

Space age

Supporting the maths development of four-year-olds requires meeting this age group's widely varying needs, writes *Judith Dancer*

Whether a four-year-old is in a Reception class or full-day nursery provision, practitioners need to be aware of the wide differences in the knowledge, skills and attitudes of this age group. That includes their mathematical development. Some may have many of the needs and interests of children aged just two and a half, while others may exhibit the mathematical development more common in a five-year-old. Effective observation, assessment and adult support are therefore essential, as is a rich learning environment.

CHILD DEVELOPMENT

Bearing in mind the differences within this age group, there are lots of things that many four-year-olds can do and are interested in. They may:

- order three items by length, height or weight – they may line up the three bears in the Goldilocks story
- use mathematical names for 3D and 2D shapes, such as square, circle, triangle, cube, sphere or pyramid
- understand that both things and actions, such as jumps and claps, can be counted
- be able to count to five or ten without omitting or repeating any numbers or muddling the order
- be able to count objects accurately – perhaps by moving or touching each object as they count
- estimate how many objects there are in a group, so may reply 'about five' when asked how many children are outside
- use mathematical language such as 'more than' and 'fewer than', often in role play or imaginative play
- describe position such as 'next to' or 'on top of', especially when involved in physical outdoor play, climbing in, on, through and under things or building dens
- recognise some numerals, especially ones that are important to them such as their age, bus numbers or car number plates

- show an interest in representing some numerals, such as writing '4' with a stick in mud.

SUPPORTING FOUR-YEAR-OLDS What can we do?

Whatever the setting they are in, four-year-olds need time and space to explore their interests and enthusiasms. They still learn by doing; they do not learn by sitting still for long periods of time. They learn best in small groups, where they can interact, ask questions and discuss things that interest them. Most young and many older four-year-olds find it very difficult to learn as part of a large group, particularly if they are expected to listen a lot, rather than 'do' things.

Historically, there has been a claim that four-year-old boys experience a testosterone surge which affects their behaviour. However, this 'fact' can be traced back to one publication, and recent research has found no evidence to support this. As Browne (2004) says, 'It has not been possible to find any research evidence to support the claim that boys experience a testosterone surge at the age of four.' However, she does go on to say that changes in levels are observable in certain situations. For example, 'when children were playing amicably, testosterone levels were low, but being on the receiving end of aggression raised testosterone levels of both girls and boys (Sanchez-Martin *et al*, 2000)'. It could be that the changes in behaviour for four-year-olds, and in particular boys, have more to do with the developing sense of self and independence that are occurring.

Remember, if four-year-olds do not get what they need – time and space to be active and learn physically and through real, meaningful experiences, they are likely to become frustrated. This frustration will either be internalised, which can lead to anxiety and withdrawn behaviour or, in the case of most boys, it often becomes

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
- Browne, N (2004) *Gender Equity in the Early Years*. Open University Press
- Dancer, J and Skinner, C (2015) *The Little Book of Numbers*. Featherstone
- Dancer, J and Skinner, C (2015) *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
- Gelman, R and Gellistel, C (1978) *The Child's Understanding of Number*. Harvard University Press
- Stevens, J (2013) *Development Wheel: A Guide to Mathematics*. KMMD Publishing



externalised through yelling, throwing, kicking, hitting or biting. It is therefore essential to plan an environment and routines that are 'right' for children, or risk avoidable challenging behaviour that will impact on all learning, including maths.

Shape, space and measure

The EYFS identifies two aspects in Mathematics – Numbers and Shape, Space and Measures. Many appropriate experiences for four-year-olds link both aspects of mathematics, as well as other Prime and Specific areas of learning.

In addition to continued experiences of pattern, measures and shape, four-year-olds need lots of support in developing their understanding of the 'space' element of 'shape, space and measures'. Children need to become familiar with words that are used to indicate where they are, and their position in relation to others. Of course, this includes positional words and phrases, such as 'next to' and 'behind', but it also includes directional words that describe routes, movement and journeys.

Children need opportunities to observe places and objects from different viewpoints. In reality, the sorts of experiences that children need when they are learning about space are the things they like doing at this age any-



way – moving around the outdoor area on wheeled toys, chasing balls, rushing around and moving about during their play.

The adult support they need often takes the form of a commentary on what they are doing, modelling the accurate use of vocabulary to describe what is happening – ‘I saw you ride the truck very fast past the climbing

frame and around the sand pit.’

