RESEARCHING EFFECTIVE CONTINUING PROFESSIONAL DEVELOPMENT IN MATHEMATICS EDUCATION (RECME)

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Abstract

The National Centre for Excellence in Teaching Mathematics (NCETM) takes a philosophical approach that values the co-construction of understanding of continuous professional development (CPD) by researchers, teachers and other stakeholders as crucially important. This philosophy also underpins the Researching Effective CPD in Mathematics Education (RECME) project. The paper explores how this philosophy has influenced and informed the design of the research and how plans to encourage co-construction of understanding involving all stakeholders (researchers, the Research Advisory Group, teachers, providers etc) at all stages of the project have evolved.

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 United Kingdom (NCETM).

The NCETM was launched in 2006, with the broad aim of enhancing mathematics teaching and learning, in schools, colleges, universities and other organisations through high-quality continuing professional development. The NCETM is a major initiative funded by the Department for Children, Schools and Families (formerly the Department for Education and Skills) to enhance professional development for mathematics teachers in all education sectors in England. The NCETM was established in response to the recommendations of the Advisory Committee on Mathematics Education (ACME) and those made in Professor Adrian Smith's report 'Making Mathematics Count' (Smith, 2004). The NCETM works with teachers of mathematics in two main ways: through a virtual presence on the Internet in the form of a

portal[1], and through a team of people working directly with schools, colleges, organisations, networks, the government and everyone involved in mathematics education. All teachers and lecturers of mathematics, together with national and international organisations concerned with mathematics education, are considered stakeholders of the NCETM.

The philosophy underpinning the NCETM 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. This notion is described in detail by Triggs and John (2004) who use a model of multi-layered communities in which knowledge flow is omni-directional. They suggest that this approach can overcome the identified 'gap' between research and practice (Weiss, 1998).

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.

Laying the foundations

The RECME project bases its philosophical approach on that of the NCETM, 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' (Harris, 2003 p 314)

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

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[1] *http://www.ncetm.org.uk*

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. The RAG designed the project in outline, first by discussing how they conceptualised the notion of professional development for teachers of mathematics, the sorts of questions they hoped the research would address, and then by developing a set of aims. They put together a design for the project and appointed the Project Director, who joined their group.

A review of the literature concerning professional development for teachers of mathematics was commissioned and the RAG played an active consultative and advisory role in the development of this review.

Research questions and aims

The first and possibly most important question the RAG addressed was putting together a 'definition' of CPD for teachers of mathematics. It was seen as important to be clear about what exactly they saw as CPD, to provide a starting point for the review of the literature. 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.

The sorts of questions the RAG developed were concerned with the context, content and process (Harwell, 2003) 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 and they were interested in the forms of interactions afforded, the forms of experimentation evoked and the stimuli provided. A further branch of questions were 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 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

Identifying the landscape and inviting participation

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 (April 2007 – July 2007) the Research Advisory Group, together 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 and what factors might contribute to 'effective' CPD. This literature reviews research papers, policy documents and inspection reports, but even at this early stage of putting the review together, it became clear that the voice of the teacher was strangely quiet. So the literature can be seen as representing a 'top down' perspective on the landscape of CPD, but the RECME project aims to include a stronger teacher voice.

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.

Launching the project

The project team invited CPD initiatives taking part in the research project to participate in a launch event where they learned more about the project and took part in small group discussions. The purpose of these discussions 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 (Watson & De Geest, 2005)

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

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

Student 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. This is in line with the philosophical underpinning of the project which emphasises the importance of inviting, and taking into account, the voices of the community.

Beginning the research

The next phases concern the refining of the research questions and the development of research instruments: how can we find answers to the research questions? 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 will be developed by the project team in consultation with the RAG and the five initiatives studied (see above).

Collecting and analysing the data

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.

At the same time, and throughout the project, participants are also 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.

Final phase

In the final phase of the project, selected initiatives will be studied in depth, producing rich case studies, presented as 'thick' descriptions (Geertz, 1983). 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. Gradually the team will withdraw support while the teachers take more responsibility for the research.

Concluding remarks

The philosophy which values the co-construction of understandings has greatly influenced the research design. 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 comments and criticism and are eager to engage in dialogue concerning the research at any stage.

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