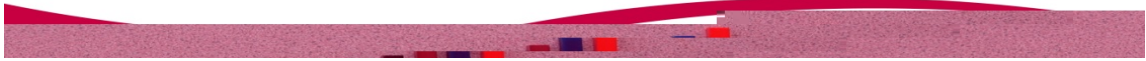




**Doncaster**  
Metropolitan Borough Council



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## Acknowledgements and thanks to:

Hexthorpe Primary School

Joanne Lowndes

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Judith Astwood

D Page

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Ann Davies

Stainforth Kirton Lane Primary School

Yvonne Chesters

Audrey Wall

Town Field Primary School

Margaret Murphy

Magdalene Rech

Windhill Primary School

Lynda Booth

Veronica Riley

# LA Continuation Mathematics Case Study

## Multi-sensory Approaches to Mathematics for Wave 3 Intervention

### Inspiration

Schools, who participated in a case study to explore the potential of national mathematics materials for wave 3 intervention, were keen to build on their developing expertise. This continuation case study was initiated to provide opportunity to focus in-depth, on the multi-sensory approach to teaching mathematics, promoted in 'Supporting children with gaps in their mathematical understanding'.

### Purpose

- To gather information on effective multi-sensory approaches to mathematics for pupils requiring wave 3 intervention to raise their attainment. This will include exploring the potential of Numicon materials as a model of numbers and arithmetic for these pupils.
- To disseminate findings across all relevant LA schools and settings.
- To provide network support for LA schools and settings with establishing multi-sensory approaches to mathematics for wave 3 intervention.

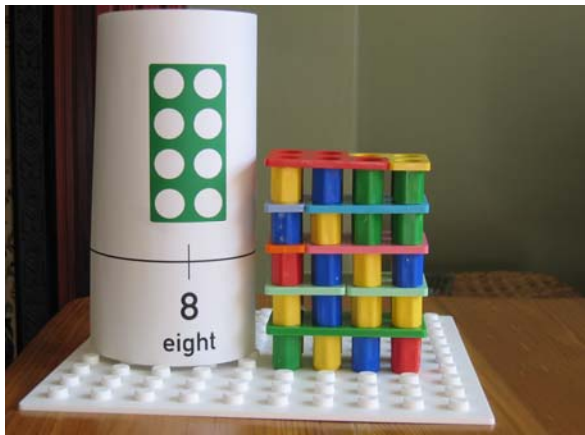
### Intended outcome

Evidence of increase in attainment and achievement of six identified pupils/students who\*:

- are currently working at least one level below age related expectations;
- have significant difficulties with mathematics.

### Time line

November 2006 – Spring/Summer 2008



## Details

### 1. Schools committed to:

- designate a person to lead and manage the case study in school and be a point of contact with the LA
- use multi-sensory approaches to mathematics with 6 or more identified children / young people not necessarily from the same cohort who meet the criteria above\*
- attend network meetings
- monitor and evaluate the implementation and effect of multi-sensory approaches to mathematics for the identified pupils / students requiring wave 3 intervention including tracking pupil progress (e.g. numeric and curricular information in summer 2006; 'mid year' assessment 2007; summer 2007; 'mid year' 2008; summer 2008)
- accept a LA officer in a monitoring and evaluating capacity
- complete written work
- assist dissemination of effective multi-sensory approaches to mathematics for pupils requiring wave 3 intervention

### 2. The LA Wave 3 Strategic Group committed to support case study schools to pilot multi-sensory approaches to mathematics for pupils requiring wave 3 intervention. It:

- provided training to launch the case study
- hosted and funded termly network meetings, beginning November 2006
- provided Numicon materials
- made monitoring visits to participants
- collated and is disseminating findings from the case study

### 3. Multi-sensory approaches to mathematics involved learning experiences that are:

- kinaesthetic / tactile
- visual
- oral ) teacher and children 'telling the story' / 'giving a running commentary'
- aural ) of their practical work

Models and images of mathematics were a common feature of lessons. The potential of Numicon materials as a model of numbers and arithmetic were explored to complement, build on and extend other models and images of number and arithmetic. Children were helped to make connections between Numicon and other models and images that they use. Where appropriate, children were supported to refine their recording following a carefully structured progression.



## Findings / evaluation

- Numicon equipment provides a unique and important structured imagery of the size of numbers and arithmetic processes
- Children made progress in mathematical knowledge, skills and understanding
- Strong evidence of children's increased confidence, willingness to 'have a go' and persistence
- Improved enjoyment in mathematics
- Using Numicon equipment and the teaching approach with whole class where appropriate, enhances the effectiveness of use in wave 3 intervention sessions
- Numicon equipment and the teaching approach have relevance for all children and all waves (1, 2 and 3)

## Dissemination

During summer 2008, case study schools wrote examples of effective multi-sensory learning activities for mathematics for pupils requiring wave 3 intervention based on their experiences, for distribution to all LA schools and settings. This written work forms part of this document. Participating staff attended a drop-in session, which provided opportunity for LA staff to talk with classroom practitioners about their experiences, and they are available to contribute to other methods of dissemination. Jane Lockwood, case study leader, is disseminating information to mathematics subject leaders and inclusion managers / SENCos at their respective network meetings.



