

AREA OF LEARNING AND EXPERIENCE

Mathematics and Numeracy



Vision and philosophy

- Mathematics is a critical part of life and for the country's economy.
- Mathematics and numeracy experiences must be engaging, exciting and accessible, as well as challenging.
- To develop mathematical proficiencies, positive dispositions and the four purposes of the curriculum.

The rationale for change

- Research about mathematics performance:
 - Estyn
 - international
 - PISA.
- Too much reliance on procedural fluency (technique/tricks).
- Not enough conceptual understanding.

How is it different?

- Organised around five mathematical proficiencies.
- Gives learners opportunities to use manipulatives and represent concepts in a variety of ways.
- Use verbs such as 'explore' and 'derive' to ensure balance between 'breadth' and 'depth'.

How is it different?

Mathematical proficiencies

These inter-dependent proficiencies used in developing the descriptions of learning are central to progression at each stage of mathematics learning. Numeracy involves applying and connecting these proficiencies in a range of real-life contexts. The five mathematical proficiencies are:

- conceptual understanding
- fluency
- communication with symbols
- logical reasoning
- strategic competence.

How is it different?

A change in emphasis from **‘What’** to **‘What and How’** will influence pedagogy and result in teaching for conceptual understanding, as shown below.

Current curriculum (Product)	New curriculum (Process)
Year 5 Calculate fractional quantities, e.g. $\frac{1}{8}$ of 24 = 3, so $\frac{5}{8}$ of 24 = 15.	Progression step 3 - I have demonstrated my understanding that a fraction can be used as an operator, or to represent division. - I understand the inverse relation between the denominator of a fraction and its value.

What Matters in Mathematics and Numeracy

- The number system is used to represent and compare relationships between numbers and quantities.
- Algebra uses symbol systems to express the structures of relationships between numbers, quantities and relations.
- Geometry focuses on relationships involving properties of shape, space and position, and measurement focuses on quantifying phenomena in the physical world.
- Statistics represent data, probability models chance, and both support informed inferences and decisions.

How did we get here?

Approach and expertise

Research

Curriculum reform

- Designing a mathematics curriculum – Indonesia, issues around mathematics curriculum reform.
- Evolution of Singapore's school mathematics curriculum.
- Mathematics curriculum in Pacific Rim Countries – China, Japan, Korea, and Singapore.
- Finland curriculum structure and development.
- National Mathematics Advisory Panel, US, 2008.
- Excellence in Mathematics – Scotland (report from the Maths Excellence Group).
- Interdisciplinary Programs Involving Mathematics – India.

How did we get here?

Approach and expertise

Research

Curricula and associated pedagogy

- Wales – Foundation Phase, Key Stages 2–4 programmes of study, National Literacy and Numeracy Framework (LNF), Task and Finish Report (Nov 2015), LNF – A Strategic Action Plan (2016).
- England – Key Stages 1 and 2, Key Stage 3, Key Stage 4, Formal Written Methods.
- Scotland – Curriculum, Pedagogy, Numeracy Experiences, Numeracy Framework
- Republic of Ireland – Primary Curriculum and Teacher Guidance, Secondary – Project Maths (programme to bring more problem solving in secondary schools).
- Singapore – Primary, Secondary.
- Finland – Curriculum (P. 158-167), Problem Solving.
- Ontario – Primary , Secondary.
- Quebec – Primary, Secondary (embedded in Maths/Science/Technology subject area).
- Mastery approach being promoted in England – mastery, video1 video2 and maths hubs.

How did we get here?

Approach and expertise

Evidence: Estyn

Mathematics

- Good Practice in mathematics Key Stage 3, 2015
- Good Practice in mathematics Key Stage 4, 2013
- Best practice in mathematics for pupils aged 3 to 7 years, June 2009

Numeracy

- Numeracy in key stages 2 and 3: an interim report, November 2014
- Numeracy in key stages 2 and 3: a baseline study, June 2013
- Numeracy for 14 to 19-year-olds, July 2011
- Improving numeracy in key stage 2 and key stage 3, April 2010

Evidence: Others

- Does Financial Education Impact Financial Behavior, and if So, When?
- Should all students be taught complex mathematics? (OECD Library Publication)
- 10 Questions for Maths Teachers ... and how PISA can help answer them. (OECD publication)
- Achievement of 15-Year-Olds in Wales: PISA 2012 National Report

How did we get here?

Approach and expertise

Expert input and feedback includes the following.

- Estyn.
- Qualifications Wales.
- Marie Joubert (NNEM researcher), various.
- Anne Watson, Emeritus Professor, Oxford University, 'Pedagogical guidance for mathematics': Excellent pedagogy and the twelve generic pedagogical principles from *Successful Futures* and 'Digital technology and the new Welsh mathematics curriculum'.
- Professor Matthew Jarvis 'AoLE Implementation of the 'Welsh Dimension and International Perspective''.
- Tom Cox, 'Wider Skills and the Areas of Learning and Experience (AoLE): An audit and analysis with proposals for future work'.
- Learning Partnership.
- Foundation Phase Expert Group.

Progression: CAMAU team

Considerations for schools

- How will your leaders, practitioners and networks be able to prepare for the next phase of co-construction and provide meaningful feedback?
- What, if any, are the resourcing implications (national and local)?
- How could you approach whole-school and/or inter-departmental approaches to both:
 - knowing **about** the new curriculum?
 - understanding **how to do** the new curriculum?