popular focus of all studies was curriculum (N=33), where the subject was likely to be mathematics, literacy (first language) or science.

Weight of evidence (WoE)

Of the 45 studies in the systematic map, 31 had already been reviewed in-depth in earlier reviews (Cordingley *et al*. 2003b, 2005). Therefore the current review involved data-extraction of 14 studies that measured teacher-only data. Of these

14 studies, three were judged to have low weight of evidence (WoE). As a consequence, the three studies were data-extracted, but were not included in the synthesis. Two of the resulting 11 studies were found to have high WoE and the rest were assessed as medium.

Findings and implications

Synthesis of findings

The first stage of the synthesis brings together the findings from the 11 higher WoE studies that only measured teacher outcomes. The syntheses of the studies that measured both teacher-and-pupil outcomes are included in the previous reviews by this group (Cordingley *et al.* 2003b, 2005).

Types of study

In the majority of the studies that collected teacher-only data (7 out of 11) the research aims primarily related to the evaluation of a particular CPD design or approach in the context of a curriculum-based goal. In four cases, the CPD studies were directed mainly at the improvement of a particular aspect of the curriculum or teaching strategies, using the CPD as the vehicle for improvement.

In all cases but one the researchers provide data about the interventions which offered us the opportunity to:

1. identify and report on the CPD processes and activities for this group of studies

2. compare these across the two groups of studies: i.e. those which present teacher impact data (synthesised in the third review) and those which also present student impact data (synthesised in the first and second reviews).

Impact of the CPD in the teacher-only studies

We have categorised all outcomes in two broad clusters: behavioural and affective.

Impact on teacher behaviour:

*   *Teaching:* In all but one of the studies, the teachers involved in the CPD interventions changed or substantially developed aspects of their teaching following the CPD intervention. The remaining study reported how the CPD helped embed professional collaboration among the teachers as an ongoing approach to professional practice, but reports no detailed data about the practical impact of this on teaching behaviours.

*   *Ongoing collaborative working:* The studies all suggest that collaborative CPD processes are linked with a disposition to work and reflect collaboratively with colleagues as an ongoing process, whether or not this is an aim of the CPD.

Affective impact

All the studies report both observable and self-reported enhancement in at least one of the affective aspects of professional learning:

- motivation
- confidence
- attitudes and beliefs

CPD processes and characteristics in the teacher-only data studies

The evidence from this group of studies reinforces the findings about the nature of effective collaborative CPD from our previous CPD reviews. Specifically, the studies provid evidence about the positive benefits of CPD that:

- made use of peer support;

- made explicit use of specialist expertise;

- made explicit mention of involving the teachers in applying and refining new knowledge and skills and experimenting with ways of integrating them in their day-to-day practice (six studies involved action research);

- involved consultation with the teachers, about their own starting points, the focus of the CPD, the pace of the CPD or the scope of the CPD;

- involved teachers observing one another as an integral part of the CPD; and

- involved specialists in observation and reflection (as part of the CPD rather than exclusively focused on data-collection).

Nature of collaboration in the teacher-only data studies

In the second review (Cordingley *et al*., 2005), as well as looking at the impact and characteristics of collaborative CPD, we began to explore the nature of collaboration in more detail and, in the light of the evidence from this review, advanced some tentative hypotheses about the characteristics of effective collaboration. These are as follows:

- Classroom-based activities may be a helpful factor in increasing the effectiveness of the CPD.
- Collaboration between teachers, which is coupled with active experimentation, may be more effective in changing practice than reflection and discussion about practice alone.
- 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.

We applied the hypotheses developed in the second review to the teacher-only data studies synthesised in the third review. Doing so identified the following patterns:

- *Location*: The majority of the interventions took place, wholly or to a significant extent, within the teachers' own schools. In general, this finding is consistent with the proposition that CPD can be effective when it has a significant in-school component.

- *Experimentation versus reflection*: The majority of the studies combined reflection and discussion about practice with active experimentation in classroom practice. This is consistent with the trend towards paired collaboration and with the hypothesis that active experimentation may be an effective means in changing practice.

- *Groupings*: Teachers working in pairs was the most common form of collaboration, although the unit of collaboration was unclear in two of the studies. In some of the larger studies, there were opportunities for collaboration in larger groups as well.

- *Voluntarism*: In all but two of the studies, teachers were voluntary participants in the CPD intervention. However, it seems the affective impact of collaborative CPD, together with the acquisition of new knowledge and understanding, engendered a sense of ownership of the intervention among teachers in all cases.

- *Student orientation*: While we did not explicitly aim, or expect, to find details about student outcomes in this third review, we did expect that teacher perceptions about the impact of the CPD on their students would feature within the teacher data. As this kind of teacher perception data was only sparsely reported, this did not prove to be the case.

In relation to the nature of collaboration, this review adds to our understanding of the nature of effective collaboration to the point where we feel more confident about our four propositions from our second review. In exploring the components of CPD that are linked to positive outcomes, we are noting strong patterns of connection rather than causation. Without further research in which the components are treated as independent variables, causation cannot be established.

How did the teacher studies compare with those reporting pupil data?

In the second phase of the analysis, we compared the nature of the higher WoE studies reporting teacher-only data (N=11 synthesised in the third review) with those providing evidence about impact on students (N=15 synthesised in the first review; N=11 synthesised in the second review; total N=26). Specifically we explored the four areas:

- aims
- nature of the interventions
- outcomes
- study design

While reviewing the studies in depth, we noticed potentially interesting and useful patterns in the literature base of the studies. This was not written into our protocol

but, as we feel that it sheds light on the aims of the study, we have included the comparison.

- *Literature base:* There appear to be two broad groups of research here. One group, which focused on changes in the teaching and learning generally, treats CPD as one of several interesting variables, while the other generally functions more as a set of evaluations of CPD in terms of teacher change. In this latter group, the teaching and learning processes feature much less prominently than the CPD processes. The CPD programmes, in which pupil and teacher data were collected, paid more attention to pre-existing evidence about teaching and learning than those where teacher-only data were collected. Since we do not know, in the teacher-only data studies, what the impact on pupils was, the lack of attention to the pedagogic research base may or may not be an important aspect of the study. It may be that the teacher-only studies did refer to pedagogic literature but did not have room to report it in the article. However, since they give considerable space to reporting the CPD literature, this seems unlikely.

- *Aim:* Teacher-only and teacher-and-pupil studies gave equal attention in their aims to exploring the impact of a specific teacher development programme or assessing the impact on teaching and learning of introducing specific pedagogic strategies (half of each group in each case). Studies which focused on teacher impact only were more likely to have an explicit intention to develop teachers' knowledge, understanding or skills, and were much more likely to have an explicit aim to change teacher beliefs or attitudes. Studies which provide pupil and teacher data were inevitably more focused on improving pupil outcomes and, perhaps as a result, on enhancing teacher practice.

- *Nature of the interventions:* The key strategies used in the two groups of studies were similar in relation to:
  - the use of specialist expertise
  - creating opportunities for teachers to observe others teach
  - peer support
  - the use of workshops and seminars

  All these strategies feature prominently in both clusters of studies, but there is a greater explicit emphasis on processes described as action research in teacher-only studies. In both groups of studies, however, programmes that make explicit reference to action research are very similar in content to those that describe themselves as coaching programmes.

- *Outcomes:* All the teacher-only data studies focused upon affective outcomes compared with fewer than half of the studies reporting student impact data. Changes in teacher behaviour was an explicit outcome of the vast majority of studies with similar proportions in each cluster providing evidence for this.

- *Study design:* All the studies are evaluations. The majority of studies in both the teacher and the teacher-and-pupil clusters are researcher-manipulated evaluations. The rest are naturally occurring evaluations. Control or comparison groups feature much more often in the teacher-and-pupil impact studies than they do among the teacher-impact studies. Teacher-only studies are much more likely to have collected data *during* the study than were those reporting student outcomes. Studies designed to explore the impact of CPD on teachers

only were generally carried out over a longer period of time than those studies which also collected pupil data.

Nature of the studies

We had wondered whether the teacher-only data studies would provide evidence about teacher perceptions of impact upon students. In fact, very few data about teacher judgment of impact upon students were recorded. The implication seems to be that CPD explored by studies that focus on teacher-only data is aimed more explicitly at changes, such as teacher knowledge, beliefs and understanding which cannot be directly observed. It could be that teacher-only studies set out to provide evidence about these phenomena as a proxy for direct pupil data. On the other hand, the studies which provide data on changes in pupil learning may feel this is sufficient evidence to imply changes in teacher attitude. Consequently, the teacher-and-pupil studies focused much less on affective outcomes.

Two broad areas of research emerged from analysis of the studies: there was either a focus on changing teaching and learning generally, in which CPD was treated as an incidental variable; or the studies set out to evaluate CPD and placed less emphasis on teaching and learning.

Furthermore, the CPD programmes in which pupil-and-teacher data were collected built more directly than the teacher-only studies on pre-existing evidence about teaching and learning. The CPD programmes in the teacher-only studies, on the other hand, focused more than the comparison group on pre-existing evidence about CPD. The teacher-only studies are, in effect, evaluations of CPD, while the other group of studies are explorations of effective ways of achieving change and improvement in teaching and learning.

There is a certain lack of potentially useful detail in reports of studies in both groups: the teacher-and-pupil data studies provide little information on the nature of intervention and underpinning rationale; whereas the teacher-only studies are lacking in evidence on teaching and learning.

Strengths and limitations

Strengths

One strength of this review is the way in which it builds systematically and cumulatively on previous reviews. In doing so it has continued to probe the questions raised in previous reviews about the emphasis on impact and the exclusion of other types of evidence. Another strength is the way in which the review grows from live concerns and consultation with policy-makers and practitioners through the involvement of a number of user groups in setting and refining the questions, and interpreting and disseminating the findings.

In particular, the CPD Review Group considers that the review has continued to help in the following ways:

- developing a taxonomy of collaboration which is meaningful and applicable to practitioners and policy-makers

- adding to the base from which we can continue to unpack the specific processes involved in the CPD intervention and identify those which appear to influence change in teacher practice

- exploring further the effect and influence which external and specialist expertise brings to the design and impact of CPD processes

- identifying the patterns of research related to CPD and the relative strengths and weaknesses of studies that do and do not collect pupil outcomes data

Limitations

- One limitation of the review is that we did not run any additional searches to see whether there were any other articles or reports covering student data for these programmes by the authors of the teacher-only studies, although the descriptions of methods and approaches within the articles suggest this is unlikely to be the case.

- We were conscious throughout of the limitations of the data provided in the reports of studies we retrieved with regard to answering our review question. None of the studies was designed to answer our review question directly.

- In particular, we noted problems arising from the compressed timetable for completing the review. There were difficulties in responding to possible trends or patterns arising out of answers to the questions in our protocol by creating further tables. We were unable to go back to the original studies from the earlier reviews in the detail that we would have liked in order to follow up new points arising from the current review. For example, we would have preferred to carry out a more detailed analysis of the outcomes for teachers.

- We also noted the following in the individual studies:
  - There was a varying amount of detail about the sample in some of the studies, and some reviewers noted that they would have liked to have been given more detail about the sample background(s) in order to make the connections between contexts.
  - The different aims and foci of the studies lacked detail and, in some cases, clarity.
  - The overwhelming majority of studies were conducted in the USA and so it is not known whether the findings could also apply in other countries.
  - There may well have been additional fruitful data in a number of PhD theses and other studies. However, we were unable to retrieve these within our timescale and note that these data remain unexplored.
  - In some reports of studies, there is a lack of discussion of the effect of using the researchers as part of the CPD intervention on the evidence.
  - The small-scale nature of some of the studies included in the in-depth analysis.

Implications

Implications for practitioners

The research suggests that collaborative CPD is linked with positive outcomes regarding teachers' attitudes to working and reflecting collaboratively with colleagues on a sustained basis. *Schools and CPD co-ordinators working with colleagues, who have little or no inclination to work with others, should consider creating and resourcing opportunities for teachers to participate in CPD in partnership with one or more colleagues.*

In cases where teachers did not volunteer to take part in the CPD but were required to do so, the collaboration designed into the intervention helped to convert initial co-operation into genuine collaboration. *Schools and CPD leaders should consider paying attention to the potential benefits of collaboration when trying to meet the needs of disaffected or demotivated colleagues. Similarly, CPD co-ordinators could ensure that they use collaboration (e.g. in refining learning goals) as an important tool for teachers facing mandatory programmes – to develop ownership and personalise their learning.*

Most of the effective CPD in the research included learning which took place in the teachers' own schools and classrooms. *CPD leaders and teachers should consider harnessing all available in-school opportunities for professional learning: for example, through team teaching, and ensuring that lesson-planning takes place collaboratively and is structured to include opportunities for debriefing.*

The positive outcomes reported in the studies in the review were linked to CPD interventions which combined reflection with active experimentation. *CPD leaders and head teachers may wish to review CPD plans and opportunities to ensure that opportunities for professional dialogue are linked to opportunities to experiment with new approaches in order to root learning conversations in classroom evidence. Teachers should consider seeking out such opportunities.*

Collaborative CPD can be effective in more intimate settings. *School and CPD leaders and CPD providers might want to consider offering teachers opportunities for small group or paired work within any larger groupings.*

There was little evidence about teachers' perceptions of the impact of the CPD on their pupils' learning in the studies which focused only on impact on the teachers. But studies from previous reviews by this Review Group that do contain pupil impact data highlight the way in which pupil impact motivates teachers to sustain their learning. *CPD leaders and programme managers should consider encouraging teachers to articulate, record and reflect upon their perceptions about the impact of the CPD and related changes in classroom practice on their students' learning.*

The group of studies which focused solely on collecting teacher impact data were sustained over much longer periods than those which also collected student data. However, an earlier review found that gains for the CPD were not necessarily greater for those lasting more than one term. *CPD leaders and head teachers may wish to reflect regularly on the match between the distance to be travelled and the length of any CPD interventions, while bearing in mind the benefits associated with CPD that lasts at least one term.*

The CPD processes linked with positive outcomes for teachers in the studies with teacher-only data are consistent with those that show positive impact for pupils. *This may suggest that these characteristics of CPD, in combination, could be used by school and CPD leaders, on an experimental basis, as proxy success indicators in weighing up whether to pursue certain CPD opportunities. Policy-makers could encourage schools and CPD providers to consider the highlighted characteristics of CPD as a set of questions to be applied to CPD proposals and activities in order to probe the likelihood of positive outcomes for students and teachers. Such approaches will be experimental and their usability and utility should be monitored.*

The review found that studies which focused their aims on both teacher and student outcomes were more likely to have rooted their interventions in evidence about pedagogy. Conversely, studies which focused their aims on teacher impact were more likely to have been rooted in the literature about CPD and adult learning. *CPD providers and CPD school leaders may wish to ensure that CPD programmes draw explicitly on both the relevant public knowledge bases about teaching and learning and about CPD.*

Implications for researchers

The aims of the studies in the groups differ markedly. In the group of studies which collected data on both pupils and teachers (N=26), only three specifically targeted affective outcomes from their interventions. In the other group of studies, which collected data only on teacher impact, most (7 out of 11) targeted such outcomes. However, affective outcomes featured as incidental findings in many of the first group of studies. *Researchers exploring the impact of CPD on teaching and learning should consider collecting systematic evidence about the impact of CPD on affective aspects of teachers' professional identity.*

Studies of CPD which was linked to positive outcomes identified core elements of collaboration which recurred in combination. The specific effects of the individual components in isolation from each other were not explored. *Researchers exploring the impact of CPD should consider collecting data about the relative impact of each of these core elements, by treating the components as independent variables.*

Studies which focused on teacher data were less comparative in their designs than studies which collected both teacher and student data. *While recognising that the control and comparison groups in the first group of studies comprised students rather than teachers, we nevertheless believe that studies which focus on teachers need to place greater emphasis on collecting comparative data.*

The group of studies which focused solely on collecting teacher impact data were sustained over much longer periods than those which also collected student data. *Future reviews could explore whether this difference is accounted for by the much greater emphasis on affective goals, or by the need for a short term focus in order to enable collection of data about outcomes for particular cohorts of students.*

The review found that the CPD featured in studies which focused their aims on both teacher and student outcomes was more likely to be rooted in evidence about pedagogy. Conversely, the CPD in studies which collected teacher-only impact data was more likely to be rooted in the literature about CPD and adult learning. *Studies of CPD and the related interventions should consider*

incorporating and building equally upon the pedagogic and the CPD literature. In other words, studies that evaluate specific CPD programmes should problematise the nature of the changes in pedagogic practice as well as the CPD processes. Similarly, studies of the development of teaching and learning need to problematise the CPD processes and interventions, and to collect and analyse data about them if they are to provide research users with the information they need to operationalise findings and recommendations.

Implications for policy-makers

CPD is the vehicle through which all new policies must work if change is to become embedded rather than cosmetic. The cumulative picture of positive outcomes for teachers and pupils emerging from this series of reviews suggests that collaborative CPD between teachers has the potential to play a critical role in interpreting and embedding all policy initiatives in practice. The complex combinations of sustained peer and specialist support, of in-class experimentation coupled with protected space for reflection and structured dialogue, and the role of collaboration in personalising goals, sustaining commitment and developing ownership are all challenging. They sit at some distance from traditional conceptions of CPD and the current arrangements for organising and evaluating it in many schools. However, they reinforce the emerging consensus about the nature of a proactive, modern profession within which teachers are seen as an important resource for each other in supporting and sustaining the development of their own and their colleagues' practice. Policy-makers should consider reviewing both explicit and implicit assumptions about the ways in which new initiatives are implemented in schools and how these may be enhanced by an explicit commitment to sustained, collaborative CPD.

1. BACKGROUND

1.1 Aims and rationale for current review

This is the third review of the impact of CPD on classroom teaching and learning conducted by the CPD Review Group. In the first review, we sought to identify processes involved in collaborative and sustained CPD interventions that have a positive impact on teaching and learning. In the second review, we identified and synthesised data from studies that investigated individually oriented CPD, before comparing individually orientated CPD with collaborative CPD. In doing this, we also updated the searches from the first review and applied the results of any additional studies to the findings of the first review. This enabled us to begin to develop a detailed understanding of the nature of effective collaboration. We were interested in analysing, in detail, the nature and relative importance of collaboration as there has been a significant growth in both activity and research in this field since the first review. Indeed, in the UK this seems to have been partly as a result of the first review. The enterprise of researching a phenomenon as complex as CPD, that encompasses multiple variables, seems to have continued to pose a considerable challenge to research teams – particularly those determined to explore the impact on both teachers and pupils. Perhaps as a result, the majority of studies identified in both the first and second reviews compared CPD with *no CPD* although a few compared different CPD inputs.

CPD is a very broad concept. Our determination to try to be comprehensive in searching for studies led us to use a wide range of search terms. As a result, we have had to exclude a large number of studies. In the first review we looked at 13,479 titles and abstracts, and 266 full studies, and for the second review we looked at 5,505 titles and abstracts and 223 full studies – to focus in each case on 17 different studies for data-extraction. In doing this, we became aware that a significant number of studies whose research questions and methods relate closely to our own questions and criteria were being set aside for one reason only: they explored the impact of the CPD only in relation to its impact upon teachers.

We were interested in reviewing these studies to see what additional light they might throw on the first two reviews. In particular we wondered whether the studies with teacher-only data would:

- use the capacity freed by not focusing on pupils to explore other aspects of CPD in more depth – for example, would these studies provide more data about the CPD processes, the teachers involved in the CPD, their school contexts or the leadership of the CPD?
- result in similar or different findings about effectiveness for similar CPD processes
- adopt different methodological approaches, aims or definitions

Hence the purpose of this third review was to extend the findings of the first two reviews (Cordingley *et al*., 2003b, 2005) by synthesising data from studies which focused on the impact on teachers but not on students, and to discover whether a focus on teacher-only data enabled research teams to provide a more detailed picture of outcomes, CPD processes and evaluation processes and, in doing so, to explore the methodological issues related to evaluating data about pupils and

teachers, compared with teacher-only data. Appendix 1.2 highlights the relationship between the three reviews.

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 and second reviews.

> 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)

In this review, we have synthesised data from studies which reported on teacher impact data only and have compared the data with the findings related to both teacher and student outcomes identified the first two reviews. All the studies reviewed synthesised in the third review were identified in the searching processes for the first two reviews and so were judged to have met our inclusion criteria, with the single exception that the studies in this review report teacher-impact data only and do not go on to examine the outcomes of the CPD in relation to students.

Sustained CPD

All the included studies in the review were designed to span at least 12 weeks. 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 in this report, we mean that the CPD is sustained.

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. In all three reviews, we deliberately excluded 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. As with the earlier reviews, the Review Group hope to make some of this evidence available to practitioners in an accessible and meaningful way, to highlight the areas in which further research would make a valuable contribution to CPD strategies, and to enable evidence-informed reflections upon implications with policy-makers.

We also note in our first two reviews that, while teachers mostly volunteered to participate and were thus collaborating voluntarily, this was not always the case. In one of the largest studies in the second review, for example, the teachers had no choice about taking part in the development work. However, the extensive work on trust-building and creating opportunities for teachers to build on their own needs and starting points demonstrated by this study reassured us that the CPD could accurately be described as collaborative rather than enforced or guided co-operation. Like its predecessors, this review has not excluded programmes in which teachers were not volunteers but aimed to monitor carefully the boundaries between co-operation and collaboration.

CPD Interventions

At the outset of the review, we did not go into any more detail than the above descriptions about which processes and interventions constitute collaborative CPD. During the sourcing and classification stages of the earlier reviews, it became clear that there is a range of collaborative types of CPD which show a lot of similar characteristics, even though they were labelled differently or pursued different goals. In a number of cases, a range of strategies – including cross-moderation and contact with the authors – was used to ensure that studies were correctly defined as studies of collaborative CPD.

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, 1979a; 1979b; Fullan and Steigelbauer, 1991; Guskey and Huberman, 1995; Hargreaves, 1993). Such theoretical and scholarly work draws on a rather more restricted empirical evidence base than is the case for, say, student learning. However, this literature has continued to inform this review. It includes, for example, Huberman's (1992) idea of 'sustained interactivity', Hargreave's views of the stages of teacher development (in Elliot (ed), 1993), and Fullan and Steigelbauer's notion of the importance of 'personal development in a social context' for teacher development (1991). In view of the fact that few studies of CPD carry out significant evaluation of its impact, we have also found Guskey's (1998) concept of five levels for evaluating CPD helpful.

Askew *et al.*'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). Similarly, Desforges' (1995) reflections on the tendency of classrooms to return to the status quo – and hence the difficulties of effecting lasting change – were influential in identifying the likelihood of sustained CPD being effective.

The studies in the first two reviews had to meet objective criteria in terms of the evidence they presented about the impact of CPD on students. In the third review, there was no such requirement. Hence, one of the concerns in the present review was to look for indicators of how far teacher data could be used as a proxy for

student data in evaluating the effectiveness of CPD interventions. If teachers reported changes in student attendance/test results/quality of written work, etc. as a result of changes in their own behaviours or attitudes derived from the CPD intervention, how reliable would it be? Given that teachers are the single most important contributor to student learning, is it justifiable to study impact on teachers alone? (See, for example, Tabberer (2004) on teachers making a difference.)

1.3 Policy and practice background

Teachers' CPD continues to be regarded by the UK Government as a national priority for England. Since the second review was undertaken, the UK Government's strategy for England has resulted in the Teacher Training Agency (TTA) taking over responsibility for national CPD strategy. The Government priorities for education have been set out in the five-year strategy, in which CPD features as one of the key strands (DfES, 2004). Some of the specific issues related to CPD in this strategy, such as the emphasis on coaching, are directly related to the findings of the reviews carried out by this review group. National efforts to develop support frameworks and materials for CPD leaders (for example, the Key Stage 3 and Primary National Strategies) make explicit reference to evidence from our first review.

There are also a number of different operational initiatives with an emphasis upon the importance of collaboration and networking in teacher development. Examples include the Networked Learning Communities (NLCs), Leading Edge Partnerships, Design Collaboratives, the Primary Entitlement to Collaboration, Federations, Primary Networks and the Leadership Improvement Grant Initiative. Each of these initiatives recognises the importance of collaboration, without specifying the forms it might take.

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), 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, for some time, been encouraging experimental and incremental strategic development of approaches to CPD. It has developed the 'Teachers' Professional Learning Framework' (GTC, 2004) and created a Teachers' Learning Academy to support progression and accreditation, and published occasional papers on peer dissemination and learner conversations, all of which draw explicitly on the work from the first and second reviews.

1.4 Research background

In our reviews, we drew on a large body of literature to help us refine our question to a focus on sustained CPD. It also enabled us to conceptualise more clearly the forms of CPD with the potential to sustain teacher change. This literature included the following:

- literature related to research and evidence informed practice (Cordingley and Bell, 2002)

- evidence about the importance of teacher experimentation, feedback and coaching (Joyce and Showers, 1988, 2002)
- evidence from the implementation in the UK of large scale initiatives, such as CASE (Adey and Shayer, 1994) and CAME (Shayer *et al.*, 1999) and the national literacy and numeracy strategies about the effectiveness of coaching activities such as modelling and professional dialogue
- the stages of teacher development (Hargreaves, 1993; Rich, 1993)
- 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 the review. For example, Day's (1999) analysis of teachers' personal and organisational environments and their career cycles illustrates that CPD is a highly context-specific endeavour. 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*., 2003a; NCSL, 2004). The literature on systematic reviews has been useful for developing our understanding of the complexity of evaluating second-order activity, such as CPD (or even third order, if the impact is measured through student outcomes).

Reflecting upon the literature reinforced our view that CPD literature derived from theoretical scholarship and review still far outnumbers empirical studies and that evidence about professional learning communities (e.g. Wallace *et al.*, forthcoming) is much needed. In the meantime, it was difficult to relate the theory to evidence about impact relating to CPD and teachers' learning other than at a very broad and general 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 provided evidence about the impact of collaborative and sustained CPD in this review. 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. Clearly, much of this is linked with the time and resource constraints which operate in the real world of funded research.

Recently, there has been an increasing amount of activity in the UK in relation to the Government's national CPD strategy (see for example the Teacher Training Agency website: www.tta.gov.uk). One development of this has been a growth of interest in the evaluation of CPD strategies. For example, the GTC has launched a large-scale evaluation of CPD related activities with the aims of:

- identifying the professional development needs of teachers, and advising on specific and overall policy challenges and changes

- identifying the professional development needs of particular groups of teachers (early career teachers, more experienced teachers, subject specialists, etc.)

- developing and securing support for a generic framework of experiences and approaches to CPD (the Teachers' Professional Learning Framework) and promoting its application in practice and policy

- gathering and analysing evidence from ground-level demonstration work and from practice in order to influence national, local and school-level policy and strategy

- piloting a national system of professional recognition of teacher learning (the Teacher Learning Academy) which both acknowledges and stimulates teachers' participation and the quality of their learning

- offering a conduit (the Connect CPD co-ordinators network) for those in schools with responsibility for CPD to contribute to and draw from the GTC's intelligence and knowledge base, especially on effective CPD and its 'pedagogies'

1.5 Authors, funders and other users of the review

The first review was funded principally by the NUT and grew from the NUT's concern that its CPD provision for teachers should be rooted and developed in the context of evidence about effectiveness. The breadth of the question identified as appropriate by the Review Group and the group of 30 plus teachers who were consulted at the start made the first review particularly challenging and thus resource-intensive. Additional financial support from the DfES via the EPPI-Centre, the GTC and CUREE (Centre for the Use of Research and Evidence) was therefore very helpful. The utility of the first review to policy-makers led the DfES to provide resources for the second review both through the EPPI-Centre and from the CPD budget. Other financial support has come from CUREE and from in-kind support and advice from NUT.

The focus of the third review – with its emphasis on comparing the outcomes and processes of studies that do and do not incorporate pupil data – have the potential to inform:

- ways of evaluating CPD and the extent to which teacher judgment stands as an adequate proxy for pupil data
- approaches to evaluate the impact of CPD
- the methodological issues raised by the different approaches to evaluating the impact of CPD

In this context, and in accordance with its CPD policies and strategy, the GTC has sponsored the third review. Sponsorship and valuable practical support for this review was also provided by the Department of Education and Skills (DfES) through the EPPI-Centre. The NUT supported the review through providing hospitality for meetings and in-kind support and advice. A team of colleagues from HEIs volunteered to help with keywording and data-extraction. All members of the Advisory Group made an active contribution to the review.

The publication of the first review has encouraged a number of higher education institution (HEI)-based CPD providers to volunteer to participate in this review as a means of developing their personal knowledge of the field and associated research literature. In addition, many of the members of the first Review Group have maintained or increased their interest in, and commitment to, the work.

The core team for the third review comprised the following people:

- CUREE colleagues, including qualified teachers, researchers and information scientists
- a research officer from the Networked Learning Communities (NLC) programme
- retired and ex-teachers
- CPD academics from HEIs
- members of the Review and Advisory Groups

Additional information regarding the users can be found in section 2.1; a listing of members of the Review and Advisory Groups can be found in Appendix 1.1.

1.6 Review questions

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

What can we learn from studies of sustained, collaborative CPD which set out to explore the impact on teachers and teaching but do not also consider the impact on pupils in the context of the evidence from previously data extracted studies of collaborative CPD that consider the impact on both?

(For brevity this is sometimes shortened to: ***What do teacher impact data tell us about collaborative CPD?***) This question in relation to impact on teachers *and* pupils was answered in our first and second reviews.

The first phase of the synthesis for this review (section 4.2.1) synthesises the data relating to the question:

What is the impact of sustained, collaborative CPD on teachers and teaching?

In this part of the synthesis, we are only looking at those studies which report teacher-only impact data.

Sub-questions

We then go on to look across studies of collaborative CPD from all three reviews and compare the two groups – teacher-and-pupil focused studies with teacher-oriented studies. This comparison relates specifically to findings about the outcomes, purposes, processes and activities of the CPD interventions and the studies that explore them.

We ask the following questions:

Do the studies of the three different reviews provide evidence about different types of aims for the CPD, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Do the studies of the three different reviews provide evidence about different types of CPD processes and activities, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Do the studies from the three different reviews provide evidence about different types of outcome for the CPD, depending upon whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Finally, we explore whether studies that investigate sustained collaborative CPD use different study designs, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils.

2. METHODS USED IN THE REVIEW

This chapter describes the methods used in completing the review. Initially it outlines the question, and describes the approach and methods of involving users, before considering the detail of each of the steps of the review process.

The aim of the review was to identify those studies which focused on teachers across the 5–16 age range and provide data about teacher outcomes only to enable us to identify the specific characteristics of teacher-focused studies and also to compare the processes and outcomes of the CPD described in them with those from the teacher-and-pupil focused studies. In our first and second reviews, we examined the impact on teachers *and* pupils. This review is therefore linked to the outcomes of two previous systematic reviews of the literature. However, the current review used studies which had failed the criterion in the first and second reviews that required student impact data.

Since these studies were identified during the course of the search for the first two reviews, the inclusion criteria established for these reviews define the limits for the third review concerning the language, location and timeframe for the studies. The criteria aimed to include only those studies most likely to provide evidence which would help to answer the review question and we present them here as they were applied in the first review. The criteria were modified for the second review to include studies of individually oriented CPD and refined slightly in a number of other ways. Both stage 1 and stage 2 inclusion criteria for both the earlier CPD reviews can be found in Appendix 2.1.

