

# Empowering teachers: success for learners

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## Foreword

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There is widespread agreement about the importance of mathematics for individuals and for wider society. The Advisory Committee on Mathematics Education (ACME) believes that all students should receive high-quality mathematics teaching from teachers who are themselves professional learners. A world-class education system needs to empower its teachers by nurturing a culture of professional development. All teachers should be entitled to, and have responsibility for, continuing to update their skills and subject expertise throughout their career.

In 2002, ACME published its first report on continuing professional development in mathematics. While there has been change for the better, such as the establishment of the National Centre for Excellence in the Teaching of Mathematics (NCETM), many of the recommendations ACME made in 2002 have not been fulfilled and this is a cause for concern. A decade later – during a time of extensive educational reform – ACME decided it was time to look at professional development again.

We drew upon the expertise of our networks of advisers as well as new academic research and policy reports. We commissioned a landscape analysis to identify policies and programmes that support professional development for teachers of mathematics.

In this report, ACME considers the challenges of realising its vision for professional development. We have identified changes that need to take place at national, institutional and individual levels. ACME has come to the conclusion that these three areas urgently need addressing:

Firstly, all teachers must have access to mathematics-specific professional development opportunities. Given that the majority of school leaders will not be specialists in mathematics, they need help and advice about what good professional development looks like for teachers of mathematics. It is not ACME's role to create or disseminate this advice, but in this report we identify what is needed to achieve this ambition.

Secondly, our review confirmed that excellent professional development is sustained and subject-specific. Teachers will need access to good quality professional development throughout their careers in order to appreciate the changing uses of mathematics and the latest understanding of student learning. For example, the prevalence of large data sets and increasingly powerful technologies is now enabling mathematics to be used and learnt in new and exciting ways and this should be reflected in teachers' practice.

Finally, it is difficult for schools, colleges and Government to identify high-quality professional development activities from the many activities offered by organisations and individuals. In order to support teachers and others in choosing from the activities on offer, we are convinced that quality assurance mechanisms and support for professional development providers are key. We make proposals to ensure this is achieved.

There are many educational reforms that aim to improve and support mathematics teaching. Their chances of success will be much greater if they are supported by high-quality professional development. Adopting the recommendations ACME makes in this report and investing in professional development for teachers of mathematics will result in success for our students and for the reforms.

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## Prioritising professional development for teachers of mathematics

*...for too long, CPD for teachers has lacked coherence and focus. Despite financial constraints which we acknowledge and appreciate, we are concerned that England lags seriously behind its international competitors in this regard, and recommend that the Government consult on the quality, range, scope and content of a high-level strategy for teachers' CPD, and with an aim of introducing an entitlement for all teaching staff as soon as feasible. The consultation should include proposals for a new system of accrediting CPD, to ensure that opportunities are high-quality and consistent around the country.*

(House of Commons Education Committee, 2012)<sup>1</sup>

A world-class education system is underpinned by a world-class professional development culture. ACME believes that every teacher is entitled to, and has a responsibility to undertake, subject-specific professional development throughout their career. ACME published a report on teacher Continuing Professional Development (CPD) in 2002, recommending a sustained development programme for all teachers of mathematics, overseen by a National Academy for Teachers of Mathematics.<sup>2</sup> Some of the proposals in the 2002 report have been taken forward, others have not.

This report builds on the 2002 ACME report and considers the challenges of achieving a professional development culture for teachers of mathematics. It sets out the steps that need to be taken to develop ongoing learning provision for all teachers of mathematics that can, in turn, maximise learning of all students throughout their school and college careers.

The overriding priority of Government education policy is the improvement of student achievement. Research demonstrates that learner progress is greatly influenced by the quality of teaching: for example, a very effective teacher of mathematics elicits 40 per cent more progress in learning over one year than a poorly performing teacher does.<sup>3</sup> All students should receive such highly effective teaching. However, Ofsted has reported that there is significant variation in the quality of mathematics teaching, even in good and outstanding schools.<sup>4</sup> Ofsted found that non-specialist, less experienced or non-permanent teachers were more likely to teach students in lower sets.<sup>4</sup>

Mathematics teaching quality is critically important, yet teachers in England often have lower qualifications in mathematics and receive less initial training than their international counterparts.<sup>5</sup> Many primary teachers in England have the minimum qualification in mathematics (GCSE Grade C) and many secondary schools struggle to appoint teachers with appropriate qualifications and expertise, although the full extent of this problem is not known.<sup>6</sup>

