

# 2013 Conference Summary Report

Greater than the sum of the parts: mathematics education | [acme-uk.org](http://acme-uk.org)

December 2013



The 2013 ACME Annual Conference **Greater than the sum of the parts: mathematics education** was held on a beautiful summer's day on 9 July at the Royal Society. Over 150 delegates gathered to discuss policy developments related to mathematics education. The conference thus proved, once again, to be a good opportunity to bring teachers, politicians, policymakers, education researchers and other stakeholders together. It was designed so as to allow all delegates to explore strategic priorities for mathematics education policy.

Delegates had the opportunity to discuss issues such as the current mathematics reforms, including changes to the National Curriculum and to qualifications, as well as discussing a range of policy-related issues, including continuing professional development, policy development processes, problem solving and post-16 qualifications, among many others. The ACME Annual Conference is recognised as an integral part of the work that ACME does and is a key mechanism ACME uses to inform the work of the Committee and to identify strategic priorities. The discussion groups and panel sessions have directly informed ACME's work throughout 2013 and will continue to do so in 2014.

This report provides an overview of the 2013 ACME Annual Conference.

## Introduction from the Chair

Professor Stephen Sparks FRS

Chair of ACME and Professor of Geology, University of Bristol

Professor Sparks acted as chair for the day and gave an introductory speech. He invited delegates to take advantage of the opportunity to feed into ACME's work, to gain an insight into what ACME had been working on, to share views about ACME's current projects and to offer suggestions about what ACME should be doing in the future. He drew attention to the role of the Outer Circle in the work of ACME, and encouraged practitioners, researchers and others to apply to the annual Outer Circle open call. He also encouraged others to engage with ACME directly when they recognised issues to be of importance.

In referring to the title of the conference, **Greater than the sum of the parts**, he noted that this title was chosen to emphasise that education policy reforms, in mathematics and in other subjects, should be undertaken in the understanding that each element being reformed impacts other areas of education. Reform of mathematics education therefore needs to be integrated and coherent, considering and measuring how a change in one aspect of education impacts another aspect. In practice, he remarked, coherence has often been missing. He acknowledged that the pace and scope of reform in education policy meant the last couple of years proved to be an exceptionally busy time for mathematics education policy. He listed the reforms underway in almost all aspects of education. For ACME, he noted, the reform agenda meant responding to a large number of consultations, including the National Curriculum, accountability and subject knowledge enhancement within a very short period of time. He also drew attention to the range of work that ACME invested in during 2013, such as post-16 mathematics qualifications and continuing professional development of teachers of mathematics.

*"This is a really great opportunity today to say what you think about what we're doing, what we should be doing."* Professor Stephen Sparks

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 mathematics education strategy and policies with a view to improving the outcomes of mathematics teaching and learning in England and so secure a mathematically enabled population. ACME was established by the Joint Mathematical Council of the UK and the Royal Society, with the explicit support of all major mathematics organisations. ACME is currently supported by the Department for Education, The Gatsby Charitable Foundation, the Royal Society, the Wellcome Trust and a range of other organisations across the STEM landscape. Details of ACME's current membership and activities are available at [www.acme-uk.org](http://www.acme-uk.org)





## Welcome

### Professor John Pethica FRS

Physical Secretary and Vice-President of the Royal Society

In opening the conference Professor John Pethica noted the centrality of mathematics to computing, finance and engineering, as well as its importance for wider society. He acknowledged support for ACME's work in mathematics education, noting in particular the work it undertook over a number of years on post-16 mathematics in order to ensure that as many people as possible have access to mathematics education and qualifications post-16. He commented that a range of other organisations and individuals have very important roles to play in education, including schools and higher education institutions. Referring to the degree and depth of change occurring at present in mathematics education, he underlined the requirement for support for teachers, which would be necessary to realise the Society's aspirations for mathematics education. He signalled that appropriate teachers had to be trained to bring about change and that all teachers of mathematics would need access to adequate professional development support.

As a Fellow of the Royal Society, he drew attention to the Vision project underway at the Royal Society, the aim of which is to develop a long-term vision for science and mathematics education. The high-level committee, he remarked, had carried out extensive engagement and was in the process of developing principles on how the UK could ensure the development of a high performing science and mathematics education system in the next 15-20 years. He invited attendees to engage with this process.