2.1 User-involvement

2.1.1 Approach and rationale

In this report, the term 'users' is defined as groups for 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, head teachers, CPD co-ordinators and other 'practitioners' who were concerned with identifying effective CPD in relation to desired outcomes. This also included academics, governors, local authorities and providers of CPD.

We adopted a number of methods to encourage a wide and inclusive base of user involvement facilitated by the National Teacher Research Panel (NTRP) and the NUT, DfES and GTC networks. Some of the users had contributed to the previous two reviews by keywording and data-extracting. We also enrolled a new member from the National College of School Leadership (NCSL). We had more active participation in the third review from the academic community, perhaps because of the considerable interest in the findings from the first and second reviews, and increasing interest in the process of systematic reviewing generally.

2.1.2 Methods used

Policy-makers, academics, teachers, initial teacher training (ITT) practitioners and providers were all represented on the Review Group and contributed to selecting the topic for the research focus, deciding and refining the review question, and developing the protocol. Some members of the Review Group and a small number of HEI colleagues also helped with data-extraction.

In the first review, the focus on sustained and collaborative CPD was strongly influenced by teacher input, and 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. The strong orientation towards user perspectives was maintained throughout the second and current (third) review but through a range of more indirect methods. Our experience of involving some practitioners directly in data-extraction in EPPI-Centre reviewing was not felt to have been an appropriate use of practitioners' time. CUREE regularly consults users regarding research priorities and CPD via focus groups, and this flow of information shaped thinking at every stage. In addition, Review Group members who were teachers, or worked closely with teachers, and CUREE colleagues who had recently been teachers – in some cases until very recently – were involved in a number of ways. They provided a user perspective in the development of the protocol, and – with help from an ex-teacher from NCSL – played a major role in data-extraction. Professional colleagues on the Review Group were instrumental in steering the review. In addition, experienced ex-teachers working for CUREE were key participants in drafting the final report.

We offered training in EPPI-Centre methods via day-long training sessions and workshops on data-extraction 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 HEI user group colleagues whose support was invaluable throughout the review process.

2.2 Identifying and describing studies

2.2.1 Defining relevant studies: inclusion and exclusion criteria

For this review, the studies for inclusion were selected from those excluded from the first and second in-depth reviews because they did not explore or report pupil outcomes.

The very few studies of individual CPD that were included in the data-extraction and synthesis for the second review were excluded because we wanted to hold all variables constant except pupil outcomes. The protocol defined collaborative CPD as teachers working together. We did not specify a typology of collaboration, nor which processes and interventions constitute definition as collaborative CPD. We defined sustained CPD as lasting at least 12 weeks or at least one term. 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 current practice, were excluded.

The first and second reviews (and hence the third review which explored studies uncovered as a result of the search process for the first two reviews) limited the search chronologically to capture studies that had been *published* or reported after 1988 (first review) and after 1991 (for the second review). This 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 reviews confined themselves, 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 reviews only included studies written in English because of translation costs but did not limit the search geographically. We correctly expected to retrieve most of our studies from outside the UK, specifically from the USA.

Studies included in the systematic map for the third review had to meet the following criteria:

1. focus on CPD that provides explicit information about whether the CPD was designed to facilitate collaboration to support individual teachers
2. focus on CPD which is designed to meet explicit, learning objectives
3. focus on CPD designed to sustain learning for 12 weeks, or one term or more
4. have set out to measure impact on teachers and teaching
5. describe the methods of data-collection and analysis, and the target population
6. attempt to establish the reliability and validity of data analysis
7. report on the aims and objectives of the research
8. focus on teachers of the 5–16 age
9. be written in English
10. show how they have used what is known already (e.g. by including a literature review)
11. have been published after 1991

Appendix 2.1 contains the full list of criteria from both the first and second reviews. The criteria in the second review were broadly similar to those in the first review for purposes of consistency. However, they 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 screening studies earlier. This initial set of criteria was applied to the titles and abstracts uncovered in the search.

2.2.2 Identification of potential studies: search strategy

The third review used teacher-only data studies which had already been identified and so the search strategy is as described in the first and second reviews.

The studies were identified for the first two reviews as follows:

- Searching electronic databases, including Educational Resources Information Centre (ERIC), the British Education Index (BEI), Current Educational Research in the UK (CERUK), Education-Online, Online Computer Library Centre (OCLC) FirstSearch and INGENTA. We retrieved some theses from our overall search strategy, and attempted to track down other theses and related journal articles by identifying potential authors and contacting them directly.

- 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 Council for Research in Education (SCRE), the National Foundation for Educational Research (NFER), the Office for Standards in Education (OFSTED), DfES, British Educational Research Association (BERA), and selected Local Education Authority (LEA) and university websites.

- 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.

More details on the search strategies employed in the first and second reviews are presented in Appendices 2.2 and 2.3.

2.2.3 Screening studies: applying inclusion and exclusion criteria

The studies in the third review had already been screened and had the systematic map (stage 1) and in-depth (stage 2) inclusion and exclusion criteria from the first and second reviews applied to them. For this process in both reviews, our inclusion and exclusion criteria allowed us to screen the studies for relevance to our review questions. 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 those 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 reference management tool (Biblioscape). 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 fulfilled our stage 1 criteria.

As additional screening for the third review, we revisited the studies and cross-moderated them to confirm their inclusion in the in-depth review. Three studies were eliminated as a result of this process because they did not meet the inclusion criteria.

2.2.4 Characterising included studies

Reports meeting the criteria for inclusion in the third review had already been keyworded using both EPPI-Centre generic (EPPI-Centre, 2002) and CPD review-specific keywords to provide a broad descriptive map of the topic area of the studies in the review (refer to Appendix 2.4 for CPD review-specific keywords and Appendix 2.5 for their definitions). The review-specific keywords were modified after each of the earlier reviews in order to make them more useful. All teacher-only data studies included in the third review (N=14) were re-keyworded, using the same set of review-specific keywords to facilitate systematic mapping.

Core keywording: EPPI-Centre educational keywording system

Keywords, as defined by the EPPI-Centre, classify key characteristics of the studies from all reviews, including language, country, topic, curriculum, sample population, characteristics of learners, educational settings and study type. While the EPPI-Centre made refinements to the keywords (for example study type) between reviews 1 and 2, the definitions and coding categories remained essentially the same.

CPD review-specific keywords: CPD processes and outcomes

The Review Group extended the number of CPD review-specific keywords between each review. Those studies relevant to the third but excluded from the first review had fewer review-specific keywords than those in the second review, and the third review-specific set of keywords was more detailed still. To create a consistent and coherent map, it was therefore necessary to re-keyword all studies, using the same set of review-specific keywords. This enabled us to categorise outcomes such as teacher attitudes, and staff/teacher understanding, knowledge and skills. Although the studies reported only on teacher-impact data, the review-specific keywords (student/pupil achievement, motivation and learning) were also included in order to highlight evidence in these areas arising from teacher self-report. We also identified review-specific processes and activities and developed keywords that are detailed and defined in Appendix 2.5. These include peer and specialist coaching; peer support; peer and specialist observation; joint planning; internal, external and specialist expertise; and mentoring. The full set of review-specific keywords is available in Appendix 2.4.

2.2.5 Identifying and describing studies: quality-assurance process

Studies used in the third review had already had the inclusion and exclusion criteria applied to them. To ensure consistency between all three reviews, these decisions were cross-moderated and a further three studies excluded from in-depth review as reported above. Members of the EPPI-Centre assisted in applying criteria and keywords to studies for a sample of studies.

2.3 In-depth review

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

All studies included in the systematic map were included in the in-depth review. However of these, 31 had previously been data-extracted, quality-assessed and included in the in-depth reviews for the first (N=17) and second (N=14) CPD reviews. Therefore data-extraction and quality assessment for the third review was only completed on the 14 studies that measured teacher-only outcomes. To ensure consistency between all three reviews, these decisions were cross-moderated and a further three studies excluded from the in-depth review as reported above. Members of the EPPI-Centre assisted in screening and applying keywords to a sample of studies.

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-extraction was completed using EPPI-Reviewer software by two separate reviewers who then compared their results.

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 CPD intervention, the processes involved and the details of implementation. Because of this, and building on what we learnt through the process of the first two reviews, we decided to complement the methodological rigour of the EPPI-Centre data-extraction guidelines with a new set of review-specific, data-extraction questions in order systematically to pinpoint the detail of the CPD (Appendix 2.4). Having learnt from the previous reviews where we had needed to revisit the studies to mine further information, we refined the previous review-specific questions in order to design new ones.

The EPPI-Reviewer software allowed reviewers to interrogate the data from the extracted studies, according to the set of questions posed in the generic data-extraction and review-specific, data-extraction questions.

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

As in the first two reviews, 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 WoE 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, irrespective of our review question. As a prompt, reviewers were reminded of some of their previous responses, automatically highlighted as part of the EPPI-Reviewer software. 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 this 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.

2.3.4 Synthesis of evidence in relation to (a) teacher-and-pupil impact studies and (b) teacher-only data studies

Bringing together the findings of the review involved a two-stage process. The first stage involved synthesising data from the studies data-extracted for this review that only focused on teacher outcomes. The second stage looked across the findings relevant to collaborative CPD from all three reviews.

First stage

In order to allow comparisons between the findings from the third review and those from the first two reviews, data were extracted from the studies for the following analytic categories, consistent with the first two reviews.

Impact 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

We also recorded any teacher perceptions of the impact of the CPD on pupil learning and any instruments used to structure such perceptions.

Second stage

We looked across the findings from the two clusters of studies (i.e. those with pupil and teacher impact data from the first and second reviews, and those with teacher-only impact data from the current review) to pursue the four sub-questions described in section 1.6 relating to types of aims, processes, outcomes and study design.

The synthesis also explored, where possible, issues which had been identified by members of the Review and Advisory Group, including both practitioners and policy-makers, as particular areas of interest. These include the following:

- the potential for using teacher data as a proxy for pupil data when evaluating CPD
- the different patterns related to the characteristics of effective CPD practice across the findings of the three reviews
- the patterns of planned and unplanned outcomes
- the patterns of costs and benefits (although it was noted that this may be difficult to ascertain)
- the possibility of developing a typology of collaboration within CPD, building on the findings from the second review
- the use and allocation of time
- evidence about individual and general professional efficacy
- the location of CPD activities in teachers' classrooms

There were three further issues identified by the Review Group as relevant to the review:

- the relationships between approaches to research/evaluation design and CPD design across the findings of the three reviews
- the matrix of relationships between all of the above and between the different types of findings associated with the types of study and types of CPD
- the characteristics of the evaluation models across the three reviews

We want to revisit the findings to look at these issues as the year-long timescale laid down by the EPPI-Centre did not allow this in this particular review. We are hopeful that this is something we can do in the future, if funding allows.

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 days 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 by comparing and reconciling their decisions. 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

All the studies in the third review had already been identified in the first and second reviews by this group – and hence already been included in the map for either review one or two. The comparative map of the studies in this chapter describes those studies (N=45) reviewed in-depth across all three reviews (N=17, N=14, N=14 respectively). Chapter 3 presents the combined results of the searches (conducted for the previous two reviews), the results following application of inclusion criteria, and a generic description of the characteristics of the included studies. Chapter 4 goes on to synthesise the studies with teacher-only data reviewed in depth for this the third review. This is then followed by comparative data which highlights the similarities and differences in the aims, processes, design and impact of the CPD between the studies with teacher-only data and those with teacher-and-pupil data.

3.1 Studies included from searching and screening

Table 3.1 shows the combined total of studies retrieved and included/excluded for the first and second reviews. It also shows the studies which were excluded at the stage 2 screening for not giving pupil outcomes data in the first and second reviews, but which were included in the present, third review for their teacher-only data. For the third review, no further identification of abstracts or retrieval of reports was carried out. All reports which were keyworded for the third review only were also data-extracted (N=14). The map includes all studies from all three reviews which passed all inclusion criteria at stages 1 and 2, plus the teacher-only data studies included in the third review.

Table 3.1: Studies included from searching and screening for this review

Studies	N
Total number of titles, abstracts and reports identified	18,963
Number of abstracts meeting final inclusion criteria	557
Number of full reports retrieved by the cut-off date	489
Number of full reports meeting all Stage 1 and 2 inclusion criteria and therefore included in the in-depth reviews 1 and 2	31
Number of full reports excluded from in-depth reviews 1 and 2 because they had no pupil outcome data	14
Number of studies meeting the inclusion criteria for the systematic map and in-depth review 3	45

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

Figure 3.1: Filtering of papers from searching to map to synthesis

* For details of particular criteria that studies in the first two reviews failed on, please see those reviews (Cordingley *et al.,* 2003b; Cordingley *et al.,* 2005).

3.2 Characteristics of the included studies

The detailed characteristics of the 45 studies included in the systematic map are presented in the tables within this section of the report.

The mapping encompasses those collaborative studies that reported teacher-and-pupil data, and included in the in-depth reviews for the first and second reviews, and those studies with teacher-only data which have now been fully data-extracted for in-depth analysis in this, the third, review. These are shown in the Table 3.2

Table 3.2: Description of the type of CPD (N = 45, mutually exclusive)

Type of CPD	N
Teacher-and-pupil data	31
Teacher-only data	14
Total	*45*

Study source

We have presented, in Table 3.3 the identification of all the studies in the third review. ERIC retrieved the most studies overall (N=23), however, as this database was the first to be used in searching for the first and second reviews, it gives a skewed version of how successful the other databases and methods of searching were, as they did retrieve studies that ERIC had already uncovered.

Table 3.3: Identification of studies in the systematic map (N=42, mutually exclusive*)

Source	Teacher-and-pupil data (N = 28*)	Teacher-only data (N = 14)
Electronic database: ERIC	17	6
Contact	3	1
Electronic database: BEI	2	0
Electronic database: Ingenta	2	5
Citation	2	2
Electronic database: ECO	1	0
Handsearch	1	0

*For three studies collecting both teacher-and-pupil data, the source of identification was unknown and is not included in these figures.

Study type

Studies with teacher-and-pupil data were mostly keyworded as *Evaluation: researcher-manipulated studies* (N=23), and about a quarter of the studies were keyworded as *Evaluation: naturally occurring*. Eight out of the fourteen teacher-only data studies were researcher-manipulated evaluations.

Table 3.4: Description of the type of study in the systematic map (N = 45)

Type of study	Teacher-and-pupil data (N = 31)	Teacher-only data (N = 14)
Evaluation: researcher-manipulated	23	8
Evaluation: naturally occurring	9	6
Description	0	0
Development of methodology	0	0
Exploration of relationships	0	0
Systematic review	0	0
Total	*32**	*14*

*One study was coded as both a researcher-manipulated and a naturally occurring evaluation.

Countries in which the studies were conducted

As in the studies that measured teacher-and-pupil outcomes, most studies measuring teacher-only data were conducted in the USA (N=9, 64% in teacher-only studies compared with 58% in studies reporting pupil data), with the next most from the UK (N=2). One each was conducted in Canada, Taiwan, Jamaica, and the Netherlands.

Table 3.5: Countries in which the studies in the systematic map were conducted (N = 45)

Country	Teacher-and-pupil data (N = 31)	Teacher-only data (N = 14)
USA	18	9
Canada	4	1
UK: England	3	2
New Zealand	3	0
Namibia	1	0
South Africa	1	0
Taiwan	1	1
China	1	0
Jamaica	0	1
The Netherlands	0	1

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

Educational setting

Although focusing on teacher-only data, the educational setting of the teachers was coded as this was relevant to the type of CPD they needed/received. The vast majority of teacher-only data studies were focused on CPD for primary school teachers (N=9). Of the one keyword for 'Other' educational settings, the CPD took place in a science institute and a science camp – which were not elaborated on further.

Table 3.6: Type of educational setting of the studies (N = 45)

Type of educational setting	Teacher-and-pupil data (N = 31)	Teacher-only data (N = 14)
Secondary school	21	3
Primary school	20	9
HEI (in addition to the school)	7	1
Government department	1	0
Independent school	1	0
Nursery school	1	0
Special needs school	0	1
Other educational setting (i.e. middle school, intermediate school)	4	1

Note: Some research combines more than one type of educational setting.

Topic focus

Topic focus is given in Table 3.7. For the teacher-and-pupil data studies, all teacher-only data studies were keyworded as focusing on teacher careers (N=14), as they all covered CPD, which is inextricably linked to career. Nearly all studies with teacher-only data also focused on teaching and learning (N=11), as did all of the studies with teacher-and-pupil data (N=31). The next most popular focus of all studies is curriculum (teacher-only data N=9, teacher-and-pupil data N=24).

The particular curriculum areas focused on is broken down in Table 3.8. The rank order is similar but few studies with equal opportunities as a focus featured teacher-only data (N=2), whereas ten studies of teacher-and-pupil data focused on this area. Perhaps this reflects the fact that equal opportunities is an area more strongly related to pupil outcomes than to staff outcomes. Organisation and management was not a topic focus for studies with teacher-only data.

Table 3.7: Topic focus of the studies in the systematic map (N = 45)

Topic focus of the studies	Teacher-and-pupil data (N = 31)	Teacher-only data (N = 14)
Teacher careers	31	14
Teaching and learning	31	11
Curriculum	24	9
Equal opportunities	10	2
Classroom management	8	1
Assessment	3	0
Organisation and management	3	0
Methodology	2	2
Other	0	1

Note: Some research combines more than one type of focus.

Curriculum focus

Once again, mathematics was a popular area of focus for the included studies. Having been the most frequent curriculum focus in the teacher-and-pupil data studies (N=7), it was also the most frequent in the teacher-only data studies (N=4), which is a relatively higher proportion. The spread across the curriculum was not as great for the teacher-only data studies as for the teacher-and-pupil data studies, which may have reflected the fact that most of the studies in the third review were set in primary schools rather than secondary schools. While two studies each focused on literacy–first languages and science, and one study was cross-curricular, overall fewer teacher-only data studies focused on curriculum in the third review.

Table 3.8: Curriculum areas of the studies in the systematic map (N = 33)

Curriculum area of the studies	Teacher-and-pupil data (N = 24)	Teacher-only data (N = 9)
Mathematics	7	4
Cross-curricular	6	1
Science	6	2
ICT	5	0
Literacy – first language	5	2
Literacy – further languages	3	0
General	2	0
History	1	0
Other (language/arts/social studies)	2	0

Note: Some research combines more than one curriculum focus.

3.3 Identifying and describing studies: quality-assurance results

Ambiguities which had been cleared up in the previous review were checked again in the present review for those studies which had come from the first review. This particularly covered keywording all studies as concentrating on learners, including the teachers as learners, as undertaking CPD is a learning process. The age-groups of participants led the 'over 21' option to be used as a keyword specifically for teachers taking part in the study; therefore, all studies in the map have this keyword. Although many of the teacher-only data studies did give the ages of pupils taught by the teacher participants, their ages were not coded in the third review as the studies did not show pupil outcomes of the CPD. One can assume the general age groups taught by the teachers from the school(s) where they taught (See Table 3.6).

All studies had already been keyworded by at least two different reviewers, and some by members of the EPPI-Centre (14 in the second review). The keywords had all been reconciled and uploaded to the database, but in order to ensure consistency across the different reviews, keywords were all checked again for the

present review. Three studies were eliminated as a result of this process because it was decided that they did not meet the inclusion criteria.

4. IN-DEPTH REVIEW: RESULTS

This chapter firstly presents in greater detail the specific characteristics of the teacher-only studies data-extracted and synthesised in the third review of CPD (section 4.1). We synthesise these findings in section 4.2.1, and then *compare* characteristics across the two groups of studies (i.e. those which explored the impact of the CPD on teachers and those which restricted the research to impact on teachers) as they relate to the:

- study aims
- CPD interventions
- outcomes
- designs

Since many of the CPD interventions involved a large number of different components, confident analysis of which components are the effective ones is not possible until studies start to unpack further their interventions. What we are able to do is to identify which components recur in programmes with positive outcomes and with what frequency.

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

This section looks in more detail at the group of studies in the in-depth review which explored impact on teachers but not on students (N=14). Further characteristics of the studies that explored the impact of CPD on both teachers and students can be found in the previous reviews (Cordingley *et al*. 2003b, 2005).

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

One of the criteria for inclusion relates to the extent to which the study demonstrated that 'researchers have used what is known already', for example, by including a literature review. Appendix 4.2.2.3 gives more information about the use of research literature to inform the CPD and/or the studies.

All the reports referred to previous research or literature to inform the studies. Of these, four were located within a single particular model of professional development.

Specifically:

- Farmer *et al*. (2003) discuss a preliminary impact study conducted in relation to the same project together with theoretical perspectives about how mathematics teachers develop their own learning.
- Goodell *et al*. (2000) referred to a model of professional development called the Ohio Statewide Systemic Initiative (SSI), known as Project Discovery, and drew on research related to inquiry teaching in mathematics.

- Morin (1998) referred to a theoretical model previously developed by the researcher and to other research into educational change, adult learning and past professional development practice.
- Swafford *et al*. (1997) discuss literature about peer coaching which directly informed the CPD.

The other ten studies were informed by a more extensive range of models from the literature.

Specifically:

- Greenwood and Haury (1995) refer to a range of research about inquiry teaching in science (for the content of the CPD) and to other research related to peer support and coaching (for the processes of the CPD).
- Hawkes and Romiszowski (2001) describe a wide range of literature and research about collaborative CPD, particularly where it involved professional conversations and reflection; further research is highlighted with reference to participation in computer-mediated dialogue.
- Henson (2001) explores literature and research relating to exploratory teacher research, sustained collaborative professional development and teacher self-efficacy; the study also used tools drawn from the research literature.
- Lin (2002a) was informed by empirical research about teacher education and the creation of cases, and by theoretical studies related to teacher learning through reflection, cognitive conflict and social interaction.
- Lloyd (2002) refers to literature about professional development with a particular focus on action research and critically reflective practice.
- Lloyd *et al*. (2000) refer to research about teacher confidence and understanding in science contexts – including the processes of science – and about self-efficacy.
- McLymont and Costa (1998) describe a wide range of theoretical studies exploring professional development, discourse, collaboration and coaching.
- Turvey (1996) refers to a wide range of research and other literature related to professional development of teachers to promote greater inclusion.
- Vaughn *et al*. (1998) reviewed literature covering the needs of special learners, teachers' responses to needs and professional development models for teaching special learners.
- Xu (2003) refers to previous research relating to the conflict between demands on teachers and opportunities for professional growth, models of professional development and teaching portfolios.

Seven of the studies that built explicitly on the literature were rooted in scholarship and evidence about CPD. Three were rooted in evidence about teaching and learning, and one was concerned with both.

Characteristics of the teacher-only data studies

The CPD interventions, although separately conceived for different purposes shared many characteristics as shown in Table 4.1. All studies except one used specialist expertise and it is unclear whether it was used in the exception. Twelve studies used peer support and the same 12 studies report joint planning as part of the CPD. While it is a characteristic of about half of the CPD interventions, interestingly, peer observation was not always part of the peer-support process. Half of the studies also used peer-coaching as a significant component of the

CPD. In two cases, the studies which did not use peer support were subsequently excluded for low WoE.

Table 4.1 Characteristics of CPD processes

Attribute	Number	Study
Specialist expertise	**13**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd (2002), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Turvey (1996), Vaughn *et al*. (1998)
Peer support	**12**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)
Joint Planning	**12**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)
Observation: peers	**8**	Goodell *et al*. (2000), Greenwood and Haury (1995), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Workshops	**8**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Turvey (1996)
Coaching: peer	**7**	Goodell *et al*. (2000), Greenwood and Haury (1995), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Action research	**7**	Farmer *et al*. (2003), Henson (2001), Lin (2002a), Lloyd (2002), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Observation: specialist	**3**	Farmer *et al*. (2003), Lin (2002a), Vaughn *et al*. (1998)
Coaching: specialist	**3**	Lloyd *et al*. (2000), McLymont and Costa (1998), Vaughn *et al*. (1998)

(See also Appendix 4.2.2.2.) Codes are not mutually exclusive.

Consultation with teachers about CPD

Consultation with teachers took place in all the CPD studies. It took several forms, as shown in Table 4.2, the most common of which was to find out what the teachers knew and could do already. The CPD programmes that did involve

consulting the teachers about their learning often did so in multiple ways: about teachers' own starting points for the CPD, the pace of the CPD, or the scope of the CPD. In over half the studies, it appears that some teachers themselves took on at least some aspects of the CPD. Evidence from the studies suggests this was classroom level leadership within a strategic framework.

Table 4.2 Consultation with teachers about CPD

Consultation of teachers/participants and ownership	Number	Study
To find starting points/what they knew	**10**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Vaughn *et al*. (1998), Xu (2003)
To design scope of CPD	**9**	Farmer *et al*. (2003), Greenwood and Haury (1995), Henson (2001), Lin (2002a), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)
To lead CPD	**8**	Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Vaughn *et al*. (1998), Xu (2003)
To define pace of CPD	**7**	Greenwood and Haury (1995), Henson (2001), Lin (2002a), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Xu (2003)
To identify study foci	**6**	Farmer *et al*. (2003), Henson (2001), Lin (2002a), McLymont and Costa (1998), Morin (1998), Xu (2003)

(See also Appendix 4.1.1.) Codes are not mutually exclusive.

Reflection and experimentation

The importance of experimentation began to emerge in the second CPD review (Cordingley *et al*., 2005) where it began to appear that those programmes that focused exclusively on reflection and dialogue were linked to less successful outcomes than those that also included active experimentation with new approaches. This led us to explore whether any of the teacher-only data studies were focused on reflection to the exclusion of experimentation. Our analysis of the CPD processes revealed a spectrum of activity between the two extremes. The spectrum comprises:

- reflection
- learning from theory/other people's research
- structured professional dialogue
- shared planning as a learning activity
- experimentation

Most of the CPD programmes covered by the review studies involved some core activities from the action end of the spectrum. All involved structured professional dialogue as a learning strategy. All but one (Xu, 2003) involved experimentation. However, Xu's study did involve a high degree of collaborative planning. Only one CPD programme from this group of studies (Goodell *et al.*, 2000) did not involve reflection as an explicit learning process. This programme focused almost entirely on experimentation and dialogue. Six programmes involved direct use of theory and research evidence. The use of planning as a learning activity that bridges theory and reflection, and practice and experimentation, was evident in eight of the studies.

Table 4.3 Reflection and experimentation

Reflection/action	Number	Study
Structured professional dialogue	**12**	Farmer *et al.* (2003), Goodell *et al.* (2000), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al.* (1997), Vaughn *et al.* (1998), Xu (2003)
Reflection	**11**	Farmer *et al.* (2003), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al.* (1997), Vaughn *et al.* (1998), Xu (2003)
Experimentation	**11**	Farmer *et al.* (2003), Goodell *et al.* (2000), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al.* (1997), Vaughn *et al.* (1998)
Planning lessons/ teaching materials (collaborative)	**8**	Greenwood and Haury (1995), Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al.* (1997), Vaughn *et al.* (1998), Xu (2003)
Learning from theory/ research	**6**	Farmer *et al.* (2003), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Morin (1998), Vaughn *et al.* (1998)

(See also Appendix 4.1.2.) Codes are not mutually exclusive.

Data-collection and analysis

Nine studies used both qualitative and quantitative methods of data-collection and analysis. Those studies which only used qualitative methods used a number of data types in order to triangulate their findings. For example, Lin (2002a) used group and individual interviews, observations and self-completion reports. Three studies which aimed to develop specific teacher knowledge and skills (Greenwood and Haury, 1995; Lloyd *et al.*, 2000; Turvey, 1996) employed tests or another form of assessment to measure the changes in teachers' performance. Data were often analysed using a grounded theory approach, for example Swafford *et al.* (1997) analysed qualitative data from observations, interviews and

reports, using a coding process to facilitate the comparison of the data across all sources. Typically, combined qualitative and quantitative approaches made use of questionnaires and pre- and post-teacher assessments, supplemented in most cases by observations and interviews, and analysed statistically after establishing reliability and validity. For example, Goodell *et al.* (2000) used interviews, observation and questionnaires. The quantitative data were analysed using factor analysis and the qualitative data were analysed using NUD*IST or similar software.

Table 4.4 Data-collection methods

Method of data-collection	Number	Study (N = 14)
One to one interview (face to face or by phone)	**11**	Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd (2002), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (1998)
Observation	**9**	Farmer *et al*. (2003), Goodell *et al*. (2000), Hawkes and Romiszowski (2001), Henson (2001), Lin (2002a), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Self-completion questionnaire	**8**	Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lloyd (2002), Lloyd *et al*. (2000), Morin (1998), Turvey (1996), Vaughn *et al*. (1998)
Other documentation	**6**	Farmer *et al*. (2003), Greenwood and Haury (1995), Hawkes and Romiszowski (2001), Morin (1998), Vaughn *et al*. (1998), Xu (1998)
Self-completion report or diary	**5**	Farmer *et al*. (2003), Lin (2002a), Lloyd (2002), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Group interview	**2**	Lin (2002a), Morin (1998)
Curriculum-based assessment	**2**	Lloyd *et al*. (2000), Turvey (1996)
School/college records (e.g. attendance records, etc.)	**1**	Lin (2002a)
Practical test	**1**	Lloyd *et al*. (2000)
Focus group	**1**	McLymont and Costa (1998)
Examinations	**1**	Greenwood and Haury (1995)
Other	**2**	Morin (1998), Swafford *et al*. (1997)

(See Appendix 4.1.3 for details of the individual study's methods of data-collection and analysis.) Codes are not mutually exclusive.

Weight of evidence (WoE)

Table 4.5 Weight of evidence (WoE)

Item	WoE A	WoE B	WoE C	WoE D
Farmer *et al*. (2003)	Medium	Medium/Low	Medium	Medium
Goodell *et al*. (2000)	Medium	Medium	High	Medium
Greenwood and Haury (1995)	Medium	Medium	Medium	Medium
Hawkes and Romiszowski (2001)	Medium	Low	Low	Low
Henson (2001)	Medium	Medium	Medium	Medium
Lin (2002a)	Medium	Medium/Low	Medium	Medium
Lloyd (2002)	Low	Low	Medium	Low
Lloyd *et al*. (2000)	High	High	High	High
McLymont and Costa (1998)	Medium	Medium	Medium	Medium
Morin (1998)	Medium	Medium	Medium	Medium
Swafford *et al*. (1997)	High	High	High	High
Turvey (1996)	Low	Low	Medium	Low
Vaughn *et al*. (1998)	Medium	Medium	Medium	Medium
Xu (2003)	Medium	Low	Medium	Medium

Of the 14 studies in the in-depth review, three have been excluded from the synthesis because of their WoE ratings. Lloyd (2002) was rated low WoE, both in relation to the study's own trustworthiness and in relation to the review-specific question about appropriateness of research design. Turvey (1996) was excluded for the same reasons. Hawkes and Romiszowski (2001) was rated low for the two review-specific questions about research design and about relevance to the review, and so was excluded. Of the 11 studies included in the synthesis, two (Lloyd *et al*., 2000; Swafford *et al*.,1997) were high WoE and nine medium WoE.

4.2 Synthesis of evidence

As outlined in the protocol for this review, bringing together the findings of the review involved two phases. In the first phase, we synthesised the data from the 11 higher WoE studies which present data in relation to the impact of the CPD on teachers but not on students in relation to our umbrella question:

What is the impact of sustained, collaborative CPD on teachers and teaching?

