

ARITHMETIC AND NUMBER

Before a child can carry out such arithmetical operations as addition and subtraction it is necessary that he or she develops some notions about **number**, or to put it more clearly, **numerical quantity**.

Ideas such as 'twoness' and 'fiveness' grow out of a child's unwittingly grouping and re-grouping the things around him.

After a while two groups of objects may be seen as separate not because the objects or the colours or the materials from which they are made are dissimilar but because the two collections differ in numerical quantity.

This is a natural **SORTING** process but it can be encouraged by means of sorting games of every kind, not just number games.

Speech does not come into this, neither does 'counting'.

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Even when a child can recognize 'two things' or 'four things' this does not mean that he or she understands quantity, for simply to recognise the quantities does not imply that he knows that one quantity is 'more

To begin to understand 'more than' or 'less than' it is first necessary to recognise the differences between the collections already recognised... and this is the function of **MATCHING**.

Matching draws attention to differences and, in the case we are discussing, to differences between the quantities that the child can already recognise. For example, if he recognises 'oneness', 'twoness', 'threeness', 'fourness' and 'fiveness' he may begin to notice that the difference between 'fiveness' and 'threeness' is 'twoness', and in due course that the difference between some pairs of collections (or sets) is 'one'.

This latter observation leads to the notion of 'oneness' or unity as the basis of numerical quantity. Again, it is important to point out that this has nothing to do with 'counting'.

So far the mental processes of **sorting** and **matching** - perhaps helped by sorting and matching play - have led to the recognising of all the small number quantities, up to perhaps five or six . . . but they have no special order.

Another mental process, **SERIATION**, develops in such a way as to have the child able to follow, or to generate for him or herself, patterns in space and time so that even when only a part of the pattern is apparent more of it can be guessed or inferred: for example, if something starts to get bigger, the child can envisage that, later, that particular something will be even bigger.

This **seriational ability** which allows us to go beyond what we already know, to extrapolate, also tends to encourage us to arrange or organise our materials into patterns; and so, in due course, the child will tend quite naturally to order the numerical quantities derived from sorting and matching so that the quantities increase in one direction and decrease in the other.

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Now the child has the basis for 'more than' vs. 'less than'.

SORTING has led to the discovery of each quantity

MATCHING discovered the differences and led to recognising the unit

SERIATION allowed the quantities to be ordered according to size, which in this case means numerical quantity - 'how many'

MATCHING also encourages the attending to each part or component of a pattern, a process which is the basis of point-to-point or 'one -to-one' correspondence

whilst

SERIATION allows this to be done in a systematic ongoing way so that we rhythmically recite a series of words each one can be put into one-to-one correspondence with a thing or a part.

Now we can recite "one; two; three . . ." whilst attending to, and perhaps pointing to, each of a 'number' of things. This is **pre-'counting'** and it is a very useful skill, but it *is not* a way to understand number.

Real **counting** comes later, beginning perhaps during the sixth year, and relies on the notions of numerical quantity learned from **sorting**, **matching** and **seriation**, and on 'pre-counting'.

In due course these ideas can be linked to conventional language - but the *ideas come first, not the speech*. The ideas can be fostered and exercised in a variety of sorting, matching and seriation nursery games which help the child to develop a firm foundation for the later growth of more advanced number ideas and for the sorts of arithmetical skills expected of a school child.

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