*"I could give you a simple list of where mathematics is the centre of everything, including science, computing, finance, engineering, epidemiology – I could go on for a long time...."* Professor John Pethica



## KEYNOTE ADDRESS

# Elizabeth Truss MP

Parliamentary Under Secretary of State  
for Education and Childcare



Elizabeth Truss noted that she had previously presented at an ACME conference on a panel and was delighted to be giving a keynote address. In her speech, she set out some of the Government's plans for school mathematics at primary level, secondary level and beyond, saying that the Government was 'keen to make sure that maths is at the heart of our education

system'. As well as this emphasis on mathematics in school, she drew attention to her understanding about what could be done to promote mathematics as a discipline more widely across the country. Her argument was that mathematics should be open to everyone, regardless of school attended, social status or gender. She wished to inspire others to see the great beauty, pleasures and puzzles in mathematics, but also to highlight to young people that knowing how to do mathematics provides great opportunities in the workplace.

A key governmental aim was described as finding a way to compete with the best countries in the world in mathematics education. To move towards being one of the best countries in the world, she believes, requires students being taught to master the basics before moving on to problem solving and reasoning. She drew attention to the Department for Education's work in recent months to revise the National Curriculum, as well as reforming GCSE and other qualifications. She noted that the revised National Curriculum was designed with the aim of seeking to ensure that students master essential mathematical knowledge. The GCSE, she said, should also be designed in such a way as to focus on deep learning, with the aim that

students understand mathematics and how they use it. She stated her commitment to new post-16 qualifications and noted ACME's work in facilitating an expert panel to submit guidelines on 'Core Maths' qualifications to the Department for Education. Such new qualifications, she said, are aimed at those who 'are interested and excited about maths, but don't want to do a full A level in maths'.

As well as more students doing more mathematics in school, she stated her goal that the broader population come to understand that so many applications used in the world have mathematics as their underlying basis. How can this message be communicated to others? For the minister, people who are passionate about mathematics must highlight to others the extent to which 'the modern world is built on this essential discipline'. She acknowledged that the message that not enough people were doing mathematics to supply the economy was being heard. However, she said that another message needed to be disseminated: that mathematics was not only important for those going to work in industry or going to university, but also was essential for teachers of the future, the journalists of the future and many others.

*"I know I don't have to convince anybody in this room about the importance of mathematics nor to explain why mathematics is a universal entitlement for every young person rather than just a minority pursuit for the few, why maths is vital for all of our futures and how maths is already governing the world around us and what we do."* Elizabeth Truss



## Issues raised by delegates

- A question was raised about the place of problem solving, reasoning and open-ended problems at primary level and the importance of practical, mental and verbal reasoning in mathematics was highlighted.
- A concern was raised about changes to initial teacher training and how this affected graduates from applied mathematics subjects entering mathematics teaching.
- A statement was made about the need to continue to highlight the importance of professional development in primary schools for all those involved in teaching mathematics.

## PANEL DISCUSSION I

# The strategic priorities for mathematics education



The panel discussion followed a 'Question Time' approach. Questions were submitted in advance of the conference by delegates, and further questions were asked from the floor.

Chaired by

**Warwick Mansell, freelance education journalist**

**Professor Jeremy Hodgen, Professor of Mathematics Education, King's College, London**

**Jane Jones HMI, Ofsted**

**Professor Celia Hoyles, Professor of Mathematics Education, Institute of Education, University of London**

**A number of recent reports on mathematics education have suggested that one of the main causes for our problems in mathematics is the societal attitude that suggests that it's okay to be bad at mathematics. Does the panel think that tackling this attitude should be a priority for mathematics education and if so how should we go about it?**

Panel members noted that there has long been an issue with how mathematics is perceived within wider society. One panellist noted 'if you say you're a mathematician everyone runs away if you're at a cocktail party or whatever'. Despite the pervading negative attitudes to mathematics, this panellist noted that 'things have changed enormously and got much better', pointing to the fact that mathematics and its uses are part of radio and television schedules.