Since we go on in part two of the analysis to compare the types of outcomes across all three of the reviews, we have categorised them here for later comparative purposes. We report on impact in relation to:
- affective Impact – teacher attitudes, beliefs, commitment, self-efficacy, job satisfaction, morale
- teacher behaviours: classroom teaching, collaboration

In the second phase we consider the studies used for synthesis across the three reviews. We compare data from studies which provide evidence of pupil outcomes with those focusing on teacher impact only to pursue the four sub-questions, taking into account both the nature and the content of the studies:

- aims of the studies
- CPD processes and activities
- outcomes
- study designs

In each case, we will be looking to see if there are differences between Reviews 1 and 2 taken together (teacher-and-pupil), and Review 3 (teacher only), which might highlight characteristics of research into collaborative CPD which is designed to explore impact on pupils and learning; and research which is designed only to explore impact on teachers and teaching.

4.2.1 Synthesis of evidence from teacher-only data studies

This synthesis of the data from the studies that measured teacher-only data, asks the question:

What is the impact of sustained collaborative CPD on teachers and teaching?

In order to answer the question, we synthesise data from the 11 studies which were judged to have high or medium WoE. Any differences between numerical data in the synthesis and descriptive data in section 4.1 are because three low WoE studies were excluded from the synthesis. In the first section, we report briefly on the aims of the research. We then go on to report on the outcomes in relation to impact based on the same framework of characteristics as that used in our first two reviews: teachers' motivation, confidence, attitude, beliefs, and practice.

Aims

In six studies (Farmer *et al*., 2003; Goodell *et al*., 2000; Greenwood and Haury, 1995; Henson, 2001; Morin, 1998; Xu, 2003), the research aims were primarily concerned with the evaluation of a particular CPD design or approach in the context of a curriculum-based goal. In four cases (Lin, 2002a; Lloyd *et al*., 2000; McLymont and Costa, 1998; Vaughn *et al*. 1998), the CPD studies were directed primarily at the improvement of a particular aspect of the curriculum or teaching strategies, using the CPD as the vehicle for improvement. In one study (Swafford *et al*., 1997) the research appears to be targeted equally at the focus for improvement (literacy) and the CPD (peer-coaching).

Findings

In nearly all cases, the findings are reported across a range of teacher outcomes (see below) and the researchers draw conclusions about the CPD design in relation to these. Because we go on in part two of the synthesis to compare the types of outcomes across all three of the reviews, we have categorised them here for later comparative purposes in two broad clusters: behavioural and affective.

Impact on teacher behaviour

Teaching

In all but one of the studies, the teachers involved in the CPD interventions changed or substantially developed aspects of their teaching. In Xu's study (2003), the focus was on the promotion of professional collaboration per se. Although the intervention was successful in achieving this aim, and hence in influencing teachers' professional (collegial) relationships and their approach to their own learning, there are no data reported about impact on teaching behaviours.

Developments in teaching practice covered a broad terrain:

- improving mathematics instruction by means of inquiry (Farmer *et al*., 2003; Goodell *et al*., 2000)
- developing activity-based, inquiry-oriented science teaching (Greenwood and Haury, 1995)
- implementing specific, research-based classroom interventions (Henson, 2001)
- learner-centred approaches to teaching mathematics (Lin, 2002a)
- teaching process skills in primary science (Lloyd *et al*., 2000)
- improving mathematics teaching through cognitive coaching (McLymont and Costa, 1998)
- implementing new instructional strategies (Morin, 1998)
- improving literacy teaching via the literacy instruction framework (Swafford *et al*., 1997)
- enhancing the quality of instruction for students with learning difficulties in the general classroom (Vaughn *et al*., 1998)

Reflection and collaboration

Some of the studies emphasised commitment to continuing professional collaboration and reflection as an outcome as well as a CPD process:

- Lin (2002a) found that collaborative, school-based action research, using case writing, enhanced teachers' understanding of students' learning and enhanced their reflective thinking about their teaching.
- McLymont and Costa (1998) report increased collaboration and reflection amongst the mathematics teachers participating in cognitive coaching.
- Morin's (1998) CPD model (Sherwood School's Project Learn) resulted in teachers' increasing collaboration and sharing.
- Swafford *et al*.'s (1997) peer-coaching programme resulted in improvements in literacy teaching with concomitant changes in teacher confidence, collaboration and reflective discussion.
- Xu's (2003) study was directly focused upon generating sustainable collaboration as a means of building and expressing professional identity. Teachers in this study became more collaborative in their everyday practice: for example, coming together at lunchtime to discuss their teaching.

Affective impact

All the studies report observable and self-reported changes in at least one of the affective aspects of professional learning:
- motivation
- confidence

- attitudes and beliefs

Since the studies focused on teacher impact, we wanted to explore affective outcomes for any new evidence about this important, but under-explored, aspect of professional learning. All the studies used a number of methods to measure impact. For example:

- Greenwood and Haury (1995) aimed to change primary teachers' attitudes to science. The researchers monitored the changes through interviews carried out during the programme and follow-up questionnaires.
- Henson (2001) used interviews and questionnaires complemented by observation to assess teachers' self-efficacy in teaching behaviourally-challenging students.
- Swafford *et al*. (1997) conducted a peer-coaching programme for teachers of literacy in primary schools. Data were collected through interviews supported by classroom observation.

We also noticed that seven of the teacher-only studies in the synthesis (N=11) collected data during the intervention in contrast to three of the teacher-and-pupil data studies (N=26). In the event, few studies reported affective impact across more than one aspect.

Teacher motivation

Two studies highlighted the motivating impact of the CPD intervention:
- Vaughn *et al*. (1998) found teachers to be extremely positive about the year-long teacher research programme. They were motivated by perceived improvements in the students' learning and keen to continue the project in the following year.
- Xu (2003) found that teachers developed a renewed 'sense of purpose' and felt 'energised' to take risks and to examine their practices on an ongoing basis.

Teacher confidence

Four studies identified changes in teacher confidence as a direct outcome of the CPD intervention:
- Greenwood and Haury (1995) found evidence of increased confidence and positive attitudes towards science teaching among programme teachers who experienced Project Discovery, compared with those who had not experienced the intervention programme. They went on to involve themselves in peer-teaching, delivering inservice workshops and, for many, gaining positions as science specialists in their schools.
- Henson's (2001) study found teacher participation in research to have a powerful impact on teacher efficacy and levels of collaboration in an alternative school (SEN) setting.
- Lloyd *et al*. (2000) found that as teachers' understanding of process skills in science increased their overall confidence in their ability to teach these skills diminished, but they developed greater confidence in their ability to identify process skills and target them in their teaching.
- Swafford *et al*. (1997) reported increases in teachers' confidence: 'After a year they are all more confident about the methods they use, their understanding of why methods are powerful and the decisions they make' (p 423).

Teachers' attitudes and beliefs

Three studies identified specific changes in teachers' attitudes to, and beliefs about, their teaching:

- The teachers in Farmer *et al.*'s (2003) small scale, case-based study of inquiry-oriented mathematics teaching changed their attitudes and beliefs about what constitutes 'good' mathematics teaching and became more thoughtful and self critical.
- Goodell *et al.*'s (2000) larger-scale controlled trial also found evidence of attitudinal change amongst the project teachers who not only profoundly changed the way they taught, but were more reflective about how they taught.
- Morin's (1998) CPD model (Sherwood School's Project Learn) resulted in teachers changing their beliefs about assessment.

CPD processes and activities

To ensure consistency within the syntheses across the three reviews, the same analytic framework was used to synthesise the findings of the studies that only measured teacher outcomes data, as that used to synthesise the data from studies in the first two reviews. There was a high degree of consistency across the 11 studies in the synthesis in respect of their use of:

Peer-support
- All the CPD interventions made use of peer support.

Experimentation and action research
- All the interventions made explicit mention of involving the teachers in applying and refining new knowledge and skills and experimenting with ways of integrating them in their day-to-day practice. Six studies involved action research.

Taking account of teachers' concerns and starting points
- Ten of the interventions involved consultation with the teachers, either about their own starting points, the focus of the CPD, the pace of the CPD or the scope of the CPD. In the case of Goodell *et al.* (2000), it is unclear how far the teachers had been consulted about the details of the CPD intervention.

Specialist expertise
- Ten of the CPD interventions made use of specialist expertise. In Xu's study of the use of portfolios, the extent of expert input into the design of the intervention is unclear.

Observation and reflection
- In nine cases, specific mention was made of teachers observing one another; in four studies, observation and reflection (as part of the CPD rather than exclusively focused on data-collection) involved specialists.
(See Tables 4.1 and 4.3 for details of the CPD interventions; further details can be found in Appendix 4.2.2.2.)

Researchers' conclusions about their CPD designs

Without further research in which the components are treated as independent variables, it is not possible to measure their individual impacts. In addition, the lack of control or comparison groups in many studies makes it difficult to assess the effect of confounding variables. Nonetheless, these were the CPD processes which the researchers themselves considered, in the light of their findings, to have been particularly influential in achieving the desired impact on teachers and

teaching: action research, peer-support or co-coaching, consulting teachers, and combining different elements.

Action research

- Teacher research may be a particularly powerful method of professional development that can 'impact teacher efficacy' (Henson 2001, p 834).
- Case construction (using observation, discussion and refining – access to other teachers' perspectives) is a 'potential factor' in the source of the changes in the teachers' ways of thinking and in the breadth and depth of pedagogical content knowledge' (Lin, 2002a, p 345).

Peer-support or co-coaching

- 'The benefits of peer coaching make it an important element of staff development programmes in which teacher change is the goal' – in this case teachers improved their literacy teaching, grew in confidence and became more reflective about their practice (Swafford *et al*., 1997, p 425).
- '…coaching, in-class demonstration lessons and a supportive community of other teachers and professionals' led to sustained changes in teacher practice around inclusion (Vaughn *et al*., 1998, p 59).
- Cognitive coaching '…a non-judgemental process built around a planning conference, observation and a reflective conference….whereas prior to PDP teachers utilised the direct teaching methodology as their chief way of helping students to learn…..they are now allowing the students to learn by understanding for themselves the concepts they need to learn' (McLymont and Costa, 1998, p 20).
- Teacher collaboration around student portfolios 'illustrates the potential of this approach in providing purpose, focus, and substance along with a sense of ownership and belonging in which teachers learn with and from each other' (Xu, 2003, p 357).

Consulting teachers

- Taking teachers' personal and professional needs into account helped ensure that they internalised what they learnt and so were able to shift their beliefs and their teaching (Farmer *et al*., 2003).

Combining different elements

- Sustained professional development, with continued involvement and support through follow-up activities and networking opportunities, resulted in profound changes in teaching practice and teacher beliefs (Greenwood and Haury, 1995).
- A combination of direct instruction, partnership work and equipment provision 'can produce a significant change in teachers' understanding…' (Lloyd *et al*., 2000, p 367).
- Morin (1998, p 8) believed that a number of factors were important, in combination: '…Features that are consistently associated with…successful teacher change: self-directed learning, individual and group introspection, continuous professional interaction, a well-defined knowledge base…participation in curriculum development, classroom-based trials, adequate support and resources and ongoing feedback…resulted in a range of changes: reorganisation of spaces to facilitate collaboration; increased sharing and collaboration; new instructional strategies.'

Nature of collaboration

In the second review (Cordingley *et al*. 2005), we began to explore the nature of collaboration in more detail and developed some very tentative hypotheses about the nature of effective collaboration based on what we found out about the interventions. These are as follows:

- CPD with a significant in-school component may be more effective than CPD which is mainly off site, 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.

Our intention, as we stated in the second review, was to test these propositions in the light of what we discovered about the nature of effective collaboration in relation to its impact on teachers and teaching, but not on pupils. In exploring the components of CPD which are linked to positive outcomes, we looked for recurring patterns and connections between activities and outcomes in a range of studies. To establish causal relationships among the components and the outcomes, further research will be necessary. Therefore we interrogated the data from the group of studies in this review (which report on teacher outcomes but not on student outcomes) as follows.

Was the collaboration between teachers and between teachers and specialists off-site, in the teachers' own classrooms or both?
Eight of the studies reported interventions which took place in the teachers' own schools (Goodell *et al*., 2000; Henson, 2001; Lin, 2002a; Lloyd *et al*., 2000; McLymont and Costa, 1998; Morin, 1998; Swafford *et al*., 1997; Xu, 2003). In two of these, teachers were also involved in CPD off-site (Goodell *et al*., 2000; Morin, 1998). In one study (Greenwood and Haury, 1995) the teachers worked off-site with their own students and, in two studies, it is unclear (Farmer *et al*., 2003; Vaughn *et al*., 1998).

In general, this finding is consistent with the proposition that CPD can be effective when it has a significant in-school component.

Did the collaboration involve experimenting with and adapting/improving different teaching approaches, was it purely reflective/discursive or was it a combination of both?
The majority of the studies combined reflection and discussion about practice with active experimentation in classroom practice (Farmer *et al*., 2003; Goodell *et al*., 2000; Greenwood and Haury, 1995; Henson, 2001; Lin, 2002a; Lloyd *et al*., 2000; McLymont and Costa, 1998; Morin, 1998; Swafford *et al*., 1997; Vaughn *et al*., 1998).

This is consistent with both the in-school location of the collaborative CPD (so teachers have an opportunity to work with their own students) and the trend towards paired collaboration (which enables teachers to review issues arising from observation in a non-threatening environment). It is also consistent with the hypothesis that active experimentation may be effective in changing practice.

Did it involve groups of teachers, pairs of teachers or other combinations?
Teachers working in pairs was the most common form of collaboration, although it was unclear in two of the studies what the unit of collaboration was. In some of the larger studies, there were opportunities for collaboration in larger groups as well. Greenwood and Haury (1995) report a three-phase programme, starting with a one-year collaborative planning phase, followed by a one-week science institute. In phase 3, the teachers applied their new knowledge and skills with two teachers supporting each other in leading student activities. Lloyd *et al.*'s (2000) study also involved three phases. The first phase was devoted to reviewing teachers' starting points and developing a framework for evaluating children's learning; in phase 2, teachers planned, taught and observed each other in pairs in their own classrooms; and, in phase 3, teachers and their head teachers met together for an evaluation session.

Voluntarism
In all but two of the studies (Morin, 1998; Xu, 2003) teachers were voluntary participants in the CPD intervention. However, it seems clear from the researchers' reports of affective impact that the collaborative processes involved in the CPD models, together with the new knowledge and understanding experienced by the teachers, were effective in achieving teacher ownership in all cases.

The nature of collaboration
The frequency of these patterns and incidences across the two reviews do not constitute evidence of cause and effect. However, they have increased our understanding of the nature of effective collaboration to the point where we feel more confident about our four propositions.

Student gains
This phase of the synthesis was also intended to record any teacher perceptions of the impact of CPD on pupil learning and any instruments used to structure such perceptions. However, a search through the original studies revealed scant information – a few passing references in some studies to ways in which the teachers were encouraged by perceived student responses to new approaches, which were not sufficient to warrant inclusion.

4.2.2 Comparison across the findings from both clusters of studies (Reviews 1 and 2, and Review 3)

In this phase of the analysis we look across the findings from the two groups of studies in relation to our four sub-questions. Since we are committed to working with a significant quantity of good quality evidence, we compared studies which were judged to have overall high, medium-high or medium WoE, and to omit those where there was a judgement that the WoE was low.

First (although we did not set out to do this in the review protocol), we compared the literature bases of the two groups as we noticed distinct patterns and decided that the comparison might have the potential to help us understand and account for other differences when we came to look at the comparisons in the sub-questions. We divided the literature into broad categories: that which related to models and processes of CPD and adult learning; and that which related to pedagogy and pupil learning (see Table 4.6).

Table 4.6 Comparison of literature informing the studies

	Teacher-and-pupil studies (N = 26)	Teacher-only studies (N = 11)
All or mostly CPD	**5** Boudah *et al*. (2003), Da Costa (1993), Gersten *et al*. (1995), Ross *et al*. (1999), Wilkins (1997)	**7** Goodell *et al*. (2000), Henson (2001), McLymont and Costa (1998), Lin (2002a), Morin (1998), Swafford *et al*. (1997), Xu (2003)
All or mostly teaching and learning	**10** Anderson (1997), Britt *et al*. (2001), Ertmer and Hruskocy (1999), Harvey (1999), Jacobsen (2001), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Saxe *et al*. (2001), Shapiro *et al*. (1999)	**3** Greenwood and Haury (1995), Lloyd *et al*. (2000), Vaughn *et al*. (1998)
Evenly split	**11** Appalachia (1994), Britt *et al*. (1993), Brown (1992), Bryant *et al*. (2001), Fine and Kossak (2002), Harwell *et al*. (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Parke and Coble (1997), Zetlin *et al*. (1998)	**1** Farmer *et al*. (2003)

(See Appendix 4.2.2.3.)

The comparison figures are as follows:

- Teacher-and-pupil – 19% about the CPD, 38% about the teaching and learning strategies, and 42% about both
- Teacher only – 64% about the CPD, 27% about the teaching and learning strategies, and 9% about both

There appear to be two broad fields of research here. One group focused on changes in the teaching and learning, and generally treats CPD as one of several interesting variables. The thrust of these studies appeared to be towards how to bring about a desired change in pupils' achievement and teachers' practice in a particular area of teaching and learning. The other group generally functions more as a set of evaluations of CPD in terms of teacher change. In this latter set, the teaching and learning processes feature much less prominently than the CPD processes.

The CPD programmes, in which pupil-and-teacher data were collected, paid more attention to pre-existing evidence about teaching and learning than those where teacher-only data were collected. Eighty per cent of the former group use the literature on teaching and learning directly in designing the intervention, compared with 36% of the latter. Since we do not know in the teacher-only data studies what the impact on pupils was, the lack of attention to the pedagogic research base may or may not be an important aspect of the study. It may be that the teacher-only studies referred to pedagogic literature but did not have room to report it in

the article. However, since they give considerable space to reporting the CPD literature, this seems unlikely.

Broadly speaking, of the two groups of studies, the following observations can be made:

- The CPD evidence in the teacher-and-pupil data studies is less granular. *Users* looking to these studies to inform their CPD will look harder for more detail about the nature of the intervention and its underpinning rationale.
- The teaching and learning evidence in the teacher-only data studies is less textured and hence likely to be less persuasive to a user audience.

Our own reading of these trends is that, in future, studies of CPD should incorporate and build equally upon the pedagogic and the CPD literature. In other words, studies that evaluate specific CPD programmes need to problematise the nature of the changes in pedagogic practice as well as the CPD processes. Similarly studies of the development of teaching and learning need to problematise the CPD processes and interventions, and to collect and analyse data about them if they are to provide research users with the information they need to operationalise findings and recommendations.

We had wondered whether the teacher-only data studies would provide evidence about teacher perceptions of impact upon students. We wondered too whether a close relationship between such data and data from the previous reviews would enable us to form a view of how far teacher-only data could act as a proxy for pupil-impact data. In fact, very few data about teacher judgement of impact upon students were recorded. However, the processes used in the effective CPD in both groups of studies were consistent. It may be that these characteristics of CPD, in combination, could be used on an experimental basis as a framework for evaluating the potential usability and utility of CPD plans and proposals.

The four comparative sub-questions were addressed as follows in sections 4.2.2.1–4.2.2.4; discussion follows in section 4.2.2.5.

4.2.2.1 Do the studies of the three different reviews provide evidence about different types of aims *for the CPD depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?*

Table 4.7 Aims of the studies in the synthesis

Aim	Teacher-and-pupil studies (N = 26)	Teacher studies (N = 11)
Impact of a specific teacher development model/programme	**15** Appalachia (1994), Boudah *et al.* (2003), Britt *et al.* (1993), Da Costa (1993), Fine and Kossak (2002), Gersten *et al.* (1995), Harvey (1999), Jacobsen (2001), Kirkwood (2001), Kohler *et al.* (1999), Lin (2002b), Parke and Coble (1997), Ross *et al.* (1999), Saxe *et al.* (2001), Shapiro *et al.* (1999)	**7** Farmer *et al.* (2003), Goodell *et al.* (2000), Greenwood and Haury (1995), Henson (2001), Morin (1998), Swafford *et al.* (1997), Xu (2003)
Impact on teaching and learning of introducing specific pedagogic strategies	**14** Anderson (1992), Appalachia (1994), Boudah *et al.* (2003), Britt *et al.* (2001), Brown (1992), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Gersten *et al.* (1995), Harwell *et al.* (2001), Martin *et al.* (2001), McCutchen *et al.* (2002), Saxe *et al.* (2001), Wilkins (1997), Zetlin *et al.* (1998)	**5** Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Swafford *et al.* (1997), Vaughn *et al.* (1998)
Impact of CPD which aimed to develop teachers' knowledge, understanding or skills	**9** Britt *et al.* (1993), Bryant *et al.* (2001), Ertmer and Hruskocy (1999), Gersten *et al.* (1995), Harvey (1999), Jacobsen (2001), Kimmel *et al.* (1999), Lin (2002b), Wilkins (1997)	**7** Farmer *et al.* (2003), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al.* (2000), McLymont and Costa (1998), Morin (1998)
Changes in students' performance, either formal (i.e. assessment) or informal (i.e. behaviour)	**26** Anderson (1992), Appalachia (1994), Boudah *et al.* (2003), Britt *et al.* (2001), Britt *et al.* (1993), Brown (1992), Bryant *et al.* (2001), Da Costa (1993), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Gersten *et al.* (1995), Harvey (1999), Harwell *et al.* (2001), Jacobsen (2001), Kimmel *et al.* (1999), Kirkwood (2001), Kohler *et al.* (1999), Lin (2002b), Martin *et al.* (2001), McCutchen *et al.* (2002), Parke and Coble (1997), Ross *et al.* (1999), Saxe *et al.* (2001), Shapiro *et al.* (1999), Wilkins (1997), Zetlin *et al.* (1998)	
Changes in teacher beliefs/attitudes	**3** Boudah *et al.* (2003), Parke and Coble (1997), Zetlin *et al.* (1998)	**7** Farmer *et al.* (2003), Goodell *et al.* (2000), Henson (2001), Lin (2002a), Lloyd *et al.* (2000), Morin (1998), Xu (2003)

(See also Appendix 4.2.2.1.)

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

The two samples diverged absolutely, of course, with regard to whether they set out to explore whether CPD programmes had an impact on pupil learning.

There are, nonetheless, some broad similarities with regards to the aims of the two samples (studies that collect pupil impact data and those that do not) in relation to:
- the impact of a specific teacher development programme (teacher + pupil = 58%, teacher = 64%)
- the impact on teaching and learning of introducing specific pedagogic strategies (teacher + pupil = 54%, teacher = 45%)

However, the two samples are more distinctive in relation to whether they set out to explore CPD that aimed to:
- develop teachers' knowledge, understanding or skills (teacher-and-pupil = 35%, teacher = 64%)
- change teacher beliefs or attitudes (teacher-and-pupil = 12%, teacher = 64%).

The implication seems to be that CPD explored by studies that focus on teacher-only data is aimed more explicitly at changes (such as teacher knowledge, beliefs and understanding) that cannot be directly observed.

We are not clear about the reason for these differences, although it seems likely that the primacy of the goal of affecting pupil learning in the teacher-and-pupil samples may have stood as a proxy for evidence about these largely implicit phenomena in those studies. By contrast, the teacher studies might have set out to provide direct evidence about these phenomena as a proxy for direct pupil data.

It should also be noted that almost all the studies collected data about teacher knowledge, understanding and skills, whether or not this was an explicit goal of the CPD programme.

4.2.2.2 Do the studies of the three different reviews provide evidence about different types of CPD processes and activities, depending on whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Table 4.8 CPD processes and activities

Type of intervention	Teacher-and-pupil (N = 26)	Teacher only (N = 11)
The use of specialist expertise	**26** Anderson (1992), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Britt *et al*. (1993), Brown (1992), Bryant *et al*. (2001), Da Costa (1993), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Gersten *et al*. (1995), Harvey (1999), Harwell *et al*. (2001), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Parke and Coble (1997), Ross *et al*. (1999), Saxe *et al*. (2001), Shapiro *et al*. (1999), Wilkins (1997), Zetlin *et al*. (1998)	**11** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)
Observation	**20** Anderson (1992), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Britt *et al*. (1993), Brown (1992), Da Costa (1993), Fine and Kossak (2002), Gersten *et al*. (1995), Harwell *et al*. (2001), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Ross *et al*. (1999), Shapiro *et al*. (1999), Zetlin *et al*. (1998)	**9** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Peer support	**26** Anderson (1992), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Britt *et al*. (1993), Brown (1992), Bryant *et al*. (2001), Da Costa (1993), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Gersten *et al*. (1995), Harvey (1999), Harwell *et al*. (2001), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Parke and Coble (1997), Ross *et al*. (1999), Saxe *et al*. (2001), Shapiro *et al*. (1999), Wilkins (1997), Zetlin *et al*. (1998)	**11** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)
Action research (as an explicit feature)	**6** Britt *et al*. (2001), Britt *et al*. (1993), Fine and Kossak (2002), Harwell *et al*. (2001), Kirkwood (2001), Ross *et al*. (1999)	**6** Farmer *et al*. (2003), Henson (2001), Lin (2002a), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)

Type of intervention	Teacher-and-pupil (N = 26)	Teacher only (N = 11)
Workshops and seminars	**15** Anderson (1992), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (1993), Bryant *et al*. (2001), Fine and Kossak (2002), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Parke and Coble (1997), Shapiro *et al*. (1999), Zetlin *et al*. (1998)	**7** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998)
Pre-designed training programmes	**11** Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (1993), Bryant *et al*. (2001), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Harvey (1999), Jacobsen (2001), Lin (2002b), Saxe *et al*. (2001), Shapiro *et al*. (1999)	**6** Farmer *et al*. (2003), Goodell *et al*. (2000), Lloyd *et al*. (2000), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Consultation with teachers to identify areas for research/strategies for intervention or implementation	**16** Anderson (1992), Boudah *et al*. (2003), Britt *et al*. (1993), Britt *et al*. (2001), Brown (1992), Fine and Kossak (2002), Gersten *et al*. (1995), Harwell *et al*. (2001), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Lin (2002b), Ross *et al*. (1999), Shapiro *et al*. (1999), Wilkins (1997), Zetlin *et al*. (1998)	**9** Farmer *et al*. (2003), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Vaughn *et al*. (1998), Xu (2003)

(See also Appendix 4.2.2.2.)

The key strategies used in the two samples (teacher-and-pupil, and teacher) are similar in relation to:

- the use of specialist expertise (teacher-and-pupil = 100%, teacher = 100%)
- observing others teach (teacher-and-pupil = 77%, teacher = 82%)
- peer support (teacher-and-pupil = 100%, teacher = 100%)
- the use of workshops and seminars (teacher-and-pupil = 58%, teacher = 64%).

However, there was a much greater explicit emphasis on action research in teacher-only studies (teacher-and-pupil = 23%, teacher = 55%), although, it should be noted that despite a limited number of programmes describing the CPD as action research, the activities described in many programmes as peer-support or peer-coaching actually bear many similarities to those described as action research.

In the light of this pattern, we have found nothing in this review to cause us to question the findings or conclusions about the processes and activities involved in effective CPD from the first two reviews of studies which looked at both teacher-and-pupil impact. On the contrary, the evidence from this group of studies reinforces the findings about the nature of effective collaborative CPD.

4.2.2.3 Do the studies from the three different reviews provide evidence about different types of outcome for the CPD, depending upon whether they explore only the impact on teachers and teaching, or explore the impact on teachers, teaching and pupils?

Table 4.9 Outcomes from the CPD

Outcome	Teacher-and-pupil (N = 26)	Teacher only (N = 11)
Behaviour (including classroom teaching, collaborative and reflective practice)	**26** Anderson (1992), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Britt *et al*. (1993), Brown (1992), Bryant *et al*. (2001), Da Costa (1993), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Gersten *et al*. (1995), Harvey (1999), Harwell *et al*. (2001), Jacobsen (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Parke and Coble (1997), Ross *et al*. (1999), Saxe *et al*. (2001), Shapiro *et al*. (1999), Wilkins (1997), Zetlin *et al*. (1998)	**10** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998)
Affective (including attitudes, beliefs, commitment, self-efficacy, job satisfaction, morale)	**10** Britt *et al*. (2001), Brown (1992), Da Costa (1993), Gersten *et al*. (1995), Fine and Kossak (2002), Harwell *et al*. (2001), Kimmel *et al*. (1999), Lin (2002b), Ross et al. (1999), Shapiro *et al*. (1999)	**11** Farmer *et al*. (2003), Goodell *et al*. (2000), Greenwood and Haury (1995), Henson (2001), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)

(See also Appendix 4.2.2.4.)

There are more differences in the outcomes between the two samples.

Only 38% of teacher-and-pupil studies focused upon affective outcomes, compared with 100% of teacher studies. It seems likely that the need to focus upon pupil outcomes has squeezed this aspect of learning lower down the priority list for the teacher-and-pupil sample.

The pattern is much more similar in relation to teacher behaviours and actions in classrooms. In the teacher-and-pupil samples, 100% of the studies targeted changes in teacher behaviour. In the teacher sample, 91% of the studies targeted changes in classroom behaviour.

***4.2.2.4 Are there any differences in patterns of** study design between
studies that investigate the impact of sustained collaborative CPD only on
teachers and teaching, and those that explore both the impact on teachers,
teaching and pupils?*

Table 4.10 Comparison of study designs

	Teacher-and-pupil (N = 26)	Teacher (N = 11)
Evaluation: researcher-manipulated	**22** Anderson (1997), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Brown (1992), Bryant *et al*. (2001), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Harvey (1999), Harwell *et al*. (2001), Kimmel *et al*. (1999), Kirkwood (2001), Kohler *et al*. (1999), Lin (2002b), Martin *et al*. (2001), McCutchen *et al*. (2002), Parke and Coble (1997), Ross *et al*. (1999), Saxe *et al*. (2001), Shapiro *et al*. (1999), Wilkins (1997), Zetlin *et al*. (1998)	**7** Greenwood and Haury (1995), Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Xu (2003)
RCT	**4** Anderson (1997), Martin *et al*. (2001), Saxe *et al*. (2001), Shapiro *et al*. (1999)	
Control, quasi-random	**2** Britt *et al*. (2001), McCutchen *et al*. (2002)	
Control, non-random	**5** Fine and Kossak (2002), Harvey (1999), Kohler *et al*. (1999), Parke and Coble (1997), Wilkins (1997)	**1** Greenwood and Haury (1995)
Comparison without control	**2** Appalachia (1994), Boudah *et al*. (2003)	
No control	**9** Brown (1992), Bryant *et al*. (2001), Ertmer and Hruskocy (1999), Harwell *et al*. (2001), Kimmel *et al*. (1999), Kirkwood (2001), Lin (2002b), Ross *et al*. (1999), Zetlin *et al*. (1998)	**6** Lin (2002a), Lloyd *et al*. (2000), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997), Xu (2003)
Data collected before and after	**17** Anderson (1997), Appalachia (1994), Boudah *et al*. (2003), Britt *et al*. (2001), Brown (1992), Bryant *et al*. (2001), Ertmer and Hruskocy (1999), Fine and Kossak (2002), Harvey (1999), Harwell *et al*. (2001), Kirkwood (2001), Kohler *et al*. (1999), Martin *et al*. (2001), McCutchen *et al*. (2002), Saxe *et al*. (2001), Shapiro *et al*. (1999), Zetlin *et al*. (1998)	**4** Lloyd *et al*. (2000), Greenwood and Haury (1995), McLymont and Costa (1998), Xu (2003)
Data-collected after	**4** Kimmel *et al*. (1999), Parke and Coble (1997), Ross *et al*. (1999), Wilkins (1997)	**2** Morin (1998), Swafford *et al*. (1997)

	Teacher-and-pupil (N = 26)	Teacher (N = 11)
Data-collected during	**1** Lin (2002b)	**5** Lin (2002a), Greenwood and Haury (1995), McLymont and Costa (1998), Morin (1998), Swafford *et al*. (1997)
Evaluation-naturally occurring	**4** Britt *et al*. (1993), Da Costa (1993), Gersten *et al*. (1995), Jacobsen (2001)	**4** Farmer *et al*. (2003), Goodell *et al*. (2000), Henson (2001), Vaughn *et al*. (1998)
RCT		
Control, quasi-random		
Control, non-random	**1** Da Costa (1993)	**1** Goodell *et al*. (2000)
Comparison without control	**1** Britt *et al*. (1993)	
No control	**2** Gersten *et al*. (1995), Jacobsen (2001)	**3** Farmer *et al*. (2003), Henson (2001), Vaughn *et al*. (1998)
Data collected before and after	**2** Britt *et al*. (1993), Da Costa (1993)	**2** Henson (2001), Vaughn *et al*. (1998)
Data-collected after	**1** Jacobsen (2001)	**1** Goodell *et al*. (2000)
Data-collected during	**2** Gersten *et al*. (1995), Jacobsen (2001)	**2** Farmer *et al*. (2003), Vaughn *et al*. (1998)

(See also Appendix 4.2.2.5.)

