

PROFESSIONAL DEVELOPMENT OF MATHEMATICS TEACHERS: ADDRESSING THE CHALLENGES OF SUSTAINABILITY AND SCALABILITY

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Mathematics in Education and Industry

The UK charitable organization Mathematics in Education and Industry (MEI) designed and manages a well-established national programme to support secondary mathematics education in England. In recent years, in response to an increasing need for professional development for secondary mathematics teachers, MEI has found ways to scale up its teacher support activities. This paper describes how MEI has developed its programmes and is supporting and working with others in order to widen access to high quality professional development.

INTRODUCTION

Mathematics in Education and Industry (MEI) is a UK charitable organization dedicated to improving mathematics education for all. It was founded in the 1960s and works extensively to support secondary mathematics in the areas of curriculum development, student and teacher resources and teacher professional development (PD). In the year 2000 MEI created a pilot project to support the teaching and learning of pre-university mathematics to 16 – 18 year olds. The programme was very successful and went on to receive government funding for national roll-out in 2005. This programme, known as the Further Mathematics Support Programme (FMSP), has now been running for 10 years. An overview of the extensive work of the FMSP can be seen on its website (www.furthermaths.org.uk/fmsp) and an evaluation of its activities has been reported in Lee and Searle (2012).

Through its FMSP work, MEI has created, implemented, reviewed and modified, in an evolutionary process, its extensive programme of PD for secondary mathematics teachers. In academic year 2015-16 over 5000 teacher days of PD will be delivered through the FMSP.

There follows a brief overview of MEI's PD provision, with its guiding principles and influences, and a detailed description of ways in which MEI is adapting its work to meet the increasing needs of the mathematics teaching profession throughout England.

AN OVERVIEW OF MEI'S PD

MEI's PD courses vary in length (from single day to year-long courses), in content (subject-content and pedagogical-content knowledge, leadership of mathematics departments) and in delivery (from entirely face-to-face to entirely online).

MEI offers three different one-year-long courses, designed to support those teaching, often for the first time, each of the three main 14-19 mathematics qualifications in England. Across these courses the teachers attend up to eight face-to-face study days over the year, have access to regular sessions in an online classroom and purpose designed web-resources, receive formative lesson observations, and have the option of Masters level accreditation. Almost 2000 teachers have undertaken these

courses over the last decade. Courses with a more specific subject-content focus usually span two days, separated by several weeks, with online support and ‘gap tasks’ in between; see Knights and Lee (2015). A three day course for new and aspiring heads of mathematics departments combines leadership styles, the responsibilities of the role and how to develop a vision for mathematics teaching across the school. A suite of one day courses for experienced teachers looking for inspiring ideas has recently been designed and will be offered for the first time this year.

MEI makes extensive use of an online classroom to provide Live Online Professional Development (LOPD). In a typical LOPD course, a tutor will meet with about five teachers (from anywhere in the world) for a 60 to 90 minute session each week over a period of five to ten weeks. The focus is usually specific mathematical content, looking at the underlying mathematical concepts and ideas for how these can be taught. Communication is via a shared whiteboard, instant messaging, audio conferencing and application sharing, and sessions are recorded for playback/review later. MEI’s LOPD has been discussed in de Pomerai and Tripconey (2011).

GUIDING PRINCIPLES

In all its courses, MEI believes it is important to promote mathematical thinking, present mathematics in an interconnected way, provide resources that promote mathematical learning, and support teachers in embedding new ideas in their classrooms.

MEI employs approximately 30 academic staff, almost all of whom have a secondary mathematics teaching background. MEI is committed to developing its staff, supporting them in studying for Masters level qualifications, working with university partners in England and abroad, and becoming involved in national and international mathematics education projects. This range of experience ensures MEI’s PD is sympathetic to the demands that teachers face, is grounded in classroom practice, and is evidence-based.

In 2008 the National Centre for Excellence in the Teaching of Mathematics (NCETM) reviewed mathematics PD across England to produce the Researching Effective CPD in Mathematics Education (RECME) report, see Back (2009). This report, along with ACME (2002) and ACME (2006), influenced the NCETM’s CPD Standard, a quality mark that MEI holds.

SCALING AND SUSTAINING MEI’S PD PROVISION

In England unprecedented levels of change are currently taking place in the secondary school mathematics curriculum. The key mathematics qualifications taken by students aged 16 (GCSEs) and aged 18 (AS/A levels) are undergoing a change in both content and assessment structure, see Lee and Proffitt (2015). With a backdrop of a year-on-year increasing demand for MEI’s PD, such widespread changes are resulting in a significant further need. MEI is meeting this challenge through a range of initiatives which are described below.

