

One, two, three

How can settings best support the particular maths development needs of three-year-olds, asks *Judith Dancer* in the fourth part of this series

With the vast majority of three-year-olds enjoying some level of funded nursery education, it is easy to assume that this age group will have some common knowledge and experiences. In fact, their personal circumstances, needs and interests vary enormously, and all these need to be considered if practitioners are to support three-year-olds' mathematical development effectively.

CHILD DEVELOPMENT

Some three-year-olds may have spent well over two years in a group care setting, some may have spent a lot of time with a childminder, while others may have spent the majority of their time at home with a parent or other family member.

Turning three is also a time of huge transition for many children. While some may stay within the same setting, perhaps just moving to a new room, many may move to another setting and enter a group setting for the first time. So, an average nursery class in a school will have 25 unique children, whose maths development will depend on many factors.

As for mathematical experiences, some three-year-olds will have experienced a wide range of exploratory activities in a group care setting or within their own home. They may be very familiar with number rhymes and songs; have investigated 2D and 2D shapes including assorted construction equipment; played with sand, water, mud, gravel and other sensory materials; used everyday objects for real purposes including cooking; and played outdoors exploring distance, shape and space

as they climbed, used wheeled toys and built dens.

These children may have also had many opportunities to interact with one or more interested adults who have modelled the use of mathematical vocabulary and supported their mathematical explorations and investigations.

Other children may have had more limited experiences, with very few opportunities to explore mathematical concepts. They will be unfamiliar with number rhymes, collections of everyday objects and outdoor spaces, and are likely to have spent much of their time with adults not confident in supporting their mathematical development.

The developing brain

We also know that from age three, a child's brain begins a phase called 'synaptic' pruning. What this means is that between the ages of three and five, the connections in the child's brain that are the least relevant to their current environment and experiences are lost, while those that are important grow more efficient and complex (Tau and Peterson 2010).

At age three a child's brain is twice as active as an adult's (Brotherson 2009). Three-year-olds are continuing to grow very rapidly and learn very quickly. So, we need to make sure that they have the experiences needed to build firm mathematical foundations.

Most three-year-olds are continuing to explore, investigate and develop their understanding of the world around them. They are extremely active and their language development, although varied, includes a rapidly growing expressive vocabulary – the amount of words they use



MORE INFORMATION

- For our maths series by Carole Skinner and Sheila Ebbutt, visit: www.nurseryworld.co.uk/mathematics-in-eyfs
- Bennett, E and Weidener, J (2011) *Everyday Maths through Everyday Provision*. Routledge
- Brotherson, S (2009) *Understanding Brain Development in Young Children*. North Dakota State University
- Dancer, J and Skinner, C (2015) *The Little Book of Numbers and The Little Book of Shape and Space*. Featherstone
- Skinner, C and Stevens, J (2013) *Foundations of Mathematics: an active approach to number, shape and measures in the early years*. Featherstone
- Stevens, J (2013) *Development Wheel: A Guide to Mathematics*. KMMD
- Tau, Z and Peterson, B (2010) 'Normal development of brain circuits', *Neuropsychopharmacology*, Vol.35, Issue 1, pp147-168



increases on a daily basis, given the right support and stimulation. Three-year-olds are incredibly curious and may ask vast amounts of questions – 'what', 'why', 'when' and 'how' questions pepper their everyday talk.

Another feature of this age group is their rich imagination. They also enjoy physical activity and, while they may have strong fears and anxieties, they are generally more comfortable and confident away from familiar adults. Three-year-olds often enjoy being with other children and are beginning to play together, rather than alongside each other. In general, they are developing social skills, often in a larger group, though this will be a lot easier for some than others.

SUPPORTING THREE-YEAR-OLDS:

What can we do?

Three-year-olds need time and space to explore their own interests and enthusiasms. It is important to allow them lots of uninterrupted time to get deeply involved in experiences which really engage them and where they can explore indoor and outdoor environments, without having to stop and move on to something else. Children also need opportunities to choose from a wide range of open-ended resources that support mathematical



Three-year-olds learn about the properties of 3D shapes by exploring them, taking them apart and constructing them

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development, when and where they want to use them.

Shape, space and measures

Many appropriate maths experiences for three-year-olds link both aspects of mathematics – Numbers and Shape, Space and Measures – as well as other Prime and Specific areas of learning.

Three-year-olds need lots of experience of making models by combining and taking apart pieces of construction sets to discover and understand the properties of 3D shapes. As they explore sets of their choice, or natural objects and recycled materials:

- Encourage the children to build tall towers and large-scale models with large boxes. Make sure you

have a regular supply of boxes, which will get squashed and flattened.

- Provide large amounts of wooden and plastic blocks of different sizes so they can make walls, stairs and bridges. It is better to have a large amount of one or two high-quality sets than a very small amount of lots of different sets. This will also encourage collaboration and co-operation.
- Discuss 3D shapes with them as the children build different things – support their early attempts to name shapes and talk about them: if the child says, 'It's a roundy one', reply, 'That's right. It's a sphere.' Many children confuse the 3D name of the shape with the 2D shape of the face, so if a child says, 'It's a square one', reply, for example, 'Yes, I like building with cubes. They're great for towers.'
- Encourage the children to try out different shapes in their constructions and to think about which one is best. For example, if a child is looking for a door for their 'house', talk about the different shapes and sizes.
- Support their 'trial and error' methods as they build models, using comments such as, 'I wonder what will happen if you move that block?'
- Explore shapes as part of tidying-up time: make 2D paper shadows to match large wooden blocks and attach these to shelves, so children can match the blocks

EYFS MATHS AT A GLANCE

Numbers

- Numbers in order
- Counting
- Recognising numerals
- Adding and subtracting

Shapes

- 3D shapes
- 2D shapes
- Position, direction, movement
- Pattern and symmetry

Measures

- Length
- Weight
- Capacity
- Time

Throughout this series, these elements will be explored

alongside lots of practical ideas for appropriate experiences for babies, toddlers and young children.