All the studies were evaluations:
- Of the teacher-and-pupil studies, 85% were researcher-manipulated evaluations and 15% were naturally occurring.
- Of the teacher-only studies, 64% were researcher-manipulated against 36% naturally occurring.

When comparing the use of control or comparison groups:
- 58% of the teacher-and-pupil studies used them, while
- only 18% of the teacher studies did so.

When comparing when data were collected, before and after or after only collection of data was fairly similar (teacher-and-pupil studies = 92%; teacher-only studies = 82%), but the teacher-only studies were much more likely to collect data during the study (teacher-and-pupil studies = 12%; but teacher-only studies = 64%). It is probable that this greater emphasis on collecting data during the study is a reflection of the goal of evaluating the CPD processes. It may also be linked to the primacy of the aim of creating affective changes among the teachers reflected in the teacher-only studies, compared with the highly specific aim of improving students' achievement that features in the teacher-and-pupil data studies. We offer the suggestion that, where the CPD is being evaluated the study may be more exploratory, more qualitative, without control groups, more focused on processes and with fewer of the constraints that occur when a study is implemented with a specific goal in mind.

Length of CPD intervention

While comparing the study types we became aware of differences in the duration of studies, which are presented in Table 4.10. While one of the studies focusing on teacher-and-pupil impact was planned to last for three years, the vast majority of the studies were a year or less in duration. By contrast, all the teacher-only data studies lasted for at least a year, with several lasting considerably longer.

Table 4.11 Duration of CPD interventions

Length of the intervention	Teacher-and-pupil data studies (N = 26)	Teacher-only data studies (N = 11)
Three months /one term	**6** Anderson (1992), Boudah *et al*. (2003), Fine and Kossak (2002), Jacobsen (2001), Kohler *et al*. (1999), Shapiro *et al*. (1999)	
Five to six months	**2** Bryant *et al*. (2001), Martin *et al*. (2001)	
Eight months	**1** Brown (1992)	
One year	**11** Appalachia (1994), Da Costa (1993), Ertmer and Hruskocy (1999), Harwell *et al*. (2001), Kimmel *et al*. (1999), Lin (2002b), McCutchen *et al*. (2002), Parke and Coble (1997), Saxe *et al*. (2001), Wilkins (1997), Zetlin *et al*. (1998)	**5** Farmer *et al*. (2003), Goodell *et al*. (2000), Henson (2001), Lloyd *et al*. (2000), McLymont and Costa (1998)
Between one and two years	**2** Ross *et al*. (1999), Gersten *et al*. (1995)	
Two years or over	**4** Britt *et al*. (1993), Britt *et al*. (2001), Harvey (1999), Kirkwood* (2001)	**6** Greenwood and Haury (1995)**, Lin (2002a), Morin (1998), Swafford *et al*. (1997), Vaughn *et al*. (1998), Xu (2003)

(See also Appendix 4.2.2.5.)

*This was a rolling CPD programme which grew substantially in number of participants and involved some repetition of CPD activities.

**Teachers could choose to participate for one or two years.

In summary the comparative figures are as follows:

- under one year: teacher-and-pupil 35%, teacher only 0%
- between one and two years: teacher-and-pupil 50%, teacher only 45%
- two years or over: teacher-and-pupil 15%, teacher only 55%

Given that the teacher-and-pupil data sample studies recorded very positive outcomes for the teachers and students involved and the general moral pressure in education for improvements in practice to happen quickly in order to increase the learning achievement of all pupils, the costs and benefits of longer timescales need careful scrutiny. It is particularly interesting that both the research and the CPD continued for these extended periods, suggesting an intimate link between the researchers' interests in the data and their engagement in supporting the

CPD. Perhaps there is a model of formative research and assessment implicit in these studies?

We are not sure how to account for this marked difference between the two groups of studies. One hypothesis is that, freed from the need to pursue pupil impact data, the research teams no longer need to match teacher and student cohorts so that research beyond academic year boundaries becomes much more possible. Similarly, the lack of a requirement to develop research instruments spanning pupil variables may have freed resources for extended follow-up.

Alternatively, it may be that studies measuring impact on students are more concerned with the immediate learning or behavioural effects of the intervention. It may also have been the researchers' hypothesis that deeply internalised teacher change takes much longer than student learning. Unfortunately, the studies do not provide an explanation for their choice of duration for either the programme or the study. This is clearly an important resources consideration of considerable interest to both research funders and practitioners; this is explored further in the following section.

4.2.2.5 Discussion

Part of the rationale for this review was to explore the differences and similarities between two groups of studies: those which explore impact on students, and those which confine themselves to exploring impact on teachers. The comparison does depend on what is reported and it is possible, for example, that studies may have measured both teacher-and-pupil outcomes but not included pupil outcomes in the report. However, our analysis of the studies suggests that this is unlikely.

There were striking similarities between the groups of studies, as follows:

- All the studies reported positive impact on their target population(s).
- The combination of CPD processes:
  - specialist expertise
  - peer support
  - observation and reflection
  - action research
  - professional dialogue
  - consultation with teachers and acknowledging teachers' starting points
- The nature of effective collaboration, specifically:
  - working on-site and in classrooms
  - working in pairs and small groups
  - active experimentation as an integral part of reflection and discussion
  - voluntarism

There were also some clear differences between the two groups, most notably:

- the theoretical and empirical research literature on which the research drew
- aspects of the study designs (e.g. data-collection frequency)
- the length of the research and the CPD intervention

We also wanted to find out whether the teacher-only data studies would provide evidence about teacher perceptions of impact upon students. If this were to be the case and if there were close similarities between these data and data from the previous two reviews, we hoped to be able to form a view of how far teacher-only

data could act as a proxy for direct pupil impact data. In the event, very few data about teacher judgments about the impact on students were recorded. However, the *processes* used in the effective CPD in both groups of studies were consistent. It may be that these characteristics of CPD, in combination, could be used on an experimental basis as a framework for evaluating the potential usability and utility of CPD plans and proposals.

4.3 In-depth review: quality-assurance results

Following initial moderation of the data-extracted studies, most differences between reviewers (including EPPI-Centre reviewers) were relatively straightforward to resolve. As in the other two reviews, the most common difference 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, although the refined questions we used for the third review left less room for different interpretations. There were also occasional differences in judgement between reviewers, for example, when assigning the WoE. 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.

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

Continued guidance from Review and Advisory Group members, who were teachers or who worked closely with teachers, enabled us to maintain a sharp focus on user perspectives. This was particularly the case in the initial stages (for example, developing the protocol) and final stages (for example, giving feedback on the draft final report). We learned from the previous two reviews that involving users (see section 2.1, for our definition of users) 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.

The Review Group agreed that data-extraction might be too time-consuming (for example, developing an understanding of statistical terms and techniques) to engage teachers and other users who were inexperienced in research processes. But, as before, because we recognised the importance of a user perspective in the in-depth section of the review, we used CUREE staff who were recently practising primary and secondary teachers, or had experience in other education-related fields, to assist in the data-extraction. As before, we also had the help of

our first review Chair, Janet Sturgis, a retired and occasional supply teacher, with recent research experience. We were also helped by an ex-teacher member of the NCSL. This served to ensure that we had practitioner perspectives on the project activities 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 with their different viewpoints, skills and experience.

5. FINDINGS AND IMPLICATIONS

5.1 Summary of principal findings

5.1.1 Identification of studies

During the searches for our first and second reviews, we sifted 18,963 titles and abstracts systematically, reviewed 489 full-text studies and identified 45 studies as relevant to the current review. These studies were then mapped as described in the next section.

5.1.2 Mapping of all included studies

Of the 45 studies included in the map, 31 are teacher-and-pupil impact studies from the in-depth reviews of our first and second EPPI-Centre reviews of CPD, while the remaining 14 came from the teacher-only impact studies that had been excluded from the previous in-depth reviews. The majority of studies came from the USA. The educational settings in which the studies took place were predominately primary (N=29) and secondary (N=24) schools, while some were in both. Twenty of the primary schools studies focused on teacher-and-pupil data and nine on teacher-only data. For secondary schools, the numbers were 21 and 3 respectively. Nearly all studies with teacher-only data also focused on teaching and learning (N=11), as did all the studies with teacher- and-pupil data (N=31). The next most popular focus of all studies was curriculum (teacher-only data N=9, teacher-and-pupil data N=24). Where studies have a curriculum focus it is mostly mathematics, literacy (first language) or science in both clusters of studies.

5.1.3 Synthesis of findings

The synthesis of findings in relation to the teacher-only data studies was based on the 11 studies which were judged to have high or medium WoE. In seven of the eleven studies the research aims primarily related to the evaluation of a particular CPD design or approach in the context of a curriculum-based goal. In four cases, the CPD studies were directed mainly at the improvement of a particular aspect of the curriculum or teaching strategies, using the CPD as the vehicle for improvement. One study reports research which appeared to be targeted equally at the focus for improvement (literacy) and the CPD (peer coaching). In all cases but one, the researchers provided data about the interventions which offered us the opportunity to:

1. identify and report on the CPD processes and activities for the teacher-only data studies
2. compare these across the two groups of studies (i.e. those which present teacher impact data and those which also present student-impact data)

In nearly all cases, the findings are reported across a range of teacher outcomes (see below) and the researchers draw conclusions about the CPD design in relation to these. We have categorised all outcomes in two broad clusters: affective and behavioural.

Since many of the CPD interventions involved a large number of different (albeit overlapping) components in combination, it is not possible to identify whether some components are more important than others until studies start to unpack their interventions further. What we are able to do is to identify which components recur in programmes with positive outcomes, and with what frequency.

5.1.3.1 Impact of the CPD in the teacher-only studies

Impact on teacher behaviour

Teaching
In all but one of the studies the teachers involved in the CPD interventions changed or substantially developed aspects of their teaching. The exception was a study which successfully promoted professional collaboration, which influenced teachers' professional (collegial) relationships and their approach to their own learning, but which reported no data about impact on teaching behaviours.

Developments in teaching practice covered a wide range:

- improving mathematics instruction by means of inquiry
- developing activity-based, inquiry-oriented science teaching
- implementing specific, research-based classroom interventions, learner-centred approaches to teaching mathematics
- teaching process skills in primary science
- improving mathematics teaching through cognitive coaching
- implementing new instructional strategies
- improving literacy teaching in relation to a new framework for literacy teaching
- enhancing the quality of instruction for students with learning difficulties in the general classroom

Reflection and collaboration
Some of the studies emphasised commitment to continuing professional collaboration and reflection as an outcome as well as a CPD process. Evidence from the studies suggests the following:

- collaborative, school-based action research, using case writing, enhanced teachers' understanding of students' learning and enhanced their reflective thinking about their teaching
- cognitive coaching enhanced collaboration and reflection among the mathematics teacher participants
- peer-coaching encouraged collaboration and reflective discussion
- collaboration can be sustainable being incorporated into teachers' everyday practice (for example, coming together at lunchtime to discuss their teaching)

Affective impact

All the studies reported observable and self-reported changes in at least one of the affective aspects of professional learning:

- motivation
- confidence
- attitudes and beliefs

Specifically

- Two studies highlight the motivating impact of the CPD intervention.
- Four studies identified changes in teacher confidence as a direct outcome of the CPD intervention.
- One small-scale, case-based study of inquiry-oriented mathematics teaching reports changes in teachers' attitudes and beliefs about what constitutes 'good' mathematics teaching.
- A large-scale controlled trial also found evidence of attitudinal change among the project teachers which encouraged them to be more reflective about their teaching.
- In another study, the CPD resulted in teachers changing their beliefs about assessment.

5.1.3.2 CPD processes and characteristics

The studies provide evidence about positive benefits of CPD that:

- made use of peer-support
- made explicit use of specialist expertise
- made explicit mention of involving the teachers in applying and refining new knowledge and skills, and experimenting with ways of integrating them in their day-to-day practice; six studies involve action research
- involved consultation with the teachers, either about their own starting points, the focus of the CPD, the pace of the CPD or the scope of the CPD
- involved teachers observing one another as an integral part of the CPD
- involved specialists in observation and reflection (as part of the CPD rather than exclusively focused on data-collection).

5.1.3.3 Nature of collaboration

In the second review (Cordingley *et al*., 2005) we began to explore the nature of collaboration in more detail and developed some very tentative hypotheses about the nature of effective collaboration based on what we found out about the interventions. These are as follows:

- Within school, classroom-based CPD may be more effective than off-site CPD alone 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.

Our intention, as we stated in the report, was to test these propositions in the light of what we discovered about the nature of effective collaboration in relation to its impact on teachers and teaching, but not on pupils. Therefore we interrogated the data from the group of studies in this review (which reported on teacher outcomes but not on student outcomes) as follows:

Where did collaboration take place?
In general, the findings from the review are consistent with the proposition that CPD is effective when it has a significant in-school component.

What part did reflection and professional conversation play in relation to changing practice?
The majority of the studies combined reflection and experimentation with active classroom practice. This combination appeared to be effective in changing practice.

How many teachers at a time collaborated and what form did it take?
Teachers working in pairs was the most common combination, although it was unclear in two of the studies what the unit of collaboration was. In some of the larger studies, there were opportunities for collaboration in larger groups as well. In some studies teachers collaborated in different ways in different phases of the CPD. For example, in one study teachers' starting points were reviewed during the first phase and a framework for evaluating children's learning was developed; in the second phase, teachers planned, taught and observed each other in pairs in their own classrooms; and, in the third phase, teachers and their head teachers together evaluated the CPD.

Was the CPD voluntary or mandatory?
In all but two of the studies, teachers were voluntary participants in the CPD intervention. However, it seems clear from the researchers' reports of affective impact that the collaborative processes involved in the CPD models, together with the new knowledge and understanding experienced by the teachers, were effective in motivating teachers and enabling them to take ownership.

Nature of collaboration
The frequency of these patterns and incidences across the studies do not constitute evidence of cause and effect. However, they have increased our understanding of the nature of effective collaboration to the point where we feel confident about our four propositions. The majority of effective CPD models across the 11 studies we drew on for the synthesis exhibit the characteristics we had previously identified.

Did teachers refer to students' gains?
There was very little evidence about teacher perceptions of the impact of CPD on pupil learning, apart from a few passing references in some studies to ways in which the teachers were encouraged by perceived student responses to new ways of doing things. These references lacked sufficient detail to enable analysis.

5.1.3.4 How did the teacher studies compare with those reporting pupil data?

In the second phase of the synthesis, we compared studies reporting teacher-only data with those providing evidence about impact on students.

Specifically we explored the four areas:

- aims
- nature of the interventions
- outcomes
- study design

Aims

While the two samples differed absolutely with regard to whether they set out to explore the impact of CPD programmes on pupil learning, there are some similarities in relation to their aims. A little over half of the samples in each group aimed to explore the impact of a specific teacher development programme. Aims related to the impact on teaching and learning of introducing specific pedagogic strategies were a common feature of about half the studies in each cluster.

On the other hand, the two samples are more distinctive in relation to other aims. Studies which focused on teacher impact only are more likely to have had an explicit intention to develop teachers' knowledge, understanding or skills, and are much more likely to have had an explicit aim to change teacher beliefs or attitudes.

We are not clear about the reason for these differences although it seems likely that the goal of changing pupil learning in the teacher-and-pupil sample may have stood as a proxy for evidence about these largely implicit phenomena in those studies. By contrast, the teacher studies might have set out to provide direct evidence about these phenomena as a proxy for direct pupil data.

Almost all the studies collected data about teacher knowledge, understanding ands skills, whether or not this was an explicit goal of the CPD programme.

Nature of the interventions

The key strategies used in the two samples are similar in relation to the following:

- the use of specialist expertise
- observing others teach
- peer support
- the use of workshops and seminars

All these strategies feature prominently in both clusters of studies, but there was a much greater explicit emphasis on action research in teacher-only studies.

It should be noted that, while only a limited number of programmes are described as action research, the activities reported in many programmes as peer-support or peer-coaching bear similarities to those described as action research.

We have found nothing in this review to cause us to question the findings or conclusions about the processes and activities involved in effective CPD from the first two reviews of studies which looked at both teacher-and-pupil impact.

Outcomes

There are more differences in the outcomes between the two samples.

All the teacher-only data studies focused upon affective outcomes compared with fewer than half of the studies reporting student-impact data. It seems likely that the need to focus upon pupil outcomes has squeezed this aspect of learning lower down the priority list for the teacher-and-pupil sample.

Changes in teacher behaviour was an explicit outcome of the vast majority of studies with similar proportions in each cluster providing evidence.

Study design

All the studies are evaluations. About three-quarters of the teacher-and-pupil studies are researcher-manipulated evaluations, compared with roughly two-thirds of the teacher impact only type. The rest are naturally occurring evaluations.

Over twice as many teacher-and-pupil studies used control or comparison groups as did the teacher impact studies. We also noticed that teacher-only studies were much more likely to collect data during the study than were those reporting student outcomes.

A significant difference that we found between the two clusters was in the length of time during which the collaborative CPD took place. In studies which had both teacher and student impact data, nearly all the studies took place in a year or less.

However, in the current review of studies which did not collect or report on student impact, none was less than a year and over half were conducted over a period greater than one year.

5.2 Strengths and limitations of this systematic review

Strengths

One strength of this review is the way it builds systematically and cumulatively on previous reviews. In doing so, it has continued to probe the questions raised in previous reviews about the emphasis on impact and the exclusion of other types of evidence. Another strength is the way in which the review grows from live concerns and consultation with policy-makers and practitioners through the involvement of a number of user groups in setting and refining the questions, and interpreting the findings.

In particular, the CPD Review Group considers that the review has continued to help in the following ways:

- developing a taxonomy of collaboration which is meaningful and applicable to practitioners and policy-makers
- adding to the base from which we can continue to unpack the specific processes involved in the CPD intervention and identify those which appear to influence change in teacher practice
- exploring further the effect and influence which external and specialist expertise brings to design and impact of CPD processes
- identifying the patterns of research related to CPD, and the relative strengths and weaknesses of studies that do and do not collect pupil outcomes data

Limitations

- One limitation of the review was that we did not run any additional searches to see whether there were any other reports covering student data for these programmes by the authors of the teacher-only studies, although the descriptions of methods and approaches within the reports suggest this is unlikely to be the case.

- 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 problems arising from the compressed timetable for completing this review. There were difficulties in responding to possible trends or patterns arising out of answers to the questions in our protocol by creating further tables. We were unable to go back to the original studies from the earlier reviews in the detail that we would have liked to follow up new points arising from the current review. For example, we would have preferred to carry out a more detailed analysis of the outcomes for teachers.
- In the individual studies, we also 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
  - the overwhelming majority of studies being conducted in the USA and it not known whether the findings could also apply in other countries
  - the possibility of additional fruitful data in a number of PhD theses and other studies, which we were unable to retrieve within the timescale, and thereby leaving these data unexplored
  - a lack of discussion, in some studies, of the effect of using the researchers as part of the CPD intervention on the evidence
  - the small-scale nature of some of the studies included in the in-depth analysis

5.3 Implications

5.3.1 Practice

The research suggests that collaborative CPD is linked with positive outcomes regarding teachers' attitudes to working and reflecting collaboratively with colleagues on a sustained basis. *Schools and CPD co-ordinators working with colleagues, who have little or no inclination to work with others, should consider creating and resourcing opportunities for teachers to participate in CPD in partnership with one or more colleagues.*

In cases where teachers did not volunteer to take part in the CPD but were required to do so, the collaboration designed into the intervention helped to convert initial co-operation into genuine collaboration. *Schools and CPD leaders should consider paying attention to the potential benefits of collaboration when trying to meet the needs of disaffected or demotivated colleagues. Similarly, CPD co-ordinators could ensure that they use collaboration (e.g. in refining learning goals) as an important tool for teachers facing mandatory programmes – to develop ownership and personalise their learning.*

Most of the effective CPD in the research included learning which took place in the teachers' own schools and classrooms. *CPD leaders and teachers should consider harnessing all available in-school opportunities for professional learning:*

for example, through team teaching, and ensuring that lesson-planning takes place collaboratively and is structured to include opportunities for debriefing.

The positive outcomes reported in the studies in the review were linked to CPD interventions which combined reflection with active experimentation. *CPD leaders and head teachers may wish to review CPD plans and opportunities to ensure that opportunities for professional dialogue are linked to opportunities to experiment with new approaches in order to root learning conversations in classroom evidence. Teachers should consider seeking out such opportunities.*

Collaborative CPD can be effective in more intimate settings. *School and CPD leaders and CPD providers might want to consider offering teachers opportunities for small group or paired work within any larger groupings.*

There was little evidence about teachers' perceptions of the impact of the CPD on their pupils' learning in the studies which focused only on impact on the teachers. But studies from previous reviews by this Review Group that do contain pupil impact data highlight the way in which pupil impact motivates teachers to sustain their learning. *CPD leaders and programme managers should consider encouraging teachers to articulate, record and reflect upon their perceptions about the impact of the CPD and related changes in classroom practice on their students' learning.*

The group of studies which focused solely on collecting teacher impact data were sustained over much longer periods than those which also collected student data. However, an earlier review found that gains for the CPD were not necessarily greater for those lasting more than one term. *CPD leaders and head teachers may wish to reflect regularly on the match between the distance to be travelled and the length of any CPD interventions, while bearing in mind the benefits associated with CPD that lasts at least one term.*

The CPD processes linked with positive outcomes for teachers in the studies with teacher-only data are consistent with those that show positive impact for pupils. *This may suggest that these characteristics of CPD, in combination, could be used by school and CPD leaders, on an experimental basis, as proxy success indicators in weighing up whether to pursue certain CPD opportunities. Policy-makers could encourage schools and CPD providers to consider the highlighted characteristics of CPD as a set of questions to be applied to CPD proposals and activities in order to probe the likelihood of positive outcomes for students and teachers. Such approaches will be experimental and their usability and utility should be monitored.*

The review found that studies which focused their aims on both teacher and student outcomes were more likely to have rooted their interventions in evidence about pedagogy. Conversely, studies which focused their aims on teacher impact were more likely to have been rooted in the literature about CPD and adult learning. *CPD providers and CPD school leaders may wish to ensure that CPD programmes draw explicitly on both the relevant public knowledge bases about teaching and learning and about CPD.*

5.3.2 Policy

CPD is the vehicle through which all new policies must work if change is to become embedded rather than cosmetic. The cumulative picture of positive outcomes for teachers and pupils emerging from this series of reviews suggests that collaborative CPD between teachers has the potential to play a critical role in interpreting and embedding all policy initiatives in practice. The complex combinations of sustained peer and specialist support, of in-class experimentation coupled with protected space for reflection and structured dialogue, and the role of collaboration in personalising goals, sustaining commitment and developing ownership are all challenging. They sit at some distance from traditional conceptions of CPD and the current arrangements for organising and evaluating it in many schools. However, they reinforce the emerging consensus about the nature of a proactive, modern profession within which teachers are seen as an important resource for each other in supporting and sustaining the development of their own and their colleagues' practice. Policy-makers should consider reviewing both explicit and implicit assumptions about the ways in which new initiatives are implemented in schools and how these may be enhanced by an explicit commitment to sustained, collaborative CPD.

5.3.3 Research

The aims of the studies in the groups differ markedly. In the group of studies which collected data on both pupils and teachers (N=26), only three specifically targeted affective outcomes from their interventions. In the other group of studies, which collected data only on teacher impact, most (7 out of 11) targeted such outcomes. However, affective outcomes featured as incidental findings in many of the first group of studies. *Researchers exploring the impact of CPD on teaching and learning should consider collecting systematic evidence about the impact of CPD on affective aspects of teachers' professional identity.*

Studies of CPD which was linked to positive outcomes identified core elements of collaboration which recurred in combination. The specific effects of the individual components in isolation from each other were not explored. *Researchers exploring the impact of CPD should consider collecting data about the relative impact of each of these core elements, by treating the components as independent variables.*

Studies which focused on teacher data were less comparative in their designs than studies which collected both teacher and student data. *While recognising that the control and comparison groups in the first group of studies comprised students rather than teachers, we nevertheless believe that studies which focus on teachers need to place greater emphasis on collecting comparative data.*

The group of studies which focused solely on collecting teacher impact data were sustained over much longer periods than those which also collected student data. *Future reviews could explore whether this difference is accounted for by the much greater emphasis on affective goals, or by the need for a short term focus in order to enable collection of data about outcomes for particular cohorts of students.*

The review found that the CPD featured in studies which focused their aims on both teacher and student outcomes was more likely to be rooted in evidence about pedagogy. Conversely, the CPD in studies which collected teacher-only

impact data was more likely to be rooted in the literature about CPD and adult learning. *Studies of CPD and the related interventions should consider incorporating and building equally upon the pedagogic and the CPD literature. In other words, studies that evaluate specific CPD programmes should problematise the nature of the changes in pedagogic practice as well as the CPD processes. Similarly, studies of the development of teaching and learning need to problematise the CPD processes and interventions, and to collect and analyse data about them if they are to provide research users with the information they need to operationalise findings and recommendations.*

6. REFERENCES

6.1 Studies included in map and synthesis

6.1.1 Studies included in in-depth review and synthesis

*The references below are for **teacher-only data** studies which were included in the third review in the in-depth review and synthesis.*

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*These **teacher-and-pupil data** studies were included in the third review but were data-extracted and the results synthesised in the first and second reviews.*

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Appendix 1.1: Advisory Group membership

Review Group membership

Philippa Cordingley	Centre for the Use of Research and Evidence in Education (CUREE) and Chair of Group
John Bangs	National Union of Teachers (NUT)
Miranda Bell	CUREE
Donald Evans	CUREE
Hazel Hagger	University of Oxford
Jasbir Mann	National College for School Leadership (NCSL)
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

Keith Andrews	Department for Education and Skills (DfES) CPD Team
Jill Bourne	University of Southampton
Chris Day	University of Nottingham
Janet Draper	University of Exeter
Paula Penny	Department for Education and Skills (DfES) CPD Team
Ray Waterhouse	Teacher

Advisory Group: correspondent membership

Norbert Pachler	Institute of Education, University of London (IoE)

CUREE reviewers

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Philippa Cordingley	Chief Executive
Gillian Crawford	Research Officer
Donald Evans	Research Officer
Antonia Firth	Information Officer
Kate Holdich	Research Officer
Colin Isham	Research Officer
Emma King	Research Officer
Sarah Thomason	Research and Information Team Leader

EPPI-Centre support

Zoe Garrett
James Thomas

Academic reviewers

Harriet Marland	Bishop Grosseteste College
Neil Herrington	University of East London
Tim Rutter	Edge Hill College of Higher Education
Alison Stott	NCSL Research Officer

Appendix 1.2: Relationship between the three reviews
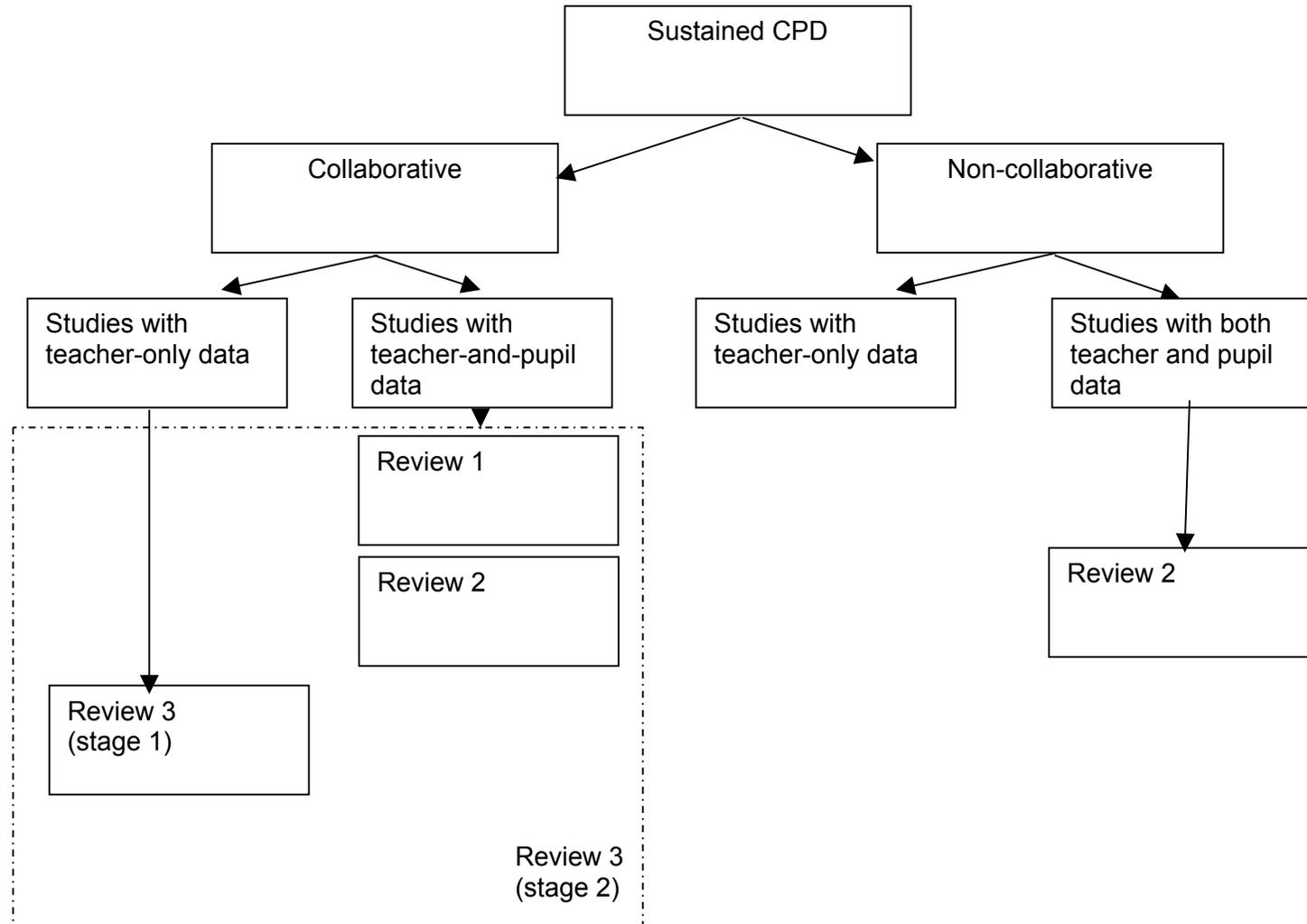
Appendix 2.1: Inclusion and exclusion criteria

The inclusion and exclusion criteria for the first and second reviews are listed here. Studies included in the third review were identified from the second stage criteria as being excluded from the previous reviews only because they omitted student impact data.

