

"I want all children to have the best education they can and mathematics is a fundamental part of that. It is essential for everyday life and understanding of our world. Too many pupils do not fulfil their potential, including many of the most able, and those who get off to a poor mathematical start or fall behind in their learning never catch up."

Sir Michael Wilshaw HMCI

Note: This guide contains the key findings and recommendations from the report, using the language of the original document.

Key findings

- Children's varying pre-school experiences of mathematics mean they start school with different levels of knowledge of number and shape. For too many pupils, this gap is never overcome: their attainment at 16 years can largely be predicted by their attainment at age 11, and this can be tracked back to the knowledge and skills they have acquired by age 7. Low attainment too often becomes a self-fulfilling prophecy. Pupils known to be eligible for free school meals fare particularly badly.
- The best schools tackled mathematical disadvantage with expert insight and ambitious determination, with policies and approaches understood and implemented consistently by all staff to the benefit of all pupils. Developing such expertise should be the goal for all schools.
- Too many able pupils across the 3–16 age range are underachieving. Many more pupils could gain the highest grades at GCSE and be better prepared to continue to A level. Without this, the future supply of mathematicians and the national challenge of meeting the diverse mathematical needs of our technologically advanced world and our economic well-being are threatened.
- Attainment in GCSE and AS/A-level examinations in mathematics has risen. At the same time, however, successive changes in GCSE and A-level specifications and structure have reduced the demand of the examinations for many pupils. Those pupils attaining the highest grades at GCSE are increasingly opting to study AS and/or A-level mathematics, leading to a rapid growth in uptake.
- Attainment in national Key Stage 2 mathematics tests has shown incremental rises in the proportions of pupils attaining the expected Level 4 and the higher Level 5. Improvements have also been made in children's knowledge and skills in the Early Years Foundation Stage. Teacher assessments at the end of Key Stage 1, however, indicate that attainment has plateaued and the downward trend in the proportion reaching the higher Level 3 shows no sign of being reversed.
- Schools have implemented a wide variety of strategies to improve performance..... The most common strategy has been better monitoring of pupils' attainment and progress coupled with greater use of intervention programmes. In most primary schools, intervention has become more focused and timely.... It remained centred on examination performance in the majority of secondary schools, linked to widespread use of early GCSE entry and repeated sitting of units. This has encouraged short-termism in teaching and learning and has led to underachievement at GCSE, particularly for able pupils, as well as a lack of attention to the attainment of the least able. In the better schools, high-attaining pupils' needs are met through depth of GCSE study and additional qualifications.
- ... the percentage of pupils not reaching the expected level or grade for their age increases as pupils progress through their mathematical education, and is more marked for some groups than others..... attaining a key threshold does not represent adequate mastery of skills and sufficient depth of conceptual understanding to prepare pupils for the next stage of mathematics education.
- The quality of teaching varied by key stage, leading to uneven learning and progress as pupils moved through their mathematics education. In each phase, those pupils nearest to external assessments received better teaching. Less experienced, temporary and non-specialist teachers were more likely to teach lower sets or younger pupils. Learning and progress were good or outstanding in nearly two thirds of lessons in Key Stage 4 higher sets, double the proportion observed in lower sets where around one in seven lessons was inadequate.
- Teaching was strongest in the Early Years Foundation Stage and upper Key Stage 2 and markedly weakest in Key Stage 3. Teaching in the sixth form was slightly stronger than at GCSE. Year 1 was the weak spot in primary teaching.
- While the best teaching developed pupils' conceptual understanding alongside their fluent recall of knowledge, and confidence in problem solving, too much teaching concentrated on....enabling pupils to pass tests and examinations but did not equip them for the next stage of

education, work and life. Teachers' use of assessment in lessons has improved although it remained a weak aspect of teaching. Monitoring of each pupil's understanding was not strong enough...

- Very few schools provided curricular guidance for staff, underpinned by professional development that focused on enhancing subject knowledge and expertise in the teaching of mathematics, to ensure consistent ...approaches ..
- Schools were more aware of the need to improve pupils' problem-solving and investigative skills, but such activities were rarely integral to learning.... Many teachers continued to struggle to develop skills of using and applying mathematics.

Recommendations

The Department for Education should:

- ensure end-of-key-stage assessments, and GCSE and AS/A-level examinations require pupils to solve.. problems and demonstrate fluency and accuracy in recalling and using essential knowledge and mathematical methods
- raise ambition for more-able pupils, in particular expecting those pupils who attained Level 5 at Key Stage 2 to gain A* or A grades at GCSE
- promote enhancement of subject knowledge and subject-specific teaching skills in all routes through primary initial teacher education
- research the uptake, retention and success rates in AS and A-level mathematics and further mathematics by pupils attending 11-16 and 11-18 schools ..

Schools should:

- tackle in-school inconsistency of teaching, making more good or outstanding, so that every pupil receives a good mathematics education
- increase the emphasis on problem solving across the mathematics curriculum
- develop the expertise of staff:
- in choosing teaching approaches and activities that foster pupils' deeper understanding, including through the use of practical resources, visual images and information and communication technology
- in checking and probing pupils' understanding during the lesson, and adapting teaching accordingly
- in understanding the progression in strands of mathematics over time, so that they know the key knowledge and skills that underpin each stage of learning
- ensuring policies and guidance are backed up by professional development for staff to aid consistency and effective implementation
- sharpen the mathematical focus of monitoring and data analysis by senior and subject leaders and use the information gathered to improve teaching and the curriculum.

In addition, primary schools should refocus attention on:

- improving pupils' progress from the Early Years Foundation Stage through to Year 2 to increase the attainment of the most able
- acting early to secure the essential knowledge and skills of the least able.
- In addition, secondary schools should:
- ensure examination and curricular policies meet all pupils' best interests, stopping reliance on the use of resit examinations, and securing good depth and breadth of study at the higher tier GCSE.

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