It is important that children experience appropriate challenge, and adults can help less active children find out more about what they can do with their bodies by setting challenges. To support children’s developing understanding of space:

- Play movement games involving instructions about direction:

Maths should not be taught to young children in a formal way, but integrated into usual activities and the things that interest them



‘Take three steps forward, one step sideways and two steps backwards.’

- Challenge them to move in different ways: move around or in and out of a circle, stretch up tall or run only in straight lines.
- Construct circuits and obstacle courses outdoors: things to climb under, over and through.
- Organise trails: make a trail of crumbs (building on the Hansel and Gretel story) for children to follow, make a chalked trail on the ground or create arrows to follow, using sticks or twigs.
- Mark chalk roadways outdoors: support the children as they either follow these on wheeled toys, or use smaller cars and trucks.
- Devise treasure hunts: give children positional and directional clues to find ‘hidden treasure’ or missing toys.
- Create a maze using wooden blocks ➤

Four-year-olds still learn by doing; they do not learn by sitting still for long periods of time

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.’



and plastic crates: support children as they find their way to the centre without climbing over or moving the obstacles.

Numbers

We want children in our settings to become confident mathematicians who can use numbers in their everyday environment for labelling, quantifying and calculating. Counting is the significant aspect of children's understanding of number on which quantifying and calculating skills are built. Familiarity and confidence with numbers are essential to measures too of time, weight, length and money.

Four-year-olds are often fascinated by numbers and when they are familiar with number names in order, they begin to count real objects that interest them, and then move on to counting things such as claps, jumps and bounces. Counting includes a lot more than saying number names in order. As children's counting skills develop, they begin to understand the counting principles, identified by Gelman and Gellistel (1978):

- One-to-one correspondence: when children touch or point to each object individually as they count and match a number to each object that is being counted.
- The need for stable order: children gradually come to understand that numbers need to be said in the same order.
- Abstraction: children begin by counting objects such as cars 'in

the here and now', when they are in front of them, but then also realise that many things can be counted, such as claps and jumps.

- Order irrelevance: when counting a group of objects in a random layout, it doesn't matter where you start – you can start at the top, the middle or the bottom; as long as each object is only counted once, the result is the same.
- Cardinality: understanding that the last number counted indicates how many things are in the set (group). To help children's developing understanding of the counting principles:
 - Explore large collections of objects so children can find out about 'big numbers' – what do a hundred conkers look like?
 - Count in everyday, real-life

When they are familiar with number names in order, they begin to count real objects that interest them

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, often without realising it. Think about how you use estimation of numbers every day:

- Identifying how many people are in each queue, to choose the one with fewer and so may be quicker
- Guessing how many items are in the shopping basket to join the till for 'ten items or fewer'
- Estimating how many apple slices there are to ensure there will be one for each child
- Working out if there are enough slices of bread to make sandwiches for the whole family
- Approximating the number of guests at an event

situations – count the number of seats at the lunch table, or apple slices for a snack.

- Play estimating games – put different numbers of soft toys in large boxes and ask children to guess how many are in each, then count together to check.
- Bake together – it is the perfect activity for involving children in counting and measuring weight, capacity, time and temperature (three eggs, one cup of milk, bake for ten minutes at 200°C).
- Use a small set of number rhymes on a regular basis – for example, chant and act out 'Five currant buns', 'Five little ducks' or 'Five little speckled frogs'.
- Model counting of random arrangements of objects – for example, throw a handful of leaves into the air and count them where they land.
- Play clapping games – clap a set number of claps for children to 'echo', then let them take the lead.

Key points

- The first thing to remember when working with four-year-olds is that they still need lots of time and space to get involved in the aspects of mathematics that really interest them.
- They have very different needs and many and varied interests, and the learning environment should reflect this. Some children will be interested in 'big numbers', so they need large collections of interesting items to investigate and explore. Other children may be fascinated with 3D shapes and need access to lots of construction sets and natural objects indoors and outdoors.
- Four-year-olds learn best when they are physically active and can choose what to explore and when – they need access to clearly labelled resources that support their mathematical learning throughout the indoor and outdoor learning environment.
- When we are supporting the mathematical development of four-year-olds, we need to remember that 'All areas of learning and development are important and inter-connected' (*EYF5 Statutory Framework*, paragraph 1.4). We need to remember not to 'teach' maths in isolation or by rote or to think that maths means sitting down, or being quiet. ■