

How children learn about counting – research findings

(from A. Montague-Smith and A. Price, 2012, Mathematics in Early Years Education)

Babies and toddlers will start counting by copying counting behaviours modelled by adults. Gelman and Gallistel (1986) describe five principles which are used when counting and can be divided into two groups: *how* to count and *what* to count:

How to count principles:

- the one-one principle
- the stable-order principle
- the cardinal principle

What to count principles:

- the abstract principle
- the order-irrelevance principle

The one-one principle

This principle refers to the need of matching one counting word to each item in the set to be counted.

To understand the one-one principle, children will need to:

- Recite the counting words in order
- Coordinate the touch and oral count so that they happen at the same time. Pointing to/touching items and counting is important in the process of counting as it ensures that each item is included
- Keep track of items that have been counted and those that have not been. Children find it easier to move items as they count to keep track and, therefore, find counting objects easier than pictures (Potter and Levy, 1968).

The stable-order principle

Children need to also learn to say the counting words in order. Usually young children's counting 'string' will consist of the first few words learnt correctly, a group of correct words with some omissions followed by words chosen randomly (Fuson et al. 1982). Learning to count in the English language is complicated as it involves rote learning of words that do not have a recognisable pattern until the number fourteen.

Initially children may just be chanting words memorised through rhymes and stories with it not having much meaning. Increasingly, the order of words takes meaning and children will begin to realise that the order of counting words is always the same and must always be said in this order: the stable-order principle.

The cardinal principle

Children often learn counting as a process without understanding that the purpose is to find out the *total* number in the set. In other words, not realising that the final number in the count is not just identifying and labelling the last item counted but that this final number is a representation of the total number of items. The cardinal principle usually develops after the one-one principle and the stable-order principle. It is, therefore, important for adults to make the purpose of counting clear emphasising the final count is representing the total amount. Suriyakham (2007) recommends the use of gesture at the end of the count to develop this understanding, for example, a circular gesture which includes the whole set and emphasis is put on the final count word.

The abstraction principle

This principle refers to counting when children are moving on from counting objects which they can see and touch to counting through hearing and imagining items as they say the words.

Most young children's counting experience is limited to using simple counting objects with most five-year-olds counting money in 'ones' irrespective of its value (Carraher and Schliemann, 1990). This limited experience can affect the development of place-value concepts at a later stage so it is important from the early years to teach pupils to use the correct number names for money, for example, this is *two* pence.

The order-irrelevance principle

Understanding that the total number in a set of objects will be the same when objects are counted in another order is a complex concept for young children to understand. Children may need to understand the cardinal principle more fully in order to develop the order-irrelevance principle. Interestingly, if a puppet is used to change the order of objects, children are more likely to realise the total amount will be the same compared to when an adult changes the order.

References:

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