Foundation Phase Numeracy Enriching Encounters at the 2011 AMESA National Congress

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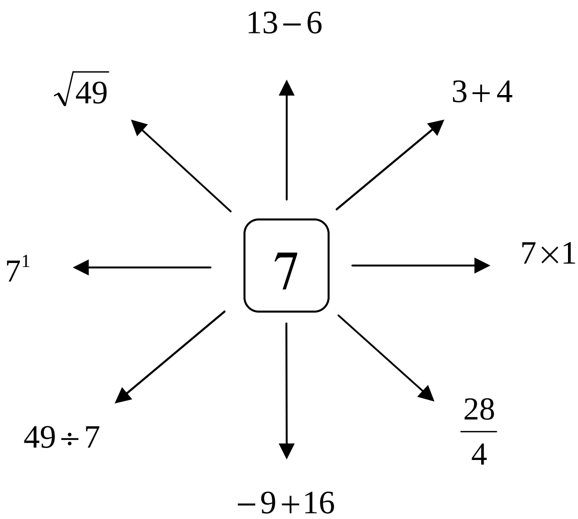
The 2011 AMESA Congress was hosted by the Wits School of Education from 11 to 15 July 2011. In this report I reflect on some of the enriching primary mathematics encounters I experienced as a congress delegate. With my research focusing on primary mathematics, I purposefully attended workshops, *How I Teach* sessions, formal paper presentations and *Maths Market* sessions that specifically targeted Foundation and Intermediate Phase educators. In this paper I report on a selection of these with a view to encouraging primary mathematics educators to attend future provincial and national AMESA conferences.

On the first day of the congress I attended a simple yet insightful presentation by Thandeka Morris on how to use transparent tracing paper to transform and reflect objects. Once learners have chosen a line of symmetry as well as an object to reflect, the sheet of tracing paper is placed over the chosen object such that the edge of the tracing paper lies along the line of symmetry. The object is then traced onto the tracing paper. To reflect the object across the line of symmetry, all the learner now needs to do is flip the tracing paper from one side of the line of symmetry to the other, almost like turning a page of a book.

A joint presentation by Said Sima and Femi Otulaja focused on the learner-centred, fun-filled and activity-based concept of *flavouring mathematics*. The presenters argued for multiple ways of presenting numbers as a means of teasing out the "behaviour" of a number as well as the basic mathematical operations that can be used with that number. In our group we chose the number 7, and this is how we presented it:



For mathematics classroom activities, teachers can let students choose any number and allow them to investigate various ways of representing that number. In the process of such an investigation learners will explore the characteristics of their chosen number as well as how different mathematical operations could be applied to that number.

On the second day of the congress I attended Ingrid Sapire's presentation on how to reflect on learner mathematical misconceptions or errors about place value. The workshop's group activities focused on the 2006 Grade 3-9 International Competitions and Assessments for Schools (ICAS) multiple choice items. In our group we chose the following Grade 5 question:

> Ian wrote down an even number. His number was between 5 100 and 5 500. Which of these could be Ian's number?
>
> (A) 5 022 (B) 5 223 (C) 5 390 (D) 5 540

In the group discussion we investigated ways of thinking that learners might have used to arrive at the correct answer or to make an incorrect choice. Ingrid encouraged us to give possible reasons for the learners' errors/misconceptions, and these she called 'distractors'. In the above question a learner's inability to distinguish between even and odd numbers could lead to the learner incorrectly choosing B. The other distractors could be a learner's lack of knowledge on number ranges which could lead to the learner selecting either A or D. Ingrid highlighted that the most important aspect of learner error analysis is that it provides teachers with essential information on central mathematical issues which need to be considered when teaching numbers.

I was also part of a well attended workshop by Shanba Govender on how to make multiplication memorable. The presenter, who is a Foundation Phase educator, discussed various techniques for teaching multiplication. Of particular interest to me was her discussion of the 9 times table pattern (as exemplified below) in which the two digits of the product always add up to 9:

$$\begin{aligned} 9\times 2 = 18 &\rightarrow 1+8=9 \\ 9\times 3 = 27 &\rightarrow 2+7=9 \\ 9\times 4 = 36 &\rightarrow 3+6=9 \\ 9\times 5 = 45 &\rightarrow 4+5=9 \end{aligned}$$

Although this particular pattern only holds up to 9×10, there are many other patterns to discover in the table. One could also extend the idea by investigating similar tables from 9×11 upwards.