First CPD review	Second CPD review
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	Published after 1991
8 –	Written in English
Criteria that were Stage 2 in the first review but Stage 1 in the second review	
9 Clearly identify learning objectives for teachers	Focus on CPD which is designed to meet explicit learning objectives
10 Clearly state 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 in the first and second reviews: BEI, CERUK, ERIC, Ingenta, OCLC Firstsearch.

CPD	Collaborative techniques	Setting
professional development	collegiality	school
teacher research	collaboration/ive	primary school
continuing professional development	coaching	secondary school
continuing education	peer coaching	curriculum
inservice education	networks	middle school
professional education		elementary school
teamwork		high school
knowledge		
learning		
individual development		
reflective practice		
masters degree		

Format	Processes	People
report	teach	teacher(s)
research	learn	mentors
		science teachers

Searches which were specifically for collaborative CPD studies were carried out for the first review, and brought up to date in the second review to cover the years 1990–2003 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 in the second review. 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 on as they would appear anyway if they were related to CPD.

Search for first review and to update first review in second review

Database	Search strategy	Number of hits for E1 (1991–2001)	Number of hits for E2 update search (2001−2003)
BEI	Teacher research	28	7
BEI	School teachers professional development	39	2
BEI	Coaching AND primary school teachers	3	1
BEI	Secondary school teachers AND professional development	14	17
BEI	Collegiality AND teacher collaboration	206	0
BEI	Teachers professional development	234	12
ERIC	Teachers AND collaborative AND professional AND development	144	170
ERIC	Continuing AND professional AND development AND teachers (NB not used in the first review)	–	50
ERIC	Teachers continuing professional development AND continuing education	250	15
ERIC	Collegiality AND teacher collaboration	185	29
ERIC	Teachers…collaborative… professional…development (proximity indicators)	–	2
ERIC	Teachers collaborative professional development	144	1
ERIC	Mentors AND professional development	774	166
ERIC	Primary AND school AND teachers AND professional AND development	436	87
ERIC	Collegiality AND professional development	149	42
ERIC	Inservice education AND collegiality	12	0
ERIC	Peer coaching AND teacher research	4	0
ERIC	Professional education AND science teachers	58	0
ERIC	Collaborative professional development AND curriculum	318	2
ERIC	Professional development AND (teacher collaboration OR teamwork)	525	156
ERIC	Professional development AND secondary school teachers	3,109	336
Ingenta	Continuing AND professional AND development AND teachers	28	43
Ingenta	Professional AND development AND collaborative AND teachers	20	33
Ingenta	Collaborative professional development AND schools	19	21
Ingenta	Teachers AND peer coaching	25	8
Ingenta	Teachers AND mentors	60	51
Ingenta	Professional AND teachers AND networks	8	16
Ingenta	Professional AND teachers AND knowledge	132	242
Ingenta	Professional AND teachers AND learning	203	255

Search specific for individual studies (EPPI 2)

Database	Search strategy	Time period of search	Number 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 illustrative selection of the 38 searches conducted by the Review Group.

SEARCH 1

ERIC: CIJE & RIE 1990 to June 2004
S1: 78657 records: three 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 to March 2004
S1: 14961 records: three 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 three term(s): Publication year=("2001" OR "2002" OR "2003")

(DISPLAY)

SEARCH 3

ERIC: CIJE & RIE 1990 to June 2004
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 Oxford, University of Warwick, and the NUT library as they regularly covered CPD research but were not available to search electronically.

Journal	Years
American Education Research Journal	1997–2001
American Journal of Education	1998–2000
British Educational Research Journal	1990–2003
British Journal of Educational Psychology	1990–2001
Cambridge Journal of Education	1990–2001
Curriculum Inquiry	1995–2001
Curriculum Journal	1995–2001
Education Action Research Journal	1993–2003
Education Journal	1995–2001
Educational Research	1994–2001
Educational Researcher	1999–2001
Educational Review	1990–2001
Educational Studies	1990–2001
European Education	1999
European Journal of Teacher Education	1992–2003
Harvard Educational Review	1992–2003
International Journal of Educational Research	1995–2001
Journal of Curriculum Studies	1995–2000
Journal of Education for Teaching	1992–2003
Journal of In-Service Education	1992–2003
Journal of Research and Development in Education	1994–2000
Journal of Teacher Education	1992–2003
Mathematics Teaching	1992–2001
Oxford Review of Education	1990–2001
Research in Education	1990–1998
Research Papers in Education: Theory and Practice	1990–2000
Review of Educational Research	1997–2000
Review of Research in Education	1993–2000
School Science Review	1992–2001
Teachers 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 keyword

V0.9.7 *Bibliographic details and/or unique identifier*

A1. Identification of report
Citation
Contact
Handsearch
Unknown
Electronic database
(Please specify) ....
 	
A2. Status
Published
In press
Unpublished
 	
A3. Linked reports
Is this report linked to one or more other reports in such a way that they also report the same study?
 	
Not linked
Linked (Please provide bibliographical details and/or unique identifier)
....
....
....
....
 	
A4. Language (Please specify)
....
 	
A5. In which country/countries was the study carried out? (Please specify)
....
....
....
	A6. What is/are the topic focus/foci of the study?
	Assessment
	Classroom management
	Curriculum*
	Equal opportunities
	Methodology
	Organisation and management
	Policy
	Teacher careers
	Teaching and learning
	Other (Please specify).........................
	
	A7. Curriculum
	Art
	Business studies
	Citizenship
	Cross-curricular
	Design and technology
	Environment
	General
	Geography
	Hidden
	History
	ICT
	Literacy – first language
	Literacy further languages
	Literature
	Maths
	Music
	PSE
	Physical education
	Religious education
	Science
	Vocational
	Other (Please specify)..........................
		A8. Programme name (Please specify.)
		
		....
		
		A9. 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
		Other (Please specify).............................
		
		A10. Age of learners (years)
		0–4
		5–10
		11–16
		17–20
		21 and over
		
		A11. Sex of learners
		Female only
		Male only
		Mixed sex
			A12. 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
			Nursery school
			Post-compulsory education institution
			Primary school
			Pupil referral unit
			Residential school
			Secondary school
			Special needs school
			Workplace
			Other educational setting (Please specify)..
			
			A13. Which type(s) of study does this report describe?
			A. Description
			B. Exploration of relationships
			C. Evaluation
			  a. naturally-occurring
			  b. researcher-manipulated
			D. Development of methodology
			E. Review
			  a. Systematic review
			  b. Other review

Review-specific keywords

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)

Type(s) of practice/intervention

Action learning sets	Peer coaching
Action research	Peer observation
Coaching	Peer support
Collaboration	Planning schemes of work
Counselling	Post graduate education
Curriculum design/development	Role play
External expertise	Seminar
Internal expertise	Sharing practice
INSET	Specialist expertise
Lesson analysis	Study groups
Mentoring	Teacher research
Modelling	Team teaching
Networks	Training
Observation	Workshops
Online courses	Other (Please specify)

Outcomes

Staff/teacher knowledge	Student/pupil self-esteem
Staff/teacher morale	Subject knowledge
Staff/teacher motivation	Teacher attitudes
Staff/teacher skills	Teacher beliefs
Staff/teacher understanding	Teachers
Student/pupil achievement	Teaching
Student/pupil learning	Teaching strategies
Student/pupil motivation	

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).

....
....
....

In order to ensure a fair comparison across the reviews, the review-specific keywords were narrowed in this review. They are listed below.

Review-specific keywords used in the comparison review

Type of practice/intervention
Action research
Coaching: peer
Coaching: specialist
External expertise
Internal expertise
Joint planning
Mentoring
Observation: peers
Observation: specialist
Post graduate education
Peer support
Training
Workshops
Other (Please specify.)

Outcomes

Teachers
Teaching strategies
Staff/teacher understanding
Student/pupil learning
Student/pupil self-esteem
Teacher attitudes
Staff/teacher knowledge
Staff/teacher motivation
Staff/teacher skills
Staff/teacher morale
Teacher beliefs
Subject knowledge
Student/pupil motivation
Student/pupil achievement
Teaching

Appendix 2.5: Definitions of CPD review-specific keywords

Type(s) of intervention

Action research

Use this keyword if the intervention was provided through systematic enquiry within the establishment which was designed to yield practical results that are applicable to a specific situation or problem.

Coaching: peer

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

Peer-coaching is undertaken between teachers who agree to develop their professional learning through a mutual process of support and challenge.

Coaching: specialist

Use this keyword if the intervention involves coaching as defined above, but where the coaching is provided by external CPD providers.

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.

Joint planning

Use this keyword where teachers are involved in collaborative activities related to any of the following:

- development of curriculum materials
- learning activities

- learning objectives

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.

Observation: peers

Use this keyword if the intervention focuses on classroom observation involving teachers and their professional colleagues as part of their professional development.

Observation: specialist

Use this keyword if the intervention focuses on classroom observation carried out by outside specialists as part of the professional development process.

Post-graduate education

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

Peer support

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

Training

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

Workshops

Use this keyword if the intervention involves provision of information or materials provided through workshops with the aim of imparting knowledge which can be cascaded to various groups (e.g. students, teachers, governors, parents).

Appendix 4.1.1: Consultation of teachers/participants and ownership

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Farmer *et al..* (2003)	Unclear/Not stated A 'teacher-leader' was involved, but there is no explanation of whether they were leading the CPD.	Yes: Teachers took what they wanted, and or were able to take from the CPD sessions. The researchers created a model describing how teachers were interacting with the project in order to try to learn better what teachers were taking from it.	Yes: The researchers treated participants as individuals, realising they would all interact differently in the project, and took this into account when analysing the impact of the project on teachers.	Yes in all of these as explained: 'As the project progressed, it became clear that various participants had rather different ways of interacting with it, and hence, seemed to experience different effects from their participation. Some appeared to be mostly interested in obtaining specific activities for use in their classroom, or in receiving credit for their participation. Others were interested in enhancing their professional skills, and their understanding of the subject material. Still others seemed to be "turned on" to a different way of thinking about and doing mathematics, and eager to uncover implications for their students and classrooms. We began to create a model describing how teachers were interacting with the project, and tried to learn in greater depth what they were taking from it.' (p 339) The model the researchers constructed showed that teachers had three levels of appropriation: 1. Concrete activity and content 2. Professional principles and understandings; attitudes and beliefs 3. Teaching as inquiry

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Goodell *et al.* (2000)	Yes: The CPD programme was Ohio-wide, carried out over a decade, so must, the reviewer infers, have involved the local authority, higher education (HE) experts, and heads of schools.	Unclear/Not stated The size of the programme meant that it was determined centrally, not by individual teachers.	Unclear/Not stated	Not stated
Greenwood and Haury (1995)	Yes: HE experts led the CPD initially, and in the third and fourth years of the science institutes, the teachers began to lead sessions for their peers as they had grown in confidence and experienced. Support and Empower your PAL (SEPAL) in previous years.	Yes: This was the whole aim of SEPAL. The planning group was made up of teachers who planned and designed the science institute. They also led sessions for their peers in the third and fourth years of the project. So teachers led the CPD as well as received it.	Yes – to some extent. Teachers' individual needs and starting points are not stated in the study, although teachers in the local area were consulted, as they identified their needs before SEPAL began. The researchers also state that the teachers were not science graduates and most of them lacked confidence and knowledge in teaching science.	Yes: Teachers were on the Planning Group, which planned the CPD (recruitment strategies, instructional activities and evaluation plans) and they were able to discuss concerns and experiences together. However, the aims of the study and the science content were decided by the researchers, at the beginning of the project, albeit with some input from teachers on what their needs were.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Hawkes and Romiszowski (2001)	Unclear/Not stated Project teachers provided input on the development of an electronic toolkit located in a district server file folder where electronic tools could be retrieved to develop and refine teacher's problem-based learning (PBL) units. There is no report on how leadership was involved.	Unclear/Not stated This is not stated, although it is assumed that teachers had some control of the pace at which they delivered the PBL unit in their classrooms.	Unclear/Not stated	Unclear/Not stated There is little information given about the actual programme which the teachers undertake. There is therefore no information on the evidence of ownership of the CPD by these teachers. Teachers had opportunities to discuss the CPD through meetings and use of the computer-mediated discourse, and they were able to build on their own knowledge in those sessions. There is no report on whether teachers were able to choose their own PBL units.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Henson (2001)	Yes: The school's principal initiated the CPD. However, his exact role is unclear. Also, the extent to which the author/researcher collaborated in the implementation / leadership of the programme of professional development being followed by the participants, and studied within the research, is unclear.	Yes: The model of teacher research was teacher-driven. Teachers identified challenges relevant to themselves and designed the research project around them.	Yes: There is evidence throughout that the teacher-research programme of professional development provided addressed teachers' individual learning needs and starting points. The teachers in this study were particularly interested in behavioral management issues. Accordingly, they tended to develop interventions aimed at reducing disruption or facilitating on-task behavior.	Yes: There was evidence that the model of CPD provision within the study provided the teachers with considerable ownership. 'The model actively engages teachers in a collaborative process to critically explore their own classroom contexts and is consistent with the orientation of researchers such as Cochran-Smith and Lytle (1990).' (p 821) 'The model of teacher research used in the present study was highly participatory and teacher-driven, thereby providing professional development of an active nature as suggested by Ross (1994) and Little (1984).' (p 822) 'Following the model, teachers first brainstorm to identify instructional challenges that are relevant to them in the instruction and/or behavioral management of their students. Teachers then devise data-based methods with which to corroborate or refute their perception of these challenges. Following group discussion of the verified challenges and a brief review of the applicable literature, the teachers develop intervention studies in an attempt to remedy or positively impact student achievement, behavior, or other elements of the classroom that they have identified.' (p 826) The teachers tended to develop interventions aimed at reducing disruption or facilitating on-task behaviour, which was a big issue in the school in this study. The teachers and instructional assistants involved were able to direct the focus of the interventions that they developed through the teacher research in which they were involved. The model of professional development provided allowed them to focus on classroom issues which were of importance to them. The reviewer infers that this would allow them to build on their own knowledge and starting points. However, the teachers appear to have had little involvement in selecting the overall choice of strategies to be used; this was already focused on teacher research.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Lin (2002a)	Yes: Both the researcher and the teachers shared leadership of the CPD, however, the researcher was expected to contribute more theory than practice, while the four teachers were expected to share more classroom experiences.	Yes: The reviewers infer this is the case because the development of cases depends on the details of the experiences of the teachers in response to what is going on in their classrooms, not according to some externally set criteria.	Yes: The researcher assesses the individual needs of the teachers prior to the study.	Yes 'Each teacher of the team took responsibility for planning, practicing, and modifying the processes of the research, but the researcher was the pilot of the study and worked with the team to discuss teachers' implementation needs before the research started.' (p 322)

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Lloyd *et al.* (2000)	Yes: The CPD was led by four science teacher trainers from a HEI - Bretton Hall, College of Leeds University. They determined the details of training and led the project. Insofar as they acted as peer coaches for one another, teachers might be said to 'lead' some of the CPD (reviewers' inference). Headteachers of schools were invited to participate in the last hour of the half-day session in stage 3 in order to enable a joint evaluation from a whole school perspective. Heads were enthusiastic about the project, but there is no evidence of anything other than general leadership.	Unclear/Not stated The teachers and co-ordinators had limited input for determining pace and scope of the CPD but were able to set the pace of their work with each other within phase 2 in school.	Yes: Apart from the opportunity to address individual needs during phase 2 (peer coaching), individual teachers' level of knowledge with regard to process skills in science was carefully measured at the outset of training. The study reports no measures to address teachers' individual needs; however, one assumes that the subsequent training addressed the needs thus identified.	Yes – to some extent There is no clear evidence of teachers choosing strategies. It is assumed that teachers could input into the study aims to a limited extent in phase 2 of the project. There were opportunities for teachers to build on their own knowledge through discussing challenges and problems. However, there were no opportunities for teachers to choose strategies or input to study aims/focus of mission.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
McLymont and Costa (1998)	Yes: school leaders, the teachers, and the researcher The principal was directly involved: he helped set up the study; the vice-principal and head of mathematics were also involved and supportive (although to a more limited extent).	Yes: The researcher believed that it was very important that the group took an active role in the planning so that ownership became theirs and not that of the researcher.	Yes: Teachers were encouraged to identify their own needs and starting points, and reflect on these as part of the programme.	Yes: Teachers were involved in the development of the CPD and teacher ownership of the process was seen as vital to the success of the programme. There were many opportunities to discuss the CPD and the effects on teaching and learning.
Morin (1998)	Yes: School leaders, consultants, HE experts and teachers were all involved in planning and driving the CPD through committees, supervisions and observations. We can assume the LEA equivalent was involved in the planning and leadership of the CPD as some of the funding came from the River East District no 9 and the Manitoba Council for Leadership in Education and a number of consultants (LEA experts) were involved, but this is implied.	Yes: Teachers suggested topics, guest presenters or experiences, which led to a series of workshops being organised and implemented. The project was developed collaboratively by the school principal and her staff during the school planning meetings so they were able to determine their own pace.	Yes: Through individual needs assessment. The principal of the school knew her teachers well individually and, as teachers were also involved in planning the CPD, their individual starting points were taken into account.	Yes: Through the steering committees, individual needs assessment, analysis of group orientation and exploration of group needs and planned changes. All the staff in the school, including support staff: 'Project Learn was activated within a change community which consisted of teachers in the school, teaching assistants, the school principal and a university professor who collaborated together to bring about change in the school.' (p 11) 'The project [was] developed collaboratively by school principal Sharon Hay and her staff during the school planning meetings...' (p 11) Planning meetings, planning committees and steering committees to discuss problems, issues and ways forward. 'An additional aim of the small group discussions was to set a Professional Development agenda for the future.' (p 29) 'The teachers discussed the on-going relevancy of the goals of Project Learn and their commitment to them.' (p 35) ... and 'the present and future agenda' (p 36)

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Swafford *et al*. 1997	Unclear/Not stated Since the literacy programme was being implemented by the local school district, the LEA was clearly involved, but the involvement was not described. Similarly, the academic input from Texas Tech University is implied, but not specified. The study is not clear as to the leadership structure.	Unclear/Not stated The reviewers infer this is the case because the report states that teachers differed in how extensively they implemented the framework, and that some needed more time for experimentation and reflection (see p 423). The researchers were also sensitive to some teachers' lack of time in the classroom to implement their CPD, and other teachers had limited access to appropriate reading materials.	Yes: As the study was undertaken in order to assist teachers in changing their practice, the reviewer infers that individual starting points had to be a consideration, but no evidence in support of this assumption is provided.	Yes: There was evidence that, during conferences, teachers played a large part in directing the reflection and discussion in relation to questioning strategies, reading materials, organisation of classes, and class procedures.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Vaughn *et al.* (1998)	Yes: It would appear that the CPD was designed and led by the researchers and the teachers involved in the professional development (PD). However, it is unclear if school leaders and/or LEAs were involved in the leadership of the CPD.	Yes: To some extent, they determined the scope as they were consulted about what the appropriate strategies to learn would be. There is no information regarding the pace of the CPD, except that the teachers were keen for the support to continue after the one-year programme had ended.	Yes: To some extent, it did as it was focused on the teachers' needs in the classroom and they were able to choose aspects of the CPD which were relevant to themselves and their own classrooms. The researchers also collected information at the start of the programme regarding teachers' familiarity with the programmes; some were more familiar than others, but it is not clear if the CPD was altered or adapted to take account of this.	Yes: Opportunities to discuss problems/challenges The CPD described in this report was based on some PD programmes which had run before, so content was already established; however, teachers were able to identify instructional adaptations and strategies relevant to their own classrooms. 'We [the researchers] communicated to all teachers (general and special education) that their role was to serve as co-researchers to learn how best to implement the instructional practices in large urban classrooms that include students with disabilities.' (p 60) Developed a 'community of teachers' to provide ongoing support and solutions about implementing the instructional practices. (p 71) There is no evidence of teacher ownership of CPD in the choice of strategies chosen in the intervention. Although teacher knowledge is assessed, it is unclear whether the CPD intervention builds on teachers' own knowledge. There is no clear evidence that there is teacher ownership of the study aims.

Item	Leadership of the CPD. Were school leaders involved? LEA? HE experts? Teachers?	Were teachers actively involved in determining the pace and scope of their CPD?	Did the CPD address teachers' individual learning needs and starting points?	Was there evidence of teacher ownership of the CPD in (a) choice of strategies, (b) study aims/focus of mission, (c) building on teachers' own knowledge, and (d) opportunities to discuss problems/challenges?
Xu (2003)	Yes: The school principal had strategic responsibility.	Yes: Although the principal had strategic control, the teachers selected their own areas of interest.	Unclear/Not stated However, the reviewers infer that this was the case as a major part of the CPD was based on the teachers identifying and pursuing their own needs within an overall school context established by the principal.	Yes 'One condition was for both the teachers and the administrators to have a sense of joint control over professional learning. This was realised when the teachers selected an individual area of interest to work on while the principal decided on a larger focus for the school each year. This sense of joint control was especially important for teachers in the beginning. As one teacher observed, it opened up a door for them to think about working on something individually interesting as well as meaningful.' (p 355) 'Closely related to a shared sense of control was a desire to keep the project manageable. Ms. Fry was very careful not to overwhelm the teachers. She explained, "It's about taking what they've already got and adding other dimensions." Rather than besieging them all the time with new stuff, she encouraged them to focus on one area of interest and "use the portfolio as a way to bring new initiatives that make sense to them".' (p 355)

Appendix 4.1.2 Reflection/action/theory

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
Farmer *et al*. (2003)	This was encouraged during workshops and seminars, in oral or written form, and teachers were also encouraged to keep a reflective record in their own time.	Teachers could take what they had learnt from the CPD sessions, but it appears that they planned lessons, etc. by themselves rather than collaboratively. No specific detail is provided, but it does state in the outline of the project sessions discussion of planning implementation activities.	The book by Sullivan and Clarke (1991*) was given to participants in the project to learn about 'good questions'. The researchers discussed explicitly with participants how they used Sullivan and Clarke's procedure to create one of the mathematics tasks at a seminar. * Sullivan P and Clarke DJ (1991) *Communication in the Classroom: The importance of good questioning*. Australia: Deakin University Press.	Both. Teachers discussed and reflected in workshops and seminars. They also reflected on their teaching after individual lessons that they had done using what they had learnt in the workshops and seminars. Material for lesson plans was supplied in the workshops, but teachers were also expected to use the ideas rather than just concrete activities, in their classrooms.
Goodell *et al*. (2000)	Unclear/not stated The reviewer infers that, as the study background section attributes failure of many teacher professional development activities to factors including the lack of 'including time for reflection', reflection time was built into the programme.	Unclear/Not stated Again, the reviewer infers that such opportunities were built into the programme, and particularly the stress on email support illustrates the emphasis on continuing collaboration.	Unclear/Not stated There is no indication as to whether the research which grounded the whole programme was shared with the teachers.	Yes it included both.

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
Greenwood and Haury (1995)	Teachers were able to reflect during their discussions in the afternoons at the science camp, after they had been putting their newly constructed ideas into practice.	Eight teachers worked together throughout the year on the planning group in order to prepare for the summer activities. During the summer activities for the students, the planning group teachers worked in pairs to prepare the activities.	During the intensive science institute, the teachers had the opportunity to explore inquiry-based learning. The reviewers inferred that this would include some theory as it was led by university people, one of whom had presented a paper at a research conference.	Both, with an emphasis on 'doing it'
Hawkes and Romiszowski (2001)	The key variable being measured was the amount of reflective dialogue that was taking place in computer mediated or face to face discourse. This implies that there was the opportunity for professional reflection to take place.	Yes, in the larger project. Teacher teams completed and delivered their first problem-based learning (PBL) unit in the spring of the first project year. Teachers planned for refinements to the first PBL units and the development of a second unit through the summer. Collaboration was promoted through the use of the networks to communicate and share ideas with each other.	Unclear/Not stated There is no mention of any research that may have been introduced to the teachers involved.	The intervention involved the creation and implementation of PBL units, but also reflection in face-to-face meetings and through CMC discourse.

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
Henson (2001)	The approach actively engages teachers in a collaborative process critically to explore their own classroom contexts. Using a participatory research and development (PRandD) model of teacher research, the participants first identified instructional challenges that are relevant to them in the instruction and/or behavioural management of their students After implementation of the studies, the teachers met and evaluated the effectiveness of their interventions.	As part of the 'participatory research and development (PRandD) model of teacher research, the participants collaborated in small groups to develop intervention studies in an attempt to remedy or positively impact student achievement, behaviour, or other elements of the classroom that they have identified.	The participants undertook a brief review of the relevant literature. No further details are provided of such opportunities to learn from research and/or explore theory.	The CPD intervention included a balance of discursive/reflective activities and practical application-based activities: • six formal study team meetings (lasting 2–3 hours each) • small group meetings as needed. Teachers then devised data-based methods with which to corroborate or refute their perception of challenges. • The teachers developed intervention studies in an attempt to remedy or positively impact student achievement, behaviour, or other elements of the classroom that they have identified.
Lin (2002a)	This was a specific component of the research. The whole report is studded with instances of reflection.	The teachers met after observing each other's lessons to address issues and solve pedagogical problems. This led to in-depth discussions.	There was a little evidence for this. The researcher offered a theoretical account related to the distinction among various comparison-type word problems.	Both were critical elements of the CPD.

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
Lloyd (2002)	Professional reflection formed a considerable part of the professional development opportunity. Data-collection for the research involved several self-reflective activities by the teacher-students.	Unclear/Not stated.	A considerable component of the programme of professional development involved the students undertaking their own action research on which they reflected. However, within the programme there was also opportunity to study theoretical perspectives relating to SEN as a disability issue; the politics of SEN; social construction and creation of SEN; SEN as an equal opportunities issue; and the whole integration/inclusion debate.	Essentially, the master's degree programme of study was discursive/reflective. It involved discussion of theoretical issues. The students actively engaged with action research, which involved examining their own practice and exploring the impacts of changes that they introduced in the classroom. Hence, the professional development included both types of activities mentioned.
Lloyd *et al*. (2000)	Teachers were given the opportunity to reflect during work with their partner teachers. They were also given the opportunity to reflect after they had completed the three phases of the programme.	The 15 co-ordinators and their partner teachers were given the opportunity to plan together, teach and observe each other in their own classrooms with a focus on process skills, and to review the result.	Not stated It is not stated if the teachers were introduced to the theory on which the activities were based.	Yes, both The intervention involved teachers identifying process skills in a baseline and end assessment. The teachers and co-ordinators worked together in schools to plan and teach using the knowledge and skills they had learnt, and talked about this work together afterwards, reviewing the result. 'Through the course we had the chance to consider in detail the different process skills and what they involve. We have focused on what to look for in the children's work and contributions when different skills are being targeted.' – teacher (p 363)

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
McLymont and Costa (1998)	Teachers met for PD sessions, which included debriefing to share experiences, suggestions and reflections on their practice and what had been happening with the students. Co-coaching depended on collaboration and extended dialogue with colleagues and reflection.	Some. The coaching and co-coaching involved elements of joint planning and evaluation of practice.	Unclear The teachers were exposed to new techniques, but how much of this was simply directed by the researcher rather than allowing teachers to explore theory is unclear.	It seems to be both: 'The coaching approach demands reflection on action and experience.' (p 17)
Morin (1998)	There were opportunities in the meetings for staff to engage co-operatively in a reflective appraisal of instruction in the school. To aid self-reflection and analysis, teachers kept written or audio logs. Teachers comment in the results and questionnaires that they appreciated the opportunity to clarify, reflect and collaborate.	Teachers had the opportunity to help each other plan new curriculum and new ways of teaching. Strategies in Project Learn included: • team curriculum planning • testing new practices • teacher dialogue and sharing	The PD model used in this study incorporated presentations on PD days; text resources and related readings. Steering Committees functioned like study groups. Readings were shared formally at workshops and planning meetings, while specific readings were shared more informally with teachers. New professional resources related to Project Learn were placed in the Sherwood School library.	Yes - Both. The programme involved a mixture of meetings, discussions, seminars, planning, practical work, observations, peer support and collaboration. For example, 'Teachers' abilities to link theoretical understandings about reforms with practice improves dramatically when they have the chance to apply theory in their own classrooms.' (p 18)
Swafford *et al*. (1997)	This was a major component of the conferences.	While there is no direct evidence of collaborative lesson-planning, the report refers to shared reflective thinking about their practice in a number of parts of the report. Teachers began to discuss the implementation of the literacy framework. They worked collaboratively to plan classroom management.	Unclear/Not stated There may well have been some theoretical input about the coaching process for the coaches as they themselves worked closely with academic people.	Both

Item	Were there opportunities for professional reflection?	Were there opportunities to plan lessons, teaching materials or schemes of work within a learning framework? Was this collaborative?	Were there opportunities to learn from research and/or explore theory?	Was the CPD intervention application-based (doing it) and/or discursive/reflective (talking about it) or both?
Turvey (1996)	Unclear/not stated The reviewers infer that opportunities existed because teachers had to identify needs and problems in relation to their own classrooms, and this would presumably involve some reflection on what they themselves had done up to that point.	The teachers planned and wrote new curriculum units. They also worked together to identify strategies which would help towards inclusion.	In the first workshop, the teachers were presented with two research papers to read.	The CPD seems predominantly discursive rather than practice based.
Vaughn *et al.* (1998)	The role of the teachers included 'to engage in ongoing reflection about the practices' (p 60).	To some extent, the teachers worked with their special education colleagues to implement the strategies. The researchers acted as coaches by co-teaching the instructional practices and problem-solving with teachers. This included helping the teachers to tailor the strategies for their classrooms. The teachers provided ongoing support for each other.	To learn from research but not to explore theory	Both
Xu (2003)	There are many references to reflection. Teachers reflected upon samples of students' work which were kept in teaching portfolios. They reflected on the aims and activities in their teaching, individually and collaboratively.	The study refers in several places to collaborative working, although these seemed to be casual/informal rather than a planned part of the CPD: 'One teacher said, "It gives us something on paper to use and to share with others about our teaching styles and our ideas. It gives us a chance to talk to each other and to really collaborate."' (p 353)	No	Unclear/not stated It was more about reflection, but it did involve application too.

