

short activity

Dynamic Counting: A suggestion for developing flexibility with counting and place value

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It is frequently surprising to new teachers (and even those of us with experience) when they find that not only do some children need to recount the group they have just counted to be assured of the total but also that this need seems to be resistant to intervention. Although moving from “counting-all” to “count-on” is sometimes assumed to be constrained by developmental factors, as teachers it is our responsibility to continually explore methods and pedagogies for accelerating such transitions.

Similarly, it is surprising how difficult some students seem to find answering questions like $32 + 10$, $95 - 10$, $326 + 100$, etc. Although many students in Year 1 may begin to grasp place value in an elementary sense, applying this knowledge dynamically (i.e., as a number changes), rather than statistically (i.e., to an individual number), is often a far slower process. Moreover, it is difficult to find the right experiences to help students develop fluency in flexibly applying their knowledge of place value to solve such problems. This in turn delays their ability to answer multi-digit addition and subtraction problems using more sophisticated partitioning and compensation strategies (e.g., $37 + 49 = 86$ because $37 + 50 = 87$ and $87 - 1 = 86$).

In this short article, we present the principle of Dynamic Counting, and a set of activities related to this principle, as a teaching tool that might be useful in addressing both of these issues.

Describing Dynamic Counting

The principle of Dynamic Counting is extremely simple but potentially powerful. The term ‘dynamic’ is intended to convey that the totals are changing rather than static. Imagine that students are sitting in groups of 4, with one of them (or an adult) acting as the ‘dealer’. For Foundation level children, the dealer progressively adds or removes one counter from the table, while the other group members must say the total together. As shown in Figure 1, the total of the counters on the table might be, progressively: 3, 4, 5, 6, 7, 6, 7, 8, 7...

The idea is that the pace of the activity illustrates to children that it is not intended that they recount the total.

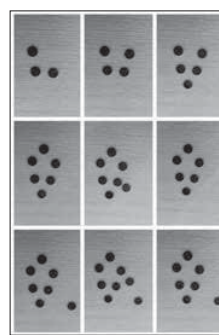


Figure 1. An Introduction to Dynamic Counting.

Rather, it is expected that they base their decision regarding the new total on what the previous total was and the action (adding or removing 1) that was done. Dynamic Counting also seeks to assist students who see the total number of a group as “1, 2, 3, 4, 5”, rather than “5”.

Note that this is not so much about recognising the total quickly (subitising) but instead using the clues to work out what is 1 more, 1 less etc. In fact, it is important for the dealer to go beyond the numbers that the students can recognise immediately (such as 1, 2, 3) to the numbers for which some strategy is needed (such as 6, 7, 8, 9). The students in the group can take turns at being dealer.

Of course, children are ready to make these connections at different stages. However, through having mixed ability groups, the students who are not quite ready to ‘trust the count’ and count dynamically are still hearing the numbers articulated as they see the corresponding total change. In other words, participating in Dynamic Counting can create a valuable foundational experience for students, even if they are not always able to keep track of the total.

Dynamic Counting is also ideal for one on one interactions (such as can be done by parents, or teaching aides) in that the pace can be adjusted and fine-tuned to suit an individual child’s current counting proficiency.

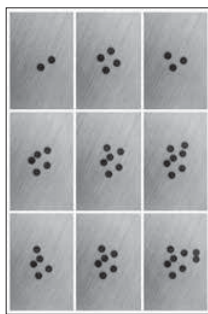


Figure 2. Extending Dynamic Counting to 1 or 2 counters.

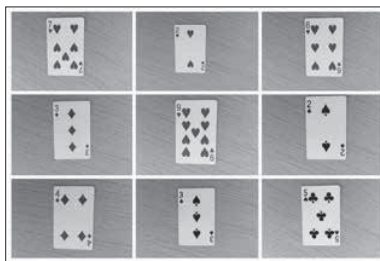


Figure 3. Linking Dynamic Counting to symbolic representation.

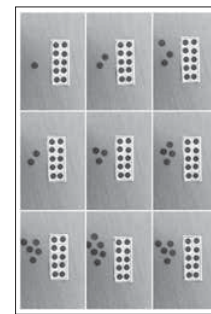


Figure 4. Dynamically counting the teen numbers.

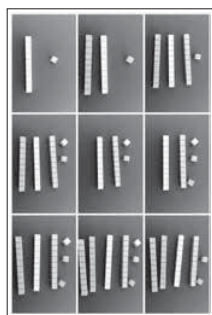


Figure 5. Dynamically counting the numbers between 10 and 100.

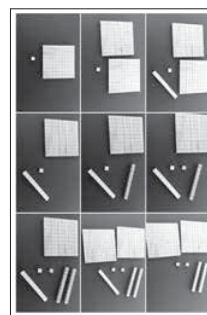


Figure 6. Dynamically counting the numbers between 100 and 1000.

Even in small groups with an adult (or a peer tutor) the group members can take turns at saying the progressive total (rather than saying the total together) in order to better monitor individual learning. In addition, Dynamic Counting can also be done as a whole class activity (e.g., as a number fluency ‘warm-up’ presented on an Electronic Whiteboard) with the class chanting the changing total number of objects together.

Extending Dynamic Counting

Once children are comfortable with the dynamic counting process, it can be extended such that the dealer adds or removes one or two counters, rather than simply one counter. In this more advanced version of Dynamic Counting (see Figure 2), the total number of counters on the table might be, progressively: 2, 4, 3, 5, 6, 7, 5, 6, 8...

Beyond counting objects, the concept of Dynamic Counting can be modified to focus on symbolic number representation. For example, the dealer may choose a pre-determined rule (e.g., one more than, two less than) and then display a sequence of single digits to which students have to apply the rule. For example, if the rule was ‘one less than’, students would chant the following numbers when confronted with the digits displayed in Figure 3: “6, 1, 5, 2, 8, 1, 3, 2, 4”.

This variation has the advantage of connecting the number word with the associated symbols through the same dynamic approach. Additional variations on

how the Dynamic Counting concept can be used when working with older children are outlined below.

Year 1: The dealer places 10 counters on a tens frame (or base 10 ‘long’) on the table. Additional counters are then added and subtracted to dynamically explore the numbers between 11 and 19. For example: 11, 12, 13, 12, 13, 14, 15, 16, 15... (see Figure 4). The purpose of this variant is to offer students the experience that we do not need to recount the 10, nor do we even need to recount the additional ‘ones’, in order to recognise a teen number.

Year 2: The dealer adds or removes either a group of 10 (base 10 long or counter labelled ‘10’) or a single unit to begin to connect the process of Dynamic Counting to flexibly applying place value concepts. For example: 11, 21, 31, 32, 22, 23, 33, 43, 42... (see Figure 5).

Middle primary years: The dealer adds or removes either a group of 100 (e.g., base 10 ‘flats’; counters labelled 100), a group of 10, or a single unit. For example: 101, 201, 211, 111, 121, 122, 132, 232, 222... (see Figure 6).

In our experience, Dynamic Counting is a process which students at all levels find difficult at first, however rapidly improve with exposure and practice. We believe it has great promise for moving young students (e.g., Kindergarten, Foundation, Year 1) on from ‘counting all’, and deepening older students’ (e.g., Year 1 to Year 5) understanding of place value and capacity to work flexibly with multi-digit numbers.