Introduction

This paper reports on the Researching Effective CPD in Mathematics Education (RECME) project, which was set up under the umbrella of the National Centre for Excellence in Teaching Mathematics in the UK (NCETM)\(^1\).

The NCETM is committed to research on professional development for teachers of mathematics, and commissioned both the RECME project and a number of small scale research projects. Their vision is that the findings of these projects will feed into the ongoing development of the NCETM in order to meet its aim of providing excellent advice, resources and professional development for teachers.

The RECME project is ongoing and is currently in the third of the four main phases. In this paper we describe in detail how the project was set up and developed, and discuss the progress to date.

1 Project outline and progress

1.1 Philosophical underpinning of the project

The RECME project bases its philosophical approach on that of the NCETM, which is based on the notion that understandings and knowledge growth concerning the CPD of mathematics teachers are most valuable when they are co-constructed by teachers, researchers and other stakeholders. The RECME project adopts this same philosophical approach and extends towards a model of distributed leadership, which moves away from a ‘top-down delivery’ model of working:

‘Taking this view [of distributed leadership], leadership is about learning together and constructing meaning and knowledge collectively and collaboratively. It involves opportunities to surface and mediate perceptions, values, beliefs, information and assumptions through continuing conversations. It means generating ideas together, seeking to reflect upon and make sense of work in the light of shared beliefs and new information; and creating actions that grow out of these new understandings. It implies that leadership is socially constructed and culturally sensitive. It does not imply a leader/follower divide, neither does it point towards the leadership potential of just one person’\(^2\)

The notion of distributed leadership implied calling on the knowledge and expertise of mathematics educators in research, in policy and in practice. In the early stages, a Research Advisory Group (RAG) was formed, whose members (about twenty) were selected on the basis of their research reputations, and on the educational sector in which they conduct their work. This group is chaired by Rosamund Sutherland, Professor of Education at the Graduate School of Education, University of Bristol. Professor Sutherland is also an active member of the research team. They commissioned a review of the literature relating to professional development for teachers of mathematics.

The RAG designed the project in outline, in four separate but related phases. (This design has subsequently been expanded; this expansion is included in the discussion below).

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\(^1\) www.ncetm.org

1.2 Phase 1 (April 2007 – July 2007)

Outline
The focus of this phase was to establish what the RAG meant by professional development for teachers of mathematics, to provide a starting point for the review of the literature. They put together a list of the sorts of questions they hoped the research would address. They then developed a set of aims and put together a design for the project. Finally they appointed a project director.

Towards a definition of CPD for teachers of mathematics
The first and possibly most important question the RAG addressed was putting together a ‘definition’ of CPD for teachers of mathematics. The following broad ‘definition’ was developed:

> CPD for mathematics teachers should stimulate teachers to re-think, to experiment, to make fresh distinctions and to probe those distinctions to explore how they are informative in enabling choices related to teaching and learning.

It was felt to be important that there was wide consultation with all stakeholders in the early stages of the project, to draw out their views on CPD in general, in order to begin expanding joint understandings of what CPD is and to obtain a full, coherent and detailed view of the CPD landscape in England.

To do so, in the first phase of the project the Research Advisory Group, along with the NCETM regional co-coordinators, invited teachers, local authority advisors and providers of CPD for mathematics teachers to contribute to the database of CPD initiatives built via an on-line questionnaire on the NCETM portal. Potential contributors to the survey were alerted and invited to contribute through an advertisement in the national professional press (Times Educational Supplement) and on the NCETM portal’s homepage and through invitations emailed to members list of professional and research associations (Association of Teachers of Mathematics, Mathematics Association, Association of Mathematics Education for Teaching, British Society for Research in Learning Mathematics).

The developing literature review also contributed to shared understandings of what is meant by CPD.

Research questions and aims
The sorts of questions the RAG developed concerned context, content and process of CPD. For example, they thought it was important

- to understand the institutional and contextual settings in which programmes of CPD took place,
- to take account of the content of the programmes so they could understand the kinds of professional capacity being developed
- to find out forms of interactions afforded, forms of experimentation evoked and the stimuli provided.

A further branch of questions was concerned with the short and long term changes that might occur as a result of CPD programmes, with a focus on what counts as evidence of change and particularly what constitutes evidence for effective CPD.

