

# Early Mathematical Development

## A briefing paper to inform the Knowledge Makes Change Seminar Series

Knowledge Makes Change is provided as part of the Early Childhood Development Programme which is led by the National Children's Bureau in partnership with States of Jersey and Jersey Child Care Trust, informed by the Department of Children, Young People, Education and Skills, the Department of Health and Community Services, the [Best Start Partnership](#) and the Jersey Safeguarding Partnership Board. The programme officially started in April 2016 and is funded by UBS Optimus Foundation UK.

### What supports early mathematical development?

Mathematics begins with babies exploring the world with their senses: contrasting colours, tactile objects or a toy clattering onto the floor all provide stimulus to a baby's developing brain. Research shows that even babies under one year of age have some sensitivity to quantities and number: babies have been found to recognise the difference between sets of one, two and three objects and young children often use their bodies as a tool for understanding mathematical concepts such as time, space, direction and positioning (in Evangelou et al, 2009).

Yet the interaction of responsive caregivers is also vitally important: the significance of both a stimulating environment and adult interaction is reflected in research about children's mathematical development as they move through their earliest years.



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## What supports early mathematical development?

Research evidence shows that a range of social and interactive practices support young children's learning and development in mathematics. For example, engaging children in practical, purposeful experiences is often found to be a more effective way to support mathematical learning than doing the same mathematical activity for no specific purpose (Gelman, 2006).

Researchers following a child to the age of three also noted that activities involving social interaction, such as giving objects to other people, provided better opportunities for mathematical development than abstract mathematical tasks (in Evangelou et al, 2009). Adult role models are also important: witnessing adults counting out loud or using numbers to solve real life problems can help children to understand the mathematical activity involved (Barber 1998).

Finally, research findings have also confirmed the rich mathematical possibilities of picture books: when pairs of parents and children were observed sharing a story book, the child's mathematical learning was encouraged and supported as the parent provided strategies, asked questions and provided information (Anderson et al, 2004).

## Why does maths matter?

There is strong evidence to suggest that supporting children's early mathematics, especially in the home, has a positive impact on long term attainment in mathematics and in other areas of learning and development.

The Effective Pre-school, Primary and Secondary Education project (EPPSE) followed over 3,000 children from pre-school age to the end of their secondary education. Researchers found that playing with and learning numbers was one of seven key early home learning activities that were closely linked with children's overall attainment on entry to school, at age seven, age eleven and beyond. The same study also found that a strong early home learning environment had a significant positive effect on children's attainment in mathematics at age eleven (Sylva et al, 2010).

## Why does maths matter?

Looking ahead to adulthood, the available evidence shows both the positive lifetime impact of acquiring mathematical skills and the potential limitations of not doing so. Professor Sir Adrian Smith's review of Post 16 Mathematics commented that 'well-established evidence shows that adults with basic numeracy skills earn higher wages and are more likely to be in employment than those who fail to master these skills' (p24, DfE, 2017) The same review also highlighted the importance of mathematical skills and techniques across a wide number of academic disciplines and areas of employment, with the demand for quantitative skills only likely to grow due to increasing computerisation.

On the other hand, poor mathematical skills may have a negative impact that is wider than an individual's educational or employment opportunities. Research conducted by the Money Advice Service found that participants' levels of numeracy were strongly linked to their financial capability, especially the frequency of savings and the ability to manage day-to-day finances. This association was found to be true even when income levels and other factors were taken into account (Money Advice Service, 2017).

Research has also highlighted the importance of people being able to make sense of numerical information to make health decisions: for example, being able to understand the nutritional information on a food label, understand risk or self-manage some health conditions. Research into colorectal cancer screening found that 46% of respondents gave the incorrect answer when asked if a risk of 1 in 100, 1 in 10, or 1 in 1000 resulted in more chance of getting a disease (National Numeracy, 2016).



## The Early Years Foundation Stage

Mathematics is one of the specific areas of learning and development within the Early Years Foundation Stage (EYFS), the statutory early years curriculum framework for England that is also used by nurseries, pre-schools and schools in Jersey. It is one of four specific areas of the EYFS, through which the prime areas (communication and language, physical development and personal, social and emotional development) are applied and strengthened. The EYFS requires that settings provide children with 'opportunities to develop and improve their skills in counting, understanding and using numbers, calculating simple addition and subtraction problems; and to describe shapes, spaces, and measures' (EYFS, 1.5). In the EYFS, mathematics is also subdivided into two aspects: numbers and shape, space and measures.

Development Matters in the Early Years Foundation Stage is guidance material that provides practitioners with examples of mathematical development across different ages and stages. It also contains suggestions of what practitioners might do to support learning in mathematics, based around two of the key themes or principles of the EYFS: positive relationships (what adults could do) and enabling environments (what adults could provide).

