Title: Numicon – a multi-sensory approach to teaching mathematics

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Target Audience: Workshop is aimed at Foundation Phase teachers

Motivation for the workshop:
Numicon is a tried-and-tested Foundation Phase teaching approach and based on 16 years of research. Numicon offers the solution to the difficulties that children experience in mathematics. This approach could support the increasing of the Numeracy levels in our country.
Numicon is a multi-sensory approach to teaching maths. Seeing pattern in our number system is a vital part of mathematical thinking. The Numicon approach is designed to play a strong sense of pattern that is present in all children.
Through a combination of structural apparatus, such as shapes and objects, it creates an enjoyable and interactive mathematical environment. Supported by a programme of largely practical classroom activities, the Numicon approach is helping children understand the fundamental mathematical ideas and concepts. At the same time it is transforming their understanding of number and number relationships.
"Students, too, appear to enjoy using Numicon, a happy by-product of which is increased engagement in maths. The Project Report described how "Teachers found very quickly that Numicon began to take over, the children wanted to continue their learning and explore Numicon further at wet play-time, and were more confident and engaged..." (Article from an Australian Magazine: Education Today)
Children love the Numicon approach, their enthusiasm and increased confidence allows them to persevere. This leeds to a deeper understanding of the mathematical concepts and raise their achievement.
Teachers benefit from the detailed guidance available with the Numicon Kits and a wealth of free additional online support and resources.
The full Challenges for Australian Education: Results from PISA 2009 report (Thomson, De Bortoli, Nicholas, Hillman & Buckley, 2010) concluded that "An important aspect of mathematical literacy is engagement with mathematics: using and doing mathematics in a variety of situations," and Numicon certainly offers schools an opportunity to do just that. As Julie Baillie explains: "Numicon provides a multi-sensory primary maths teaching program that engages learners with its visual, auditory and kinaesthetic approach. "Out of the 20,000 primary schools in the UK, 6,000 are now using Numicon. (Article from an Australian Magazine: Education Today)

Numicon is fully aligned to the principles of NCS as it encourages children and teachers to work together, in a small group, whole class and individually. It promotes tolerance and understanding amongst learners and creates space for the learners to think creatively and to strive for excellence.

Numicon support 'Every Child Counts' but it is applicable to any learners aged over 4 years. It also works well with children suffering from epilepsy and Down syndrome. It works well for home schooling as well as intervention and in remedial programs.

Description of the content of workshop:
This will be an interactive hands-on workshop where the teachers will be interacting with the Numicon shapes and objects, doing calculations and solving problems. In group discussion there will be the opportunity to share best classroom practice.

1. Challenges and Key factors on teaching Mathematics
   - Ability to sequence
   - Working memory/auditory visual
   - Processing
   - Language Skills
   - Motor Skills
   - Attitude
   - Teaching approach

   What are the challenges in the classroom for teaching Mathematics?
   - Maths use familiar words in an unfamiliar context
   - Numbers are abstract ideas…..all we can show children are representations of numbers
   - Numerals are arbitrary symbols

2. Counting or calculating
   - What is counting? Counting experience forms an essential part of children's developing understanding of numbers, but it is by no means the best foundation for their calculating. Counting collection is important bus does not show number relations.
   - What is calculating? Calculating is used to answer 'how many?' question without counting. Adding is what we do instead of counting. Multiplying is what we do instead of adding. Complex ideas can appear deceptively simple
   - Teaching calculating through counting can be open to error, does not support relational understanding and can lead to misconceptions.
   - Counting and place value

3. Pattern at the heart of mathematical thinking. Seeing a pattern is at the heart of mathematical thinking. When you see a pattern, you are able to predict. When you can predict in life, you stay alive. The power of mathematics lies in its ability to predict. We call seeing a patterns 'generalising'. Generalising in mathematics is called 'algebra'.

Encouraging children to make connections -structured imagery help learners to connect their different mathematical experiences within mathematics itself, and between everyday mathematical experiences and 'classroom' learning. Pattern: children's strengths. Daily counting and regular work on patters is important. Patterns are all around us. Copying and making patterns, using beads, pegs and other objects. We use patterns in PE, music, art which is part of the Life Skills curriculum.

We use pattern in reciting numbers, counting songs and rhymes, counting one-to-one objects, pictures, children etc. Using the Numicon patterns is preparing for place value. Practical calculating with Numicon Shapes, focus on action and language.

Using pattern to find out 'How many without counting' using pattern to begin to calculate.

Calculating with whole number rather than relying on counting. Support daily counting with number lines.

4. How to develop calculation strategies: to be able to calculate learners need to understand the structure of arithmetic operation and where they occur, recall key number facts instantly and develop efficient calculating strategies. Develop calculation strategies by connecting pattern, place value and calculating and understanding use of +/- = symbols. Also the importance of recognising pattern when 10 is added/subtracted and understanding which digit changes when 10 is added/subtracted. Learners need to be able to add/subtract 10 to/from any 2-digit number. Arithmetic symbols can by introduced with active learning with Shapes, language, sign and symbol. It is important that learners can spot symbols in the environment through spoken language, reading the words, action for sign, using an applying. Using practical activities e.g. multiples of 10, rounding, using addition facts of 10 to reach the

next tens number and using number facts to develop bridging strategies Teaching subtraction as a difference between two numbers within the same decade and two numbers in different decades.
Introducing multiplication by teaching the language of multiplication. Multiplication introduced as '4 times a 3' but can also read as '3 multiplied by 4'. Division is introduced as the inverse of multiplication – how many in.
Conclusion: The rationale for using Numicon in the classroom

- Quality first learning
- Progressive
- Inclusive
- Children are supported to
    - Understand number relationships
    - Do calculating without counting
    - Learn mathematical language in context
    - Make connections to use and apply their understanding and
    - Apply their understanding

How to create a number rich environment with Numicon

- Supports learning and teaching
- Shows the relevance of mathematics
- Supports the development of children's concept image
- Helps children to make connections

Wrap Up: How Numicon can support CAPS
Mathematics has 5 main content areas:

- Numbers, Operations and Relationships (65% - 58%)
- Patterns, Function and Algebra (10%)
- Space and Shape (Geometry) (11% - 13%)
- Measurement (9% - 14%)
- Data Handling (Statsitics) (5%)

Numicon can be used with success in all the content areas.
Numicon can also be used in whole class and ability group teaching.
Numicion works very effective for children learning through English as their LOLT.

Programme of activities:

Introduction: Maths in everyday life	(5 min)
Activity 1: Challenges of teaching Mathematics in the classroom (group discussion)	(15 min)
Activity 2: Counting or calculating?	(15 min)
Activity 3: Pattern at the heart of mathematical thinking	(15 min)
Activity 4: Develop calculation strategies	(20 min)
Conclusion: The rationale for using Numicon in the classroom	(10 min)
Wrap Up and Questions	(10 min)