Aims

- To gain a greater understanding of some of the challenges inherent in maths
- To see how working with Numicon can help children and their teachers through the use of visual imagery and practical work
- To give teachers the knowledge and confidence to use Numicon within their everyday teaching
- To understand how the use of ongoing assessment using Numicon can help to remove gaps in children's mathematical understanding

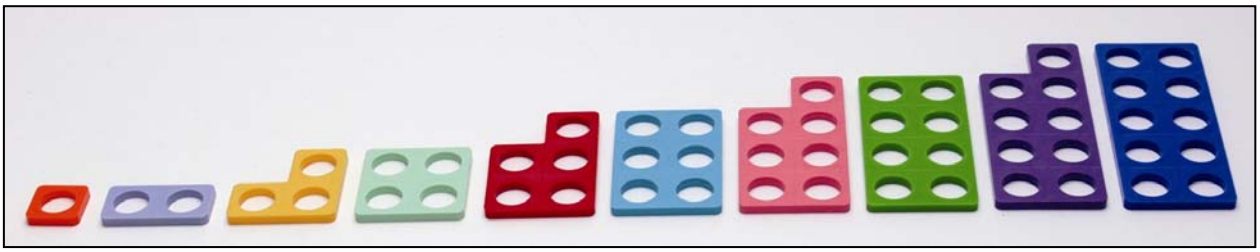
Key factors influencing mathematics learning

- Ability to sequence
- Working memory/auditory, visual
- Processing
- Language skills
- Motor skills
- Attitude – is maths seen as relevant?
- Teaching approach

Some challenges in mathematics

- Maths uses familiar words in an unfamiliar context
- Numbers are abstract ideas… all we can show children are number representations
- Numerals are arbitrary symbols… 1 2 3 4 5 6 7 8 9 10

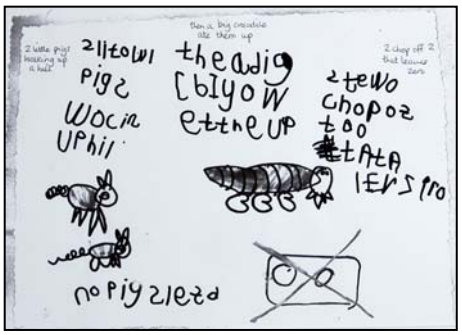
Numicon provides structured number representations



Seeing a pattern is at the heart of mathematical thinking

Effective teachers of numeracy help children to make connections

Numicon structured imagery can help children to connect their different mathematical experiences both within maths itself and between everyday mathematical experiences and classroom learning.



Rationale for using Numicon

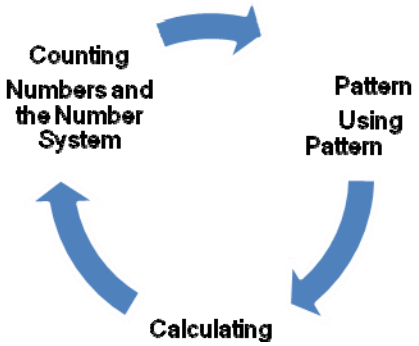
- Quality first learning
- Inclusive
- Progressive
- Children can understand number relationships
- Children do calculating without counting
- Children learn mathematical language
- Children learn to make connections to use and apply their understanding

Numicon is a progressive teaching programme

All activities focus on language with action and also on making connections to establish a fundamental understanding of number.

All Numicon Kits cover these 3 areas:

Firm Foundations Kit – EYFS
Closing the Gap – NC P level 4 to NC level 1c
Kit 1 – progression through KS1 Primary Maths Strategy
Kit 2 – progression through KS1 Primary Maths Strategy
Investigations with Numicon - mathematical challenges for KS2



The Numicon website has links to show EYFS and P levels and the strategy objectives for each of the Numicon activities.

Exploring and making connections

Numicon provides a structure for children to explore and make connections within a number rich environment. The teaching guides give examples of lots of practical experiences with Numicon in sand, water, dough, and so on. The activity cards in **Firm Foundations** have activities which help children to make these vital connections.