Given the growth in the numbers of primary school children, concerns about the subject expertise of Key Stage 3 (KS3) teachers<sup>4</sup> and the Government's ambitious goals for post-16 mathematics participation, there is an urgent need to increase the number of well-qualified teachers of mathematics in schools and colleges. However, the supply of newly qualified teachers will be insufficient to meet these demands. Most of those who will be teaching over the next ten years are already in post. Their professional development must be prioritised in order to meet student achievement goals, secure the successful implementation of reforms and improve teacher retention.<sup>7</sup>

Until recently, much professional development support came from local authorities, initiatives such as the National Strategies<sup>8</sup>, awarding organisations and schools of education in higher education institutions (HEIs). The education landscape is now changing quickly and new professional development networks and markets are emerging. The partial demise of specialist mathematics advisors and the increasing number of academy chains and Teaching School Alliances<sup>9</sup> offer new possibilities for teacher development as well as raising questions about quality, availability, support, monitoring and evaluation.

### Professional development

Continuing Professional Development (CPD) is generally understood to mean the on-going education of teachers following completion of formal training. CPD consists of educational activities which help to maintain, develop or increase knowledge, problem solving, technical skills or professional performance standards all with the goal that teachers can provide better classroom experiences for students. In this report ACME uses the term professional development to refer to all such activities and also to the development of teacher skills and professional expertise.



## The changing landscape

### Policy coherence

ACME's review of professional development for teachers of mathematics resonates with the House of Commons Education Committee findings.<sup>1</sup> Since 2002, there has been little coherent policy, guidance or quality-assurance to ensure high-quality, relevant, career-long professional development for all teachers of mathematics. Professional development has often been reactive to the latest initiatives, is rarely continuing and has lacked progression for individual teachers: this is a serious concern.

One exception to the lack of coherent policy was the National Strategies, which ran from 1997 to 2011. This, however, offered 'one-size-fits-all' professional development to a large number of teachers of mathematics in primary and Key Stage 3 classrooms.

Through the period of the National Strategies each local authority had a number of mathematics consultants and advisors. The ending of the Strategies in 2011 therefore had a particular impact on mathematics professional development provision across the country; the numbers of consultants attached to local authorities reduced dramatically. Many became independent consultants but even so, the geographical equity was lost.

There appears to be no plan to coordinate teachers' professional development nationally. The coalition Government promotes Teaching Schools as the principal strategy for the local coordination of teacher development.<sup>10</sup> Each Teaching School is tasked with organising outstanding local teachers to support school and teacher development. Schools qualifying for Teaching School status require an 'outstanding' Ofsted grading but this, in itself, is no guarantee of having the necessary subject expertise in mathematics, or of having mathematics specialists who are able and available to influence the practice of others. There is also no requirement for Teaching Schools to draw upon other expertise, such as HEIs and subject associations, although some very successful partnerships do exist.



### Performance measures

The influence of accountability measures on mathematics learning and teaching has strengthened during the past ten years and this has made an impact on professional development provision. Strong incentives for schools to improve their position in performance tables have resulted in an emphasis on teacher development targeted at enhancing examination outcomes around key performance thresholds. Although the raising of student attainment is a worthy goal, an overly narrow diet of professional development focused on short-term gains for some learners will not achieve the longer-term ambition of effecting systemic improvement in teaching mathematics.

### Curriculum, qualification and assessment reform

There are many curriculum and assessment reforms currently under way, all of which require new support for teachers. One challenge will be to ensure that all teachers, irrespective of where they live and work, get access to the necessary professional development to ensure that these reforms achieve their goals. Currently there is no clear line of responsibility for providing, monitoring or quality-assuring such provision.

#### All teachers of mathematics

When we use all teachers of mathematics this encompasses all those who teach mathematics through all phases of education and those who teach mathematics within other subjects.



## ACME's vision for professional development for teachers of mathematics

### ACME's vision

*All students are taught by well-qualified teachers who are themselves professional learners. Schools and colleges are vibrant learning communities in which students thrive because teachers are actively collaborating in professional learning networks, inquiry groups and with experts. Teacher development is both an entitlement and a responsibility and is framed by common national guidelines. Institutional commitment and local infrastructure support the career-long professional development of all teachers. Activities are purposeful, engaging and high quality, occurring formally and informally in a variety of ways.*

The following aims and principles underpin ACME's vision. ACME has also identified a wide range of activities that can support professional development throughout a teacher's career.

#### Aims

The aim of professional development for all teachers should be to enhance the learning of each and every student. To do this teachers need to:

- develop deeper mathematics subject knowledge, pedagogical content knowledge and other professional learning, including the use of digital technologies
- engage with mathematics and its uses
- consider the implications and implementation of policy changes where appropriate, for example new curricula and assessment.

