

## **‘Count it Out’ & ‘Out for the Count’**

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Counting plays an important part in the development of young children’s early understanding of number and in their later acquisition of number facts and calculation strategies. Counting as **recitation** involves the ability to say the number words in the correct order on each occasion. But counting can also be **enumeration** – the ability to use this number-word sequence to find the number of objects in a collection.

### RECITATION

Reception teachers will be familiar with those parents who insist that their child can count up to a hundred when what they actually mean is that the child can correctly recite the counting words, without necessarily having any idea how to use this sequence to count objects.

Recitation, however, is an important prerequisite for enumeration: if you only know the number names up to six, you cannot correctly count seven objects!

When children first learn the counting word sequence, they often treat it as a continuous sound string (*wontoothreefor*), and only later come to realise that the sequence comprises separate words. For children at this stage of understanding, the sequence can only be recited by starting at the beginning; it cannot yet be ‘broken’ and produced from an arbitrary starting point.

With experience, children gradually come to treat the counting word sequence as a breakable chain, and learn to continue reciting from a given number within it. This is essential in order for them to develop the skill of ‘counting-on’.

### CATCHING OUT MISS COUNT

A useful and interesting class or group activity for young children who are either struggling with or just learning the counting word sequence involves the use of a puppet called Miss Count.

The children have to spot the mistakes made by the puppet when she recites the counting words. Research shows that when children are asked to correct mistakes, they respond more freely to a teacher-controlled puppet than to an adult figure of authority.

The following errors, which Miss Count might make, will help to highlight the various difficulties frequently experienced by young children when learning to count.

- One, two, four, five... - word omitted;
- One, two, three, five, four, six... - words in the wrong order;
- One, two, three, three, four... - repeating a word;
- Three, four, five... - not starting from the beginning;
- Thirteen, fourteen, fiveteen... - error by analogy;
- Eighteen, nineteen, tenteen... - error by analogy;
- Twenty-nine, twenty-ten... - error by analogy.

Discussion of these counting mistakes can provide feedback for the teacher on individual children's level of understanding. At the same time, it improves the counting ability of those children who are having difficulty.

### DECADE CHANGES

Children need to appreciate that words such as *x-ty-nine* signal a change in the structure of the sequence, and that the sequence as a whole is a repetitive system. Even when they have come to understand that *x-ty-eight, x-ty-nine...* is followed by a different *x-ty-one, x-ty-two...* children often do not know the order of the *x-ty* words. Some practice in reciting the multiples of ten is often valuable in helping them. Miss Count can be used to focus on these particular aspects of the counting process. For example, the puppet might incorrectly count ...*twenty-eight, twenty-nine, forty...* offering the wrong multiple of ten, or she could count incorrectly in tens reciting the decade numbers in the wrong order. Don't forget that Miss Count occasionally gets things right! (see also the games NEXTUP and TENZO below)

### ENUMERATION

Enumeration involves assigning the correctly-ordered number words in one-to-one correspondence with the objects being counted. Most young children point to the objects that they are counting. Some are *visual counters* who 'point' with their eyes; others are *touch counters* who touch the objects but do not displace them, and then there are the *physical partitioners* who move the objects – where possible – while counting them.

Guide children to point with their fingers rather than their eyes, and encourage them to touch the objects in question as this can help them to keep track, eliminating some of the potential enumeration mistakes.

### MATHEMATICAL MISTAKES

Because of the complexity of this aspect of the counting process, mistakes can be easily made when enumerating. There are three different phases during which children can make counting errors: *recitation, coordination, and keeping track*. Again, teachers can use the Miss Count puppet to provoke discussion among the children about enumeration mistakes. Some of the coordination mistakes that the puppet can make while enumerating a collection of objects include:

- Getting the recitation and the pointing completely out of synch;
- Pointing to one of the objects without saying a number word at the same time and then continuing correctly;
- Saying a number word without pointing at a specific object and then continuing correctly;
- Pointing at the spaces between objects and assigning number names to these spaces;
- Coordinating the recitation with the pointing but missing out one of the objects;
- Coordinating the recitation with the pointing but counting one object twice;
- Correctly enumerating five objects and then saying, 'there are six'.

## **‘Out for the Count’**

Children need practice at counting objects in different arrays; straight lines are obviously the easiest, while circles or random arrays are the most difficult. Counting out a certain number of objects from a larger collection is a demanding task because the child must not only count accurately, but also remember when to stop enumerating.

Some children have difficulty in keeping track of the objects they have counted. It helps if they move each counted object to a new pile. For fixed objects, they need to start in an obvious place and enumerate in a particular direction.

Miss Count can be used to simulate these difficulties and to provoke discussion about specific keeping-track strategies.

### **HOW MANY ALTOGETHER?**

Even when children no longer make enumeration errors, it does not automatically follow that they can count. They also need to realise that the number that they have assigned to the last object tells them how many objects there are in the collection (the cardinality principle).

When asked for the total in a collection that they have just counted, many children will count the whole set again. They think the answer to this type of question is the total counting sequence. Help them by asking, ‘Do you need to count them all again?’ or ‘What was the last number you just said?’