In Jersey, the Early Years team works closely alongside the Maths Adviser, meeting regularly to discuss recent initiatives and approaches, as well as delivering joint training. The Maths Adviser is currently writing a guide to supporting parents with their child's mathematical understanding and development. The Early Years guidance has been written in collaboration with the Early Years Advisory Team. This will be published later in the year.

With the introduction of Making Maths REAL we now have 46 practitioners trained in over 30 settings. Successful home visits and Maths REAL events have been taking place all over the island. Some of these have included a Friday fish and chip night for children and families, Saturday REAL maths mornings and trips and outings involving shopping and looking for environmental print related to mathematics. These events have been well attended and feedback has been really positive.

## Final thoughts

Being confident in using and applying mathematics has a positive impact on children's lives. Adults can support children's mathematical development, right from birth, through interaction, play and by using maths together in everyday life. Early years practitioners can also build parents' confidence in supporting their child's mathematical development through discussing with them activities run in their settings which parents can repeat at home.

### Five things practitioners can do to support children's mathematical development in early years settings:

- **Ask children to solve real mathematical problems:** How many pieces of fruit or cartons of milk will we need at snack time? How many buckets of water are needed to fill up the water tray? Is this toy box the right shape to fit in the cupboard?
- **Talk openly to children about how you use maths:** Share your thinking and problem solving aloud: 'I am counting how many children are here today, so I know how many lunches we will need.'
- **Use interactions as opportunities to develop children's understanding of mathematics:** ask questions that stimulate and extend a child's thinking and understanding of numbers, shapes and measures.
- **Encourage children to use maths in social and playful contexts:** provide opportunities and resources to develop and extend mathematical thinking during all kinds of play, taking children's needs and interests into account.
- **Share mathematical resources with parents:** lend picture books, games and other resources to parents in order to support children's mathematical learning and development at home.

## Working with families: the Making Maths REAL project

The **Making Maths REAL project** was developed by NCB as part of the innovations strand of DfE funding for Making it REAL literacy work.

In Making it REAL the **ORIM** framework is used to plan and reflect on how parents help their children's early literacy development by providing **O**pportunities, **R**ecognising children's achievements, **I**nteracting and providing **M**odels of literacy use.

The purpose of the Making Maths REAL project work was to see how the ORIM framework could be applied to three areas or strands of mathematics that children might encounter in their everyday lives: Environmental Maths, Everyday Maths and Stories, Songs and Rhymes. A small group of early years settings was asked to trial some materials and approaches with parents. Feedback from this work was drawn together with research evidence, resources and other examples to develop a set of materials for practitioners.

Practitioners then used these practical examples with children and families in their early years settings. Parents responded really well to the idea that mathematics can be developed through ordinary, everyday activities that you can do at home, without needing to buy expensive toys or special equipment.

Following the success of this approach NCB offers 'A REAL approach to early Mathematics' training using the ideas and framework from the Making Maths REAL project.

[\*\*Making Maths REAL\*\*](#) is a report that looks at how parents can use the ORIM framework to support their children's learning and development in mathematics. It also includes resources and ideas for practitioners to use with children and parents and is recommended to anyone who has attended Making it REAL training.

[\*\*Making Maths REAL Year 2 Report\*\*](#). This report evaluated the impact of the work on children, parents and practitioners.

## Five things parents can do to support children's early mathematical development at home:

- **Making counting objects or actions a regular habit.** For example, count the stairs every time you go up, count the number of plates on the table before a meal or count fingers and toes after bath time.
- **Sing counting songs or rhymes.** For example, 'Five Little ducks', 'One, Two, Buckle my Shoe' or 'Ten Green Bottles'. Repeat the same songs or rhymes on a regular basis and use finger actions to show the mathematical meaning of the words.
- **Use the language of maths.** For example, use words such as 'more' or 'less' to compare quantities when you are cooking together. Use words such as 'add' when putting pieces of fruit on a plate; and 'take away' when pieces of fruit are eaten!
- **Share books together.** Read picture books with your child and talk about the story and the pictures. Ask your child open-ended questions: 'What do you think will happen?'
- **Provide collections of safe, interesting objects for counting and mathematical play.** This might include blocks, cars, teddy bears, recycled objects or natural resources\*.

\* See the [Child Accident Prevention Trust](#) for guidance on safety in the home, including newer hazards such as button batteries.

## Resources

<https://www.nationalnumeracy.org.uk> contains materials for both adults and children, including the National Numeracy Challenge online tool for adults who want to improve their maths.

<http://nrich.maths.org/early-years> contains content based around the Early Years Foundation Stage, including links to resource sheets for practical activities.

<https://www.early-education.org.uk/maths-everywhere> links to a free Maths is Everywhere leaflet for parents.

<https://bristolearlyyearsresearch.org.uk/mathematics-further-reading/> examples and links to further academic research on early mathematics

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