## Looking ahead

- Case study schools strengthen the connections they make between Numicon and other mathematical models, and broaden and deepen their multi-sensory teaching for all children.
- Include a strong focus on taking a multi-sensory approach to mathematics for lower attaining and lower achieving pupils in professional learning within the LA.
- Heighten awareness of the range of mathematical models available and enhance skills in selecting them appropriately and using them effectively in a multi-sensory way with all children.
- Where appropriate, make links with LA participation in 'Every Child Counts' initiative.
- Primary mathematics and inclusion consultants continue to work together in supporting schools with enhancing their mathematics provision for lower attaining and lower achieving pupils.

Julie Day, Senior Inclusion Consultant

Jane Lockwood, Primary Mathematics Consultant (LA employee / freelance) Autumn 2008

## Children's comments

As part of monitoring, evaluating and celebrating a summer mathematics fun afternoon was held at Carr House Centre. Participating children were given the opportunity to express their opinions about Numicon at this event, and in their school context. Here are some of their comments.

Numicon is good and it is all bright colours.

It's good. It's fun. I put them in a line to draw and count.

I like putting them back in order.

Odd numbers have got chimneys.

Even numbers have all got a friend next to them.

You count numbers with Numicon. It is really good.

It helps me do time. We sort them in to the right order.

I like building hotels and houses with Numicon.

It is so good Numicon.

It's really good to make number bonds. It's really different. It makes counting easier.

It's nice to play with. It makes learning about sums easier.

I like the way you get to add numbers together.

It has helped me doing different ways of adding.

I like where Mrs. Lowndes thinks of a number and we ask question to guess the number.

It helps me.

I love Numicon. Where do you buy it from? I want some for home.



# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Hexthorpe Primary

Date: 11.06.08

Headteacher: Cath Lawson

Lead person: Joanne Lowndes

Written by: Joanne Lowndes

<p>Mathematics focus</p> <p>Number bonds up to 10 and 20</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work <input checked="" type="checkbox"/></p> <p>Individual work</p>
<p>Objectives</p> <p>Knowing and using number facts</p> <p>Y2 Derive and recall all addition and subtraction facts for each number to at least 10</p> <p>Y3 Derive and recall all addition and subtraction facts for each number to at least 20</p> <p>Extensions</p> <p>Add more than two numbers</p> <p>Understand halving is the inverse of doubling</p>	
<p>Resources</p> <p>Numicon shapes</p> <p>Number rods</p> <p>Digit cards 0 – 9, 0 - 20</p>	
<p>Activity</p> <p><u>Warm up</u></p> <p>Line up Numicon shapes 1 – 10</p> <p>Play 'Identify the missing shape'. (One child removes a Numicon shape and the other says what it is.)</p> <p><u>Number bond activities</u></p> <p>Make the 'number bond sandwich'. (Pile pairs on top of a 10 Numicon shape – 10, 1&amp;9, 2&amp;8, 3&amp;7, 4&amp;6, 5&amp;5, 10)</p> <p>In pairs, one child holds up a Numicon shape and the other finds its partner to total 10, e.g. 6 and 4. Match with digit cards and say the number sentence.</p> <p><u>The activity can be carried out:</u></p> <ul style="list-style-type: none"> <li>- using any number up to 10;</li> <li>- using number rods alongside or instead of Numicon shapes;</li> <li>- making a teens number or 20, e.g. 9 and 11;</li> <li>- using three Numicon shapes, e.g. 3 and 2 and 4 for making 9;</li> <li>- using double facts to extend addition facts to 10 or 20, e.g. using <math>3 + 3 = 6</math> to change <math>6 + 4 = 10</math> into <math>3 + 3 + 4 = 10</math>.</li> </ul>	

Multi-sensory features

Kinaesthetic – fitting Numicon shapes (or number rods) together and matching to illustrate they are equivalent to the total, as a single shape (or rod)

Visual – seeing the total made up of one of more Numicon shapes (or number rods)

Oral/aural – describing and hearing related number sentences while looking at / holding the Numicon shapes (or rods)

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Know number bonds up to and including 10 for fast recall

Use number bonds to 10 to find number bonds to 20

Use known double facts to extend addition facts to make 10 / 20

Other

Using previously learned number bonds and working with Numicon shapes, children show increased confidence and perseverance in attempting more ambitious addition sums. the equipment gives them security that they will find the correct answer.



# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Hexthorpe Primary  
 Headteacher: Cath Lawson  
 Written by: Joanne Lowndes

Date: 11.06.08  
 Lead person: Joanne Lowndes

<p>Mathematics focus</p> <p>Number patterns</p> <p>Recognise odd and even numbers</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work <input checked="" type="checkbox"/></p> <p>Individual work</p>
<p>Objectives</p> <p>Using and applying mathematics</p> <p>Y2 Describe patterns and relationships involving numbers.</p> <p>Counting and understanding number</p> <p>Y2 Describe and extend number sequences, recognise odd and even numbers.</p>	
<p>Resources</p> <p>Numicon shapes</p> <p>Digit cards</p> <p>Whiteboards and pens</p>	
<p>Activity</p> <p><u>Warm up</u></p> <p>A group of children sort Numicon shapes by any criteria – colour, size, personal preference</p> <p>Questions:</p> <p>What do you notice about the shapes of the Numicon?</p> <p>Can you put them into two groups?</p> <p>For sorting into odd and even, notice pieces in one group have one ‘sticking up’. Introduce the idea of a ‘chimney’.</p> <p>Tease out these shapes have one piece left over, ... an ‘odd’ piece.</p> <p><u>Main activity</u></p> <p>Line up Numicon shapes 1 – 10 into a number line.</p> <p>Push out the ‘odd’ pieces.</p> <p>Investigate: even + even; odd + odd; even + odd; and odd + even.</p> <p>Share and discuss findings.</p> <p>Put rules into practice – would <math>4 + 4</math> be odd or even? How do you know?</p>	
<p>Multi-sensory features</p>	