This last question leads to the overarching aim of the RECME project, which is to investigate the interrelated factors that contribute to ‘effective’ CPD for teachers of mathematics. The other aims were based on the questions and were phrased as:

- To characterise different types of continuing professional development for teachers of mathematics (to include both formal and informal experiences)
- To illuminate the types of evidence that could demonstrate that CPD is informing teachers’ practices and enhancing students’ learning
- To investigate the influence of the NCETM portal on professional development for teachers of mathematics
- To establish the roles of research in professional development for teachers of mathematics
- To inform future initiatives of NCETM

Project director
Dr Els De Geest was appointed as part-time project director and joined the RAG. Dr De Geest has been involved in several research projects at the University of Oxford where she also works as a researcher in mathematics education. She is author of ‘Many Right Answers’ (Basic Skills Agency) and co-author of ‘Deep Progress in Mathematics’ and
‘Building Learning in Mathematics’. Previously she taught for many years in both comprehensive and independent secondary schools, and worked as mathematics consultant for Slough and as tutor on the flexible PGCE course with the Open University. It was felt that Dr De Geest’s wide experience in mathematics education and research put her in an excellent position to lead the project.

1.3 Phase 2 (July 2007 – September 2007)

Outline
This phase had three primary concerns: identifying a number of initiatives to take part in the RECME project, appointing the remainder of the research team and completion of the commissioned literature review.

Selecting the sample
The RAG advised that the project should begin by studying a sample of about thirty initiatives. This, it was felt, would provide a wide enough range of types of CPD in the various education sectors. The relatively large number of initiatives would provide a broad overview of the nexus of factors contributing a joint understanding of what CPD is.

The sample was chosen from the 183 entries with information about past and present CPD initiatives logged on the portal. The selected CPD initiatives were contacted and invited to become part of the RECME project. The most important criterion for inclusion in participation was the indication of a willingness to engage in the research, working together with the research team to develop shared understandings. A further eight selection criteria were used to obtain a cross-section of the existing landscape taking on board regional variations of geographical areas; criteria highlighted in the emerging literature review, for example type of CPD such as lesson study, working on students’ conceptual development; structure, for example within school, across school, led by government agencies, university involvement; subject knowledge of the teachers; how communication takes place within the initiative; educational sector, e.g. early years, primary, secondary, further education, adult education. Above all the initiative had to be ongoing during the academic year 2007-2008 to allow for ‘live’ research to take place.

Not all criteria could be fulfilled from the CPD initiatives that were identifiable through the online survey. Further CPD initiatives that satisfied these ‘gaps’ were sought by asking RAG members and other professionals in the field to suggest such initiatives.

An indication of how the criteria are addressed through the selection of the sample CPD initiatives that are participating in the RECME project is shown in Appendix 1.

Appointing the research team
Two full time, and one half time, researchers and a part-time administrator were appointed to the team. Formal university affiliations have been arranged for all researchers. The researchers were invited to become part of the RAG.

Dr Marie Joubert, research associate, is a researcher at the Graduate School of Education in Bristol. She taught mathematics and ICT for over twenty years in secondary schools. Her research interests are concerned with mathematics education, particularly in secondary schools, and with the use of ICT in teaching, learning and research. Marie has also worked together with Professor Sutherland to produce the literature review. She is affiliated with the University of Bristol and started work on November 1 2007.

Dr Jenni Back, research associate, is an experienced teacher of mathematics to students in a variety of age groups. She has recently been involved in Initial Teacher Education and her research interests include talk in mathematics classrooms and webboard communication about mathematics (NRICH) as well as continuing professional development for teachers of mathematics at all levels. She is affiliated with King’s College, London and started work on December 1 2007.

Christine Hirst, research associate, has been involved in educational research for the past six years. The main focus of her research has been in the area of graduate mathematical education and she has worked with schools (primary and secondary) through the study of a number of other educational programmes. She has also worked with organisations and businesses studying numerical and mathematical skills in terms of employability. Her doctoral research (submitted for examination in April 2008) concerns the transfer and management of knowledge. Christine is affiliated with the University of Birmingham and started work on January 2 2008.
Grace Lloyd, administrator. As well as administering the RECME project she also administers the NCETM’s Grants Scheme. Grace also has 14 years experience as a commercial librarian and has wide experience in the retrieval and organisation of data.

The literature review was further developed and was distributed to the RAG and other researchers in the field. The review provides the background against which RECME will work. RECME will build on the findings and conclusions of the literature review, and will avoid replicating research already reported in the literature. In particular, RECME will use the review to identify useful research methodologies and instruments which can be adapted for the purposes of this project and to establish where there are ‘gaps’ in the locus of CPD research.