Importance of mathematical language

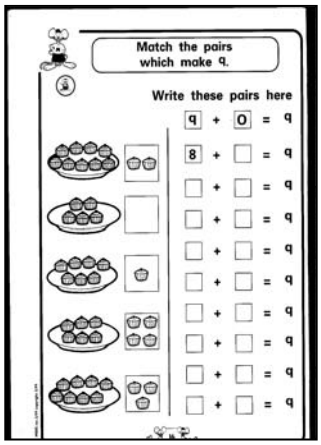
The development of children's language is ongoing throughout all activities because mathematical language and the way it is used e.g. familiar words used in an unfamiliar context, switching between using numbers as adjectives and nouns, can present children with problems. Language is signalled on each Activity card.

Firm Foundations for all learners in the Early Years

- Ordering Numicon Shapes, giving them number names and attaching numerals
- Grouping objects into Numicon patterns without counting
- Combining Numicon in addition
- Comparing Numicon Shapes in subtraction
- Confidently using the language of addition and subtraction

In Key Stage 1, Kit 1 and Kit 2 provide the foundation for all later work in KS2

- Introducing symbols for arithmetic notation and mental arithmetic strategies
- Place value
- Equivalence
- Addition and Subtraction with numbers to 100
- Multiplication & Division
- Beginning fractions



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.

What is calculating?

- Calculating is used to answer 'how many?' questions without counting
- Adding is what we do instead of counting, multiplying is what we do instead of adding
- Beware! complex ideas can appear deceptively simple

2 + 1 = 3

Key ideas addressed in Kit 1 are often where the roots of difficulties lie for older children

- Remembering the count sequence
- Creating patterns and sequencing
- Recall of addition and subtraction facts of numbers up to 10 – reliance on counting as main strategy
- Equivalence
- Place value
- Understanding symbols

Addition

- Children can calculate using Numicon, without relying on counting
- Use Feely Bag, 2 sets of Numicon Shapes 1-10, Numeral cards 1-10

Equivalence

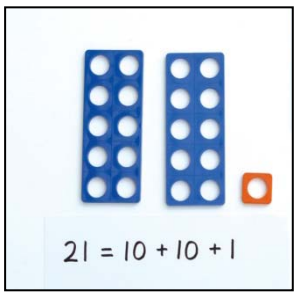
- Children learn that = means a balance – not just where to put the answer!
- Use Pan balance, 2 sets of Numeral Shapes 1-10, word cards

Subtraction

- Taught first as "take away"
- Children learn to use the action for the sign before needing to write the symbol
- Use 1 set of Numicon Shapes 1-10, spi nners, dice and can also use subtraction covers

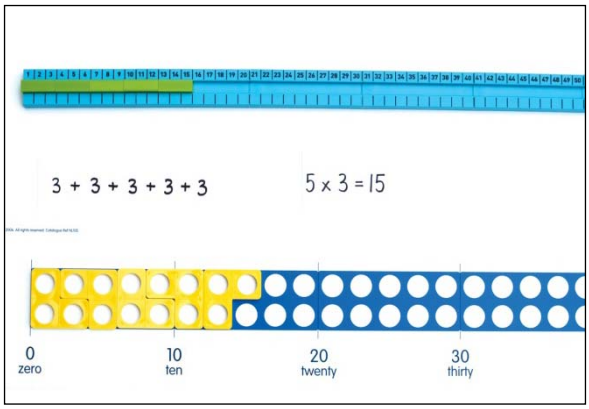
Place Value

- Numicon is useful for grouping and also for place value notation
- Practical - put Shapes in order 1-10, make 19 then put numeral cards underneath. Change to 15 – which digit changes as the Shape changes? Then build 25 - which digit needs to change this time?
- Variety of number lines can be used to find the number each time
- Calculating without counting – wrapping paper practical
- Using number lines and tracks to show relationship between the 1-100 number line and 1-100 number square



Multiplication

- Introduced through language, action and sign
- Use Numicon Shapes and number rods to show commutative properties
- The word "product" or the idea of finding an answer is not discussed until children fully understand the action of finding "lots of"
- Division is introduced as the inverse of multiplication



Key Stage 2 - all work extends ideas already met in KS1

- Look at multiplication and division in Kit 2 for work on factors, primes, square numbers
- Place value – work with higher numbers
- Addition and subtraction working with higher numbers and towards written calculation