Another panellist noted that more young people valued mathematics than was sometimes acknowledged, but many young people do not expect to enjoy learning mathematics. In order to improve enjoyment, inspirational outstanding teachers were needed.

Better communication was noted as a way of ensuring that more students took mathematics to A level. This communication should highlight the routes that are available if mathematics is studied. One panellist gave an example that young people need to be informed that mathematics, programming and coding are essential in a range of industries, including animation and video game development.

The panel recognised that shifts in how mathematics is perceived would not happen quickly. Indeed some of these shifts would take generations – as more people in England study mathematics to 18, this should filter through to how they and their children perceive and understand mathematics.

**Does the panel agree that it is time for more subject specialist teachers in primary school?**

Though specialist mathematics teachers can play very important roles, one panellist remarked that there is a great need for a huge number of teachers, not only specialist teachers. This was also proving very difficult. The question was posed 'where are we going to get those teachers from and how are we going to get those teachers without threatening other aspects of the system?'

The key issue, one panellist suggested, was having teachers who can teach mathematics effectively. It was also highlighted that specialist teachers of mathematics do not always develop the capacity of other teachers. The Primary Mathematics Specialist Programme (MaSt) programme was given as an example of a two year high quality programme, which was successful in terms of mathematics teaching and in producing teaching leaders at primary level. A range of interventions were said to be needed to ensure effective primary school teaching of mathematics. Some of the elements required for success noted were: subject specialist teachers, the MaSt programme or similar programmes, good continuing professional development programmes, subject knowledge enhancement courses and quality initial teacher training routes.

*"We say, 'Oh it's the Curriculum.' It's not the Curriculum. The Curriculum has to be mediated by the teachers and the teachers have to be involved in it."* Professor Celia Hoyles



**How important is it to good quality mathematics learning that trainee teachers have postgraduate level training in mathematics and mathematics pedagogy and how does this relate to more traditional and new forms of teacher training?**

For the panellists, it was seen as fundamental that people understand at least a little about learning mathematics and the pedagogy of mathematics education, whether they have mathematics qualifications or not. Both schools and universities were said to have a role to play in teacher education. The system would best function if there is partnership and balance between schools and universities. Higher Education institutions, for example, can ensure that the people that emerge from university training can be reflective practitioners. New forms of teacher training, such as School Direct and Teach First have 'done a good job in getting some people into teaching that wouldn't otherwise have gone into teaching and have been part of raising the profile of the profession'. It was highlighted that whatever training was undertaken 'it's how good they are at being teachers and the way they inspire and teach their pupils at the end of the day rather than the route they go through'. However, caution was noted and anecdotal evidence offered about people who are recruited through school-based schemes with only very low mathematics qualifications.

*"I think we've got a golden opportunity actually at the moment with the new Curriculum heading in our direction to take hold of it and actually work collectively with groups of teachers, with HEI's, all other providers to actually talk about which are the best ways or which are good ways that we could teach these new areas that we've not taught before."*

Jane Jones

**As a primary practitioner I would like to know if the panel believes that is important that we benchmark ourselves against countries and use comparisons in strategic planning. If so, which countries, and why?**

One panellist highlighted the need to reflect on international comparisons not only in a general sense, but also to use them in order to reflect upon and drill down to see what it is that pupils in the UK do particularly well at and what do they do less well at. Another panellist agreed about the need for caution, as 'no country has got it right and no country thinks it's got it right'. Deciding what the country values from education was said to be immensely important: deciding what we want from education isn't the same as coming top in the league tables. It was argued that if you look at international league tables the UK does quite well, although not as well as other countries, but they are certainly not 'tumbling down the league tables'. Although it is often said that the UK is a high assessment culture, in comparison to other countries, it was said to have a comparatively low assessment culture.

*"I don't have any objections per se about comparing the performance of our pupils at that age with the performance of other pupils in other countries. It's what we do with those comparisons that I think is the really important thing."*

Professor Jeremy Hodgen



# DISCUSSION GROUPS



## GROUP 1

### Education policies: working together for mathematics?

ACME Discussion Leaders:

**Richard Browne and Professor Andrew Noyes**

Delegates interested in the processes of policy development assembled to discuss the development of mathematics education policy. ACME members explained that the discussion group was designed as an opportunity to discuss the importance of developing an ACME policy project on the processes of policy development and used the expertise in the room to consider the potential directions that the project could take.