1.4 Phase 3 (October 2007 – July 2008)

Outline
Phase 3 is ongoing. It began with the official launch of the RECME project and team meetings. It has been subdivided into three separate sub-phases: Phase 3a, Phase 3b and Phase 3c. The main objective of Phase 3 is to collect and analyse data from the various samples.

The launch
The launch took place on 17th October 2007 with a working meeting, bringing together the full research team, some of the key members of the NCETM and representatives from most of the projects selected in Phase 2. During this launch, participants learned more about the project and took part in small group discussions, the purpose of which was for the project team to draw on the participants’ views and opinions to inform the development of a more detailed project design. The following questions were tabled in the first discussion:

What is CPD? What is effective CPD? Where could we find evidence of effective CPD?

Thinking prompts were provided to evoke discussion. These were taken from statements from the online survey:

- Continually examining classroom practice in the light of new methods, research and implementing informed changes.
- Ongoing exploration and reflection on both the subject content of mathematics and the way in which pupils develop their understanding of mathematics in order to be increasingly effective in teaching it.
- The process of reflecting on and developing your professional skills.
- CPD is only effective if it takes the form of collaborative practice.
- I think this means that throughout our teaching careers we are still learners and there will always be ways in which we can increase our own subject knowledge so that it impacts on the students.
- Normally I would have expected CPD to involve attending courses, but I know you can go on studying by yourself and exchanging good practice with colleagues.
- Ways of ensuring that you do not get stale. Keeping interest alive. Ways to encourage people to experiment and exchange ideas.
- A way of linking teachers’ PD with the school development plan.

The second discussion session was based around the following questions:

What kind of changes would you like to see in your students’ learning as a results of this CPD? What would you consider convincing evidence of students’ learning as a teacher?

Thinking prompts for these questions consisted of findings of what teachers considered signs of student learning in the IAMP project

- Students are more active in lessons, for example by participating in discussion, asking and answering questions, volunteering for tasks, offering their own methods.

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3 See Appendix 2 for a draft synopsis of the review
• Students are more willing to share ideas with others: teachers, peers, whole class.
• Students are showing more interest in mathematics, for example doing more homework, working on extended tasks, commenting positively in evaluation tasks.
• Students are more willing and able to tackle routine, non-routine and unfamiliar tasks if these are offered to them – resilience and resourcefulness.
• Students act as a mathematician: looking for and expecting to find coherence in tasks; expecting mathematics to make sense.
• Students are doing better than expected, or than past comparison groups.
• Students show improvements in behaviour and attendance.

The group discussions were all audio recorded and notes were taken by the research team (one member of the team for each group). The discussions will be collated and summarised and published on the RECME portal, with an invitation to contribute to developing them as the full and coherent shared understanding of the community.

Participants were also invited to contribute to the ‘chimney notes’ (post-its stuck onto a chimney breast) with comments, concerns, ideas and so on. Again, these chimney notes will be collated and distributed via the NCETM web site.

Both these strategies are in line with the philosophical underpinning of the project which emphasises the importance of inviting, and taking into account, the voices of the community.

Phase 3a (1 November 2007 to 7 January 2008)
Phase 3a concerns the refining of the research questions and the development of research instruments: how can we find answers to the research questions?

The team augmented and re-structured the aims with the following research questions:

To characterise different types of continuing professional development for teachers of mathematics (to include both formal and informal experiences)
• What are the aims and expectations of the participants and the collective?
• What is the mathematical focus of the CPD?
• What is the structures, relationships, roles and organisation of the CPD?
• What forms of interactions fostered?
• What is the role of research in professional development for teachers of mathematics?

To illuminate the types of evidence that could demonstrate that CPD is informing teachers’ practices and students’ learning

• What evidence is there of teacher learning?
• What evidence is there of improved student learning?
• What kinds of energy are generated?
• What evidence is there of mathematical focus?

To investigate the influence of the NCETM portal on professional development for teachers of mathematics

To inform future initiatives of NCETM

Contribution of participants is sought by setting up an open discussion forum on the NCETM portal. The same questions as used on the launch event are asked and participants alerted to the existence of this forum by email. Further contributions on the appropriateness and effectiveness of the research instruments and research questions are collected during visits by the research team to five sample initiatives. Data and reports of visits are fed back to initiatives and comments requested.

In this way the research instruments are built collectively and through this process the details of the nature of the data required and methods of data collection is being developed by the project team in consultation with the RAG and the five initiatives studied (see above).