#### Principles

Professional development that improves mathematics teaching and learning:

- is relevant to the needs of teachers and institutions
- is mathematics-specific and appropriate to career stage and education phase
- promotes deep subject knowledge and enhances pedagogical skills
- is both an entitlement and professional responsibility
- is sustained and transformative
- is valued and supported by colleagues, managers and governors
- is enhanced in professional learning communities and networks
- is facilitated by experienced and well-qualified experts
- is informed by research and stimulated by collaborative inquiry groups
- is planned thoroughly, well-resourced and carefully evaluated
- encourages reflection and promotes teacher inquiry.

#### Activities

Activities that support professional development include:

- those which encourage critical reflection and evaluation of what happens in the classroom and future experimentation
- one-off events, such as training days, INSET, workshops and conferences
- sustained development opportunities
- online self-study and other forms of e-learning
- active engagement in professional development communities and collaborative inquiry groups
- non-award bearing in-service events run by HEIs
- active membership of a subject association
- courses that develop subject knowledge or focus on classroom practice
- postgraduate study such as diploma, Masters or doctoral research.

*The activities above are in no particular order.*



ACME's vision, aims, principles and activities have been informed by extensive discussions with the mathematics community combined with evidence from the research literature.



## What is known about effective professional development?

Since ACME's 2002 report on CPD,<sup>2</sup> much has been written about generic teacher professional development. A UK report on mathematics-specific professional development was published by the NCETM in 2009 entitled *Researching Effective CPD in Mathematics Education (RECME)*.<sup>11</sup> This report influenced schools and has informed much of the NCETM's activity since then. ACME believes that the central messages of the RECME report still hold true:

- teachers value having time to participate in professional development and to reflect on their practice
- programmes of professional development should include stimulating and challenging mathematical activities and opportunities for teachers to develop knowledge about mathematics and ways of teaching mathematics, drawing on relevant research
- programmes should encourage teachers to try out new ideas in the classroom by giving them 'permission' to do so and building in adequate time for this and the subsequent reflection on learning
- good leadership in school or externally, is key to effective professional development for teachers of mathematics.

These messages resonate with the findings in other studies on professional development.<sup>12</sup>

Looking further afield, professional development models in other national education systems vary considerably and there is much to be learnt from how highly effective jurisdictions support the development of their mathematics teaching workforce.

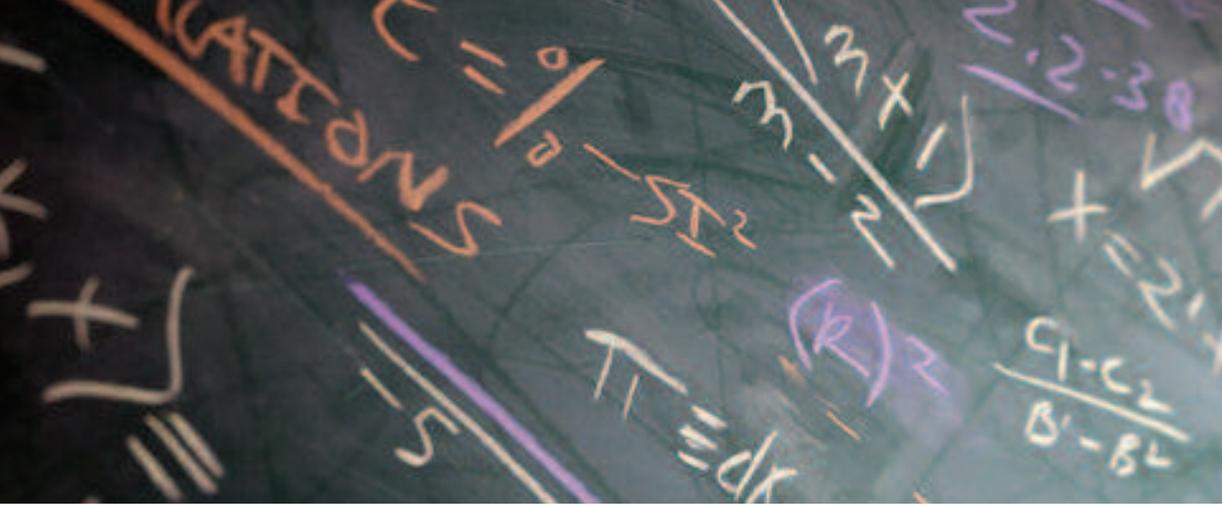
### What happens in China

In China, new teachers typically have a year of one-to-one professional development mentoring. This is followed by structured and progressively more demanding activities.<sup>13</sup> These activities are linked with each teacher's growing professional status and responsibility. Such systems underpin both the expectations and developing competencies of the teachers. This professional development process aims to ensure the consistency of student learner experiences.