Aspects and early learning goals

Practitioners need to remember that the early learning goals for mathematics are expectations for the end of the Reception year. Babies and very young children need environments and experiences that are appropriate to their current needs and interests.

Numbers

Children count reliably with numbers from one to 20,

place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Shape, space and measures

Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore

characteristics of everyday objects and shapes and use mathematical language to describe them.

As *Development Matters* (EYFS non-statutory guidance) states, it is important to remember that: 'Children develop at their own rates, and in their own ways. The development statements and their order should not be taken as necessary steps for individual children. They should not be used as checklists. The age/stage bands overlap because these are not fixed age boundaries but suggest a typical range of development.'

to the correct size and shape. Alternatively, sort the blocks into different baskets or towers as you tidy up together.

Pattern

Many three-year-olds are increasingly interested in patterns – particularly as they explore mark-making. However, they sometimes confuse ‘pattern’ with ‘design’ and may say, ‘Look at my pattern’ as they show you a design they have created with markers, mud or paint. (A pattern always contains elements that repeat over and over in a predictable way, and the key element of a pattern is its mathematical rule.)

To support children’s growing interest in pattern:

- Display and explore fabrics and wrapping paper that have repeating patterns.
- Explore patterns in sounds – for example, clapping simple rhythms ‘loud, soft, loud, soft, loud, soft’ or ‘loud, soft, soft, loud, soft, soft, loud, soft, soft’.
- Investigate patterns in movement: make up ‘follow the leader’ games, with ‘one jump, one hop, one jump, one hop’.
- Share books and stories with repeating patterns and a clear sequence – for example, *We’re Going on a Bear Hunt* by Michael Rosen. Remember to draw attention to the pattern in the story, and with any story with a repeating chorus, ask, ‘I wonder what’s going to happen on the next page?’
- Offer lots of opportunities for children to continue patterns – for example, make simple patterns with real objects (such as ‘car, truck, car, truck, car, truck’) and see who continues the pattern, or creates their own.
- Create patterns using food – for example, make fruit kebabs and support the children in creating their own, such as ‘apple, melon, banana, apple, melon, banana, apple, melon, banana’.
- Model the use of the vocabulary of pattern and symmetry, such as ‘match, shape, same, different, first, next, last, pattern, repeat, create, continue’.

Numbers

Three-year-olds are often fascinated by numbers and it is important that adults are very clear about the different aspects of number. Many families believe numbers and counting are



all about ‘recognising numerals’ – they spend a lot of time focusing on numerals (0, 1, 2, 4, 5, 6, 7, 8, 9) as symbols.

Of course, it is important to talk about numbers that are important to young children, such as the number on their front door, or the number of the bus they take to nursery. But there is so much more to numbers than this, and three-year-olds need lots and lots of time to explore saying number names, especially as part of role-play, imaginative play and real-life experiences.

At first, children will be using number names to ‘count’, but not in the correct order and they may be using number names as labels for quantities (though without any accuracy) – ‘60 cars’, ‘five biscuits’, ‘twenty-ten children’. Children need lots of time and opportunities to explore number names spontaneously before they begin to put numbers in the correct order.

Using numbers in order may

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appear simple, but it is actually quite complicated, and there are several pitfalls that children can fall into. For example, they may:

- create a string of numbers (‘onetwothreefourfive’) instead of separating the number names (‘one, two, three, four, five’). This often happens if an adult has been helping a child to learn to ‘count’
- repeat number names (‘one, two, three, four, four, five’) or miss out names ‘one, two, four, five’. This can happen when children are beginning to count out loud, or are concentrating and have forgotten the last number they said
- use correct number names but say them in a wrong or inconsistent order (‘one, two, four, three, six, five’)
- confuse ‘teen’ and ‘ty’ words (saying ‘sixty’ rather than ‘sixteen’), as it is hard for some children to differentiate what are very similar sounds. This is particularly the case with children with hearing loss, language delay or those for whom English is an additional language
- try to make sense of a number system that doesn’t, in fact, make a lot of sense, and say ‘threeteen’ rather than ‘thirteen’ and ‘fiveteen’ rather than ‘fifteen’. These are often children who have a particular interest in numbers.

When children are familiar with number names in order, they will begin to count real objects that interest them (more about this in the next article). Essentially, children learn about number order by repeated attempts at saying the names in the correct order, and practitioners can support them by:

- valuing their efforts at saying number names in order and modelling the use as part of everyday practice
- offering lots of opportunities to join in number sequences – whispering, chanting, singing, calling, shouting and echoing numbers during children’s play
- using number rhymes every day.

A great example that includes number names in order is:

*One, two, three, four, five
Once I caught a fish alive.
Six, seven, eight nine, ten
Then I let him go again.
Why did you let him go?
Because he bit my finger so.
Which finger did he bite?
This little finger on my right. ■*

MATHS IN OUR DAILY LIVES

Although we may not see ourselves as mathematicians, we are interacting with numbers, shape, space and measures all the time in our everyday lives. Think about how you use numbers every day:

- Checking the time on a watch, clock or phone
- Making sure you get on the correct bus
- Puzzling over a bank statement
- Studying bus or train timetables
- Reading the prices in a supermarket or petrol station
- Confirming the date in a diary or on a calendar
- Counting the number of plates at dinner time.

We all use numbers every day. But sometimes we don’t realise how much maths we understand and use.