5 See Appendix 3 for transcript of chimney notes
Three projects have been visited to date. Notes from the visits have been written up and shared with the participants, with the intention of eliciting their feedback. This method for the co-construction of understandings is still being developed and may be different for different initiatives, but initial results are positive.

This phase also sees the gelling of the research team, in which the complementary skills and expertise of the individual members of the team comes to the fore.

**Phase 3b (from 8 – 31 January 2008)**
During Phase 3b, the research team will work intensively to fine-tune the research questions and hence to refine the research probes and instruments. Researchers will conduct follow-up visits with the five initiatives from Phase 3a to explore and work with mathematics educator-researchers as co-constructors of meaning: is what we are doing valid? Will it answer the questions? Will it work from a practical point?

**Phase 3c (from 1 February to July 2008)**
The focus of Phase 3c will be collection and ongoing analysis of data from all initiatives in the sample. It is envisaged that data will be collected and analysed in an iterative cycle. Members of the research team will visit each of the initiatives to collect data using semi structured interviews and observations. Representatives of each initiative (chosen by the initiative) will be asked for comment on the data and will contribute to the ongoing analysis of the data.

In a similar way, the research design will be adjusted and developed in consultation with the RAG and participants in the study.

Participants will also be invited to report on ongoing professional development activity via the NCETM portal and to write articles, talk at meetings, write a blog or wiki with the support of the research team.

This phase of the project will conclude with a twenty-four hour residential summer school, attended by the research team, representatives from the sample initiatives, some members of the RAG and some regional members of the NCETM team. In this summer school, the data and analyses from the various initiatives will be presented for discussion, which will feed into the final analysis and findings from this phase of the project. Once again, this way of working is in-line with the philosophy backgrounding the project.

**1.5 Phase 4**
In the final phase of the project, selected initiatives will be studied in depth, producing rich case studies, presented as ‘thick’ descriptions. During this phase, teachers will be encouraged to engage with the project in the role of action researchers with the support of the research team.

**1.6 Remarks about the project outline**
The philosophy which values the co-construction of understandings behind this research design is deliberately built into all aspects of the research design. In particular, we suggest that it helps to overcome the ‘gap’ between research and practice by involving practitioners and researchers in the design of the research, in the analysis of the data and in the dissemination of the findings.

The project is characterised by a rigour which derives from ongoing scrutiny from the research community, the participants in the research and practitioners in mathematics education. This is because we share our progress on the NCETM portal, we welcome comment and criticism and are eager to engage in dialogue concerning the research at any stage.

**2 Dissemination**
The project team plans to share findings throughout the study, through presenting papers at national and international conferences, via the NCETM portal and through meeting and talking to others interested in, and involved in, research with a similar focus. Dissemination so far has included:

Presentations at termly meetings of the British Society for Research in Learning Mathematics. These have been in the form of ‘working groups’ which, in line with the philosophy of the project, have invited feedback, comment and input from the audience. Presentations have taken place on March 3, 2007 (London South Bank University,
The portal has been used to publish the project design and to invite comment. The portal is seen as the major conduit through which to share project information, elicit feedback and build a research community. The list below summarises the ways in which it has been, and will be, used (some of which have already been described) in order to raise the profile of the project, to provide current information and to seek the contributions of both the project participants and the wider NCETM audience:

- The NCETM audience was invited to contribute to the online survey (see Phase 1) to report on their CPD experiences. The responses submitted were logged and formed the core of the database of initiatives from which the sample was chosen.
- The NCETM audience was invited to comment on the discussion questions from the launch via a RECME forum. This invitation has been issued to encourage discussion on these questions, which the RECME team sees important. It is envisaged that contributions could take the form of scholarly debate, anecdotes, opinion and examples from classroom practice. Postings on the forum will contribute to the understandings the team builds concerning these issues.
- To establish the RECME research project presence on the ‘Research’ area of the NCETM web page. It is intended that, through the life of the project, this presence will be built up to include reports on initiatives taking part in the project, pointers to interesting and relevant reading, downloadable past and current newsletters and links to participant blogs or other publications. The RECME area will also link to a pdf of the full literature review and to a ‘web-friendly’ version, which will include a synopsis of the review.
- To publish the outline research design for the project on the area devoted to RECME. Again, the wider NCETM audience is invited to comment and to offer ideas.

The project team has submitted a paper to the Professional Development Topic Study Group for the International Conference for Mathematics Education in 2008.

