



Sir Andrew Carter
Carter Review of Initial Teacher Training
Department for Education
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Sir Andrew,

In September 2014 the Advisory Committee on Mathematics Education (ACME) wrote a letter in response to your call for evidence in which we highlighted ACME's new project on the initial teacher education (ITE) of teachers of mathematics. ACME's project will set out principles of good mathematics teacher education needed for high-quality mathematics teaching at primary and secondary level. To do this, we are first looking at mathematics-specific teacher education practice in England and in high-performing jurisdictions. As our work is at an early stage, ACME cannot draw any conclusions. However, in view of the parallel nature of our work and short timeframes, ACME is keen to share its thinking as it emerges.

ACME has so far not identified any high-performing jurisdiction that organises ITE in a pattern similar to that in England. Evidence of the impact of England's unique model has also not been identified. This is a cause of concern and is leading us to consider whether a long term review of ITE arrangements in England alongside a review of the best international practice should be undertaken over a period of several years.

Two themes have emerged from our preliminary research and discussions that are important for your Review Group to consider. These are school based mentors for trainee teachers and the mathematics pedagogic subject knowledge and reflective practice of teachers.

School based mentors

There are substantial differences in the quality and qualifications of school-based mentors within ITE in England and compared to high-performing jurisdictions.

- Ofsted's review of mathematics ITE in 2012-13 (['Promoting improvement in Initial Teacher Education \(ITE\): primary mathematics'](#)) showed that primary mathematics ITE was weaker than the overall picture for primary ITE. The report was particularly critical of the quality of mentors in school-based training, especially their lack of insight and guidance for their trainees and absence of mathematics specific detail with expertise to promote improvement. Ofsted's last three-year review '[Made to Measure](#)' (2012) also highlighted concerns that secondary schools' schemes of work did not set out a coherent learning journey in mathematics for pupils. Subject mentors in such schools, especially if they have had only a few years' experience, may not be performing to a high standard.

- The quality of mentoring in England is in marked contrast to some high-performing jurisdictions, where the quality and subject expertise of the mentor is highly valued. For instance, in Chinese Taipei there are specific qualification requirements for school-based mentors.

These concerns raise questions that need more consideration about the desired qualifications and skills of school-based mentors. Should school-based mentors:

- be required to have masters level qualifications themselves;
- have a defined minimum profile of experience;
- have links to current research and researchers?

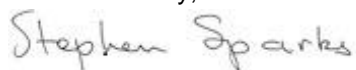
Mathematics pedagogic subject knowledge and reflective practice

The amount and quality of subject-related knowledge of teachers varies significantly in different countries. In the teaching of primary age pupils, a research study showed the gulf in conceptual understanding of elementary mathematics between teachers of primary mathematics in the United States and China.¹ Chinese trainee teachers have also been shown to outperform English trainee teachers in an audit of the mathematical skills and knowledge of trainees in 10 countries.² ACME is concerned about the limited amount of time dedicated to the development of subject knowledge in ITE in England,³ and the lack of further qualification opportunities for subject specific professional development thereafter. In Shanghai during the ITE of primary teachers there is a focus on ideas such as variance and invariance, and the role that these concepts play in teachers' planning.⁴ Given the concerns about mathematics-related knowledge in England, it may be more time needs to be given during ITE and professional development to developing subject-related knowledge to at least the same extent as in Shanghai, and arguably more.

ACME's professional development report [Empowering teachers: success for learners](#) makes the case for coherent and systematic professional development. It may be that incentives are needed for early career teachers of mathematics in England, both primary and secondary, to undertake master's level study. This could enhance their subject related knowledge and high-quality pedagogy within a framework of evidence and research. Teachers then, in turn, might engage with educational research and reflect upon the practice of both themselves and colleagues. Finland, Singapore and Shanghai all ensure that student teachers interrogate their own and others' practice, using self-evaluation, peer-review and external research.⁵

I hope that the issues raised above are of interest to your Review Group. An ACME representative would welcome a discussion on these issues with you or someone from your team. Please contact Phoebe Harris from the ACME Secretariat at phoebe.harris@royalsociety.org or on 020 7451 2575 to help set up a meeting or for further information.

Yours sincerely,



Professor Stephen Sparks
Chair, Advisory Committee on Mathematics Education

¹ Ma, L (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of mathematics in China and the United States*. Mahwah, NJ: Lawrence Erlbaum Associates.

² Burghes, D (2011). *International comparatives in mathematics teacher training: Research paper*. CfBT Education Trust, <http://cdn.cfbt.com/~media/cfbtcorporate/files/research/2011/r-international-comparative-study-in-mathematics-teacher-training-research-2011.pdf>.

³ ACME (2013). *Empowering teachers: success for learners*, <http://www.acme-uk.org/media/19381/etsifullreport2014.pdf>.

⁴ Li, Y & Huang, R (eds). (2013). *How Chinese Teach Mathematics and Improve Teaching*. Routledge.

⁵ Tatto, M.T (2013). *The Role of Research in International Policy and Practice in Teacher Education*, London: BERA.