Kinaesthetic – fitting the Numicon shapes together like a jigsaw to investigate adding odd and even numbers

Visual – odd have 'chimneys', even go straight across the top; seeing odd + odd = even etc

Oral/aural – describing findings alongside demonstrating examples

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

See a pattern of numbers that look similar, e.g. the shape identifies them as a group

Know rules of addition that will eliminate incorrect answers, e.g.  $E + E = E$  so  $4 + 4$  cannot be odd

Use rules to have a sensible, more confident attempt at simple mental addition of two numbers

Other

Seeing the pattern of numbers visually was a breakthrough for some children, who had reached Year 3 and not understood odd numbers

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Hexthorpe Primary  
 Headteacher: Cath Lawson  
 Written by: Joanne Lowndes

Date: 11.06.08  
 Lead person: Joanne Lowndes

<p>Mathematics focus</p> <p>Place value</p> <p>Two digit numbers</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work <input checked="" type="checkbox"/></p> <p>Individual work</p>
<p>Objectives</p> <p>Counting and understanding number</p> <p>Y2 Read and write 2-digit numbers in figures and words</p>	
<p>Resources</p> <p>1 and 2-digit number cards</p> <p>Whiteboards, pens, rubbers</p> <p>Numicon shapes</p> <p>Numicon number line</p> <p>Number rods</p> <p>Number rod track</p>	
<p>Activity</p> <p><u>Warm up</u></p> <p>Think of a number – The teacher chooses a secret shape. Children ask questions to eliminate Numicon shapes and guess the secret/correct shape. They can use a line of Numicon shapes and eliminate them as numbers are discounted. Questions to ask might be:</p> <p>Is it odd or even?</p> <p>Is it fewer than 5?</p> <p>Is it greater than 6?</p> <p>Is it in the three times table?</p> <p><u>Main activity</u></p> <p>One child picks a number card from the pack and reads the number.</p> <p>The other children make that number using Numicon shapes on the number line (or number rods on the rod track).</p> <p>Discuss the shapes or rods used to make the number, including talking about tens and units.</p> <p>Record the number in symbols on whiteboards.</p> <p>Say /write what we know about the number, e.g. for 43, 4 tens and 3 units; fewer than 50; odd.</p>	

Multi-sensory features

Kinaesthetic – making a number with Numicon shapes or rods develops a feel for the size of the number

Visual – seeing a number represented with Numicon shapes or number rods supports the creation of an image of the size of the number

Oral / aural – saying / hearing the number name and describing it in terms of tens and units provides a stepping stone to partitioning 2-digit number mentally

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Develop an image of the size of a 2-digit number

Match a 2-digit number card to Numicon shapes

Read 2-digit numbers

Partition a 2-digit number into tens and units

Explore properties of 2-digit numbers

Other

The children extended this relatively straightforward task to find out more about numbers. Gaining a feel for the size of a number was valuable to them and increased their confidence to calculate mentally; they know for example that  $34 + 17$  will probably be nearer to 50 than 100 because  $30 + 10 = 40$  and there is just the units to add on.

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Mexborough Montagu Junior School      Date: 11/06/08  
 Headteacher: J C Scatchard      Lead person: D Page / J Astwood  
 Written by: J Astwood

<p>Mathematics focus</p> <p>Counting by grouping activity I</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work</p> <p>Paired work</p> <p>Individual work <input checked="" type="checkbox"/> in group setting</p>
<p>Objectives</p> <p>To use arrays to make counting more efficient</p> <p>To extend counting range</p>	
<p>Resources</p> <p>Numicon number shapes 1-10</p> <p>Pegs</p> <p>Base board</p> <p>Numicon number line</p> <p>Numicon Kit I (Teachers book) Card 3A</p> <p>Numicon number line</p> <p>0-100 number line</p>	
<p>Activity</p> <ul style="list-style-type: none"> <li>• Pupils arrange a set of Numicon in order in front of them</li> <li>• Pupils select a handful of pegs from the basket and randomly arrange them on the base boards</li> <li>• Ask the children to arrange the pegs into the 10 pattern and in the pattern of whatever is left without counting them (i.e. the 10 pattern and the 4 pattern if they picked 14)</li> <li>• Ask the children to identify the shapes of the numbers they have created from the line of number shapes</li> <li>• Over lay the Numicon shapes onto the pegs</li> <li>• Repeat using a variety of other countable objects i.e. counters, shells, pennies etc.</li> </ul> <p>Extension: Ask pupils to estimate how many items they have picked before they arrange them.</p>	

Multi-sensory features

Kinaesthetic – concrete apparatus used, Numicon, pegs, etc develop a feel for the size of each number; number lines help children know where a number fits in the number system