Appendix 4.1.3 Data-collection methods and analysis

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Farmer *et al.* (2003)	One-to-one interview (face to face, or by phone): At least two interviews were completed with each of the three teachers in the study. Observation: At least two classroom observations were carried out with each of the three teachers in the study. Self-completion report or diary: The researchers had access to teachers' daily reflections on work they did during both the summer institutes and the Saturday seminars (p 344). Other documentation: 'Emails teachers sent and final implementation reports were collected.' (p 344) Coding is based on authors' description.	Explicitly stated 'The data were coded, codes were refined and each case was analysed for important themes. These were then related to the model, and a description of the kinds of appropriation was generated for each case.' (p 345)

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Goodell *et al.* (2000)	One-to-one interview (face to face, or by phone): With teachers (also principals and students but these are not used in this analysis) Observation of teachers involved in the institutes (but again these are not used in the analysis) Self-completion questionnaire from teachers who had and had not attended the summer institutes. Coding is based on authors' description.	Explicitly stated Quantitative: A principal-components rotated-varimax method of factor analysis was employed twice: once for the frequency responses and once for the importance responses in the questionnaire. Cattells Scree Test was applied to determine the optimum number of factors for each analysis. Following the factor analysis, the internal consistency of the factors was determined using coefficient alpha. Effect sizes were used to investigate differences in the reporting of these factors by SSI and non-SSI teachers. Qualitative: Qualitative data were analysed using NUD*IST software; interview transcripts were entered into the software and 'codes' that described specific things teachers talked about were attached to appropriate segments of text. The codes were based on Rossman's conceptual framework for synthesising case studies located within the practice of systemic reform. The dimension most relevant to this study was the technical dimension, which covered the areas of professional development experience, the provision of resources to support the suggested reforms, the establishment and maintenance of teacher support networks.
Greenwood and Haury (1995)	One-to-one interview (face to face, or by phone): The reviewers inferred they were individual interviews. Self-completion questionnaire: The researchers gave the participating teachers two 'physical science' surveys during the programme (p 156). Examinations: Teachers completed a 'Science survey' to test science content knowledge (p 156). Other documentation: Anecdotal evidence about teachers' leadership and in-house expertise Coding is based on authors' description. Coding is based on reviewers' inference.	Explicitly stated 'An ANOVA performed on the mean responses for each group of teachers' from their questionnaire answers. The numbers of correct answers were compared for the science knowledge surveys. The numbers of teachers becoming specialists/leaders in their schools was counted. (p 156) Not stated/unclear: Very little is written about methods of analysis, especially for the discussions and interviews. Four quotations from teachers are included in the study (p 156).

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Hawkes and Romiszowsk(2001)	Observation Other documentation: Data were collected by recording team meetings onto audio tape and copies of the computer-mediated communication were also collected.	Explicitly stated Analysis of the flow, frequency, and volume of communication activity and the nature of the dialogue: it centres on the reflective attributes of the discourse. All computer-mediated and face-to-face communications between project participants were scored on a seven-point reflection rubric. Low-level reflective responses are those which merely describe events and appear disconnected from the observer. More reflective responses richly describe events and attempt to explain them in light of theory or principle. To prepare the face-to-face discourse for analysis it was 'chunked' into frames comparable to that of the electronic discourse. A team of three independent raters with doctoral degrees in education and a combined 40 years of experience in educational research participated in message-rating training and calibration to ensure the reliability of the results. After all identifying information (school and individual) was removed from electronic messages and transcripts, raters judged each of the 'chunked' exchanges in the face-to-face (N=222) and computer-mediated (N=79) messages, using the seven-level rubric.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Henson (2001)	One-to-one interview (face to face, or by phone): Interviews and field notes. Each teacher was formally interviewed at the beginning and end of the project. The school principal, the two assistant principals, and two mentor teacher researchers were also interviewed. It is not explicitly stated who conducted these interviews, but the reviewer infers that they were conducted by the author/researchers. Observation: Process observations and field notes were made through the project. The reviewer infers that these observations and field notes were made by the author/researchers. Self-completion questionnaires: -teacher efficacy scale -school participant empowerment scale -school-level environment questionnaire -degree of project implementation -level of collaboration	Explicitly stated Qualitative analysis, data handling: Typed transcripts of interviews were developed for analysis. Field notes were also submitted to qualitative analysis. Data analysis: The author explicitly describes both the qualitative and quantitative data analysis methods used. Data were examined for convergence on the three primary data sources: quantitative indices, qualitative interviews, and process observations and field notes. All surveys were submitted to item analysis and examined for score reliability. Repeated measures analyses were used to examine change in general and personal teaching efficacy, empowerment, collaboration, and perceptions of school climate from pre- to post-test. Gain scores for these variables were predicted by level of implementation to determine effects attributable to implementation of the teacher research projects. Regression analyses were also used to examine the relationships between the variables. Qualitative data (i.e. interviews and field notes) were submitted to a constant comparative analysis in which themes were allowed to emerge into meaningful categories. The data were grouped according to the categories and interpreted in light of the study's overall focus on teacher research and efficacy to provide a rich description of the experiences of participating teachers.
Lin (2002a)	Group interview One-to-one interview (face to face, or by phone) Observation Self-completion report or diary Coding is based on authors' description	Explicitly stated Data were analysed using a grounded theory approach, as described by Strauss and Corbin. In this approach, the research is the primary instrument of data-collection and analysis, applying inductive methods and striving to derive meaning from the data. In keeping with this approach there were no predetermined criteria or coding system in the analysis. To document teachers growth of knowledge, the transcripts of interviews, group meetings and observations were analysed using a procedure in which all documents were reviewed and annotated. Each transcription was coded by the researcher and two graduate students. The results were reciprocally examined to see if the codes from paragraph to paragraph were consistent among the analysts.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Lloyd (2002)	One-to-one interview (face to face, or by phone) Self-completion questionnaire for the whole sample. A follow-up questionnaire with the three students selected for semi-structured follow-up interviews. Self-completion report or diary	Not stated/unclear Researcher/author states explicitly that 'the collection and analysis of data was a collaborative enterprise between myself and the students…' (p 116), but no further details are given in terms of the methods of data analysis employed.
Lloyd *et al.* (2000)	Curriculum-based assessment: The teachers were tested (in a practical test) on how well they could identify the use of specific scientific skills (referred to as process skills and part of the National Curriculum Attainment Target AT1) in a 'circus' of practical activities set up for them. Self-completion questionnaire Practical test: The teachers were given a practical test on a 'circus' of practical activities set up for them.	Explicitly stated For teacher subject confidence: use of confidence index 'A "Confidence Index" was computed for each subject by taking a weighted sum of the percentages replying using each category. This weighted sum was calculated by taking the percentage for "Fully confident" multiplied by 4, that for "Confident" by 3, "Can manage" by 2 and "Need help" by 1, and then the figures summed to give the index figure. The maximum possible confidence index value is therefore 400 with a minimum of 100.' (p 357) For confidence in teaching science, a similar confidence index was used. For teachers' estimate of difficulty of teaching different aspects of science, they calculated a 'difficulty index': 'The Difficulty Index is calculated in a similar way to the Confidence Index with the percentage replying "Not all difficult" being multiplied by 1 and "Very difficult" being multiplied by 4.' (p 358) For teachers' understanding of the skills used in practical work (pre- and post-test), 'we adopted a system where their score for a task was the number of correct answers divided by the total number of answers given' (p 361). The pre- and post-test scores were compared, using a paired t-test.. A non-parametric test was also carried out on these data to aid validity.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
McLymont and Costa (1998)	Focus group One focus group at the end of the project. Group interview Extensive use of ongoing reflections and interactions during the seminar series and monthly professional development sessions video-taped and audiotaped. Open-ended questions were used. One-to-one interview (face to face, or by phone) Face to face with individual teachers. Semi-structured. Three interviews in June, October and December; started in June 1997 prior to the seminars. Observation: Data collected on classroom observations, conversations and meetings and PDP sessions.	Explicitly stated Data gathered were transcribed and analysed. Through narrative accounts, emerging themes from various modes of data-collection were informed by the constructs in the conceptual framework. The conceptual framework, however, did not limit the analyses since these analyses were also sought using inductive data analysis techniques. The themes have been induced from the data which account for the ways that individuals experience, interpret, understand, perceive or conceptualise aspects of their coaching experience and the activities in which they were involved.
Morin (1998)	Group interview Recording of small group discussions: small group discussion questions (Appendix) One-to-one interview (face to face, or by phone) Semi-structured interviews were conducted and auto-recorded with all the teachers observed as well as the school principal. Interview Recording Form (Appendix) Observation: Observation Recording Forms (Appendix) Classroom observations and school tours were conducted twice during the first year of the two-year study. These were documented via note taking, verbatim description of events and photography. Field notes Self-completion questionnaire Reaction forms (feedback forms to Professional Development Days): School/college records (e.g. attendance records, etc.) Minutes of meetings School newsletters	Explicitly stated Data analysis was based upon analytic induction and the constant-comparative method, both suggested techniques for case studies using more than one data source. Data were reviewed, interpreted and coded as an ongoing process throughout the data-collection period. Triangulation was used to help confirm the findings of the study.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Swafford *et al.* (1997)	One-to-one interview (face to face, or by phone): Research assistant interviewed each teacher on two occasions. Peer coaches also interviewed. The peer coach 'conferenced' with each teacher after each of the four types of CPD intervention. Observation: Lesson observations to inform reflective papers and coaching conferences. Self-completion report or diary Reflective papers completed by teachers and peer coaches. Other documentation: Some lessons were videotaped for discussion later. These interviews between the peer coach and the teacher were audiotaped, then transcribed.	Explicitly stated (p 418) 'Inductive data analysis (Bogdan and Biklen, 1982) procedures were used to analyse the data'. Transcriptions of audiotaped data from interviews and peer coaching conferences, as well as copies of teacher reflection papers were read and re-read to get a sense of the data as a whole. Then notes were written to record initial impressions of topics that re-occurred in the data and to note the relevance to research questions. To code the data, segments were highlighted and tagged with a code and then stored on an electronic index card. During the initial coding process, data were sorted by codes and printed. Then the sorted data were examined and checked to make sure all data identified by a particular code were similar. When codes appeared to be related or to overlap, a more general code was used to identify the data. Conversely, when codes were too broad, they were redefined and divided into subcodes. Codes were examined to determine how they were related and then sorted into categories. Later, the data were examined for patterns or linkages across categories to identify possible themes. Patterns were related back to the research questions. (HyperRESEARCH (1991-4) software was used to manage the coding process.)
Turvey (1996)	Self-completion questionnaire The participants prepared new curriculum units to support inclusion which were inspected by the researcher.	Implicit Numerical comparison of pre- and post-test scores, given as percentages. The researcher read the new curriculum prepared by the teachers and compared their responses with her own checklist, although this is not made available.

Item	Which methods were used to collect the data?	Which methods were used to analyse the data?
Vaughn *et al.* (1998)	One-to-one interview (face to face, or by phone): Five semi-structured interviews during the year-long intervention. Observation: Researchers used intervention validity checklists to assess the extent to which teachers implemented components of the instructional practices. Researchers also kept logs of their classroom observations. Self-completion questionnaire Each teacher chose five barriers and five facilitators to implementation from a list of 24 possibles.	Explicitly stated Most of the data collected for this study were a result of field notes, interviews and observations. The first flow of analysis occurred during data-collection and involved two activities (a) researcher transcribed tapes and notes, summarised transcriptions and field notes and brought their written materials to weekly meetings, and (b) researchers meeting weekly to listen to reports and to discuss organisational frameworks and whether further data sources were needed. The researchers then carried out data reduction. The second flow of analysis included the development of data summaries by six researchers. One researcher examined all the summaries and identified significant findings. The central findings were then subjected to individual re-examinations of data sources. The third flow of analysis involved reviewing conclusions and subsequently verifying them. Conclusions were drawn over time and reported if they were found to be explicit and grounded.
Xu (2003)	One-to-one interview (face to face, or by phone): Open-ended interviews were used twice over eight months. All interviews were conducted at the school, and the data were collected on audiotape. The first interview was conducted at the beginning of the school year and was transcribed immediately. Other documentation: Teaching portfolios were collected from all of the teachers. Other collected documents included students' work, the principal's letters to teachers relating to their portfolios, and teachers' written feedback to the principal. These documents were used to inform the development of interviews, particularly the second round of interviews.	Explicitly stated Data analysis was conducted simultaneously with data-collection. Themes derived from preliminary analysis of the first round of interviews were used to inform the development of the second round of interviews conducted near the end of the school year. Analytical files were built after a school visit or during the transcription of an audiotape. During the final stage of analysis, the constant comparative method was used to analyse the data from various sources. Here data were analysed in such a way that an existing item was replaced by a new one, if it provided a better example to illustrate the category.

Appendix 4.2.2.1: Aims of the studies

Report	Broad aims of the study
(a) Teacher-and-pupil data studies	
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.
Appalachia Educational Laboratory (1994)	The aims of the questioning and understanding to improve learning and thinking (QUILT) programme are explicitly stated: 'to increase and sustain teacher use of classroom questioning techniques and procedures that produce higher levels of student learning and thinking' (abstract). The aims of the study are implicit in that it seeks to assess the effectiveness of the programme in meeting these goals.
Boudah *et al.* (2003)	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.
Britt *et al.* (2001)	To enable teachers to make lasting changes to their teaching. To evaluate the usefulness of professional conversations on classroom practices and student learning.
Britt *et al.* (1993)	This research project aimed to examine the effectiveness of a teacher development programme in mathematics which took place over two years.
Brown (1992)	To investigate the effects of introducing a number of new strategies for learning to students and their teachers in two New Zealand secondary schools, and whether such interventions would raise the standard of learning for the lower achievers in each class.
Bryant *et al.* (2001)	To examine general and special education teachers' personal knowledge about their struggling readers and reading strategies; to learn about the views of the professional development activities; and to examine the implementation of three reading strategies in context area classes.
Da Costa (1993)	To compare four teacher consultation approaches, the goal of which was to permit teachers to make sense of their classroom behaviours through their own values and norms. The study then proposed to examine the effects of these interventions on students' learning.
Ertmer and Hruskocy (1999)	To support teachers' technology integration efforts at Midland Elementary School.
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?

Report	Broad aims of the study
Gersten *et al.* (1995)	To explore how coaching could be used to support research-based teaching practices in general education classrooms to improve the quality of reading instruction offered to students with learning disabilities.
Harvey (1999)	To present evidence relevant to the development of more effective models of in-service education and training (INSET) where activity-based teaching methods are being introduced. To compare the teaching methods of primary science teachers who were provided with coaching with those who received only centre-based workshops and a control group which received no INSET.
Harwell *et al.* (2001)	To initiate action to make classroom learning environments more representative of a constructivist epistemology while integrating technology into learning activities. Intervention aimed to enhance the use of technology in the classroom.
Jacobsen (2001)	The investigation aimed: (a) to examine what effective technology integration looks like (b) to find out the extent to which children can be engaged in authentic learning tasks with information and communication technology (ICT) (c) to explore how professional development can effectively support teachers to integrate technology effectively into teaching and learning (d) to explore the resulting impacts on student learning when teachers take advantage of technology for their teaching tasks
Kimmel *et al.* (1999)	To bring general and special educators together for collaborative participation to develop and implement a model of CPD to improve their knowledge and skill in mathematics and science, and to address the needs of special education students in general education classrooms.
Kirkwood (2001)	The project was established in response to substantial concerns voiced by teachers in one Scottish secondary school and aimed to assess the impact of teachers' professional development on the teaching and learning of computer programming skills.
Kohler *et al.* (1999)	To examine the effectiveness of reciprocal peer coaching for promoting changes in kindergarten teachers' conduct of pupils paired activities.
Lin (2002b)	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. How can elementary science teachers improve the effectiveness of their teaching and increase student learning of science concepts (using constructivist strategies)?
Martin *et al.* (2001)	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.
McCutchen *et al.* (2002)	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.

Report	Broad aims of the study
Parke and Coble (1997)	To examine the impact of practice of a professional development model which focused on linking theory and practice through collaborative curriculum design. A further broad aim was to evaluate the influence of the model on students' attitudes and achievements.
Ross *et al.* (1999)	To examine whether studying peers helped teachers to conduct enquiries into their own practice. To explore effective methods of evaluating individual student progress in collaborative learning situations.
Saxe *et al.* (2001)	To provide bottom-line evidence of the influence of professional development programmes on student learning.
Shapiro *et al.* (1999)	To investigate the impact of an experiential inservice programme and consultation processes in facilitating the inclusion of students with emotional or behavioural disorders (EBD) into general education settings. The primary objective of the project was staff development, with secondary outcomes related to individual student change; only general outcome data related to students are reported. Following these data, more extensive results indicative of staff development variables are presented.
Wilkins (1997)	To determine the effects of a resident mentor teacher on student achievement in mathematics
Zetlin *et al.* (1998)	To investigate whether a comprehensive and collegial approach to professional development would result in increased adoption of teaching practices and behaviours which enhance literacy development in language minority [ESL] students. Sustaining the training over an extended period was a fundamental aspect of the project.
(b) Teacher-only data studies	
Farmer *et al.* (2003)	The researchers wanted to know what was being accomplished in EMES, and what the participants were getting from it. The three aims were to find: • what an inquiry stance toward mathematics teaching looked like • how this stance developed • what the role of the EMES project was in its development
Goodell *et al.* (2000)	The researchers wanted to describe the impact, on participating mathematics teachers, of those specific aspects of Project Discovery that concerned their views of mathematics, their pedagogy, and the involvement of their school principals and students' parents with their work as mathematics teachers.
Greenwood and Haury (1995)	The broad aims were to: • provide experiential learning for teachers • promote an inquiry oriented approach to science teaching
Henson (2001)	The study aims were to examine the motivational effects of a teacher research initiative that was implemented in an alternative and special education school. More specifically, the study investigated the self-efficacy, empowerment, collaboration, and perceptions of school climate of teachers who participated in teacher research.

Report	Broad aims of the study
Lin (2002a)	The goals of the research were as follows: • to enhance the rethinking of mathematics teaching in classrooms in the spirit of the curriculum standards • to foster teachers' awareness of children's learning • to support teachers as they began to put into practice their new vision of a learner-centred approach to teaching mathematics • to promote teachers' ability to reflect on their teaching experiences This study was designed to examine the effects of constructing cases with a collaborative research team in order to develop knowledge central to teaching.
Lloyd *et al.* (2000)	This article investigates the possibility of changing confidence about, and understanding of, the teaching of process skills in primary science.
McLymont and Costa (1998)	To explore alternative approaches to the teaching and learning of mathematics at the high-school level through a fluid approach to professional development utilising cognitive coaching.
Morin (1998)	The purpose of the study was to 'explore the effects of professional development experiences based on the theoretical model developed by Morin (1990, 1994) on teachers' abilities to implement planned educational change in the context of Sherwood School's Project Learn' (p 5). Key questions identified features of planned educational change, including: • What factors contributed to positive teacher change? • What evidence can be provided to suggest the Project Learn is being successfully implemented in the school? • What factors are inhibiting teachers from changing?
Swafford *et al.* (1997)	The purpose of this study is to examine teachers' and coaches' perspectives on the efficacy of peer-coaching.
Vaughn *et al.* (1998)	The study aimed to build on previous knowledge and, through providing an intensive, collaborative professional development programme, measure the extent to which this programme encourages and enables teachers to include and enhance the quality of their instruction for students with learning difficulties in the general education classroom.
Xu (2003)	This study aimed to understand better how a school used teaching portfolios as a primary mechanism supported by a set of conditions to promote professional learning and collaboration among teachers at different developmental stages, and to add to knowledge in this area. The two research questions were as follows: • What was the impact of the teaching portfolios on professional learning and collaboration? • What were the enabling conditions that helped foster school-centred professional development through this portfolio project?

Appendix 4.2.2.2: CPD intervention, processes and activities

Report	Intervention and type of collaboration
(a) Teacher-and-pupil data studies	
Anderson (1992)	Workshop-based training sessions, teaching videotaped, peer support, self-evaluation workshops. The training module included the following elements and techniques: • research involvement • teaching shifts, videotapes, and self-evaluation • principles and techniques for fostering active reading • peer-support
Appalachia Education Laboratory (1994)	Seminars were held every four to five weeks to provide opportunities to: • share successes and problems • review-specific content • practice/apply associated skills and behaviours • plan for classroom use • plan for work with a partner Seminars include 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 were 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.
Boudah *et al.* (2003)	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 1.5 to 2 hours of onsite 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. 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.
Britt *et al.* (2001)	The study was concerned with the impact of teacher conversations on teacher behaviour, beliefs and subject understanding as manifested through increased pupil achievement. This was a two-year programme during which teachers met researchers each month and worked in groups of two or more in their schools. Researcher observed teachers and gave feedback.

Report	Intervention and type of collaboration
Britt *et al.* (1993)	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: • classroom observations by researchers - fed back to teachers with their notes added so that a summary of the main aspects of their teaching could be written • group sessions (8 in the first year and 10 in the second) of the project providing 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 (CGI).
Brown (1992)	A consultant was engaged to work with teachers, offering options of strategic interventions which were appearing in the current professional literature. The consultant outlined a number of options teachers could follow and worked with teachers in developing these options into practical and effective teaching strategies, with mutual support. The study looked at how teachers took up the opportunity; the effects of the programme on their beliefs and practices; effects on student beliefs and practices; changes in student academic and social behaviour; and the costs of implementing such a programme on a wider basis.
Bryant *et al.* (2001)	Four-month professional development programme for sixth-grade, middle-school teachers and some special education teachers to enhance reading outcomes of struggling students in content area classes. Teachers' professional knowledge of the following reading strategies was developed: word identification; fluency and comprehension skills. Implementation was monitored and findings of pupil progress and teacher perceptions of the effectiveness of each strategy reported. Each team consisted of a language, arts, science, social studies, mathematics and special education teacher. The teachers in each team shared planning and advisory periods, and worked collaboratively to address their students' needs. Implementation was monitored, and findings of pupil progress and teacher perceptions of the effectiveness of each strategy were reported.
Da Costa (1993)	All the teachers in this study implemented over one year an approach to collaborative professional development based on a Local School District training course. The teachers were split into groups, according to their specific plans for intervention. These groups included pairs of teachers working by collaborative consultation (peer-based using direct observation); collaborative consultation in a team teaching environment; collaborative consultation direct observation by a teaching partner; and collegial consultation of one teacher by a non-reciprocating supervisor.
Ertmer and Hruskocy (1999)	The study describes the START programme, which involved professional support, instructional support and technical support to teachers and students to enhance their own skills and confidence, and to help integrate technology in their classrooms. Support was provided through monthly meetings, technology inservice workshops and 'on-call' technical support from university personnel. Selected students also received training in an after-school technology programme.
Fine and Kossak (2002)	Simulations, planning and discussions based on the course materials containing rubric questions. The demonstrating 'teacher' specifies what is to be observed and what data or observations are 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.

Report	Intervention and type of collaboration
Gersten *et al.* (1995)	Two project staff with extensive experience in classroom consultation and special education teaching worked with two special educators in the process of coaching 12 classroom teachers. The special educator and project staff member usually began the coaching by conducting classroom observations, focusing on several aspects of the students' learning environments. As soon as possible after each observation, the special educator would share perceptions of the observed instructional interactions with the teacher, including, where possible, pupil data. Teachers and coaches repeated the weekly cycle of observation, feedback and planning for a period ranging from 3 to 30 weeks.
Harvey (1999)	The intervention is concerned with the provision of effective INSET to teachers of primary science in South Africa by the Primary Science Project. A consultant outlined a number of options teachers could follow and worked with teachers in developing these options into practical and effective teaching strategies. The study looked at how teachers took up the opportunity; the effects of the programme on their beliefs and practices; effects on student beliefs and practices; and changes in student academic and social behaviour.
Harwell *et al.* (2001)	Learning environments research and constructivist learning environments. Action research as catalyst to improve professional practice within schools aimed at enhancing use of technology in the classroom. A collaborative action-research effort between practicing teachers and university researchers was the focus for an investigation into the nature of the classroom learning environment prior to technology integration and after technology integration.
Jacobsen (2001)	Joint planning for the term ahead; but collaboration was mostly one to one, rather than workshops and seminars. The intervention was carried out in classes which: • 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 • modelled pedagogical methods with children to enable the teacher to be a participant observer • worked with technology support staff in the school and at the district level as advocates and leaders • observed and worked alongside teachers using new methods and discussed the results with them afterwards • worked with teachers to design appropriate assessment of student work • gathered, organised and shared resources with teachers and students • led professional conversations to build and extend teachers understanding of fundamental teaching and learning issues • provided scholarly and intellectual mentorship
Kimmel *et al.* (1999)	The programme was designed to bring general and special education teachers together for collaborative participation in professional growth activities. Teachers were given access to appropriate instructional materials, educational technologies and hands-on experiences. As well as workshops during the academic year, teachers were invited to summer 'practicum' experiences. Built into the programme were opportunities to work collaboratively, at seminars and in workshops, with regular opportunities for reflection, and discussion of alternative practices together with observation and feedback on the implementation.
Kirkwood (2001)	Teachers collaborated on a wide variety of development evaluation and dissemination activities in a variety of forums, such as regular planning meetings, workshops, reciprocal visits to exchange ideas and observation, small working groups and writing teams, preparing INSET sessions and presentations at conferences.

Report	Intervention and type of collaboration
Kohler *et al.* (1999)	The study explores the impact of peer-coaching by teachers on attempts to enhance pupils' learning through pair activities developed within the integrated instructed approach (IIA) framework. The three teachers received half a day of instruction, then met during the course of the study for mutual observation and discussion.
Lin (2002b)	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.
Martin *et al.* (2001)	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 reflection on the metacognitive aspects of their activities.
McCutchen *et al.* (2002)	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.
Parke and Coble (1997)	The teachers collaborated with university science education specialists in the design of a new curriculum, based on teaching strategies which incorporated ideas from research, students' learning needs, the way students learn, understanding rather than content. Emphasis was placed upon the ability of teachers to design curriculum and classroom environments collaboratively.
Ross *et al.* (1999)	The effect on teachers' practice – and hence on pupil learning – of collaborative action research supported by academic involvement. The approach of this study was to build on teachers' prior observation of other teachers to develop through action-research improved strategies for their own practice in promoting student self-evaluation during group learning activities.
Saxe *et al.* (2001)	The study compared three interventions: two initiated by the researchers and one in current practice. Group 1 worked on implementation of the Integrated Mathematics Assessment (IMA) which gave teachers the opportunity to work with other professionals concerned with effective implementation of reform. A five-day summer institute was followed by fortnightly meetings during the school year focused on the four sets of activities. Group 2 The Support Programme (SUPP) provided opportunities for collaborative exploration of how to implement the two new curriculum units. Teachers met nine times a year, sharing approaches, curriculum materials and discussing students' work. Group 3 Traditional classrooms with no professional development activity

Report	Intervention and type of collaboration
Shapiro *et al.* (1999)	Intervention strategies teaching observation, discussion and sharing practice, lecture presentation, videotape demonstration, and discussion and interaction with the presenter and other project staff. The two-and-a-half day inservice 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 co-operative 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 with Centennial staff to discuss and share teaching strategies.
Wilkins (1997)	The researcher trained one teacher specialist in each of two schools in the strategies and teaching techniques. The specialist then taught colleagues in these techniques and gave them prepared units of instruction. The teacher specialists practised with the units and used the information gained to prepare a second unit. Each resident specialist used regularly scheduled staff development sessions in the local school to train fellow teachers in performance instruction and assessment.
Zetlin *et al.* (1998)	Approximately 10 hours of professional development to develop awareness of (a) the theories underlying a developmental language arts approach, and (b) effective instructional practices for implementation of a comprehensive language arts programme. Researchers met for one to three hours with teacher pairs to facilitate and support their classroom reorganisation. Collaborative discussions took place as to benefits/disadvantages of various classroom arrangements. Weekly professional development meetings with a researcher present were held throughout the school year for teachers and faculty to observe and discuss new strategies and curricula being implemented, and to resolve problems as they arose. Teachers implemented elements of the programme at their own pace. Aspects of the CPD included: • 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, 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 university faculty
(b) Teacher-only data studies	
Farmer *et al.* (2003)	It incorporated: • finding what teachers knew and building on it • specialist input including modelling mathematics pedagogy • professional dialogue and shared reflection • collaborative working among teachers • classroom observation and feedback. The CPD took place over two one-week summer institutes, regular Saturday sessions held during the academic year and observations in schools.

Report	Intervention and type of collaboration
Goodell *et al.* (2000)	The intervention on which this study reported involved: • six-week summer institutes for mathematics and science teachers, conducted by outside specialists who modelled practice • six one-day workshops • ongoing profession collaboration with experienced teacher peers • ongoing collaboration via an electronic network
Greenwood and Haury (1995)	Phase 1 involved teachers working with specialists to plan summer CPD activities and went on throughout the year. Phase 2: During a one-week science institute, the teachers acquired new knowledge and skills in science and teaching through specialist input. Phase 3 was a one-week summer science camp for students taught by the teachers who applied their new knowledge and skills, and worked with peers in planning and leading the activities.
Henson (2001)	The intervention was a university-school collaborative effort. It was a highly participatory and teacher-driven research project implemented in an alternative school for students with severe learning/emotional disabilities. Their practical action research involved: • reviewing research literature • collaborating with other teachers • reflective investigation • critical evaluation of their own practice • developing intervention strategies There were six formal study team meetings (lasting 2–3 hours each) and small group meetings as needed, facilitated by two mentor teacher researchers.
Lin (2002a)	The intervention focused on developing cases to guide teacher learning and education. This three-year research project involved an action-oriented approach which aimed to help teachers examine their classroom practice by: • sharing classroom experiences • sharing critical reflection through professional dialogue • approaching case writing collaboratively The researcher was also the CPD provider and worked to establish teachers' needs at the start. The researcher contributed theory, modelled case writing and also acted as a partner to the teachers in helping them put ideas generated in discussion into practice.
Lloyd *et al.* (2000)	The intervention was related to teacher understanding of process skills in science and had three phases: • Activities were designed to explore teachers' understanding and confidence in process science. • The 15 co-ordinators and their partner teachers collaborated in planning together, teaching and observing each other in their own classroom. • Teachers attended an evaluation session to see how their understanding and confidence had changed.

Report	Intervention and type of collaboration
McLymont and Costa (1998)	Teachers worked together with a researcher to improve mathematics results through: • seminars • monthly professional development meetings • weekly coaching session • reciprocal coaching dyads The researcher served as coach for each teacher in the initial stage, then as co-coach as coaching dyads took on the roles of coach and coachee. There was specialist input in the form of information about the principles of coaching.
Morin (1998)	The intervention incorporated: • professional learning • individual and collaborative reflection • specialist input • collaborative planning (e.g. new curriculum units) • classroom-based experimentation • ongoing feedback It involved weekly meetings seminars at which teachers collaborated in small groups to plan and reflect together. The researchers also introduced research literature. There was modeling by outside experts. Teachers took part in observation.
Swafford *et al.* (1997)	The intervention comprised peer coaching coupled with literacy teaching strategies to bring about improvements in teachers' behaviour. The literacy strategies were introduced by experts at the start of the intervention. The strategies were reinforced by weekly meetings. The peer coaching involved observation and feedback, and collaborative reflection.
Vaughn *et al.* (1998)	The intervention was based on a researcher-teacher professional development group working to include selected students with disabilities in mainstream. The project involved classroom based activities and meetings. It incorporated: • building on teachers' current knowledge and understanding • coaching • in-class demonstration lessons • collaboration and support in a professional community of other teachers and professionals
Xu (2003)	In this intervention teachers kept portfolios of samples of students' work for one academic year. During this year the teachers engaged in: • professional learning • collaboration with colleagues including the school's principal and staff developer provided guidance and strategic leadership.