The session was designed to be interactive and had a number of breakout sessions to discuss the main actors and organisations that need to be considered when reflecting on the development of mathematics education policy. During the discussion session, the often fragmented responses at a policy level across different phases and stages of education, as well as the exploitation of mathematics education by political parties were noted as challenges that needed to be tackled.

Key themes identified for future mathematics education policy development included the importance of mathematics education policy being developed in a coherent and stable way, underpinned by political consensus across political parties and informed by a range of evidence. Andy Noyes and Richard Browne noted that the group would be kept informed of the development of the policy project, in whatever form it would take and the Committee would use the discussions in planning the remit and methodology of the project.

## GROUP 2

### Problem solving in mathematics

ACME Discussion Leaders:

**Dr Niall MacKay and Lynne McClure**

Committee members Niall MacKay and Lynne McClure led the session on problem solving. They explained that the discussion session at the conference would inform an ACME policy paper on problem solving. They noted that mathematical problem solving has become something that is discussed in a variety of contexts, including in discussions about the National Curriculum for primary and secondary schooling, as well as in relation to GCSE and post-16 mathematics.

Delegates split into groups with a primary and secondary focus to discuss what problem solving meant and the distinctions of meaning across different phases of education. It was clear from discussion that there was no common understanding of what problem solving meant or what this implied for the way in which teachers plan and carry out lessons in the classroom. The attendees looked at some of the barriers or obstacles for integrating problem solving into teaching and what teachers might need in order for this to change.

It was noted that at all levels an investment would need to be made in the way in which trainee teachers are taught to teach, as well as a significant financial commitment to professional development. At secondary level, the difficulties in aligning problem solving and current assessment structures were noted as serious obstacles. The outputs of the discussion group will feed into ACME's developing report and recommendations.





## GROUP 3

### Post-16 provision: a mature GCSE?

ACME Discussion Leader:

**Sybil Cock**

Sybil Cock led this session on post-16 mathematics. ACME had already done a significant amount of work on post-16 mathematics, particularly focusing upon the development of a new qualification for students who decide not to do A level mathematics. In this discussion session, delegates examined the possibility of developing another new qualification. This qualification would be for those students without a GCSE grade C or equivalent Level 2 qualification in mathematics.

The delegates discussed why a new qualification was required and reflected upon ACME's recently published discussion paper entitled 'Post-16 Mathematics: Engaging the New Cohort'. Discussion was therefore focused upon post-16 students who had not yet gained a GCSE Mathematics qualification, but would not benefit from sitting GCSE Mathematics multiple times until they received a Grade C, potentially failing. Preparing students for an examination many times is both off-putting and potentially damaging for students. Instead a new qualification, designed for more mature students who want to gain a Level 2 qualification in mathematics, was considered. Such a qualification, it was discussed, might have more of a focus on mathematics in societal contexts, in financial literature and a range of other 'real life' situations. Delegates thought about what this type of qualification should be named, and many of those in the room did not see the benefit in calling the new qualification a 'mature GCSE'. However, there was agreement that the qualification should be the same level of difficulty as a standard GCSE in mathematics. Delegates also cautioned that there should not be multiple pathways offered and rather there should only be a GCSE and the new qualification.

## GROUP 4

### ACME's policy on continuing professional development (CPD)

ACME Discussion Leaders:

**Jennie Golding and Jo Lees**

ACME began a new policy study on the professional development of teachers of mathematics in 2013 after discussions at the ACME Conference in 2012. The remit of the study was to revisit ACME's 2002 report and research policy developments with an impact on professional development of teachers of mathematics. In this discussion group, delegates were invited to reflect upon the vision of professional development that ACME was seeking to develop in order to feed into ACME's developing report and recommendations. They did this through discussing the professional development landscape and important milestones, actors and organisations involved in professional development provision.

The group, which included teachers, professional development providers and researchers, gave their own personal experience of CPD. As well as this, delegates discussed some of the barriers that exist to providing good professional development, such as short-termism in education policy and the option for some schools to opt out of in-depth professional development in mathematics. A lot of time was dedicated to discussions on what ideal professional development in mathematics teaching would look like. The importance of a political commitment to education policy across all political parties, with a long term and financed plan for professional development was emphasised.