Visual – arrangement of pegs into Numicon shapes develops a feel for the size of each number and supports development of mental images for numbers

Oral/aural – group discussion/talk about task (see language below)

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Count objects in more efficient ways than ones

Extend knowledge of place value

Improve estimating skills

Explain work in small group setting

Other


Language: count, how many, number names, arrange, pattern, check, estimate

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Mexborough Montagu Junior School  
 Headteacher: J C Scatchard  
 Written by: J Astwood

Date: 11/06/08  
 Lead person: D Page / J Astwood

<p>Mathematics Focus</p> <p>Counting by grouping 2</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work</p> <p>Paired work <input checked="" type="checkbox"/></p> <p>Individual work</p>
<p>Objectives</p> <p>To use arrays to make counting more efficient – counting in 10's</p> <p>To extend counting range</p> <p>To introduce place value</p> <p>To relate counting objects to money</p>	
<p>Resources</p> <p>Wrapping paper (with individual motifs)</p> <p>Numicon pegs</p> <p>0-100 number line</p> <p>Pack of number cards</p> <p>1p coins (lots!)</p> <p>10p coins</p> <p>Numicon Kit 1 (Teacher's Guide) Card 3B</p> <p>Diennes / Base ten apparatus</p> <p>Arrow / Place value cards</p> <p>Numicon shapes</p>	
<p>Activity 2</p> <ul style="list-style-type: none"> <li>• Pupils estimate the number of motifs on the wrapping paper</li> <li>• To find how many motifs are on the wrapping paper, pupils, in pairs, place one peg on each motif until all of the motifs are covered</li> <li>• Clearing all other pegs away, pupils arrange some pegs from the wrapping paper in the Numicon pattern of 10</li> <li>• Pupils put the 10 card below the pattern</li> <li>• Pupils find the number 10 on the number line</li> <li>• Pupils continue to arrange the pegs in patterns of 10, placing the next 'tens' number card underneath the pattern, e.g. 20, 30, etc, and pointing to the relevant position on the number line each time</li> <li>• When all possible tens have been arranged, pupils arrange the remaining pegs into a Numicon pattern and find the appropriate single-digit number card</li> </ul>	

- Pupils then count in tens and 'add on' the left over single-digit number
- Pupils make the final number with arrow / place value cards
- Pupils find the final number on the number line



Differentiation: Some children may need the Numicon shapes or Numicon number line in front of them as a reminder.

Extensions:

Use Diennes units cubes to repeat the exercise and exchange 10 units for 1 ten 'stick'

Use 1p coins to repeat the exercise and exchange ten 1p's for a 10p

Multi-sensory features

Kinaesthetic and visual –

arrangement of pegs into Numicon patterns develops a feel for the size of each number and supports development of mental images of numbers

linking number cards to Numicon patterns helps children incorporate number symbols into their concept images of numbers

number lines help children know where a number fits in the number system

Oral/aural – paired discussion/talk about task (see language below)

Combining a variety of visual models and images helps children make connections

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Become familiar with a range of concrete apparatus, not becoming dependent on just one

Practise estimating

Count objects in tens

Recognise that counting in groups, tens, is more efficient and reliable than counting in ones

Combine numbers that consist of tens and units with or without arrow / place value cards

Relate counting objects to money

Cooperate in pairs, share tasks and ideas, explain what they are doing



## Other

This activity follows on from Activity 1 and can be found in the Teacher's Guide in Kit 1. The following Activity 3 is an extension of these ideas but does not follow on immediately, as it requires pupils to count in 100's. The idea for Activity 3 came from pupils working with the Numicon materials, who thought there was a quicker way to handle the task.

Language: count, how many, number names, check, estimate, tens, units, place value

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention



School: Mexborough Montagu Junior School

Date: 11/06/08

Headteacher: J C Scatchard

Lead person: D Page / J Astwood

Written by: J Astwood

<p>Mathematics focus</p> <p>Counting by grouping activity 3</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>To use arrays to make counting more efficient – 100's, 10's, 1's</p> <p>To extend counting range</p> <p>To consider area / surface area</p>	
<p>Resources</p> <div style="display: flex; align-items: flex-start;">  <div> <p>Diennes / base ten equipment that represents 100 i.e. the 'flat'</p> <p>Centimetre squared paper</p> <p>Large object e.g. sunflower leaf from allotment, small child from the class (if you are feeling adventurous)</p> <p>Scissors</p> <p>Glue</p> </div> </div>	
<p>Activity</p> <ul style="list-style-type: none"> <li>• Lay large object out onto squared paper and draw around it</li> <li>• Lay one Diennes 100 'flat' carefully over the squares on the squared paper and draw round it</li> <li>• Continue this process until most of the paper is covered</li> <li>• Group remaining smaller sections into Numicon 10 shapes where possible</li> <li>• Cut off even smaller sections and stick them down in the 10 shape until all remaining squares are arranged into Numicon arrangements</li> <li>• Count up 100's and write down total</li> <li>• Repeat for 10's</li> <li>• Repeat for left over 1's</li> <li>• Add together or select appropriate arrow/place value cards in order to find total number of squares (area) covered by the large object</li> </ul> <div style="text-align: right; margin-top: 20px;">  </div>	

Multi-sensory features

Kinaesthetic and visual – using concrete apparatus and arranging into Numicon shapes develops a feel for the size of each number

Oral and aural – discussion in group work

Visiting allotment and collecting produce!!! (Does this include the sense of smell?)