The RECME Research Team:
Dr Els De Geest, Dr Marie Joubert, Dr Jenni Back, Dr Christine Hirst, Prof Dr Rosamund Sutherland

January 2008

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6 Appendix 4: abstract for paper as submitted to ICME: Full paper attached
Appendix 1: RECME Sampling analysis early January 2008

Note: the numbers represent the number of initiatives that fulfill the respective criteria of categories. Initiatives can belong to several categories. Total sample is 30 - 35 initiatives (waiting for confirmation from some invited initiatives - mainly primary)

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<th>FE + adult</th>
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Distinctions not clear from existing data. Will have to find out once data collection is started.
Appendix 2: Draft Synopsis of the Literature review

What do we know about the characteristics of 'effective' CPD?

The literature suggests that CPD works best when:
- Programmes of professional development include commitment to the enterprise by both institutions and teachers, networking amongst teachers, and grounding professional development in practice.
- Professional development programmes are based on sound educational practice.
- The content of programmes take into account the voice of the teacher and should focus on 'mathematics for teaching', which incorporates three aspects of mathematical knowledge: knowledge of mathematics, knowledge about students' mathematical conceptions, and knowledge about ways of teaching mathematics.
- Professional development programmes build on what teachers already know.
- Professional development programmes pay explicit attention to both changes in beliefs and knowledge and changes in practice in order to understand more about the potential interrelated nature of these change processes.

The literature also suggests that it is important:
- to take into account the personal and tacit knowledge that teachers bring to, and develop in, the classroom, focusing on making tacit knowledge explicit, on 'seeing' and interpreting practice.
- for professional development programmes to be explicit about 'what change counts as improvement'.

Professional development in mathematics is about being stimulated to re-think, to experiment, to make fresh distinctions and to probe those distinctions to see if they are informative in enabling choices related to teaching and learning that influence learners' mathematical experiences and activity (Mason, 2007).

Selected readings


Researching CPD for teachers of mathematics: A review of the literature

Rosamund Sutherland and Marie Joubert

Introduction

In 2002 the Advisory Committee on Mathematics (ACME) produced a report on Continuing Professional Development (CPD) for teachers of mathematics. One of the recommendations was that:

We wish to see more professional development for teachers that seeks to broaden and deepen mathematical knowledge and to integrate this with study of pupils' learning and with teaching approaches. The notion of 'unpacking' mathematics rather than only on learning outcomes is crucial, (p 3)

Early in 2007 the NCETM commissioned a review of literature on CPD for teachers of mathematics which would inform the RECM project (Researching Effective CPD in Mathematics Education). This document summarises the main findings of this review.

FINAL DRAFT

7 Designed as folded leaflet
What do we mean by CPD?
In 2002 the Advisory Committee on Mathematics (ACME) described what they meant by CPD:

"... a sustained development programme: this could comprise different sets of professional development and some training put together so as to progress over time to reflect the teacher's needs. Thus a CPD programme in mathematics typically will continue over years, planned by the teacher in collaboration with a Head Teacher or a mathematics co-ordinator or others with expertise, with the aim of enhancing the knowledge, skills and enthusiasm of the teacher." (ACME, 2002, p6)

Those sorts of explicitly planned CPD opportunities may be voluntary or mandatory, and could involve a range of strategies, such as 'whole school training days, team planning opportunities, joint teaching, peer observation, work shadowing, residential working groups, and local and national conferences and networks' (Ofsted, 2002, p 11) and may or may not result in accreditation. These definitions do not take into account informal learning in the workplace, which the literature (e.g. Ertut, 2007 and Coe, 2000) suggests is an important aspect of CPD. Such informal learning includes:

"conversations with colleagues, passing glimpses of another teacher's classroom on the way to the photocopying machine, tips swapped in the coffee lounge ... the daily experience of the classroom." (Wilson & Berne, 1995, p 174)

To summarise, we suggest that the full landscape of teacher learning includes a "patchwork of opportunities" - formal and informal, mandatory and voluntary, serendipitous and planned (Bell & Cohen, 1995).

What do we mean by teacher knowledge?
To understand professional development and learning it is important to understand more about what it means to work, develop and learn within a profession, and particularly to understand the nature of professional knowledge. One way to understand professional knowledge is to make a distinction between cultural knowledge and personal knowledge:

"I have chosen to define the term personal knowledge as what a person brings into new situations that enables them to think and act in those situations. This definition is not based on its truth but on its use." (Ertut, 1997, 1990)

It is important to emphasise the fact that teachers' practice is more likely to be influenced by their personal knowledge than by cultural knowledge. Such personal knowledge of teachers, is mostly uncoded and tacit and therefore difficult to uncover. For professional development, this presents a challenge.