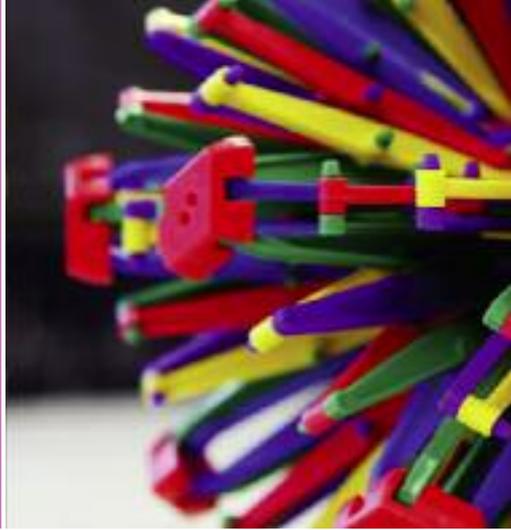
Delegates were invited to send through information on the professional development landscape, as well as passing on advice about where to gain information on other professional development initiatives, budget information, evaluations of alternative impacts measures. Many delegates followed up on this offer, which proved very insightful for the final report *Empowering teachers: success for learners*.



## KEYNOTE ADDRESS

# Stephen Twigg MP

Shadow Secretary of State for Education



Stephen Twigg noted the importance of a numerate society. He remarked that mathematics and numeracy have not always been valued in the way that English and literacy are valued, with even highly educated people openly admitting to being bad at arithmetic, which they would not say about reading or writing. To counteract this trend, he noted the need for

ways to be developed to challenge this mind-set and to increase confidence, in order to ensure that children and young people become successful in their lives, including in the jobs market. Such an approach was needed so that citizens would gain skills to help them to manage the family budget, understand credit card rates and rates of pay day lenders, and interpret the statistics used by advertisers, in the media or by politicians.

He also highlighted that there was a need to go beyond being a numerate society, saying that England 'must also value advanced mathematics and seek to be at the cutting edge of mathematical and scientific research'. In schooling, he noted the requirement to have courses in place that challenge and stretch all children whatever the level of progress they have attained. He pointed to a need to develop

an 'intelligent form of school accountability that genuinely reflects both the attainment of young people and the progress those young people have made'.

He showed his support for developing new qualifications in mathematics to ensure that young people are getting the most appropriate options after the age of 16 and ensuring that these courses are relevant to the next stage of their life, whether in further or higher education or employment, including via the route of apprenticeships.

He noted the importance of high quality mathematics teachers and access to professional development. For me, he said, 'high quality teaching and learning must mean a profession that has both high status and high morale'.

*"ACME continues to be a robust and rigorous voice championing the cause of mathematical education and as an independent committee I know that what you do is provide a comprehensive and effective challenge to politicians when it comes to a whole range of issues from curriculum design through to professional development."* **Stephen Twigg**



## Issues raised by delegates

- The importance of making policy on education based on evidence and research and relying on advice from experts and practitioners and the importance of cross party consensus on education were highlighted.
- A delegate cautioned that the emphasis placed upon GCSE and post-16 mathematics should be balanced with investment with primary level mathematics.
- The need for technology in mathematics must be integrated into education and training from cradle to grave.
- The benefits and disadvantages of personalised learning were discussed.

## PANEL DISCUSSION II

# Continuing professional development in mathematics

Chaired by  
**Professor Rosamund Sutherland, University of Bristol**



**Dean Rowley**  
Assistant Headteacher,  
Kesgrave High School, Suffolk

Dean, a teacher for 15 years, noted his involvement in the professional development of mathematics trainee teachers, primary liaison, subject heads and subject specialist teachers. In his experience, every trainee teacher is concerned about their professional development, the opportunities they are given and how they can achieve the best for their pupils in their lessons. He set out some of the challenges in getting good continuing professional development, such as constraints on teachers' time, changes in governmental policy, financial barriers, but also the challenge in 'just getting teachers together in a room to be able to talk to each other and develop ideas'.