### What happens in Singapore

In Singapore, systemic professional development infrastructures have been introduced at school and national level.<sup>14</sup> Each teacher is entitled to 100 hours of professional development each year and teachers are expected to document pedagogical development to access career progression. Mathematics teachers are expected to develop exemplary teaching by engaging in:

- lesson study
- action research
- research project partnerships
- professional development activities organised by university scholars, 'master' and senior teacher.



## What is known about effective professional development?

A typology developed by the Centre for the Use of Research and Evidence in Education outlines four levels of professional development for teachers, indicating that it can be:

- **informing:** participants consider new knowledge and implications for practice
- **influencing:** participants engage with new knowledge, compare with existing practice and consider implementation
- **embedding:** participants engage deeply and through a range of activities with new knowledge, assess their starting points, and plan application
- **transforming practice:** participants are equipped to take control of their own learning, both in an immediate and on-going way.<sup>15</sup>

One-off teacher development events often *inform* and *influence* teacher learning yet rarely *transform* practice.<sup>11</sup> Sustained development opportunities that offer teachers the opportunity for critical reflection on, evaluation of, and experimentation in one's own and colleagues' classrooms are more likely to transform practice.

A New Zealand research review<sup>16</sup> has shown that effective teacher professional development:

- has a focus on valued student outcomes
- includes worthwhile content and integrates knowledge and skills
- uses learners' needs as the basis for identifying teachers' development needs
- offers multiple opportunities to learn and apply information
- is contingent upon the different beliefs, values and experiences of teachers
- includes opportunities to work collaboratively with colleagues
- draws upon knowledgeable expertise and leads to sound theoretical knowledge and evidence-informed inquiry skills
- requires active leadership.

The findings of the New Zealand research review are consistent with the characteristics of effective professional development for teachers of mathematics identified in UK professional development research.<sup>17,18</sup> In addition, the RECME report explains that development for mathematics teachers needs to attend to matters that are specific to mathematics pedagogy (e.g. student misconceptions) and should allow opportunities for teachers to work on mathematics together.

## Professional development 'at distance'

The majority of teacher development takes place face-to-face but web-supported, blended or distance/online learning is also available in various formats, for example, the Bowland Maths PD modules<sup>19</sup> for departmental self-study, Massive Open Online Courses (MOOCs) such as Stanford's 'How to Learn Math'<sup>20</sup> or tutored distance learning such as the Open University's (OU) CPD modules that support over 700 teachers per year. There is some evidence that online provision of mathematics professional development promotes *informing* and *influencing* more than *embedding* or *transforming*.<sup>21,22</sup> Research from one OU blended programme found that 80 per cent of ex-students had integrated their learning into practice.<sup>23</sup>

New technologies are increasingly able to offer the kinds of collaborative, personalised, expert support necessary for effective professional development. With the continued rise of professional social networking, ubiquitous mobile technology and internet connectivity, virtual professional networking and learning will be a growing space of possibilities for career-long professional development through the 21st century. Organisations such as the NCETM and the NRICH project<sup>24</sup> have well-established online communities and are developing the use of web forums, Twitter and Facebook as vehicles for professional development.<sup>25</sup>



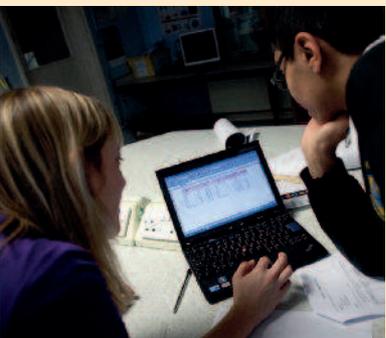


Professional development should be...



...specialist, supported and sustained

...accessible to all teachers of mathematics



...of the highest quality



# Professional development: for all teachers of mathematics



*The Government rightly aspires to have a world-leading education system in which all young people maximise their potential and develop high levels of mathematical competence and confidence. In order to achieve this, there is an urgent need to develop career-long professional development for all teachers of mathematics. In addition, many more well-qualified teachers of mathematics need to be recruited due to changing demographics and the planned increase in participation in post-16 mathematics. Newly emerging local professional development markets need to be better understood, organised and monitored in order to achieve ACME's vision for professional development and to minimise the risks of 1) skewing opportunities, 2) fragmenting pathways and 3) creating inequitable access to high-quality professional development.*

## Skewing opportunities

The skewing of professional development activity can happen in response to the immediate pressures of the target-driven culture in schools. For example, development courses can be offered for teachers to improve grades at the C/D borderline rather than for other GCSE grades. Such short-term, fragmented and/or reactive approaches to professional development need to be balanced by programmes that support the long-term development needs of teachers and hence the learning needs of all young people.

