

# Teaching number to children with Down syndrome

## What do we need to know?

Understanding and using the number system is more difficult than may be apparent at first sight. In order to be able to count correctly, children have to master several skills.

### Counting

First, children have to learn the names of the number words (*the count word sequence*) in the correct order (*the stable order*). Secondly, children have to learn how to count a small number of items so that each item is given a number name and only counted once (*one-to-one correspondence*). Thirdly, children have to understand that the last number they say in the counting task has a special meaning. It is called the *cardinal* number. It represents the total number of the counted items and is the answer to the question "How many are there?" When children can correctly answer the "How many?" question, they are described as having achieved *cardinality*. At this stage, they can also respond correctly when asked to give a certain number of items from a larger set, e.g. correctly give 2 or 4 items from a set of 8.

The *count sequence* needs to be *over-learned*, in order, from one to ten, before it will be possible for the child to separate out the numbers in the sequence and count backwards and forwards from different numbers within this range, or to 'count on' when adding (i.e. if asked to add 2 items to a group of 4, the child can 'count on' from 4 i.e. "4, 5, 6", and does not need to start counting from 1 in order to carry out the task).

### Quantity

As children gain experience with counting activities, the nature of number becomes better understood. Children realise that numbers represent *quantity*, that you can count all kinds of

different items (*the abstraction principle*) and that the order in which items are counted is irrelevant – the answer will always be the same so long as each item is only counted once (*the order irrelevance principle*). They also need to understand that each next number represents *one more equal unit* before they will understand the *equivalence* of numbers, i.e. that 4 is the same as 4 'ones' or 2 'twos' or a 'one' and a 'three'. This is where the Numicon system is so valuable – the shapes illustrate the real nature of the number system and the equivalence of numbers. This understanding of the number system cannot be conveyed easily by just counting activities. Children need to understand *equivalence* before they can tackle *number bonds* – the topic of Vikki Horner's article.

### Numerals

Children also have to learn the written digits for the number words and this becomes more difficult for the numbers from 11 to 19 as in English they do not follow a logical naming system. From 20, the system becomes logical in its representation of tens and units, as we say 'twenty-one, twenty-two, twenty-three'. In some languages (e.g. Chinese, Japanese, Korean) the same regularity for number names applies to 'ten-one', 'ten-two', 'ten-three', but in English the 'teen' words often confuse children. There is some evidence that children in countries with a regular number naming system for 11-19 learn to understand tens and units (*place value*) and calculate with the system more easily than English and American children.

Progress is in orderly steps and children need to understand *cardinality* and *equivalence* before they will understand *place value*. Using *counting knowledge*

to share begins by using "One for me, one for you" until the items are shared equally. Before this stage, children will give a handful to each child and not check to see if the piles are equal. At the next stage, children give a handful to each child and then count each pile. It is only at about 8 to 9 years of age that typically developing children count all the items to be shared and divide this number by the number of children to decide how many each child should have before beginning any distribution. This illustrates how long it takes children to really understand the nature and usefulness of the number system.

We know very little about the number learning of children with Down syndrome except at the early counting stages. We do know that, at present, many children do not reach the point where they understand *equivalence* and *place value* and this means they do not have a basis for really understanding money. We are excited by the opportunity to study in detail the number skills and understanding of a small group of children across the age range, described by Joanna Nye in the second article. We will be looking at how the children progress with the Numicon teaching programme and we will be looking at how far it helps each of them to achieve the key steps in understanding and using number described above. Once we are happy with the recording systems that we are developing for the local schools, we will be willing to share them and to include other schools and families in the data collection, as we know that many of you would like to participate. Please contact Joanna Nye if you would like to keep records for us.

Editor

See the publications in the Resource list on p. 130 for more on how children learn number