He highlighted the difficulty that there can be in accessing professional development, emphasising his experience that many training opportunities are held in London. Drawing attention to the opportunities that technology offered, he noted that technology could be better used to connect teachers 'through counties and between them'. Sometimes senior leaders need to see the importance of professional development in action in order to understand the power that it can give teachers when they develop these networks.

*"Is there a way we can push CPD so that our teachers become outstanding maths teachers for all of our students, in all of our schools?"* **Dean Rowley**

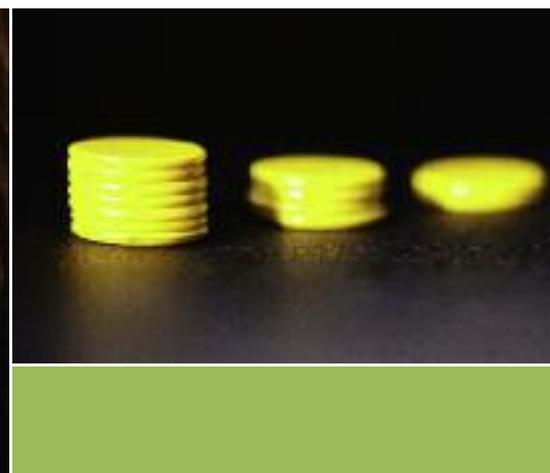


**Andrew Carter**  
Headteacher,  
South Farnham School, Surrey

Andrew began by saying that he believes that instead of continual professional development, the emphasis should be upon professional development being continuous. He developed this point by saying that it should be 'relentless', from the time someone starts to show an interest in becoming a teacher, right through to their early training, when they are teaching, right through to headship and beyond. He spoke of his experience of the School Direct programme and the potential that it had. He believes that professional development is a teacher responsibility and should be made to be an attractive part of a teacher's development. He spoke of the power that the teaching schools network could have and the need to work in partnership, for example with the National Centre for Excellence in the Teaching of Mathematics. Though he admitted that academies were not something that everyone supported, he noted that they were very important as schools legally sign up to helping each other, which can be a very powerful tool in CPD. He pointed out that teaching schools had to be involved in research, working with universities.

He highlighted that his school is committed to CPD in mathematics, and places emphasis on all teachers having mathematics qualifications. For those who do not have qualifications on appointment, his school ensures that they are placed upon a mathematics course. He emphasised the need to invest in professional development and to see it as part of a school's outputs, rather than an added extra.

*"Nothing's for free any longer... if you have CPD done for free it's by people who have got free time. What we want is CPD done by people who actually have time which is valuable. And if it's valuable then we must pay for it."* **Andrew Carter**





**Panel Discussion II** continued from previous page



**John Carr**  
Deputy Director,  
Quality and Priorities Division,  
National College for Teaching  
and Leadership (NCTL)

John gave some background to the development of the National College for Teaching and Leadership which was formed after a merger of the Teaching Agency and the National College for Teaching and Leadership. He set out that the new agency should 'enable the support and development of a school-led system' and should support a shift 'from the centre out to schools'. Schools, in this vision, should replace government or governmental machinery in managing the system in some cases. The aim is, he suggested, to help to improve the education workforce, but also to help schools to help each other to improve. For him, the main benefit of moving towards a school-led system is that the school budget is kept in place, and then dialogue is with schools and school leaders to help them understand the benefits of developing staff and providing information about how to support staff. NCTL emphasises teachers and school leaders working in groups, not only within mathematics departments but also across subjects within the school and across schools.

He highlighted that professional development needed to be seen as something that is an investment. Everyone needs to understand that there will be a direct return on the investment into professional development.

*"We've got quite a lot of evidence across lots of different programmes now that says investing resources, whether it's time or direct funding in developing your teachers, practicing skills does have a direct return on standards and kids' achievement"* John Carr