## Fragmented programmes

Teachers have different development needs at different career stages and personal development planning needs to take account of this.<sup>26</sup> The lack of good exemplification of professional pathways from novice to expert means that professional development is often unplanned and lacks the direction, coherence and depth needed for strong classroom development.<sup>27</sup> The Mathematics Specialist Teacher programme (MaST) is a good example of a programme that supports the development of primary mathematics specialists.<sup>28</sup> Although MaST is a large and specific type of programme, it is a good example of rich professional development with its three-fold aims of developing 1) mathematics subject knowledge, 2) a range of effective pedagogies, and 3) expertise in supporting others. The MaST programme is not available to all primary teachers. In secondary schools there is no recognised subject-specific professional development framework to support the development of expert teachers and teacher expertise. In further education, the Learning and Skills Improvement Service (LSIS) developed subject-specific professional development networks for mathematics teachers and lecturers yet these ceased to operate in July 2013.

## Fair access to professional development

Access to high-quality professional development opportunities should not be affected by where teachers live or work, either in terms of geographic location or institution. There is a need to create a map of formal professional development opportunities in order to establish what is available now to whom, where, of what quality and for what cost. Building upon this, there is also a need for developing clear guidelines that set out the professional entitlements to mathematics-specific teacher development.



## Mathematical needs of teachers

The mathematical needs of teachers will vary from individual to individual and will typically include:

- developing subject knowledge
- increasing pedagogical content knowledge
- becoming fluent with, and understanding the application of, key tools that can support the learning of mathematics such as digital technologies
- understanding the implications of relevant policy changes for classroom practice
- developing reflective practice
- becoming fluent in engaging with research and understanding its implications for classroom practice.

# ACME proposals: for all teachers of mathematics



## ACME proposal: national guidelines for mathematics teacher development

The decentralisation of decision making and professional development provision allows schools and colleges to address needs in a more responsive way, provided that any required external support is accessible. There is no comprehensive, up-to-date overview of teacher development activities, of who is offering and benefitting from them or of their quality and impact upon learning. As professional development planning is often undertaken or influenced by non-subject specialists such as senior leaders and governors, better guidance and support is needed for planning and evaluating career-long mathematics professional development.

National guidelines can support senior leaders, governors, heads of department and subject leaders in structuring the provision of coherent, career-long professional development programmes for teachers at all stages of their career. Such guidelines should synthesise and review existing resources, and include:

- exemplification of good mathematics teaching
- clear quality criteria for mathematics professional development
- exemplification of a broad range of professional development activities and programmes for teachers of mathematics in different phases and career stages
- strategies for managing mathematics professional development, developing professional learning communities and establishing strategic partnerships
- guidance on how to learn from research and cultivate practitioner inquiry
- guidance on how to evaluate the effectiveness of professional development.

The exemplification of professional development as part of these guidelines would enable schools and colleges to assess their staff development strategy. It should also encourage the cross-fertilisation of innovative and effective professional development strategies.

### Recommendation 1:

#### National guidelines

**The Department for Education (DfE) should work with its agencies and advisors to compile guidelines for professional development for all teachers of mathematics for use by the Government, senior leaders, mathematics subject leaders and governors.**

## ACME proposal: analysis of professional development needs

Whilst there are generic guidelines for the professional development of newly qualified teachers, there are no commonly used subject-specific interpretations of these guidelines. Furthermore, there are no widely known examples of mathematics-specific professional development pathways for teachers across their career. There is a need for good guidance on the mathematical needs of teachers as they progress from novice to expert. The mathematical needs of teachers include mathematical subject knowledge and pedagogical content knowledge.

### Recommendation 2:

#### Needs analysis

**The DfE should commission a comprehensive, cross-phase analysis of the mathematical needs of all who teach mathematics and of the capacity to meet those needs.**

## ACME proposal: monitored professional development provision

Given the increased responsibility of Teaching Schools to provide leadership of professional development and initial teacher education (ITE), there should be clear mechanisms for monitoring the quality of this provision, particularly at this time of transition. Teaching Schools will have satisfied eligibility criteria, which include having 'outstanding' Ofsted grades. However, Teaching Schools will not necessarily have outstanding mathematics teaching since this will have formed a small part of the inspection and the final grade is 'best fit'. Being 'outstanding' also means that Teaching Schools are not subject to regular whole school inspections, unless, for example, there is any cause for concern through accountability measures. Furthermore, they may not have been inspected for a few years.