Number patterns were also the focus of Valerie Ramsingh's presentation which targeted Foundation Phase educators. Valerie encouraged teachers to use the 1 – 100 number board/chart in their classes to encourage learners to investigate number patterns in the grid. The workshop had number pattern activities in which teachers could complete missing number patterns, make their own patterns, and answer questions about ball stack patterns (such as the one shown below). This workshop's activities were meant to stimulate number patterns activities for elementary numeracy classes.

Jacques du Plessis, Hamsa Venkat and Corin Matthews presented a workshop on number patterns that specifically focused on using number patterns to support algebraic reasoning skills. Different types of patterns were presented, a selection of which are shown below:

ΔOΔOΔOΔOΔOΔOΔOΔOΔOΔO…

2 ; 4 ; 6 ; 8 ; 10 ; 12 ; 14 ; 16 ; …

2 ; 4 ; 8 ; 16 ; 32 ; 64 ; …

1 ; 2 ; 3 ; 1 ; 2 ; 3 ; 1 ; 2 ; 3 ; 1 ; 2 ; 3 ; …

Rather than presenting Foundation Phase learners with infinite patterns, i.e. patterns that continue without a specified end point, the presenters encouraged teachers to expose learners to *contained* or *restricted* number patterns. The rationale behind this advice is that infinite patterns could potentially be problematic for primary school learners who might struggle with the idea of an unending sequence of numbers and thus not know when to stop the number pattern.

Infinite number pattern: 2 ; 5 ; 8 ; 11 ; …

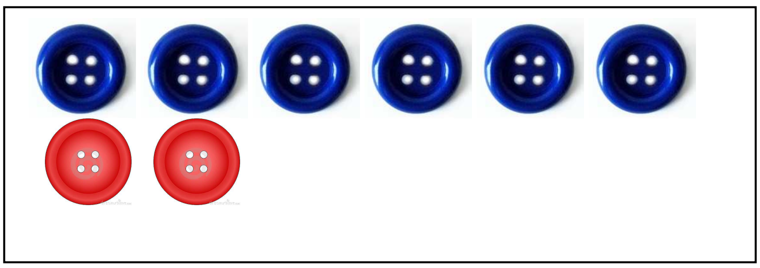
Restricted number pattern: 2 ; 5 ; 8 ; 11 ; _ ; _ ; _ ; _ ; 26

I also attended a Foundation Phase *Special Interest Group* meeting which was chaired by Shanba Govender. Part of the discussion centred on CAPS as being a "repackaged" rather than "new" curriculum. In the CAPS Foundation Phase Mathematics document there is now detailed specification of content per grade, with explicit topic sequencing, pacing, timing, and assessment guidelines within and across grades. Notable changes in the Foundation Phase are the introduction of new 2-dimensional shapes and 3-dimensional objects. In addition, Grade 1 learners are now expected to count from 0 to 50 and not only from 1 to 34 as in the previous curriculum document. Educators who attended this session expressed satisfaction with the specification of content in the CAPS documents and were eagerly awaiting its implementation.

On the final day of the congress I attended a workshop hosted by Theresa Colliton. What captivated my attention in this presentation was the use of buttons for the addition and subtraction of integers. While the use of a number line as a didactical approach to teaching the addition and subtraction of integers is of course a very good one, there are other models that can also be used. The use of buttons or counters is one such model, and what follows is a slight adaptation of what Theresa presented in her workshop.