Cultural knowledge includes the codified knowledge of the academic community and the know-how of the professional practice. For teachers of mathematics this cultural knowledge falls into three interrelated areas:

"The knowledge that teachers need consists of at least the mathematical understanding of the idea, an understanding of how children's thinking might develop and a knowledge of pedagogical strategies in relationship to both the mathematical development and the psychological development." (Leash & Doerr, 2003, p 121)

In summary, teacher knowledge is clearly a complex domain which has strong implications for professional development programmes.

How do we understand change in teacher knowledge and practice?
The literature is in unanimous agreement that it is crucial that change is sustained and ongoing, but there is some debate as to how to organise CPD to achieve this. In particular, there is debate about which should come first: a change in knowledge and beliefs or a change in classroom practice? Others argue that these are mutually re-inforcing:

"One could argue that the means by which teachers learn such knowledge is one, if not the, defining point for teacher education." (Cooney, 1994, p 611)

"Changes in beliefs and practices occur in a mutually interactive process. Teachers' thoughts influence their classroom practices. Their reflections on these activities and the outcomes of changed practice influence the teachers' beliefs about mathematics learning and teaching. Changes in attitudes and behaviours are iterative." (Frankie et al, 1997, p 972)

A crucial question is how to evaluate change from the perspective of teacher knowledge and practice and also from the perspective of student learning. Whereas it is common to evaluate change in students' mathematical attainment, it is more challenging to develop conceptual tools for teachers to gain feedback on students' learning of mathematics. It is also difficult to evaluate change in teacher knowledge and practice.
Appendix 3: Notes from the Chimney

What is effective CPD?
Effective if the individual feels more passionate about what they are doing.
Improves learners understating and experience
Inspires the teacher to take a risk / experiment
Allows you to reflect on practise and adapt ideas for your own context and learners (dissemination)
Long term effect on teachers and pupils

What is CPD?
Not one thing.
Broad range of models and stuff
External influences encourage teachers to reflect on practice
Teacher development – teachers as learners

Where could we find evidence of effective CPD?
Impact on children’s learning
Teachers’ enthusiasm and drive
Collaboration with others and facilitating reflection on practice

Evidence of Effective CPD
Pathfinder project from CIMT (noted by A.J.Russell)
Reflect – Effective CPD causes you to reflect on your own practice. What you do well and what you could improve / change in the classroom for the benefit of the pupils
CPD is a team sport
A way of evaluating and developing practice
Starts with identifying a need for you in your classroom
Does not have to be delivered from outside
Should be evaluated

Passions
The importance of CPD leaders having a passion for the content so that they can inspire and enthuse others. This may rub off on (inspire) teachers to develop their passions
Which can inspire the children
Passionate learners, deep learning.
Collaborative learning is dominating the thinking here but the teacher developing sometimes on her own e.g. reading is also important and being responsible for your own learning. There is a dependence on culture at the moment.
**CPD**

Is it possible to leap-frog the years of experience it takes to be an excellent maths practitioner by using good CPD?

Should take into account other adults in the classroom – N.N.E.Bs, T.As, volunteers

CPD should find ways of passing the experience of more experienced teachers to the lesser experienced

CPD should play a role in retaining teachers – particularly maths teachers

Gives you the chance to try something new/take risks

Develop a new way of thinking and to try it out

Time to have a go and reflect

Flexibility

Giving you the skills to effectively evaluate your CPD

Giving you the chance to be creative with units of work

Picks you up wherever you are and "moves you on". You might begin, for example, very practical ideas but later being to ask “what next?”, “why this?” – over time.
Appendix 4: ICME submission
The full paper is attached (see ICME-DeGeest.doc)

The abstract follows:

The National Centre for Excellence in Teaching Mathematics (NCETM) takes a philosophical approach that values the co-construction of understanding of CPD by researchers, teachers and other stakeholders as crucially important. This philosophy also underpins the Researching Effective CPD in Mathematics Education (RECME) project and has informed the whole design of the project which aims to involve all stakeholders (researchers, the RAG, teachers, providers etc) at all stages of the project. The paper explores how this philosophy has influenced the design of the research and explains how we plan to encourage this co-construction of understanding.