These factors combine and present potential risks to the quality of professional development for teachers of mathematics. Furthermore, Teaching Schools may have little experience in delivering or organising mathematics teacher training or professional development and may need significant support to develop excellent provision. Without monitoring in place, there is no means of identifying what level of support Teaching Schools need. There is a need to reconsider Ofsted's remit for inspecting the mathematics-specific professional development and teacher training aspects of Teaching Schools' work.

### Recommendation 3:

#### Monitoring provision

**The DfE should investigate how Ofsted might be able to inspect the mathematics-specific initial teacher education and teacher development in Teaching Schools. This could begin with a survey of current provision.**

# Professional development: supported, sustained and specialist



*The professional development needs of teachers evolve throughout their careers so responsive, on-going planning is required to maintain teacher learning and optimise student outcomes.<sup>26</sup> Middle and senior leaders facilitate, and have responsibility for, the professional learning of teachers at all career stages by identifying relevant formal development opportunities. More informally, they provide time for teachers to plan collaboratively, experiment and reflect.<sup>29</sup> In best practice, school leaders encourage the development of various subject-specific learning groups as part of an institution-wide collaborative learning culture as demonstrated by Walsall College (see below).*

## Maximising staff potential

Around 10 years ago, Walsall College set out a journey to excellence in a strategic plan with five ambitions, including maximise staff potential and performance.<sup>30</sup>

The commitment of leaders, managers and governors to this ambition has led to the evolution of a professional development culture, in which Ofsted noted “Teachers value the intensive and tailored support they receive from learning development coaches to enhance further the quality of their teaching. The vast majority of teachers are appropriately qualified and experienced in their specialist field and benefit from a wide range of professional development activities”.<sup>31</sup>

Teachers are clear that senior management buy-in has been hugely important, actively promoting the notion that the whole college – staff and students – are a learning community.

Mathematics is seen as everybody’s business and the maths team has been actively supported to develop staff across the college. Collaborative groups of specialist and non-specialist staff work together on planning and developing their skills and team-teaching supports further development.

## Teacher networks

Local collaborative networks of teachers are a growing and sustainable means of promoting inquiry-based professional development and often these are supported by mathematics subject associations. Such groups can be multi-institution, for example within academy chains, Teaching School Alliances, local groups of Primary schools, or they can be within the mathematics department of a single school or college.<sup>32</sup> These groups can benefit from partnerships with HEIs through which they gain access to research and are supported in the development of practitioner inquiry.



# ACME proposals: supported, sustained and specialist



## Networks: possible key characteristics

The nationwide NCETM Primary Host School project included 29 local networks of schools (over 500 teachers) working on improving the teaching of arithmetic in Years 3 and 4.<sup>33</sup>

### Key characteristics included:

- a clear development plan sustained over several months
- the lead role of a 'Host' school and a 'mathematics champion'
- the involvement of more than one practitioner from each participating 'visiting' school
- enthusiastic and distributed leadership by mathematics subject leaders
- support from school leadership
- established networks of sufficient size to develop and maintain momentum
- professional development activities that involve teacher inquiry into pupil learning such as lesson study and interviews with pupils
- activities to focus professional development between formal sessions
- access to external expertise and use of evidence-based inquiry during research and/or academic study.

## Sufficient time and funding

Teacher development is enhanced when an individual takes responsibility for, and control of, their learning. Yet this takes dedicated time.<sup>34</sup> This might be release from the classroom to stand back and reflect on practice<sup>11</sup> or to plan, and engage in, a programme of lesson study. Such activities could form part of a professional practice development plan arising from a performance management review. Professional development activities could also contribute towards external recognition that is provided through awards such as Chartered Mathematics Teacher Designation<sup>35</sup> and Masters-level diplomas.

Many subject-specific development activities are relatively low cost, compared to the significant cost of staff time. However, access to other opportunities is predicated upon schools and colleges allocating sufficient funds. Senior leaders should consider subject-specific professional development for mathematics teachers a priority.

Some ring-fencing of resources for professional development is also undertaken at national level. For example, the Government recently committed £10 million over five years to Project Enthuse which, when combined with matched funding from other sources, provided bursaries for science teachers to attend professional development courses at the National Science Learning Centre. This investment has been an effective way to raise the profile of professional development for science teachers in schools and colleges and a similar scale of initiative would benefit mathematics.