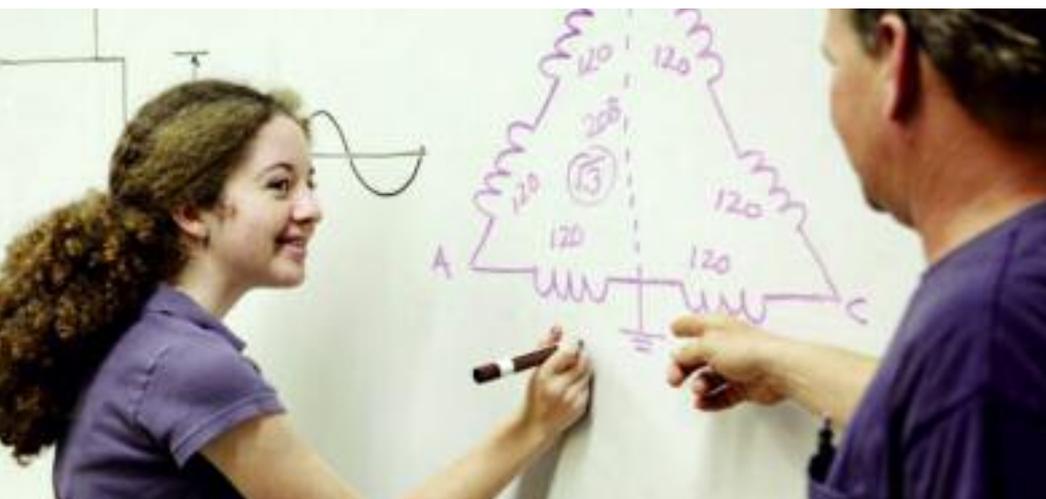


**Professor Janet Ainley**  
Director of the School of Education  
University of Leicester

Janet discussed the development of a CPD project at the level of the university, looking in particular at some of the features of the MA in Learning and Teaching at the University of Leicester. The aim of this programme is to integrate theory and practice and to support teachers in working on their own practice. A distinctive feature that she noted was the inclusive nature of the cohort that is taken in, with teachers from a whole range of backgrounds who bring very different experiences. There is also a mathematics education subject route that can be taken, which has two strands, one for less confident mathematicians and one for confident mathematicians, with both emphasising the importance of engagement with research in mathematics education.

Drawing attention to the professional inquiry element of the programme, she suggested that this provided teachers with the tools through which they can research their own practice. The programme also, she noted, provides the flexibility to accredit work that has been undertaken elsewhere, such as through National College programmes. She stressed the need for empowerment and sustainability of teachers in their own professional development and giving teachers the opportunity to be able to reflect on their practice. For this, support is required, which also means finding ways to integrate input from those with expertise in research and inquiry skills in a way that is empowering for teachers.

*"I think it takes time and it needs a commitment to time to develop skills and to build ways of working that are empowering. It takes time, it takes reflection. It's not something you do in a one day course or even in one term. I think it takes a really long-term commitment to professional development."* Professor Janet Ainley



# KEYNOTE ADDRESS

## The magic of mathematics

Professor Peter McOwan – Vice Principal, External Relations,  
School of Electronic Engineering and Computer Science, Queen Mary, University of London



### Professor Peter McOwan

Peter McOwan opened his talk by thanking those delegates who were teachers of mathematics and complemented the sterling work of mathematics teachers throughout the country. He said that his talk aimed 'to provide a little bit of light relief at the end of a hard day'. Noting that two of his great loves were magic and mathematics, he proceeded to perform tricks, inviting members from the audience to join in, even roping in the Chair of ACME for one trick. He suggested that some of these tricks could be used either in the classroom with children, or even to impress friends at parties. He broke the Magician's Code of never revealing how a trick is done, for educational purposes of course!

He demonstrated some card tricks such as the torn and restored trick and the piano trick. As his interest lies in modelling the human brain mathematically and using these ideas in building artificial intelligence systems, he integrated this element into many of his tricks. His tricks involved fractions, algebra and geometry. He explained throughout how exciting and exotic mathematics could be integrated into lessons.

He pointed to his website that gives an insight into many of the tricks that he performed and showed how he used magic to teach computer science, pure mathematics and also science and engineering, chemistry and physics.

Links: **The Manual of Mathematical Magic**  
<http://www.mathematicalmagic.com/index.html>

*"Magic tricks are, for me, very interesting because they combine two elements: one is the kind of secret techniques, the science and maths behind it. There's always science and maths behind magic because there isn't any real magic. It's all just clever disguised science and technology. But it also involves the performance and is a great way to get kids interested."* Professor Peter McOwan

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