Training external experts to deliver online PD

LOPD courses are proving popular with teachers and, noticeably, senior managers in schools. LOPD provides flexibility and accessibility, without the expense of covering for an absent teacher, travel costs, and course fees covering presenter and venue costs. Crucially, with after-school LOPD sessions, students are not deprived of their teacher whilst their teacher is being trained. Participant numbers are increasing year-on-year, with many ‘repeat’ customers from the same schools. To meet

this demand, MEI is training expert practicing and retired teachers to become MEI associate tutors to present LOPD courses. Building on their expert knowledge of mathematics education, the MEI training focuses on developing skills in interacting with teachers in an online setting.

Creating PD leads

As a national partner in the NCETM, MEI has developed a programme to support those who are new to leading professional development in secondary mathematics. Over a pair of face-to-face days, these 'PD Leads' experience a range of PD sessions wearing their 'mathematics teacher' hat and then analyse them wearing their 'PD Lead' hat. The days are structured around six key questions, related to issues such as design, evidence, impact and evaluation. A gap task between the two days is structured using a framework to encourage the PD Leads to have a clear focus on outcomes and builds in features to provide evidence of whether the outcomes are achieved, in the short and medium term. The resulting national community of PD Leads now numbers over 400.

Working with local hubs and individual experts in a nationally coherent manner

Over the past year the NCETM has established a national network of 35 school-led regional 'Maths Hubs'. These Maths Hubs are charged with supporting improvement in mathematics education in their regions. MEI is developing expertise within the Hubs through co-designing and presenting courses with local PD Leads and other lead teachers, and supporting Hubs at a strategic level.

The Cambridge Mathematics Education Project (CMEP) is a UK government funded initiative, which aims to provide innovative resources to help support and inspire teachers and students of pre-university mathematics. MEI was contracted to design a PD course based on the CMEP resources and to run this over 100 times in the period 2015-2018 to ensure all teachers throughout England were supported in using these resources effectively. At the outset MEI selected a team of twelve experienced teachers from around the country to comment on and refine an initial 2-day course outline designed by the MEI project leader. Each member of this team now offers the course in their regions and will meet each year to review the design, amend it to incorporate new CMEP resources and link them to the new 16-19 curriculum.

Train the trainer

The London Schools Excellence Fund (LSEF) has, over the last two years, supported PD projects across London schools. It was set up to stimulate new partnerships and help schools to raise standards in several curriculum areas, including mathematics. It supported evidence based activity led by state schools working together and linking with other expert partners. MEI was successful in a bid for funding which focused on working alongside lead teachers to build capacity for future PD in seven distinct PD offers. Over the two years of the project the lead teachers took an increasing role as the courses were offered several times. MEI gave its intellectual property in the courses to these lead teachers and their schools, allowing them to offer the courses through the Maths Hubs in London. MEI hopes to repeat this model in other regions.

Working with university partners

The Teaching Advanced Mathematics (TAM) course is one of MEI's year-long courses described above. It was established in 2003 in partnership with the University of Warwick. Since then, in response to demand and with government funding, nine universities have been involved in the

programme, all offering participants the option of Masters level accreditation. MEI has coordinated the programme throughout, ensuring colleagues from universities new to the programme meet with existing providers to share module guides and good practice.

Evaluating the provision

The effectiveness of several of MEI's PD projects has been defined and assessed by independent external evaluators, as well as being evaluated internally by MEI. This level of evaluation gives creditability to the projects as being cost effective and beneficial to pupil outcomes – this aligns with research by Foster et al (2013).

SUMMARY

Rapid and significant changes to the secondary mathematics curriculum in England mean that there is now a great need and an increasing demand for PD for secondary mathematics teachers. MEI continually adapts and develops its programmes to meet the needs of schools, colleges and teachers, but MEI alone does not have the capacity to meet the national demand for delivery.

Through MEI's FMSP academics and expert associates, its strong links with schools, colleges and universities, and its close involvement with the NCETM and the national Maths Hubs network, MEI has developed mechanisms for working with and training others to deliver PD for secondary mathematics teachers. This is enabling MEI to share outstanding practice at a national level and scale up delivery, whilst maintaining quality. It is also expanding the pool of expertise in PD delivery, supporting the development of a national PD provision for secondary mathematics teachers that can be sustainable in the long term.

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