## ACME proposal: funding for specialist support

School leaders need to allocate resources – both staff time and money – to support subject-specific, career-long professional development. In keeping with the science example above, ACME encourages the DfE to establish a much more extensive nationwide bursary scheme for professional development in mathematics. Such a bursary scheme would remove or reduce financial barriers for teachers. This scheme should have specific priorities and these should be reviewed regularly. Current priorities include:

- **Primary mathematics:** all primary schools should have access to at least one specialist mathematics teacher within their school or neighbouring school. A specialist mathematics teacher is one who has received sustained postgraduate training in mathematics education and who has deep subject knowledge to a level that exceeds the level to which they are teaching.
- **KS3 subject knowledge:** there is a growing shortage of teachers with mathematics expertise at lower KS3 and this problem needs addressing through more widespread professional development for non-specialist secondary teachers of KS3 mathematics, as well as increased teacher training allocations.
- **Preparation for the new post 16 programme:** the development of Core Mathematics for post-16 learners will require targeted professional development for existing and new teachers to develop new pedagogy and assessment processes.

### Recommendation 4:

#### Targeted funding

**The DfE and The Department for Business, Innovation and Skills should establish, with financial support from other organisations, a programme of targeted support for sustained mathematics-specific professional development.**

## ACME proposal: access to research

Continued efforts should be made to facilitate effective communication and collaboration between teachers and researchers, so that students in the classroom benefit fully from advances in knowledge and understanding of the most effective ways to learn and teach mathematics. There is potential for this to emerge through the Teaching School Alliances. However, with the current move to more school-based ITE there is a risk that some of this university-based research expertise will be lost, or at least become dissipated and therefore less accessible.

### Recommendation 5:

#### Research-informed

**Government agencies, subject associations and research organisations should develop more effective means of communicating research and encouraging teacher-researcher collaborations.**

# Professional development: assuring quality



*There has been a proliferation of professional development facilitators in recent years. In addition to Teaching Schools these now include a significant number of independent consultants and private companies of varying sizes, universities, subject associations, charities, publishers, academy chains and awarding organisations. This emerging market has resulted in a wide array of choices for schools and teachers. Although there are new possibilities, a rapidly changing and complex market also poses some threats.*

## Partnerships and collaboration

An overriding concern is that paid-for professional development, of whatever form and style, is high quality, cost-effective and meets the needs of participants. The above recommendations will go some way to ensuring quality through the development of national guidelines for mathematics professional development and clearer exemplification, accountability and regulation processes. Institutions need to develop partnerships that include 'critical friends' who will challenge any tendency to settle for less than the very best in the planning and implementation of professional development activities. Such partners might come from subject associations and HEIs.

Currently, teachers, schools and colleges have to make choices about professional development based on limited or inconsistent information about the quality of the provision. Moreover, with consultants and companies now in competition with one another, there is potential for reduced collaboration which could adversely impact on the richness and quality of the professional development landscape.



## Professional development for leaders and facilitators

Another by-product of the marketisation of professional development is that the channels for disseminating and discussing official governmental policy are less clear. A related issue is that there are fewer opportunities for the training and up-dating of trainers, compared with the National Strategy days, for example. Whether or not providers are well-informed has particular saliency when activities are focused on the implementation of new policies, such as the National Curriculum or Key Stage assessment.

It is critical that organisations offering professional development have up-to-date and in-depth knowledge and understanding of the latest policy and reform agendas. They should also have some insight into the broad research base on mathematics learning and teaching. Facilitators, planners and mentors need to take responsibility for remaining abreast of such wider developments and need sufficient opportunity to access relevant professional development. Subject associations have an important role to play in this respect, as does the NCETM. The National Association of Mathematics Advisers (NAMA), for example, provides support through an annual conference, termly professional development meetings and a regular newsletter. The NCETM actively supports leaders of professional development through, for example, regional meetings and in developing a community of Standard Holders. Universities, through partnerships with Teaching Schools and their alliances, can also promote the development of research-based professional development culture. Such collaborations and networks should be encouraged as part of more comprehensive local professional development hubs.

# ACME proposals: assuring quality



## ACME proposal: assuring high-quality professional development

As the professional development landscape becomes increasingly diversified, there is increased need for quality assurance. One way of approaching this would be through widespread adoption of a kite-mark which would support schools and colleges when planning professional development.

A good professional development kite-mark needs to:

- provide independent, third party endorsement of the quality of the provision
- have trained assessors who apply those criteria uniformly across the sector
- provide a freely accessible database of endorsed providers
- have transparent, clearly referenced evidence-based quality criteria
- provide substantial, constructive and developmental feedback to providers
- review providers on a regular basis, including through random sampling
- have a robust complaints procedure.

ACME welcomes the existing NCETM CPD Quality Standard.<sup>36</sup> The Standard should be reviewed periodically and form the basis for future developments in this area.

ACME recognises that achieving widespread adoption of a voluntary quality kite-mark is challenging. Centrally funded bursaries provided by the Government or other funders could be ring-fenced for use with quality-assured provision. Similarly government-commissioned professional development programmes could only be awarded to holders of the kite-mark to ensure high quality. This approach would assure the quality of centrally funded professional development and raise the profile of the kite-mark. The challenge of any future awardee of the kite-mark being a provider of professional development to teachers or providers needs to be considered.