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Counting in 100's, 10's, 1's/small groups of Numicon and choosing efficient methods of counting

Place value

Area

Cooperate in pairs, sharing tasks and ideas, explaining what they are doing

Understanding relevance of mathematics by tackling 'real' mathematics

Other

Language: count, area, how many, surface area, hundreds, tens, units, cover, centimetres

# Thoughts on using Numicon

I work with hearing impaired children, who are in main stream school, usually weekly for up to an hour. Since hearing impaired children often have difficulty acquiring language at the same rate as normally hearing children, I mainly work on vocabulary. Hearing impaired children don't pick up new vocabulary incidentally as easily as other children.

As there is such a long time between visits, I found it difficult to follow the Numicon programme of activities. I, therefore, decided to look at the planning for the term in school and pick out the mathematics vocabulary that was being taught. I then used the Numicon equipment to reinforce the language. It cannot be assumed that hearing impaired children understand everything that is being said. Often the language being used needs to be simplified and work needs to be differentiated. Activities need to be short and simple. Being hearing impaired, means that the children need a lot of visual and kinaesthetic clues and Numicon equipment is great for this.

All the children, with whom I used Numicon equipment, really enjoyed it. They all loved covering the board and the pictures on the overlay cards. Two boys with visual as well as hearing problems found the Numicon shapes really useful. They could not see the colours but they could feel the shapes. I left some equipment in one school and the LSA did a lot of work in between my visits. Then the school actually bought some Numicon equipment.

I used the Numicon with a Downs Syndrome girl in a Special School. She really enjoyed covering the board and, interestingly, she used all the one shapes first, then all the two shapes and so on until the board was filled.

Ann Davies, SPEDTeam

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: SPED Team (Hearing Impaired)      Date: 11/06/08

Headteacher: .....

Lead person: .....

Written by: Ann Davies

<p>Mathematics focus</p> <p>Language</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work</p> <p>Paired work</p> <p>Individual work ✓</p>
<p>Objectives</p> <p>To be able to use the terms odd and even confidently</p> <p>To sort Numicon shapes into categories odd or even</p>	
<p>Resources</p> <p>Number cards 1-10</p> <p>Numicon shapes</p> <p>Two large pieces of paper or card with the words odd on one and even on the other</p>	
<p>Activity</p> <ul style="list-style-type: none"> <li>• Put Numicon shapes 1 to 10 in order with the number cards 1 to 10</li> <li>• Place the large sheets on the table</li> <li>• Take a Numicon shape and discuss whether it is odd or even then place it on the appropriate sheet</li> <li>• Repeat process until child is confident</li> <li>• Child should be encouraged to repeat the words odd and even at every opportunity and also to use a visual clue or sign:             <ul style="list-style-type: none"> <li>– even the hands move to and fro in a horizontal line</li> <li>– odd tips of fingers come together at a point to indicate the extra bit</li> </ul> </li> </ul>	
<p>Multi-sensory features</p> <p>Looking at shapes</p> <p>Kinaesthetic – feeling the shapes repeating the numbers and the terms odd and even</p> <p>Kinaesthetic – making a sign for the words odd and even</p> <p>Auditory – listening to adult repeating numbers and terms</p>	
<p>Learning outcomes – mathematical; personal qualities e.g. confidence, attitude</p> <p>To be able to say whether a shape is odd or even and why</p>	

Other

The task could be extended by sorting odd or even groups of objects e.g. bundles of sticks, bags of buttons or marbles etc

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: SPED Team (Hearing Impaired)      Date: 11/06/08

Headteacher: .....      Lead person: .....

Written by: Ann Davies

<p>Mathematics focus</p> <p>Language</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work</p> <p>Paired work</p> <p>Individual work ✓</p>
<p>Objectives</p> <p>To reinforce recognition of odd and even shapes and numbers</p>	
<p>Resources</p> <ul style="list-style-type: none"> <li>• Cards with numbers 1-10</li> <li>• Numicon shapes for 1-10</li> <li>• A number of small cards or pieces of paper with the words odd or even on them</li> <li>• Feely bag with Numicon shapes in</li> <li>• Coloured pegs</li> <li>• Pairs game – number cards labelled odd / even and Numicon shape cards</li> </ul>	
<p>Activity</p> <ul style="list-style-type: none"> <li>• Child puts number cards 1 to 10 in order</li> <li>• The appropriate Numicon shape is placed with each card</li> <li>• The word odd or even is placed on each shape</li> <li>• The child should be encouraged to repeat the terms odd and even and to make a sign for them at every opportunity</li> <li>• The child's attention is drawn to different shapes for odd and even numbers</li> <li>• Feely bag containing Numicon shapes is introduced</li> <li>• Child is encouraged to feel a shape in the bag and to say whether it is odd or even</li> <li>• The shape is pulled out of the bag and checked</li> <li>• This can be made into a game with the adult taking turns</li> <li>• Finish with pairs game having numbers 1-10 on one colour card and pictures of Numicon shapes on another colour and write the word odd or even on the back of the numbers. The child then chooses a number card with the appropriate word on the back and attempts to find a pair i.e. the picture of the Numicon shape.</li> <li>• The term pair may need to be taught and can then be applied to the shapes. Even numbers are in pairs.</li> </ul>	
<p>Multi-sensory features</p> <ul style="list-style-type: none"> <li>• Visual – looking at shapes</li> <li>• Kinaesthetic – feeling the shapes repeating the numbers and the terms odd and even</li> <li>• Kinaesthetic – making a sign for the words odd and even</li> </ul>	