Appendix 4.2.2.3: Literature bases (all reviews)

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
(a) Teacher-and-pupil data studies	
Anderson (1992)	Explicitly stated. This study builds upon a pilot study. The present project was influenced by research on reciprocal teaching, strategy explanation, student self-questioning, and expert reading strategies. More directly, it grows out of ongoing research on text-processing and intentional learning. Other research cited related to the distinction between students' approaching learning as work to be finished versus approaching learning as a goal to be achieved through problem solving; intrinsic versus extrinsic motivation and task involvement.
Appalachia Education Laboratory (1994)	Implicit. The paper explicitly lays out the foundations of the QUILT programme including the questioning framework and the CPD framework. Implicitly, the study is linked to these.
Boudah *et al.* (2003)	Explicitly stated The authors construct their research on what is known about: 1. content enhancement instructional strategies 2. critical barriers to accessing teacher friendly research reports 3. poor match between teacher needs and in-service topics and instructional formats
Britt *et al.* (2001)	Explicitly stated The study drew on previous research about the following: • professional development programmes for teaching mathematics which led to change in teachers' beliefs and classroom practices • improving teaching by developing teachers' knowledge of students' mathematical concepts and by encouraging teachers to reflect on the effects of different aspects of their teaching • teachers negotiatiating their own changes in classroom practice, with ongoing support from researchers and colleagues • the effect of discussions on content and pedagogical content knowledge on classroom practice • the relationship between teachers' beliefs and the process of pedagogical change • the relationship between teachers' knowledge and their ability to teach • the integration of mathematical knowledge, as demonstrated by the connections teachers saw between the different areas of mathematics • collegial factors and professional growth

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Britt *et al.* (1993)	Explicitly stated. Four reports published in the 1980s highlighting weaknesses in students' achievement: The researchers discuss research about problem-solving which reformers in New Zealand and elsewhere regarded as a central strategy for improving mathematics learning. *References* Carss M (ed.) (1986) Proceedings of the Fifth International Congress on Mathematical Education. Boston: Birkhauser. National Council of Teachers of Mathematics (1980) An Agenda for Action: Recommendations for school mathematics of the 1980s. Reston, VA: National Council for Teachers of Mathematics. The researchers also highlighted research which informed the CPD element of the study including: • teacher awareness of students' difficulties • social constructivism • teachers' knowledge of subject matter and how students learn • creating a problem-solving environment • models of teacher change
Brown (1992)	Explicitly stated. The report was extensively informed by worldwide empirical and theoretical research, which provided a rich contextual background for the study and is explored in detail. Specifically, the study was informed by literature on effective schools, reflective teachers and the increasing influence of cognitive/developmental psychology applied to the classroom.
Bryant *et al.* (2001)	Explicitly stated. The study refers to extensively cited previous research in the field of reading and comprehension of content based texts. This previous research highlighted: • reading text fluently • possessing word identification strategies • use of context clues to comprehend the meaning of each discipline's vocabulary • using text structures to gain meaning from text Previous studies had also shown that many middle-school teachers do not feel prepared to meet the needs of their struggling readers.
Da Costa (1993)	Explicitly stated. Their model of teacher growth suggests that teacher consultation can lead to teacher growth, which in turn can affect teacher efficacy and hence further teacher growth. They provide a logical framework for considering under which conditions such activities are likely to occur. The building blocks they identify relate to: • teacher trust for their collaborator • the supportive beliefs of a teacher's collaborative, as opposed to prescriptive, advice or feedback • teacher reflection and its relationship to efficacy • teacher classroom behaviour • the key role of the coaching relationship as the factor in influencing student achievement, attitudes and behaviour

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Ertmer and Hruskocy (1999)	Explicitly stated. The researchers cite a range of evidence which identifies problems in teachers' use of technology in their classrooms including: • limited equipment, training, and support • teachers' current pedagogical beliefs and their resistance to change This research concludes that a range of types of support are necessary, including administrative, emotional, instructional, technical and professional.
Fine and Kossak (2002)	Explicitly stated. The research highlights features supporting teacher learning, including: • transforming ideas from one form to another • processing critical elements of instructional strategies through analysis and reflection Cognitive coaching was identified as a positive process in encouraging analytical reflection.
Gersten *et al.* (1995)	Explicitly stated. The study is sited in a body of research which suggests that knowledge about special education students in the general education classroom comes about through activities, including self-questioning, persistence, and attention to detail. For the CPD element the study refers to coaching – a form of expert consultation. *References* Kaufman, JM (1993) How we might achieve the radical reform of special education. *Exceptional Children* **60**: 6–16. Fullan M, Miles M (1992) Getting reform right: what works and what doesn't. *Phi Delta Kappan* **73**: 745–752.
Harvey (1999)	Explicitly stated. The study was informed by research on the importance of coaching as a classroom support strategy. Theoretically, it was informed by two developments of a social constructivist view of adult learning which has its roots in the work of Vygotsky: namely, 'activity theory' which extended Vygotskian concepts to adult professional learning, and Rogoff's theory of situated learning. The model of classroom support used in the study was based on Joyce and Showers' synthesis of research into the characteristics of INSET and the efficacy of coaching in particular.
Harwell *et al.* (2001)	Explicitly stated. Learning environments research and constructivist learning environments. Action research as catalyst to improve professional practice within schools.
Jacobsen (2001)	Explicitly stated. The study is informed by provincial politics, including legislation 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. Situated in research about the diffusions of innovations.
Kimmel *et al.* (1999)	Explicitly stated. The authors cite previous research which critiqued previous professional development, including: • Programmes are not provided within the context in which the skills and knowledge are used. • Programmes are not focused on teacher behaviour in classrooms. • Programmes are not responsive to the complex array of teacher behaviours that constitute standards-based practice. • Programmes do not consider all factors affecting teacher behaviour, belief, perceptions, beliefs, etc. • Evaluation of programmes focuses only on the outcomes of the training for teachers and does not include teacher practice.

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Kirkwood (2001)	Explicitly stated. The study is situated in literature which reflects the challenge of learning programming. *References* Dromey RG (1982) *How To Solve It By Computer*. London: Prentice-Hall International. Other research which formed a central part of the philosophy of the project was the concept of the 'learning teacher as a key component in developing learning among students'. See Fullan M (1993) *Change Forces: Probing the Depths of Educational Reform*. London: The Falmer Press, page 138.
Kohler *et al.* (1999)	Explicitly stated. There is discussion of research regarding both peer-coaching and paired peer-assisted teaching of students.
Lin (2002b)	Explicitly stated. Research cited explored constructivism and a teaching format called the 5 E model. This model suggested a teaching sequence which was engagement-exploration-explanation-elaboration-evaluation. It also provided charts that would help teachers identify their own and student behaviours that supported or contradicted the various phases of the instructional model. Furthermore, 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. Designing teaching schemes to support science learning requires: • an appreciation of the prior knowledge that students are likely to bring with them to the learning situation • a recognition that individual learners make sense of learning experiences in personal ways • learners assuming both the power and responsibility to take control of their own learning
Martin *et al.* (2001)	Explicitly stated. The study builds on previous research studying cognitive performance in deaf people and learning styles. 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 referred to moves from a time in the early 20th century when research suggested that deaf children had inferior intelligence, through a gradual series of papers 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 extends the research in the area of spatial and reading skills.
McCutchen *et al.* (2002)	Explicitly stated. Previous research suggests mounting evidence indicates that early assessments of phonological awareness are highly predictive of children's later reading and spelling. *References* Bell EW (1993) Assessing phoneme awareness. *Language, Speech and Hearing Services in Schools* **34:** 130–139. Mann VA (1993) Phoneme awareness and future reading ability. *Journal of Learning Disabilities* **26:** 259–269. 'Some researchers estimate that literacy difficulties affect as many as 20% of all children in the US and the sheer number of students at risk for reading and writing disability threatens to outstrip our ability to assist them (p69).' Lyon R (1995) Towards a definition of dyslexia. *Annals of Dyslexia* **45:** 3–27. Shaywitz SE, Fletcher JM, ShaywitzBA (1994) Issues in the definition and classification of attention deficit disorder. *Topics in Language Disabilities* **14:** 1–25.
Parke and Coble (1997)	Explicitly stated. The study draws research which recommends involving teachers in the decision-making processes associated with curriculum reform, which is something that is done with teachers rather than to them, and which involves the transformation of how teachers think about and teach science.

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Ross *et al.* (1999)	Explicitly stated. The theoretical framework of collaborative action research as an effective means of professional renewal is provided.
Saxe *et al.* (2001)	Explicitly stated. The report refers to two prior studies of the influence of professional programmes on children's procedural skill and conceptual understanding. One is a study of the role of CGI, a programme focused on enhancing teachers' knowledge of childrens' strategies for solving addition and subtraction word problems. With greater understanding of student mathematics, CGI researchers argued, teachers should be empowered to structure classroom practices in relation to their students' thinking. The second is a study of the Problem-Centred Mathematics Project. Focused on arithmetic and place value, this programme is designed to support teachers' understanding of children's mathematics as well as teachers' own knowledge of the relevant mathematics.
Shapiro *et al.* (1999)	Explicitly stated. The study refers to previous research which suggests that the integration of students identified as having emotional or behavioral disorders (EBD) into general education settings remains one of the greatest challenges to educators. Studies surveying teachers' attitudes and self-perceptions of competencies needed to effectively implement inclusionary programmes for students with disabilities have reported consistently that general education teachers for the most part feel they lack preparedness to teach these students and suggest that a specific set of knowledge and skills are necessary for general education teachers if they are to be successful in working with students with EBD. The study also draws on other research highlighting effective strategies, including class-wide peer tutoring, co-operative learning, reciprocal peer tutoring self-management, social skills training and problem-solving training. Previous research identifies the need for collaborative and intensive consultation between general and special education teachers.
Wilkins (1997)	Implicit. Research supporting this method of CPD cited studies referring to effective mathematics-mentoring and staff-development strategies.
Zetlin *et al.* (1998)	Explicitly stated. The report is accompanied by a short literature review that considers approaches to staff development, including specifically ongoing collegial support. It also examines teachers' theories and beliefs about student learning, and the creation of collaborations between universities and schools.
(b) Teacher-only data studies	

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Farmer *et al.* (2003)	Explicitly stated. The study is informed by a preliminary impact study carried out on the same project, and also additional empirical work. Theoretical perspectives are also considered and together these are put together to form a conceptual framework (a reflective model of mathematics professional development) that guides the description and analysis of the observations. Previous research cited in the study refers to: • how to support practicing teachers in implementing reforms • experimenting to discover what can 'work' • sustaining impact by addressing explicitly teachers' fundamental dispositions and beliefs about the teaching and learning of mathematics • what makes good questioning • knowledge construction Ball DL (1995) Developing mathematics reform: what don't we know about teacher learning – but would make good working hypotheses? (NCRTL Craft Paper 95–4). East Lansing, MI: National Center for Research on Teacher Education (ERIC Document Reproduction Service No. ED399262). National Council of Teachers of Mathematics (2000) *Principles and Standards for School Mathematics*. Reston, VA: Author. Rhine S (1998). The role of research and teachers' knowledge base in professional development. *Educational Researcher* **27:** 27–31. Sullivan P, Clarke DJ (1991) *Communication in the Classroom: The Importance of Good Questioning*. Australia: Deakin University Press.
Goodell *et al.* (2000)	Explicitly stated. The Landscape study was initiated to evaluate how this model of professional development has affected the teaching of mathematics and science in middle schools in Ohio. The study is informed by the implementation of the Ohio Statewide Systemic Initiative (SSI), known as Project Discovery. The background also draws on research that has considered reasons for the failure of professional development programmes to bring about long-term change. Explicitly the chapter states that it builds on earlier evaluative research suggesting that project discovery teachers made considerable changes to their teaching practices after their participation in the SSI and that these changes were sustained over time. It also complements previous research demonstrating that the mathematics performance of students in SSI groups was significantly higher than that of their non-SSI counterparts across all racial and gender groups.

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Greenwood and Haury (1995)	Explicitly stated. The researchers referred to a number of other researchers who had commented on the 'low incidence of inquiry-oriented science teaching in elementary schools'. *References* Stake R, Easley J (1978) *Case Studies in Science Education*. Urbana: Center for Instructional Research and Curriculum Evaluation, University of Illinois. Welch W (1981) Inquiry in school science. In: Harms N, Yager R (eds) *What Research Says to the Science Teacher* volume 3, pages 53–72. For the CPD the study drew on research about - peer-support and peer-coaching - follow-up support which offered teachers the opportunity to try out what they had learned (Lombard Konick and Schultz, 1985) *References* Joyce B, Showers B (1980) Improving inservice training: the messages of research. *Educational Leadership* **37**: 379–385. Lombard A, Konick R, Schultz K (1985) Description and evaluation of an in-service model for implementation of a learning cycle approach in the secondary science classroom. *Science Education* **69**: 491–500.
Henson (2001)	Explicitly stated. The study was informed by a wide range of prior research. In the first instance, literature which outlined the rationale for the study, and its background context: • the participation of schools and districts in the facilitation of professionalism • teacher professional development, in which teachers assume control of classroom decisions and actively participate in their own instructional improvement on an ongoing basis • participatory teacher research as one means of fostering meaningful professional development for teachers, including collaboration in which teachers themselves critically examine their classrooms, develop and implement educational interventions, and evaluate the effectiveness of those interventions • teacher self-efficacy as a mechanism that has consistently been linked with both positive teacher behavior and student achievement • the opportunity for teachers to increase decision-making capacity and autonomy (Boudah and Short and Rinehart, 1992b) Secondly, literature which underpinned the concepts addressed by the study are described: • the description and classification of teacher research agendas based on roles of participants, focus of the research, and outcomes intended by the process • practical action research • collaboration between university and teacher researchers which can serve to reduce the perceived tension between the worlds of research and practice • teacher experimentation • study design • teacher efficacy The literature reviewed in the study forms an extensive and detailed survey of all these items.

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Lin (2002a)	Explicitly stated. The study is informed by empirical research relating to teacher education and, in particular, the creation of narratives or cases as an alternative method of teacher education. It is also informed by a theoretical framework of teachers learning to teach including reflection, cognitive conflict and social interaction. This includes work of Piaget and Vygotsky. Other research cited suggested that cases used in teacher education may teach more effectively than traditional expository approaches to teaching since cases reflect real situations and pose problems, issues, and challenges for teachers and are vehicles for establishing a dialogic model of connecting theory and practice. Cases had been used by teachers to (1) develop knowledge of a particular theory or build new theories; (2) practise analysis and assimilate different perspectives; and (3) stimulate personal reflection. The use of cases in teacher education includes both case-discussion and case-writing. Case-discussion can play a critical role in expanding and deepening pedagogical content knowledge and fostering personal reflection through an external process. Cases constructed by a collaborative team consisting of various backgrounds and experiences for sharing multiple perspectives and comments are more likely to provide enriching exemplars.
Lloyd *et al.* (2000)	Explicitly stated. Previous literature referred to in the study included: • the interaction of confidence and understanding, but in the context of fairly specific scientific contexts • 'self-efficacy', in successful teaching • teachers' understanding of scientific concepts • the importance of process skills in science education
McLymont and Costa (1998)	Explicitly stated. Literature referred to throughout the paper. Specifically: • emphasis on collaboration • importance of discourse based cognitive coaching • critical friend
Morin (1998)	Explicitly stated. The study refers to earlier work by one of the authors and built on research which identified the following components of teacher change: • knowledge of educational change • adult learning • the experience of past professional development practice The body of research reported in the literature review is primarily concerned with professional development, including: • classroom teachers' growth • weakness of existing PD work, such as one-shot workshops, training without technical assistance or follow-up, top-down plans, courses unrelated to classroom experiences, diffusion of products, lack of attention to teacher perceived needs

Report	Was the study informed by, or linked to, an existing body of empirical and/or theoretical research?
Swafford *et al.* (1997)	Explicitly stated. The report refers to the following key components in relation to their model for teacher change: • Vygotsky's theory that meaning is socially constructed and development is facilitated through social interaction with more experienced individuals • reflection both individually and with peers, on theory and practice. Previous research on peer-coaching is referred to, including: Kohler FW, McCullough KM, Buchan KA (1995) Using peer coaching to enhance pre-school teachers' development and refinement of classroom activities. *Early Education and Development* **6**: 215–239. Showers B (1990) Aiming for superior classroom instruction for all children: a comprehensive staff development model. *Remedial and Special Education* **11**: 35–39.
Vaughn *et al.* (1998)	Explicitly stated. There is a short literature review on • covering the needs of special learners within whole class settings • teachers' perceptions of their skills and their responses to needs • professional development models for teaching special learners
Xu (2003)	Explicitly stated. The study refers to previous research about • the fundamental mismatch between new demands on teachers and existing opportunities for their professional growth • school-centred professional development, based on teachers learning with and from colleagues in their school communities and reflecting critically on their daily practices • the use of teaching portfolios for professional development

Appendix 4.2.2.4: Findings of the studies

Report	Findings and conclusions
(a) Teacher-and-pupil data studies	
Anderson (1992)	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. • Significant increase occurred 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 students in the experimental group made gains than the control group. The strongest teachers were either peer-taught by head teachers or by teachers in their own schools. Teachers who were weaker had 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.
Appalachia Education Laboratory (1994**)**	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. Condition A teachers showed significant positive changes to their use of these behaviours: • reduced the number of questions asked • significantly increased their use of wait time • an increased use of questions posed at cognitive levels above recall • an increased use of one question to more than one student • an increased use of the student-designated, after-question procedure • significantly decreased amount of repetitions of student responses Almost 10% more student answers to condition A trained teachers' questions were at a higher cognitive level following the intervention.
Boudah *et al.* (2003)	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. 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 TEQ 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 'real classroom environments with "real students"' was cited most often as an APD model asset (p13). 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.

Report	Findings and conclusions
Britt *et al.* (2001)	All teachers believed they had made marked changes. Changes in practice included a greater focus on the plenary session; less emphasis on 'telling'; and the use of students' own problems as a teaching point. Teachers showed more insight into students' thinking. Students' mathematical performance showed improvement. Secondary teachers made the greatest changes, but this could have been because the intermediate teachers were already using a student-centred approach and so there was less room for change. More experienced teachers were significantly more likely to affirm beliefs consistent with reform-orientated pedagogy.
Britt *et al.* (1993)	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. 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. Overall, the mean attitudes of students in project classes were higher than the means for the attitudes of Form 3 students in the IEA sample (original respondents of the questionnaire).
Brown (1992)	Teachers were enthusiastic and valued opportunities to develop new skills through collaborative working. They adopted strategies to suit their classes. There was a high use of co-operative learning, advance organisers and graphic transformations. Students demonstrated increased ability in the use of learning strategies as well as academic progress. They felt better prepared for examainations and more confident. Report concludes that this style of programme is highly successful in improving student performance and highly satisfying to both teachers and students.
Bryant *et al.* (2001)	Teachers were concerned about their struggling readers and valued the CPD in terms of time to share personal knowledge, receiving guidance from an expert and the opportunity to work collaboratively with their colleagues. Teachers developed knowledge of, and skills in, implementing word identification, partner-reading and collaborative, strategic reading. The CPD resulted in improvements in low-achieving students' decoding skills and reading fluency. The report concludes that teaming was an effective model for CPD in this context, but time was a major issue.
Da Costa (1993)	Teachers with a belief in personal efficacy were more likely to be teaching pupils with higher levels of attainment, but these pupils sometimes had negative attitudes towards school. Teachers with a belief in general efficacy were more likely to change their behaviour in response to CPD. Teachers who used CPD involving classroom observation were more likely to effect changes to enhance pupil attainment. Students of these teachers generally had positive attitudes to school. Teachers using a supervisory model of CPD without classroom observation and feedback were significantly less able to make changes.
Ertmer and Hruskocy (1999)	CPD had a positive impact on teachers' confidence and attitudes towards technology. Teachers used computers more for their own professional use and for instructional purposes, but needed more time to integrate technology fully into their curriculum planning. Some student trainers were able to serve as effective training resources for the teachers. The 'at risk' students, who were part of the training group, excelled, showing increased self-confidence and self-esteem. The report concluded that CPD had initiated some important changes, but further research was needed to examine whether this could be sustained.

Report	Findings and conclusions
Fine and Kossak (2002)	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. The combination of teaching a variety of expository text strategies while repeatedly teaching a single strategy with some depth resulted in significant increases in student comprehension performance and change in teachers' attitude. 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, teachers' beliefs about their empowerment to improve instruction and student performance can be dramatically altered.
Gersten *et al.* (1995)	The process of change in teachers' practice was slow and irregular, although there was evidence of more instructional time spent on specific reading strategies as the project continued. Teachers experienced some anxiety in the process of observation and feedback, but about half of them reported more positive feelings at the end of the project. Beginning teachers had special needs and needed extra mentoring. Lack of time sometimes limited communication and therefore understanding between researchers and teachers. Students were able to read more fluently, demonstrated greater understanding of subject content and were better motivated.
Harvey (1999)	PSP teachers were more focused in their aims, more versatile in their approaches, more responsive to pupils' contributions and more able to plan relevant lessons. Teachers who had participated in both classroom support and workshops were more ready to change their practice. Teachers valued counselling on contextual implementation of new methods and curriculum content, advice on specific problems and modelling of new techniques. Pupils were more likely to learn through self-activity and contributed more to lessons. The report concluded that effective INSET needs to offer an appropriate social context for the collaborative testing, validation and adoption of new teaching methods.
Harwell *et al.* (2001)	Engagement in action research led to reflective practice and acted as a powerful catalyst for educational change. Teachers showed greater competence and confidence both in technology use and in the constructivist viewpoint of teaching and learning. Commitment to change led to the construction of an action plan for the following academic year. There were no statistically significant changes in students' perceptions of the classroom learning environment after technology integration. The report concludes that CPD should combine the expertise of researchers and the knowledge of the teachers collaboratively, to create learning environments conducive to effective student learning.

Report	Findings and conclusions
Jacobsen (2001)	Instead of being a controlling and dispensing information, using a stand-and-deliver lecture format based on information transfer, the teacher became more of a facilitator, guide, co-learner and co-investigator. 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. 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. Teachers implemented both fundamentally different teaching and learning strategies, and also integrated new technologies with the support of the Galileo Network (GN) 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 the reassurance of GN teachers.
Kimmel *et al.* (1999)	The greatest improvement in planning for, and teaching, special-needs pupils within general education classrooms was noted in those teachers who had been involved for longest in the programme. Direct and successful work with special-needs children served to enhance teacher efficacy. Modelling was seen as an effective means of support. Teachers needed help in bridging the gap between an understanding of the adaptations needed for SEN students and putting those needs into practice. Students showed more enthusiasm, and participated more in lessons; their test scores also increased. Greater logical thinking and organisation of work enhanced the quality of students' work.
Kirkwood (2001)	Collaborative approach led to cross-fertilisation of ideas, promoted effective use of time, supported honest and open discussions. Leadership in driving project forward was also shared. The new curriculum units ensured appropriate pace, offered opportunities for problem-solving in technology and allowed students greater independence. Students were motivated by the new units, reporting that they enjoyed working at their own pace and felt confident. The report concludes that the three main aims for teacher learning – engaging in disciplined enquiry, experimenting within an agreed framework and sharing expertise – were clearly met.
Kohler *et al.* (1999)	Results indicated that coaching produced two changes in teachers' methods. First, both teachers increased their use of suggestions, prompts and questions to facilitate students' interaction with their peers. The second coaching phase enabled teachers to adapt teaching materials, skills or social interaction roles according to their students' needs. These changes were sustained during a maintenance phase. Pupils increased their levels of social interaction and talk. The report concluded that reciprocal peer coaching was a viable method of individualised instruction, but that further more extensive research was needed to investigate the effect of coaching.
Lin (2002b)	There were 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. Students found science easier and more enjoyable. In general, the participant teachers showed positive attitude 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 ITT 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.

Report	Findings and conclusions
Martin *et al.* (2001)	• 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 *Other effects* • 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
McCutchen *et al.* (2002)	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. *Kindergarten* • 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 *Year 1* • 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
Parke and Coble (1997)	Collaborative CPD promoted mutually informed conversations, clarification of core values and commitment to the ongoing process of reflection. Teachers designed assessments to provide feedback on pupils' understanding. Project teachers were more process-orientated than content-orientated in their planning in comparison with teachers in control schools. Students in project schools were better motivated and were given more opportunities to work collaboratively. They also participated more actively in both practical activities and lesson discussions. These students covered less of the curriculum, but achieved the same results as those in the control schools. The report concludes that teachers were helped to become architects for change by building on their current concepts instead of trying to remediate them.

Report	Findings and conclusions
Ross *et al.* (1999)	Participation in CPD led to greater self-efficacy for teachers. The exemplary teachers, while confident in collaborative learning techniques, were less confident about methods of student evaluation. Professional conversations were valued in reassuring teachers about areas of mutual concern. Data provided evidence that teachers were able to improve their evaluation of students. Repeated feedback on their effectiveness fuelled increased aspirations. Students supported the changes that their teachers made. They believed that self-evaluation was fairer and appreciated having an opportunity to state their case to the teacher. The report supported this two-step approach to action research, one in which teacher researchers first learn how to study practice with academic support and then use the results to design their own action research.
Saxe *et al.* (2001)	Every classroom, regardless of intervention, showed gains on the conceptual and computational scales. The reform programme, when supported by the IMA programme, proved effective and was associated with greater student achievement on the conceptual items. However, there was no significant difference between computational scores of students in the IMA and TRAD classrooms. Achievement on the computational scale was greater for students who had received traditional teaching than for students who were part of the teacher-support programme (SUPP). The study concludes that the use of reform curricula, when implemented with focused support for teachers, may lead to gains in students' conceptual understanding.
Shapiro *et al.* (1999)	Substantial increases over time were reported for co-operative 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. 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, co-operative learning, and problem-solving training was effective. Peer-tutoring was considered effective by everyone. 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. Follow-up data showed that many students were still included at the same level or greater level of inclusion than 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.
Wilkins (1997)	Teachers reported an increase in their enthusiasm for teaching, an improvement in their teaching skills and an increase in their feelings of confidence. All the teachers viewed the use of portfolios and journals as beneficial practice in mathematics instruction and planned to continue using these assessment techniques. All schools demonstrated improved scores from first to second year in the project. Project-school students had higher scores in graphing and computation. However, scores were not significantly different in problem-solving in the rural project and non-project schools. All schools showed a decrease for scores in measurement.

Report	Findings and conclusions
Zetlin *et al.* (1998)	Three emergent themes were identified: professional behaviour, student performance, and barriers to professional development. *Professional behaviour* • Teachers emphasised the increase in collegial interaction and formation of peer teams. • Increased time was devoted to individualised reading and writing due to the shift to centre-based activities. • Advances occurred in understanding of learning processes as well as a growing awareness of a variety of approaches and materials for language arts instruction. *Student behaviour and learning* • Students with few skills, who were significantly behind 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 regulars' 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 exhibiting behaviours that would have led to retention or referral to special education in the past thrived in the restructured classrooms. Barriers to progress were identified at district, school, process, and university levels.

Report	Findings and conclusions
(b) Teacher-only data studies	
Farmer *et al.* (2003)	The findings include evidence of improved teacher motivation ('Donna found that "When I let go of my dependency on the text and began moving towards these other approaches, I finally felt comfortable and excited to teach math."') (p 347) There was also evidence drawn from individual teachers' comments that teachers had developed their practice. '[Donna]…developed her views about what constitutes good mathematics teaching, adapted activities and processes to her own situation and created new activities…' (p 347) The report showed that teachers changed their beliefs. ('Eva believes that it is important for students to have time to work out solutions without interruptions from the teacher, and to see multiple solutions. She now gives some explicit attention to problem-solving strategies. This contrasts with her previous experience on having students practise saying numbers and on the basic operations of arithmetic.' (p 350)) It was also reported that teachers gained a real sense of empowerment, as a teacher and a learner.
Goodell *et al.* (2000)	The author describes demonstrated significant differences between programme and non-programme teachers in terms of their views of mathematics and their pedagogy. They were much more concerned with issues about 'How I teach' and 'What my students do' than non-programme teachers. Programme teachers also thought more about views about mathematics. There was also evidence that teachers changed their beliefs**.** For example, all teachers who were interviewed said that the professional development they had participated in through their involvement with SSI had caused them to change their teaching practices, and the way they thought about teaching. The study also provided evidence about supporting factors: the professional development experience itself; the willingness to find creative ways to overcome lack of resources; and the establishment and maintenance of teacher networks. Without these three aspects, it is doubtful whether SSI teachers would have been empowered to sustain the changes they made to their teaching beyond one or two years after their participation in the summer institutes.
Greenwood and Haury (1995)	The authors report that teachers changed in the following ways: • Teachers were more motivated by the CPD programme (e.g. enjoyed learning approaches for teaching science that could be used in the classroom while having the opportunity to work with other teachers). • SEPAL teachers were significantly more positive in their preferences for teaching science than teachers who had not been through the programme. • The teachers were more confident about teaching science and about participating in peer-teaching, presenting inservice science workshops, and providing assistance and feedback to pre-service elementary teachers as they taught science lessons. In some cases, they took on posts of responsibility for science teaching in their own schools. • Teachers' beliefs changed and they were willing to accept that it was acceptable not to know all the answers. • The teachers had better content knowledge than their non-SEPAL peers, although the gains were modest; the main gains were in relation to improved pedagogical content knowledge.