In this counter or button model, blue buttons are used to represent *positive* numbers while red buttons are used for *negative* numbers. Using these two different colours of buttons we could symbolically carry out the sum $+6+(-2)$ as follows:

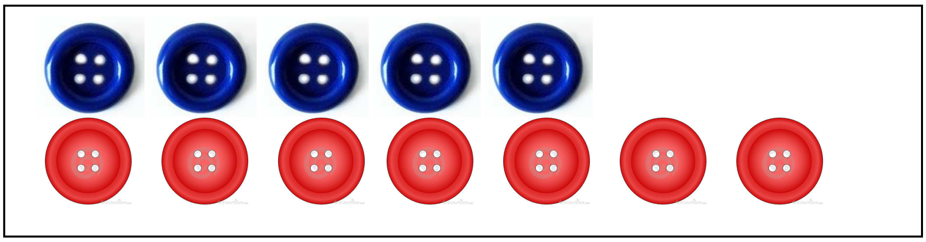
> Place 6 blue buttons (representing $+6$) in a box. Then add 2 red buttons to the box (representing the addition of -2). The box now contains 6 blue buttons and 2 red buttons. Since a blue button and a red button cancel each other out, we can cancel 2 of the blue buttons with the 2 red buttons, leaving a total of 4 blue buttons in the box. The answer to the sum is thus $+4$.



A critical aspect of this model is first to establish with learners that since a blue button represents $+1$ and a red button represents -1, a blue button and a red button together give a total of 0 since $+1-1=0$. Thus, a blue button and a red button effectively cancel each other out.

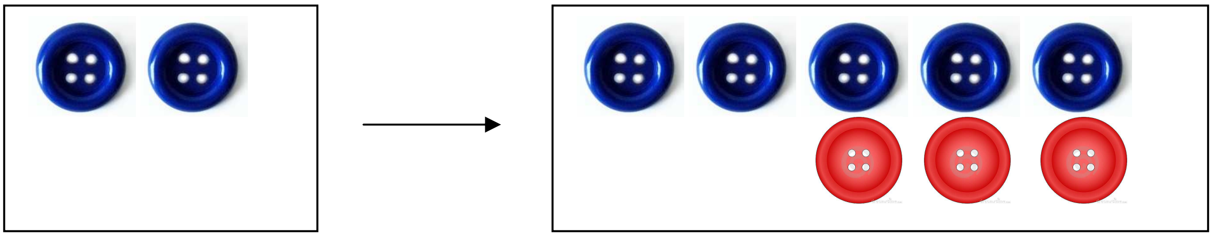
To determine the sum $+5+(-7)$, we proceed as follows:

> Place 5 blue buttons (representing $+5$) in the box. Then add 7 red buttons to the box (representing the addition of -7). The box now contains 5 blue buttons and 7 red buttons. Since a blue button and a red button cancel each other out, we can cancel the 5 blue buttons with 5 of the red buttons, leaving a total of 2 red buttons in the box. The answer to the sum is thus -2.



This model can be extended to perform more complex operations such as the subtraction of a negative integer from a positive integer. By way of example, consider the sum $+2-(-3)$.

> We begin by placing 2 blue buttons in the box (representing $+2$). The problem now is that there are no red buttons in the box for us to subtract. We can correct for this by adding 3 pairs of buttons where each pair contains 1 blue and 1 red button. Using this technique we are able to manipulate the *contents* of the box without actually changing the *numerical value* of the box. We are then able to subtract three red buttons from the box leaving a final answer of $+5$.



During the course of the congress I also attended several Maths Market sessions. Maths Market sessions are workshops/sessions provided by presenters who connect their presentation to commercial products. I have not elaborated on these in this article, but thoroughly enjoyed the sessions and recommend them to primary mathematics classroom practitioners.

At the closing ceremony of the congress, Stephen Sproule expressed satisfaction with the increase in attendance by Foundation Phase mathematics educators and looked forward to seeing more presenters from the Foundation Phase at future conferences.

The 17th AMESA National Congress had captivating and informative workshops packed with hands-on activities. Based on these experiences I thoroughly recommend all primary mathematics teachers to become AMESA members (if they have not already done so) and encourage them to attend both provincial and national AMESA conferences. On this note I hope to meet many new faces in 2012 at the 18th AMESA National Congress which will be hosted in the North West province town of Potchefstroom.

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