- Auditory – listening to adult repeating numbers and terms
- Oral – saying the numbers and terms

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

- Build confidence in using the terms odd and even numbers correctly
- Recognize that the shape of an odd number has an extra bit and an even number is smooth

Other

- If the child is confident with the shapes, the feely bag can be filled with pegs and a handful can be extracted. The child then says whether they have an odd or even number of pegs.
- Introduce the terms pairs or twos using socks, gloves etc. We used the Odd Sock Game.
- The number cards with odd or even on the back can be used as a quick revision activity by showing them a number and they say for example, "Three is odd," then turn it over to check.



# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: SPED Team (Hearing Impaired)      Date: 11/06/08

Headteacher: .....      Lead person: .....

Written by: Ann Davies

<p>Mathematics focus</p> <p>Language</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work</p> <p>Paired work</p> <p>Individual work ✓</p>
<p>Objectives</p> <p>To reinforce concept of odd and even by sorting shapes, numbers and groups of objects etc.</p>	
<p>Resources</p> <ul style="list-style-type: none"> <li>• Pictures of Numicon shapes</li> <li>• Pictures of dominoes</li> <li>• Pictures of groups of objects</li> <li>• Numbers 1 to 10 ready to cut out</li> <li>• Scissors</li> <li>• Glue</li> <li>• Large sheets of card or paper with odd written on one and even on the other</li> </ul>	
<p>Activity</p> <ul style="list-style-type: none"> <li>• Cut out the pictures of Numicon shapes and sort them into odd or even shapes</li> <li>• Stick the shapes on to the appropriate sheets</li> <li>• Repeat the process for the domino pictures and any other pictures with one or more objects on</li> <li>• Cut out the numbers 1 to 10 and stick them on the appropriate sheet</li> <li>• The child should be encouraged to say and sign the words odd and even at every opportunity</li> </ul>	
<p>Multi-sensory features</p> <ul style="list-style-type: none"> <li>• Visual – the child is looking at the pictures</li> <li>• Oral – verbalising the numbers and the terms odd and even</li> <li>• Kinaesthetic – feeling the shapes repeating the numbers and the terms odd and even</li> <li>• Kinaesthetic – making a sign for the words odd and even</li> <li>• Auditory – listening to adult repeating numbers and terms</li> </ul>	
<p>Learning outcomes – mathematical; personal qualities e.g. confidence, attitude</p> <ul style="list-style-type: none"> <li>• To be confident using the terms odd and even</li> </ul>	

- To learn that the terms apply not only to Numicon shapes but any group of objects or shapes and to the numbers

#### Other

When the child is confident with sorting, the number and Numicon shapes for 1 to 10 can be arranged in order and labels with odd or even can be placed on each number. Some children like to make their own labels. The child can see that odd and even numbers are alternate.

# Continuation Wave 3 Mathematics LA Case Study

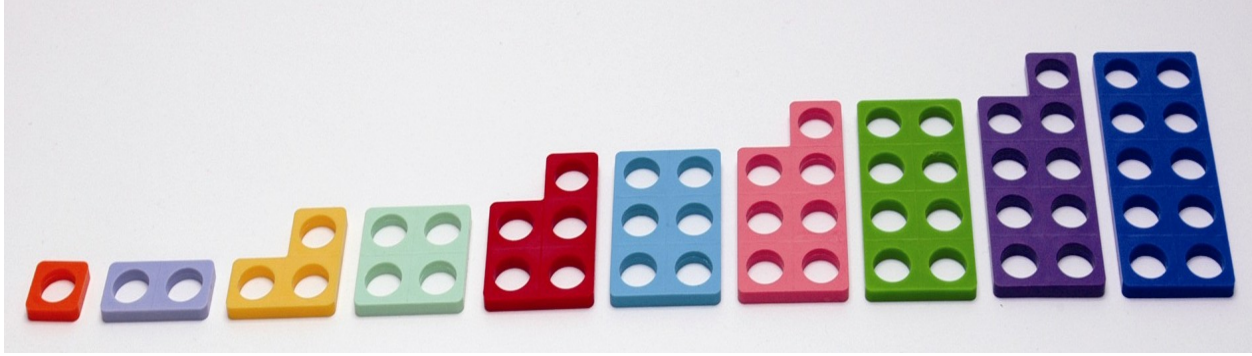
## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Stainforth Kirton Lane Primary School Date: 11/06/08

Headteacher: Mrs A Wall

Lead person: Mrs Yvonne Chesters

Written by: Mrs Chesters

<p>Mathematics focus</p> <p>Using and applying mathematics</p> <ul style="list-style-type: none"><li>Derive multiples of two, fives and tens.</li></ul> <p>Counting and understanding number</p> <ul style="list-style-type: none"><li>To count aloud in twos, fives and tens.</li></ul>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>Y1 Count on or back in twos, fives and tens.</p> <p>Y2 Count up to 100 objects by grouping them and counting in twos, fives and tens.</p>	
<p>Resources</p> <p>Numicon tiles 1-10 for each child (for warm up).</p> <p>All available Numicon tiles.</p> <p>All available Numicon beads (pegs).</p> <p>100 square number board (large).</p> <p>Pencils and post-its.</p>	
<p>Activity</p> <p><u>Warm Up</u></p> <p>1-10 tiles mixed up on table.</p> <p>Children select and order number tiles 1-10.</p> <p>Children recite colour value of the tiles to reinforce prior learning.</p> 	

### Main Activity

Children choose a number to work with as Numicon tiles, either two, five or ten.