Report	Findings and conclusions
Henson (2001)	This author reports the following: • Teachers worked more collaboratively – there was an increase in teacher efficacy. • Teachers felt more in control of their development. The findings also show the following: • The observed gains (in efficacy and in collaboration) were not due to varying levels of project implementation. • Collaboration was consistently related to general teaching efficacy improvement but not to personal teaching efficacy. • Teachers who were not experienced in collaboration gained the most during the project. • Quantitative measures of empowerment and teacher perceptions of school climate were not consistently related to efficacy.
Lin (2002a)	The study found the following: • The teachers learned about students' mistakes, thereby deepening their pedagogical understanding. The study found that the use of cases enhanced teachers' understanding of students' learning and improved their reflective thinking of teaching when cases were constructed consistently by a collaborative research team, with a university professor and same-grade teachers. • The teachers shared their thinking and reflected together.
Lloyd *et al.* (2000)	Teachers' understanding of process skills had improved. The results of the baseline audit of teachers' understanding of the process skills and the end-of-course repeat of this assessment provide evidence that teachers had significantly improved in their ability to identify and target process skills and felt able to use this in planning lessons. While teachers' confidence fell by the end of the CPD, this arose from their greater understanding of what they had to do to teach process skills effectively to their students.
McLymont and Costa (1998)	Teachers changed in a number of ways including: • becoming more reflective • increasing their understanding of mathematics teaching and learning, and being able to allow for a greater range of outcomes • collaborating more • moving towards building a learning community • learning new approaches away from direct teaching methods, and telling and showing students; instead, allowing the students to learn by understanding for themselves the concepts they need to learn

Report	Findings and conclusions
Morin (1998)	The findings include the following: • Teachers changed their beliefs towards assessment as a cyclical process – not an end or a linear process. • Teachers changed their practice in a number of ways, including an increased focus on mathematics assessment and evaluation; also increased integration of different types of assessment into daily practice; increased sharing and collaboration, adopting new teaching strategies such as interdisciplinary curriculum, developing community, authoring circles, no teacher desk, student-prepared newsletter, inquiry, writer's notebooks, portfolios, involving parents, performance tasks. • Teacher talk reflected (a) changes in beliefs about learning, (b) more talk about teaching and learning, and (c) more sophisticated talk about teaching and learning. The study also identified a range of supporting factors helpful to producing teacher change including: • shared vision for school change • professional collaboration and camaraderie • administrative and financial support • links outside the school • weekly school planning meetings • teacher-driven in-services with follow-up and links to curriculum • team curriculum planning • opportunities for testing new practices • opportunities for teacher dialogue and sharing • related teacher resources

Report	Findings and conclusions
Swafford *et al.* (1997)	Findings showed that teachers changed in a number of ways: All teachers became more adept at implementing the early literacy lesson framework. They could explain how they implement the different components, when they use them, and the materials they use. Their integration of the framework improved and they could explain why they teach the way they do. 'In terms of procedural change, teachers and coaches reported that all teachers have become more adept at implementing the early literacy lesson framework. How they implement the different components, when they use them, and the materials they use have become more refined. Their integration of the framework has improved and they can explain why they teach the way they do.' (p 423) 'Another circumstance that affected how extensively teachers implemented the framework was related to managing guided reading instruction, centers, and other components of the framework simultaneously…teachers worked together to solve this problem. They used "work boards" to direct student learning activities in learning centers. This management tool enabled teachers to meet with small groups for direct reading instruction while other students were involved in meaningful literacy activities in centers.' (p 424) Teachers also experienced affective changes: after a year, they were all more confident about the methods they use, their understanding of why the methods are powerful, and the decisions they make. Teachers also made reflective changes: as they had more time to experiment with the framework and interact with coaches and other teachers, they became more reflective. Procedural concerns became less prominent in their peer-teaching conferences, and teachers began to reflect more on their practice. Teachers began to discuss and write about implementation as a process that continues as they reflect individually, with their peers, and with their coaches. Affective changes are evidenced in teachers' confidence levels. In relation to one teacher, a coach commented: '…it's [her knowledge of the framework] empowered her. She knows the kinds of things that she needs to be doing for her kids that are going to make a difference for them and she knows why.' (p 423) *Behaviour* 'Teachers also made reflective changes. As they had more time to experiment with the framework and interact with coaches and other teachers, they became more reflective. Procedural concerns became less prominent in their peer teaching conferences, and teachers began to reflect more on their practice. Teachers began to discuss and write about implementation as a process that continues as they reflect individually, with their peers, and with their coaches.' (p 423) Many of the conclusions relate to the coaching process: the study expanded the research base about peer-coaching because it examines its effectiveness from the teachers' and the coaches' perspectives. It shows that a coach can provide the procedural and affective support teachers need when they take risks to implement new methods which may be different from those they have used in the past. A coach can help teachers focus on their strengths and help them reflectively analyse their teaching and students' learning. The benefits of peer-coaching make it an important element of staff development programmes in which teacher change is the goal, without it being evaluative.
Vaughn *et al.* (1998)	Evidence shows the following: • Teachers were very positive about the programme ('unusually so'). They wanted to continue the programme into the following year. • Teachers learned new teaching strategies, such as the writing process approach, classwide peer-tutoring, and making words on a regular basis • The teachers adopted skills needed to organise their class into small groups of students so that students could work purposefully with each other.

Report	Findings and conclusions
Xu (2003)	There is evidence of teacher motivation and collaboration. Teacher motivation: 'It provided a sense of purpose and energised teachers at different stages of development to take risks and to examine their practices on ongoing basis.' (p 356) Collaboration: 'The spirit of collaboration grew beyond teaching portfolios. Teachers started coming together on their own during lunch.' (p 353) It prompted reflection among the teachers: '…the project enabled teachers at different developmental stages to approach their work more meaningfully and purposefully. It prompted a first-grade teacher, who was in her second year of teaching, to think through more carefully the steps of everything she did: "What specific goals do I have for each lesson?" and "How can I meet the needs of the children in my class?"' (p 352) The data revealed that the portfolio project served as a means of generating teacher reflection and collegial sharing in the school community, and helped create a sense of affiliation and a means for teachers and administrators to work collaboratively and constructively. It lends support to the view that focusing first on promoting professional development may become a catalyst for more schoolwide change. It illustrates the potential of this approach in providing purpose, focus and substance along with a sense of ownership and belonging in which teachers learn with, and from, each other.

Appendix 4.2.2.5: Study design

Item	Which type(s) of study does this report describe?	If the study is an evaluation, when were measurements of the variable(s) used for outcome made, in relation to the intervention?	Study design summary
(a) Teacher-and-pupil data studies			
Anderson (1992)	Evaluation: researcher-manipulated	Before and after 'Experimental teachers were videotaped periodically throughout the study, with each teacher being taped at least three times: at pretest, in the middle of the study, and at the end of the study at posttest.' (p 395) 'Data consisted of transcriptions of pretest, mid-study and posttest videotapings of teaching sessions and pre- and post-standardised tests.' (p 397) Other Video was also used intermittently to help teachers self-evaluate progress during the course of the project.	Nine experimental and seven control teachers and their students took part in the study. The teachers were all volunteers and were randomly assigned to either group. The experimental teachers received strategy training, involving peer support from previously trained teachers, self-evaluation workshops, and the application of strategic reading techniques with their students. An instrument was devised to use in the training, which enabled the teachers to see how the ways in which they currently taught could be changed. Teachers were encouraged to start where they felt comfortable and to move to new strategies at their own pace, with support as and when they needed it. Videotaped pre- and post-test reading sessions were used to collect data relating to the effects of the intervention on the reading of the students and the shifts in the teachers' practice. A standardised comprehension test was also used to measure learning gains after three months.
Appalachia Educational Laboratory (1994)	Evaluation: researcher-manipulated	Before and after	Schools were randomly assigned to one of three conditions: (1) full QUILT programme (induction and peer support throughout year), (2) induction only, and (3) awareness only. Outcome measures were taken before and after the intervention. In addition, a subgroup of the participants from each of the three conditions were randomly sampled to be videotaped to provide further information on their use of, and their students' responses to, the questioning strategies.

Item	Which type(s) of study does this report describe?	If the study is an evaluation, when were measurements of the variable(s) used for outcome made, in relation to the intervention?	Study design summary
Boudah *et al.* (2003)	Evaluation: researcher-manipulated	Before and after The Implementation and Student Performance Questionnaire was administered at the end of the school year; the initial training in the experimental group took place between January and April. The Training Evaluation Questionnaire (to assess teacher perceptions of the CPD intervention) was administered after the training, demonstrations, teacher observations and initial follow-up meetings with teachers.	The study comprised two parts: (1) an experimental (quantitative) part and (2) a model evaluation (qualitative) part. The experimental part of the study involved 57 teachers who participated in one of two forms of staff development training on the same instructional strategy and completed the Implementation and Student Performance Questionnaire. The experimental group received APD training and the comparison/control group received traditional training. Their responses were mapped to determine effectiveness and impact. An evaluation was sent to 64 teachers and four administrators (unclear whether these were the same people or different). Multichoice (quantitative) and qualitative data were collected. It is unclear whether they had all received APD training.

Item	Which type(s) of study does this report describe?	If the study is an evaluation, when were measurements of the variable(s) used for outcome made, in relation to the intervention?	Study design summary
Britt *et al.* (2001)	Evaluation: Researcher-manipulated	Before and after	A professional development programme for 18 teachers was conducted over a two-year period. The teachers worked collaboratively to improve their mathematics teaching, with encouragement to reflect on their practice but with minimal instruction from the researchers. While the teachers experimented with their own practices, they and the researchers collected data from several sources in order to evaluate the project. Teachers' practices and beliefs were assessed through observations; transcribed audio- and videotapes of lessons; comments at group meetings and in interviews; responses to questionnaires; and entries in teachers' journals. Full notes of two initial class observations were given to each teacher. This was followed by a summary of the observations, analysed by factors, such as whole-class versus group teaching, teaching style, use of different periods of the lesson, use of materials, participation of students, and use of students' existing knowledge. For later observations, teachers indicated their chosen focus. The effect of teachers' practice on their students' mathematics and attitudes toward mathematics was measured by comparing achievement tests and attitude questionnaires in the cohort taught the second year with that taught in the first year. Pupil data were compared with results from the Concepts of Secondary Mathematics and Science (CSMS) study undertaken in England (Hart, 1981).

Item	Which type(s) of study does this report describe?	If the study is an evaluation, when were measurements of the variable(s) used for outcome made, in relation to the intervention?	Study design summary
Britt *et al.* (1993)	Evaluation: naturally occurring	Before and after Teachers completed the same questionnaires before and after the intervention. Students' progress was measured using pre- and post-testing. Changes in teachers' beliefs and behaviours was also measured by pre- and post-testing in each year.	Secondary teachers concentrated on two Form 3 classes (one per year of the study) and the intermediate teachers taught forms 1 and 2. The teachers identified their own issues to tackle. Classroom observations and group sessions – at which they learned about CGI – were the two main components of the procedure. • Researchers observed teachers teaching at the beginning of the year and took full notes to which the teachers were able to add their own comments, and use the summaries to suggest what they could introduce or modify in their classrooms. • Teachers kept a journal recording their reflections on their teaching and its effect on individual students. • Researchers observed teachers throughout the year. • Teachers carried out six-week projects (maximum) and reported on them in group sessions and in written reports. • Teachers carried out and evaluated a 'one lesson project' where they tried 'something that the had not done before'. • Teachers videotaped one of their lessons then watched it and gave their reactions to it. • Teachers wrote up their experiences of the CPD and evaluated it.
Brown (1992)	Evaluation: researcher-manipulated	Before and after Each week, teachers reviewed student progress in the light of diary entries, students' work or test results.	The study was designed to explore how use of specific teaching strategies effected the attitudes and practices of students and teachers. The researchers were keen to note whether such interventions would raise the standard of learning for the 'lower achievers ' in each class. Training in specific strategies of intervention, based on current literature and the work of previous researchers, was offered to each of the participating teachers, who then chose options that they wanted to explore with their students. Teachers met consultants once a week to receive coaching and to discuss findings.

Item	Which type(s) of study does this report describe?	If the study is an evaluation, when were measurements of the variable(s) used for outcome made, in relation to the intervention?	Study design summary
Bryant *et al.* (2001)	Evaluation: researcher-manipulated	Before and after Pre- and post-test data were collected on both students and teachers.	The study focused on ten sixth-grade teachers and their pupils, who were noted to be struggling to decode and comprehend written texts in a wide range of subjects. The researchers sought to evaluate current teaching practice in terms of personal knowledge about the teaching of reading in content areas, the teaching of reading strategies, and their perceptions of struggling students. All 10 teachers in the programme received training in three specific reading strategies over a period of four months. The researchers then evaluated each of the three strategies in terms of how teachers perceived them as manageable working tools in their classrooms and how effective they were in terms of pupil achievement.
Da Costa (1993)	Evaluation: naturally occurring	Before and after Initial input took place prior to the study. During the period of the research, the teachers interpreted and enacted the framework for peer collaboration. 'Data were collected from intact classes at two points during the school year. The first phase of data-collection took place during October and early November of 1991, the data from this phase are referred to in this study as the "pre-measures". The second phase of data-collection took place during May of 1992, the data from this phase are referred to here as the "post-measures".' (p 16)	Paper 1: 26 teachers were allocated to one of four groups, according to the perceived way in which they worked with their teaching partner and information gleaned from the teachers' answers to questions about the ways in which they worked. Allocation of individuals to building blocks within the conceptual model in Paper 1 was based on MANCOVA analyses of data for all participants. Paper 2: Teacher data were also analysed statistically to identify links within and between groups of characteristics (models of collaboration, teacher efficacy, teacher behaviour and pupil behaviour, attainment and attitude) in order to test and establish linkages between these factors. Teachers were allocated into different groups in accordance with the results of questions about their intended approach to collaboration in response to prior training. Assessment of the four categories was arrived at inductively. Data-collection took place one month after the start of the school year and one month before the end. Data were collected in relation both to teachers and pupils. There was no researcher intervention.

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Ertmer and Hruskocy (1999)	Evaluation: researcher-manipulated	Before and after The types and uses made of computers by teachers and student-trainers were measured before and after the interventions in the fall of 1996.	The project START was proposed as a collaborative professional development school effort between the university and Midland school. The main purpose of the project was to support teachers' technology integration efforts at the school. Instructional and technical training sessions were planned for both teachers and students. In addition, university personnel provided ongoing professional support to address changing needs. The report states: 'We used qualitative methods to examine changes in teachers', students' and the school's use of technology. We examined teachers' and students' uses at the beginning of the year...and we examined technology use at the end of the year to document the types of changes (if any) that occurred.' (p83)
Fine and Kossak (2002)	Evaluation: researcher-manipulated	Before and after Pre- and post-test scores on the degrees of reading power in the 18 classes (p 34). Teachers were interviewed 'at first' and 'in time' after cognitive coaching.	Two groups (experimental and control) were assessed in aspects of reading. The experimental group was given a precise method of working ('rubric') and the progress of the pupils measured against various variables. This method of working is defined as cognitive peer-coaching where teachers have to learn a technique and actively coach other teachers. The professional learning conversation is the method for providing understanding and ownership.
Gersten *et al.* (1995)	Evaluation: naturally occurring	Other Observed improvements in student performance were presented in feedback to teachers throughout the study as an integral part of the coaching process, in addition to informing qualitative evaluation at the end of the study.	This was an action research project in which researchers trained two special educators who then worked with 12 class teachers in the skills of effective teaching. The special educators provided specific and constructive feedback to the teachers. The outcomes were evaluated in terms of change in teachers' practice.

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Harvey (1999)	Evaluation: researcher-manipulated	Before and after	The study was designed to assess the 'value added' by coaching in terms of observable changes in teachers' classroom practice. Three hypotheses were framed for testing: 1. Teachers who have participated in PSP INSET use different methods from those who have not. 2. Teachers change methods more readily if they participate in workshops only. 3. Changes in teaching methods are sustainable after support is withdrawn. It is an observational study with a quasi-experimental design, cross-referenced with a number of ethnographic instruments among which are interviews and diaries. Hypothesis 1 was tested by comparing methods used by PSP teachers with a control group of non-PSP teachers. Hypothesis 2 was tested by comparing each Phase 2 teacher's performance before and after support. Phase 3 teachers who had workshops only, were compared with teachers who had both workshops and support during the same period. The control group was compared with teachers who had both workshops and support. The control group was compared with teachers who had workshops only. Hypothesis 3 was tested by comparing the performance of Phase 1 teachers as they completed classroom support with their performance 14 months later.
Harwell *et al.* (2001)	Evaluation: researcher-manipulated	Before and after CLES + CLES science and mathematics Teachers' voices	This collaborative action research reflects a co-operative partnership between a regional university and a local school, one of 45 schools in an urban school district in the southern part of the USA.

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Jacobsen (2001)	Evaluation: naturally occurring	Only after Other Measurements appear to have been taken throughout the implementation period of the Galileo Educational Network Programme; however, most interview excerpts rely on an implicit comparison by the teachers involved of what it was like prior to the implementation of the professional development programme.	The investigator utilises a case study research design using qualitative research methodologies (observation and interviews). Three cases are chosen, all of whom were receiving the Galileo Educational Network programme; teachers and students in these schools were interviewed and observed during the intervention process (biweekly), and data analysed using published frameworks of indicators of engaged learning and high technology performance.
Kimmel *et al.* (1999)	Evaluation: researcher-manipulated	Other Measurements were mainly made and reported on after the intervention, but there was some monitoring of teachers' implementation of the instructional adaptations during the programme, in the form of observations and feedback.	The study took the form of an ongoing programme of CPD, beginning in 1995. Three cohorts of teachers were involved in a model professional development programme, based on increasing subject knowledge in mathematics, science and technology (ICT) together with methodology-focused workshops on teaching pupils with diverse needs. The professional development programme was delivered in the form of academic year workshops, which included training in the use of ICT for problem-solving, and summer practicums, where teachers gained supervised experience of implementing what they had learnt. The effects of the CPD intervention were measured both during the programme and in a final assessment for all participants at the end of the three years.
Kirkwood (2001)	Evaluation: researcher-manipulated	Before and after It is implied that teachers measured student performance before and after. Each project teachers carefully monitored students' performances on the topics and coursework assessments, individual progress rates, and affective responses.	This was a project in which teachers collaborated to produce four new curriculum study units aimed at addressing issues of student and learning. The impact on students' motivation and learning was measured.

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Kohler *et al.* (1999)	Evaluation: researcher-manipulated	Before and after Teachers were observed without assistance planning and implementing activities to provide a baseline measure prior to the peer-coaching and afterwards.	The study employed a multiple baseline design, which called for the sequential and staggered application of four different conditions. Both teachers in a pairing began baseline immediately after in-service training on the IIA. Teacher 1 entered a second phase after six sessions while Teacher 2 remained in baseline. After critical level performance was reached with Teacher 1, Phase 2 was introduced with the second teacher. In this way, the two teachers entered the various experimental phases in an alternating or staggered manner.
Lin (2002b)	Evaluation: researcher-manipulated This is based on reviewers' inference.	Not stated/unclear Observations were made of the effect of the new teaching styles, but measuring levels of achievement before and after was not considered to be appropriate. The measures of success are not statistical. This does not seem to the reviewers to be problematic.	A single group of three inexperienced teachers of science was supported to try teaching in a constructivist style. The results are described and effectiveness assessed. This study was led by the researcher, who had selected the '5E model' as being an appropriate one to trial, but the three participating teachers were invited to collaborate with each other and with the researcher in developing and trialling the materials to suit their own contexts. 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. During the trials, the teachers and researcher met regularly to review their findings.
Martin *et al.* (2001)	Evaluation: Researcher-manipulated	Before and after All three variables being measured were tested before and after the intervention.	Teachers in England and China, with an interest in taking part in the study and in having cognitive skill training, were given a short programme of training lasting three hours a day for three days. They were then asked to implement explicit thinking skill activities over a six-month period two or three times a week for an average of 30 minutes each time. Pre- and post-observations and tests were taken, and comparisons were made between countries, and with a control group whose teachers did not receive training. Additional comparisons were made in England between deaf and hearing students but these showed no differences so the scores were aggregated.

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McCutchen *et al.* (2002)	Evaluation: researcher-manipulated Quasi-random intervention	Before and after Measurements of both teachers and pupils were made prior to the intervention, during the progress of the intervention and after the intervention.	The study was carefully designed along the lines of a randomised controlled trial. Teachers were assigned to condition according to socioeconomic status, with one school from each matched pair assigned to each condition. Preference was also given to schools from which there was a team of teachers, as the researchers recognised the difficulty of sustaining teacher change when teachers work in isolation. The teachers were split into an experimental group (N=24) and control group (N=20). They were followed in their classrooms for a year. Teachers were closely observed in their literacy instruction over the school year, with extensive field notes taken which were then coded (p 71). Students' literacy development was assessed a number of times (four times in kindergarten, thrice in first grade) in the experimental and control classrooms. The first intervention was an intensive two-week instructional institute, involving day-long interactions between teachers and a team of university researchers. Control group teachers were invited to join in an instructional institute during the summer following the classroom observations.
Parke and Coble (1997)	Evaluation: researcher-manipulated	Only after	The study design takes the form of an investigation of the effects of a new curriculum on the attitudes and achievements of students and on teacher practice. Project schools and control schools from the same school districts are compared.

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Ross *et al.* (1999)	Evaluation: researcher-manipulated	Only after Data were collected mainly during the process. 'For example teachers did not collect student achievement data that could be compared to data from a control group because they believed they did not need them.' (p 266) The same could be said about the researchers' evaluation of the teacher researchers: their evaluation was qualitative and a judgement rather than quantitatively measured.	The study design was to evaluate changes in the practice of five teachers resulting from their involvement as action researchers in Phase 1 of the study and the resulting impact on their own changing practice in Phase 2.
Saxe *et al.* (2001)	Evaluation: naturally occurring Evaluation: researcher-manipulated	Before and after Data were collected about the students' achievements.	Groups 1 and 2 make up an RCT. However, membership of Group 3 were selected from those who answered the letter stating that they had a commitment to teaching with traditional textbooks, in order to explore the effect of teachers' choices on their professional development. The teachers who were volunteers were interviewed and studied by questionnaires to establish a sample who had experienced a specific reform programme and received a basic level of professional development. The resulting matched sample were split into three groups to explore three distinctive forms of professional development interventions. One group was identified on the basis of interview data about their preferences for traditional approaches. The remaining group was allocated randomly into two separate groups.

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Shapiro *et al.* (1999)	Evaluation: researcher-manipulated	Before and after Measurements were taken at (a) pre-training, (b) post-training, (c) post immediate consultation assessment, and (d) post delayed consultation assessment. Note: Not all groups got all assessments: control would get a and b; immediate consultation would get a, b and c; delayed consultation would get a, b and d. Data were also collected during the course of the intervention.	A total of 25 school districts were randomly assigned to one of three conditions. Participants from one group of districts received an intensive experiential in-service programme followed by six to eight weeks of on-site consultation to help implement specific intervention strategies learned through the in-service for enhancing inclusionary practices for students with EBD. Participants in the second group also received the in-service but their consultation was delayed by six to eight weeks, during which time they were instructed to also implement the interventions for targeted students. The third group served as a wait-list control. (p 83)
Wilkins (1997)	Evaluation: researcher-manipulated	Other Measurement of the effectiveness of intervention in the seventh-grade year was obtained by collecting data from the eighth-grade mathematics performance scores of the Mississippi Riverside Performance Assessment (MRPA) instrument. Scores from the 1994–95 school year, the first year this test was administered, were collected. Scores from the 1995–96 school year test administration represented gains in scores due to state and county staff development sessions. Scores from the 1996–97 school year test administration were analysed to determine the significance of a resident mathematics specialist in the school.	One seventh-grade mathematics teacher from a rural school and one from a suburban school volunteered to receive instruction from the researcher in performance teaching and analysis, and in the creation and use of rubrics. One teaching unit was prepared by the researcher and presented to the teachers. Using this unit as a model, the teachers created three more units and trained teachers in their local schools. Measures of achievement were obtained from ITBS Performance Assessment scores from eighth-grade rural and suburban school students in 1994 (102 control, 155 treatment, rural; 455 control, 279 treatment, suburban); 1995 (100 control, 132 treatment rural; 451 control, 273 treatment suburban); and 1996 (403 control, 312 treatment suburban). Simple analysis of variance, using 1995 mean scores as a covariate, revealed mean score differences in both treatment schools were statistically significantly higher in graphing and computation. Mean score differences in the rural schools were not statistically different in problem-solving. All schools showed a statistically significant decrease in mean scores in measurement.

Zetlin *et al.* (1998)	Evaluation: researcher-manipulated	Before and after	Schools and teachers were invited to participate in a comprehensive language arts programme designed for 'at risk' children. All teachers taking part received the intervention, and measurements of instructional practices, effectiveness were taken before and after the implementation. Further observations were taken throughout the implementation period (one year) and interviews were carried out at the end. The proposed plan of action, contained the following components:

- approximately 10 hours of professional development to develop awareness of (a) the theories underlying a developmental integrated language arts approach and (b) effective instructional practices for implementation of a comprehensive language arts programme
- visitations to other school sites where model developmental primary programmes are successfully operating
- transformation of participating classrooms 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. Weekly meetings would (a) include demonstration lessons by university faculty of teacher-requested topics (i.e. how to do an integrated reading lesson, how to do individual writing conferencing, how to monitor growth in writing samples); and (b) serve as a mechanism for substantive collegial interaction where teachers could share issues, concerns and ideas as they proceeded with changes in their instructional practices
- development of peer teams 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 programmes with other teachers at their school sites
- ongoing mentoring support of peer teams by university faculty to support implementation of the elements of the comprehensive language arts programme into classroom routines

(b) Teacher-only data studies			
Farmer *et al.* (2003)	Evaluation: naturally occurring	Other Measures were taken throughout the period of the study.	Using in-depth case studies. This study focused on three teachers and followed them through their involvement in the EMES project, and reflects on the changes in their teaching and the impact the project had on their teaching.
Goodell *et al.* (2000)	Evaluation: naturally occurring The SSI ran from 1991 to 1999; this evaluation uses 1995 data, suggesting that the intervention came first, making it a naturally occurring evaluation.	Only after Data were collected from teachers who had and had not participated in the summer institutes after the institutes had occurred. These data were then compared. Site visits were also made after the institutes.	The study was comparitive, using both quantitative and qualitative data collected previously as part of a wider study of two groups of Ohio mathematics teachers: one group which had participated in a CPD programme and a second, larger, group which had not. The researchers randomly selected teachers who had participated in Ohio's professional development initiative. The researchers then randomly selected teachers from the same schools as those who had taken part in the summer institutes but who had not done so themselves. Both groups then filled out a questionnaire as part of the evaluation. A small subset of teachers was then followed up to collect qualitative data through interviews and observations.
Greenwood and Haury (1995)	Evaluation: naturally occurring	Before and after Each of the four years was evaluated. Data were collected • during (perception data) • before and after (to measure knowledge changes) • after (perception data in relation to spread of expertise)	In this study, both the how and the whether components of the CPD intervention were explored through a design which: • provided teachers with collaborative CPD, involving teachers' learning about a new pedagogic approach incorporating inquiry strategies and testing it out on students • measured the impact of the CPD on teachers' attitudes to teaching science, the change in teachers' knowledge of science topics and the extent to which the benefits of the CPD translated into leadership of science teaching in K-8 schools SEPAL proceeded in three phases, each with a different focus: Phase 1 focused on planning for the Science Institute and Science Camp and occurred throughout the school year; Phase 2 was a one-week science institute for teachers in which they acquired new knowledge and skills in science and teaching; and Phase 3 was a one-week summer science camp for elementary students taught by the science institute teachers, thereby enabling them to apply their newly acquired knowledge and skills. Modifications to each of these phases occurred during the four years as teacher comfort and confidence with science grew.

Henson (2001)	Evaluation: naturally occurring	Before and after	The teacher participants undertook an action research project over one academic year in which they developed interventions designed to reduce disruptive behaviour in their classroom. The researcher investigated the effects of the teacher research project on teacher efficacy (their feelings of effectiveness), teacher empowerment (their sense of control over their work in the classroom) and collaboration. A range of qualitative and quantitative data were collected at the beginning and end of the programme.
Lin (2002a)	Evaluation: researcher-manipulated	Data were collected at intervals throughout the project.	This is a three-year action research project initiated by a researcher following an invitation from a school undergoing a school-based project about curriculum reform. Data collected are qualitative and obtained through observations and discussions throughout the period of the intervention from October 1998 to June 1999. A group of four teachers of first-grade mathematics was chosen from a school in which a researcher was already working on consultancy arrangements related to the study (i.e. on the state-mandated curriculum innovation). The four teachers were involved in an intervention that aimed to help teachers to create and use cases to facilitate teacher development and to assist teachers in implementing the spirit of curriculum standards into classroom practices.
Lloyd *et al.* (2000)	Evaluation: researcher-manipulated	Before and after	This study describes a non-naturally occurring intervention – a programme of extended in-service training in teachers' understanding of science – and evaluates its effect by assessing participants' skills and knowledge prior to and after this training. The researcher was actively involved in delivering the training. Science co-ordinators and a partner teacher from the same school for 15 schools in Barnsley LEA undertook the same training programme to develop process skills and to see how the programme affected knowledge, confidence and skills.

McLymont and Costa (1998)	Evaluation: researcher-manipulated Evaluating a researcher-led implementation of a new professional development project	Other Before, during and after	Four mathematics teachers in one school participated in a two-phased seminar series which embodied techniques in reflective coaching discourses and translated them for the teaching and learning of mathematics in everyday classroom situations. This study was designed to explore alternative approaches to teaching and learning of mathematics at high-school level through a fluid approach to professional development utilising cognitive coaching. Phase 1 consisted of a professional development seminar series held in June and Phase 2 consisted of a second seminar series in September. Teachers then met once per month for a professional development session. From September to December, weekly coaching conferences were also held.
Morin (1998)	Evaluation: researcher-manipulated There is an attempt as part of the research to change people's experience and, as a consequence, to have control over which groups of people are 'introduced' or 'exposed' or 'allocated' to the experience, policy or practice.	During and after (not before)	The purpose of the study was to explore the effects of professional development experiences, based on the theoretical model developed by the author on teachers' abilities to implement planned educational change in the context of Sherwood School's Project Learn. The report presents the first-year findings of a two-year school-based reform project. The study is a case study of a single school, involving nine teachers as they participated in a professional development programme designed to support efforts to improve curriculum and instruction of 136 students. Non-obtrusive techniques were chosen to provide multiple perspectives (teacher-interviews, observations, additional documentary data, school tours and meeting notes).

Swafford *et al.* (1997)	Evaluation: researcher-manipulated	Data were collected at different points in the two-year programme, including the end. The study does not make clear whether any data were gathered before the training began.	This was a systematic, in-depth qualitative study of the efficacy of peer-coaching from teachers' and coaches' perspective. Study started in autumn term 1995; the first coaching conferences taking place in the autumn of 1995, but the coaches received training prior to this. Evidence was collected by researchers from January 1996; each teacher was interviewed at that time and at the end of the school year. Three reflective papers were collected from each teacher; the timescale is unclear about these. One-third of the teachers were also interviewed in November 1996. Coaches were also interviewed, from January. Ten peer-coaching conferences were audiotaped and transcribed. Coaches' reflections about the implementation of the framework during the second year of the project were analysed.
Vaughn *et al.* (1998)	Evaluation: naturally occurring	Before and after for some factors Other Before, during and up to a year after the intervention	The study was designed to build upon previous, not wholly successful, attempts to research and develop effective approaches to CPD by selecting intervention strategies to fit within demands made by teachers, and capable of addressing both the needs of students with learning difficulties and whole classes. Four instructional practices were introduced in turn over the course of the year. Initial professional development on each practice was provided by an expert and two follow-up meetings were used to discuss implementation of practice and to provide support and encouragement. In the following year, teachers were interviewed and an intervention validity checklist was completed to determine the extent to which the instructional practices were maintained. Effects were measured by bringing together a range of data about the teachers, their efforts to implement new approaches, and their perceptions about such responses and a related set of research evidence.

| Xu (2003) | Evaluation: researcher-manipulated | Before and after | The teachers collected and reflected upon samples of work, which they kept in portfolios, from three students in their class for one academic year. The researcher conducted 50-minute, open-ended interviews with the participants at the beginning and end of the school year and collected portfolio-related documents. The interviews, which were audiotaped, focused on participants' views of the process of doing the portfolio. Themes which emerged from the first interviews informed the second interviews. The portfolio documents (including students' work, the principal's letters to teachers relating to their portfolios, and teachers' written feedback to the principal) were also used to inform the second interviews. |