Refer to collections of counted objects, such as pigs or sheep, as ‘pig family’ or ‘sheep party’. This can lead children to treat their collection as an entire group instead of recounting the individual items. With experience, children gradually learn that the expected answer to ‘How many?’ questions is the last number word assigned in the enumeration process.

### **DOES THE COUNTING ORDER MATTER?**

Children who have counted a row of objects in one direction can be asked what they think will happen when they count the objects in the other direction. Some children will count a collection from right to left arriving at one total, and then count it from left to right arriving at a different total, without recognising that something is wrong.

Miss Count can be used to simulate this situation. She can add a comment such as: ‘There are seven going this way but only six going the other way’, or ‘There are six or seven. It depends which way you count’. You can assess the children’s understanding by their reaction.

Another activity is to make the puppet count small collections of objects in unconventional orders, and ask the children whether or not this is acceptable. Let the children count sets of objects in this way. For children who find this difficult, it is better to start with a small collection of animal toys, set out in a row. Make a toy at the end ‘number one’.

The difficulty can be gradually increased by making a random toy ‘number one’, and then by making another random toy ‘number two’. Gradually increase the size of the set.

## COMPARING QUANTITIES

The ability to determine which of two collections is the larger is basic to number sense. Very young children soon learn to recognise which of two groups has 'more', provided that these groups are small. They have more difficulty with 'less' and 'fewer'. However, these judgements are based on appearance, and appearances can be deceptive. With small collections (up to five or six) children are sometimes able to automatically judge the number of objects without counting them.

Over time, children learn that numbers can be used to compare quantities. They need to realise that if a number comes after another number in the counting sequence then it represents a larger quantity. They can then count one collection, of, say, seven items and another of five items and deduce that the first is larger because: 'Seven comes after five when I count'. (see the games PELMANISM, NEXT NUMBER DOMINOES, NO GO and SNIP described below).

## **NEXT UP**

### **Aim**

To help children appreciate that a number ending in signals a change in the decade structure when counting.

### **Equipment**

A calculator, set up to add on one each time the equals key is pressed. Use the constant facility (press  $1+1 = = =$  or  $1=++ = = =$ ). Children work in pairs.

### **How to play**

Once familiar with how the calculator counts in ones when the equals key is pressed, one child enters a two-digit number ending in nine. The other child says the next number that they think will appear in the display when the equals key is pressed. A record is kept of player A's original number, player B's answer and the number appearing in the calculator display. A successful answer scores a point and the players then change roles. The first to score five, wins.

## **TENZO**

### **Aim**

To provide opportunities for children to practise counting in tens.

### **Equipment**

A calculator set up to count in tens (press  $10 + 10 = = =$  or  $10 + + = = =$ ).

### **How to play**

This is a 'guess then press' game that children can play on their own with a calculator. Better still, they can work in pairs, with one child counting in tens while the other checks her sequence by pressing the equals button on the calculator. The children then change roles, and the one reaching the highest number without a mistake is the winner.

## **PELMANISM**

### **Aim**

To practise recognising the next number when numerals are used.

### **Equipment**

Two or three sets of cards marked 1 to 9 in numerals.

### **How to play**

Shuffle the cards and place them face down in a rectangular array. Each player in turn selects two cards to turn over. If the two cards are neighbours (that is, they differ by one) the player keeps the 'trick' and has another turn. Otherwise, the cards are returned face down to their original position, and players attempt to remember where the cards are situated for future use. The player with the greatest number of tricks at the end of the game is the winner.

## **NEXT NUMBER DOMINOES**

### **Aim**

To provide opportunities for children to work out 'the next number', either by counting dots or by recognising the pattern.

### **Equipment**

A set of dominoes.

### **How to play**

Proceed as for traditional dominoes but instead of putting equal dominoes next to each other you have to put down a domino with one more spot (the problem of how to follow a six was solved by a group of children by allowing the blank to be used since 'there was nothing else for the blank to follow'). Each child has to justify her move as she puts down her domino by saying something like 'five comes after four'.

## **NO GO**

### **Aim**

To give practice at selecting the larger of two numbers.

### **Equipment**

A normal pack of playing cards with the picture cards removed.

### **How to play**

The 40 cards are shuffled and dealt face down to two players. Without looking at the cards, each player places them in a pile face down in front of her. Both players simultaneously turn over the top card of their respective piles. The person turning over the larger number takes both cards. If both cards have the same value then this situation is called a 'tie', and each player has to put an extra card face down on the card that made the tie.

The game proceeds, and the person turning over the larger number this time wins all six cards. After an agreed time the player with the most cards is the winner.

## **SNIP**

### **Aim**

To provide practice at recognising the next number when numerals are used.

### **Equipment**

Two or three sets of cards containing the numerals 1 to 9.

### **How to play**

Shuffle and deal the cards among the players (two to four). Play as for normal Snap, except that 'Snip' is called when the numeral on one card is one bigger than the numeral on the other. The winner is the player who captures all the cards.

### **Alternatives**

- Call 'Snip' when one number is **two** larger than the other.
- Add a card with a zero if this is appropriate.