Encourage children to build buildings using their chosen number tile and pegs.

Let children discover or encourage them to use more than one tile to make their chosen number, e.g. 5+5 to make 10 or any 1-10 number bond, or 2+3 to make 5 etc.

### QUESTIONS TO ASK

Can you count in 2s, 5s, 10s?

Can you count your building?

Can you carry on counting?

How many will you have if you add another tile etc?

How many will you have if you take one tile away?

### EXTENSION ACTIVITIES

Find the number you have made on the 100 square board.

Write numbers onto post-its place under buildings.

### Multi-sensory features

Use of visual skills to recognise colour, shape and number.

Visual structured imagery, oral and aural experience of number sequences for counting in 2s, 5s and 10s.

Opportunity to indicate and talk about patterns in number sequences for counting in 2s, 5s and 10s on large 100 square.

### Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

- To count confidently in twos.
- To count confidently in fives.
- To count confidently in tens.
- To match the number cards to the buildings.
- To write the continuing pattern of numbers.
- To estimate the next number before adding or taking away a tile from the buildings.

### Other

Discovering how they could use number bonds to make their number needed.

Building self esteem and making them feel confident and secure in number work therefore they are able to access work being covered by the whole class.

# Continuation Wave 3 Mathematics LA Case Study


## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Stainforth Kirton Lane Primary School Date: 11/06/08

Headteacher: Mrs A Wall

Lead person: Mrs Yvonne Chesters

Written by: Mrs Wall / Mrs Chesters

<p>Mathematics focus</p> <p>Using and applying mathematics</p> <ul style="list-style-type: none"><li>• Number patterns</li><li>• Recognise odd and even</li></ul> <p>Counting and understanding number</p> <ul style="list-style-type: none"><li>• Odd and even</li></ul>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>FS Talk about, recognise and recreate simple patterns.</p> <p>Y2 Describe and extend number sequences and recognise odd and even numbers.</p>	
<p>Resources</p> <p>Numicon tiles 1-10 for each child</p> <p>Digit cards</p> <p>Post its</p> <p>Pencils</p>	
<p>Activity</p> <p><u>Warm Up</u></p> <p>1-10 tiles mixed up on table.</p> <p>Children select and order number tiles 1-10.</p> <p>Children recite colour value of the tiles to reinforce prior learning.</p> <p><u>Main Activity</u></p> <p>Children point to all tiles that have chimneys (odd numbers).</p> <p>Children point to all tiles that have a friend joined onto them (even numbers).</p> 	

The odd group will be moved away from the even numbers.

Through shape and colour recognition, the children will be able to identify the two groups.

They then can identify and count the odd numbers 1-3-5-7-9.

They then can identify and count the even numbers 2-4-6-8-10

Children then asked to put themselves into odd and even groups.

#### QUESTIONS TO ASK

Can you continue the odd pattern 9-11-13...?

Can you continue the even pattern 12-14-16...?

Can you put the right number under each tile?

Can you write your own number cards and place in correct order?

Is it an odd or even number?

#### EXTENSION ACTIVITIES

Place number cards under correct tile.

Write numbers onto post-its and place under tiles.

Simple addition of odd and odd tiles shows that they become even numbers.

Simple addition of even and even tiles shows that they remain even numbers.

Simple addition of even and odd tiles shows that they become odd numbers.

#### Multi-sensory features

Use of visual skills to recognise colour, shape and number.

Visual structured imagery of odd and even properties of numbers throughout the activity.

Using their hands to feel odd and even properties of numbers.

Physical manipulation of the tiles and themselves in activities such as moving into odd and even groups.

Naming and counting odd and even numbers and sequences involve oral and aural experiences.

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

- To see the odd pattern in the tiles.
- To see the even pattern in the tiles.
- To continue the pattern of odd and even numbers.
- To match the number cards to the tiles.
- To write the continuing pattern of odd or even numbers.
- To recognise the pattern when adding odd and even numbers.
- To build confidence with odd and even numbers.

#### Other

Children discovered how they could use each other to make odd and even groups then transferred this to other objects.

Increasing self esteem and making children feel confident and secure in number work has enabled them to access work being covered by the whole class.