Investigations with Numicon

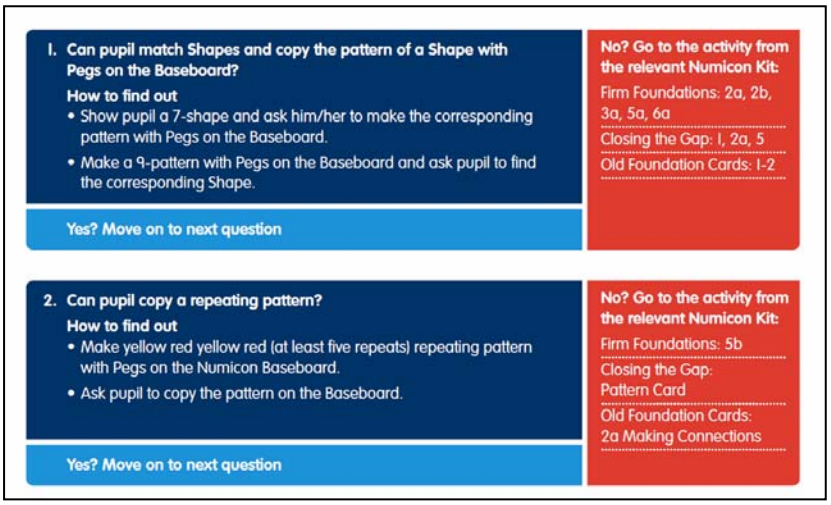
- Three in a bag - If I only have three shapes in the feely bag, what is the smallest number they could make? How about the largest? Can all totals between 3 and 30 be made with only three shapes?
- Sum and product - There are four numbers. Their sum is 10. Largest minus the smallest = 2. Product of the smallest times largest is odd. Is this set possible? Provide proof for your answer.

Who might be struggling in maths?

- Pupils having difficulty in acquiring mathematical competencies
- Pupils having difficulty in accessing mathematical teaching and learning
- Social, emotional and behavioural difficulties affecting pupil's approaches to learning
- Pupils who have missed periods of schooling, previous ineffective teaching, specific gaps in understanding, EAL

Assessing children's understanding

- Avoid labels
- Profile children using Assessment Signposts & Records of Progress
- Nothing has gone wrong when children find something difficult; it is a sign that they are learning something important
- Children need support and encouragement while they find something difficult, not immediate flight into something else that is easy



1. Can pupil match Shapes and copy the pattern of a Shape with Pegs on the Baseboard?

How to find out

- Show pupil a 7-shape and ask him/her to make the corresponding pattern with Pegs on the Baseboard.
- Make a 9-pattern with Pegs on the Baseboard and ask pupil to find the corresponding Shape.

Yes? Move on to next question

No? Go to the activity from the relevant Numicon Kit:

Firm Foundations: 2a, 2b, 3a, 5a, 6a

Closing the Gap: 1, 2a, 5

Old Foundation Cards: 1-2

2. Can pupil copy a repeating pattern?

How to find out

- Make yellow red yellow red (at least five repeats) repeating pattern with Pegs on the Numicon Baseboard.
- Ask pupil to copy the pattern on the Baseboard.

Yes? Move on to next question

No? Go to the activity from the relevant Numicon Kit:

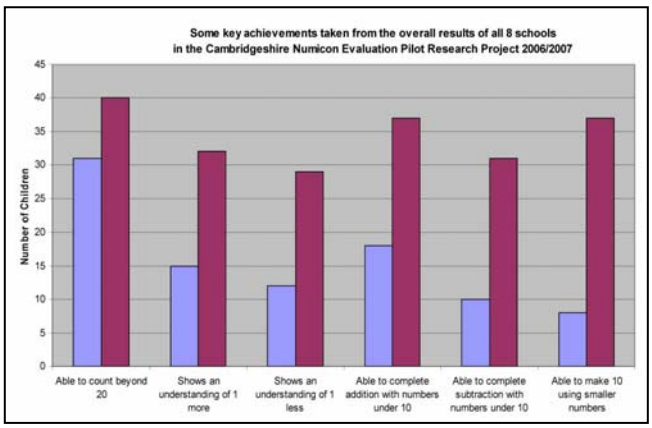
Firm Foundations: 5b

Closing the Gap: Pattern Card

Old Foundation Cards: 2a Making Connections

For Numicon to make a real difference to children's mathematical development, it needs to be part of the bank of resources available on a daily basis – not just something that comes out of the cupboard on special occasions or for those who are struggling.

Numicon is most successful where children use it not only in intervention strategies but when everyone uses it within whole class lessons.



In this multi-sensory approach we see raised achievement and a striking *confidence* in children's knowledge, skills and understanding!