### Recommendation 6:

#### Quality assurance

**The widespread adoption of a quality-assured kite-mark, based on the NCETM CPD Quality Standard, for paid-for mathematics-specific professional development activities should be encouraged as part of the national professional development guidelines.**

## ACME proposal: Support for facilitators of professional development

Professional development facilitators value and seek opportunities to engage in their own professional learning. In its 2002 CPD report, ACME proposed the establishment of a National Academy for Teachers of Mathematics to have a strategic overview of professional development at a national level and to coordinate its operation locally. This became the NCETM (launched in 2006). The Government should review and further develop the Centre's role in light of the on-going changes in the professional development landscape.

### Recommendation 7:

#### Supporting professional development facilitators

**The DfE should review and enhance the NCETM's role in:**

- providing leadership and support for local professional development hubs, leaders and facilitators
- providing a bridge between school and teacher needs and policy directives
- mediating policy and moderating professional development provision
- disseminating research and promoting inquiry.





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### About ACME

**The Advisory Committee on Mathematics Education (ACME) is an independent committee, based at the Royal Society and operating under its auspices, that aims to influence Government strategy and policies with a view to improving the outcomes of mathematics teaching and learning in England and so secure a mathematically enabled population.**

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## Summary

ACME believes that every teacher is entitled to, and has a responsibility to undertake, subject-specific professional development throughout their career. In the decade since ACME published its 2002 report on Continuing Professional Development for Teachers of Mathematics, the professional landscape for mathematics has changed significantly. Some changes, such as the establishment of NCETM and its quality standard, are long term and reflect the aspirations set out by ACME in 2002. However, other initiatives have been transitory and have not been part of a stable, long term strategy for professional development for teachers of mathematics. There is still no entitlement for all teachers to have *subject-specific* professional development, although for a time this was the case in Further Education. There has been a move from central provision by the Government or local authorities, to a more complex localised market.

The Government needs to increase the number of highly qualified, motivated, expert teachers or the Government will not be able to ensure that all students are able to study mathematics to the age of 18. The supply of newly-qualified teachers will not be sufficient to meet this demand, and existing teachers will continue to need to develop their skills and expertise.

ACME has identified three key principles that it believes should underpin a national strategy for professional development for all teachers of mathematics. Professional development should be:

- **accessible to all teachers of mathematics**
- **specialist, supported and sustained**
- **of the highest quality.**

### Professional development for all

ACME believes that all teachers should have access to relevant professional development opportunities. In order to facilitate this, ACME recommends:

- 1. National guidelines:** The Department for Education (DfE) should work with its agencies and advisors to draw together guidelines for mathematics teacher development for use by the Government, senior leaders, heads of department, mathematics subject leaders and governors.
- 2. Needs analysis:** The DfE should commission a comprehensive, cross-phase analysis of the mathematical needs, mathematics subject knowledge and pedagogical content knowledge of all those who teach mathematics and of the capacity to meet those needs.
- 3. Monitoring provision:** The DfE should investigate how Ofsted might be able to inspect the mathematics-specific initial teacher education and teacher development in Teaching Schools. This could begin with a survey of the current provision.

### Professional development should be specialist, sustained and supported

ACME believes that teachers should have access to specialist, relevant and sustained mathematics professional development throughout their careers. In order to help to embed an ethos of specialist, sustained professional development in schools and colleges, ACME recommends:

- 4. Targeted funding:** The DfE and the Department for Business, Innovation and Skills should establish, with financial support from other organisations, a programme of targeted support for mathematics specific professional development.
- 5. Research-Informed:** Government agencies, subject associations and research organisations should develop more effective means of communicating research. Teacher-researcher collaborations should be encouraged supported by national professional development guidelines.

### Paid-for professional development in mathematics should be of the highest quality

As professional development provision has become less centralised, ACME believes that it is essential that the Government and school leaders are able to identify high-quality professional development provision. In order to support these aims, ACME recommends:

- 6. Quality assurance:** The widespread adoption of a quality-assured kite-mark, based on the NCETM CPD Quality Standard, for paid-for mathematics-specific professional development activities which should be encouraged as part of the national professional development guidelines.
- 7. Supporting professional development facilitators:** The DfE should review and enhance the NCETM's role in:
  - providing leadership and support for local professional development hubs, leaders and facilitators
  - providing a bridge between school and teacher needs and policy directives
  - mediating policy and moderating professional development provision
  - disseminating research and promoting inquiry.