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Stainforth Kirton Lane Primary School Date: 11/06/08

Headteacher: Mrs A Wall

Lead person: Mrs Yvonne Chesters

Written by: Mrs Chesters

<p>Mathematics focus</p> <p>Using and applying mathematics</p> <ul style="list-style-type: none"> <li>• Number patterns</li> <li>• Recognise odd and even</li> </ul> <p>Counting and understanding number</p> <ul style="list-style-type: none"> <li>• Adding 10</li> </ul>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>Y1 Say the number that is 10 more.</p> <p>Y2 Describe and extend number sequences and recognise odd and even numbers.</p>	
<p>Resources</p> <p>Numicon tiles 1-10 for each child</p> <p>Numicon spinners 1- 5 and 6 - 10</p> <p>Extra number 10 tiles</p> <p>Digit cards up to 20</p> <p>Post-its</p> <p>Pencils</p>	
<p>Activity</p> <p><u>Warm Up</u></p> <p>1-10 tiles mixed up on table.</p> <p>Children select and order number tiles 1-10.</p> <p>Children recite colour value of the tiles to reinforce prior learning.</p> <p><u>Main Activity</u></p> <p>Children have a number 10 tile.</p> <p>Children use the spinner starting with the spinner up to 5.</p> <p>Choose the number tile they spin and add it above their number 10 tile, e.g. <math>10 + 3 = 13</math>.</p> <p>Ask if the new number is odd or even number.</p> <p>Ask children to tell you the calculation as a number sentence, e.g. "Ten add three equals thirteen."</p> <p>When children are confident with additions up to 15, use the 6 -10 spinner and repeat.</p> <p>QUESTIONS TO ASK</p> <p>Can you tell me if the number you spin is odd or even?</p> <p>Can you tell me if the final number (total) is odd or even?</p> <p>Can you put the right number card under each sum of tiles?</p>	

Can you write your own number cards and place under correct sum of tiles?

#### EXTENSION ACTIVITIES

Can you reverse the sum, e.g.  $5 + 10 = 15$ ?

Write numbers onto post-its. Place under sums of tiles in random order.

Place number cards in correct order.

Write their sum / number sentence on post-its.

Explore addition of even and odd tiles to the 10 tile and seeing that 10 more than a single digit number remains even or odd.

#### Multi-sensory features

Use of visual skills to recognise colour, shape and number.

Visual structured imagery of numbers to 20 and odd and even properties throughout the activity.

Physical manipulation of the tiles themselves to add 10 to single digit numbers.

Oral and aural experience of number sentences linked to the addition process for 10 more.

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude



To see the odd pattern in the tiles

- To see the even pattern in the tiles.
- To add the number 10 to other numbers up to 10.
- To match the number cards to the tiles.
- To say / write the sum / number sentence they have made.

#### Other

Building self esteem and making them feel confident and secure in number work therefore they are able to access work being covered by the whole class.



# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Town Field Primary School Date: 11/06/08

Headteacher: Tim Gage (Acting) Lead person: Magdalene Rech

Written by: Magdalene Rech (KS2 Maths Subject Leader) Margaret Murphy (LSA)

<p>Mathematics focus</p> <p>Counting and understanding number</p> <p>Calculation</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <math>\sqrt{\quad}</math> (6 Y6)</p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>Derive and recall all addition and subtraction facts to 10 and multiples of 10 to 100.</p> <p>Add and subtract two-digit complements of 100.</p>	
<p>Resources</p> <p>Bean bags or sponge balls.</p> <p>Numicon plates, rods and number track, counting stick, number lines (various), base 10 apparatus.</p> <p>'Wave 3 Tool box' contents e.g. 100 square, multi-link cubes, digit cards, place value cards, bead string. (Photo 1).</p>	



Photo 1

Warm up

- Chanting bonds to 10 using bead strings – increasing speed after several sequences.
- Children stand in arc and teacher calls out a single digit number and throws a sponge ball or bean bag to each child in turn who responds by catching and returning it, calling out the complement bond to 10.
- Using bead strings as before chant decade bonds to 100.
- Children stand in circle and throw the ball/bean-bag randomly to another in the group, calling out a multiple of 10. Receiver calls out the complement bond to 100 and continues by calling out a different decade and throwing to another in the circle.

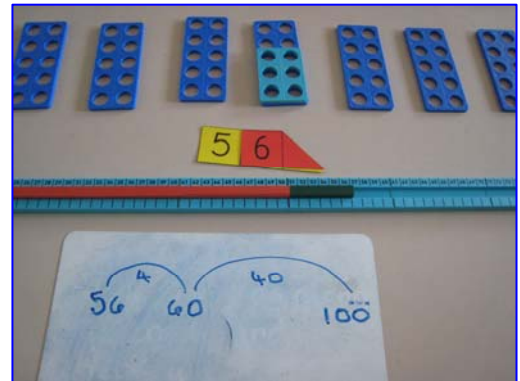
Main Teaching Activity

In pairs, children set out 10 decade Numicon plates to make 100. First child selects 2 plates for a bond to ten and places them on top of a decade plate of their choice.

Child 2 counts the decade plates, from left to right, up to the bond plate and places the corresponding place value card below the decades. Then, the corresponding unit place value card is placed below the bond plate.

Child 2 records number on mini whiteboard and both children, referring to the Numicon plates, work out the first 'unit' step to the next ten and the second 'decade' step to 100.

This is then recorded on an informal number line on the whiteboard. (Photo 2 above).



Children can then show the original number using the Cuisenaire rods and Numicon number track – slide the rods along to the end of the track and read the number revealed.

Check.... is this the number you have as your answer? (Photo 3 below). Repeat with child 2 selecting the 2 plates for a bond to ten and placing them on a chosen decade plate.

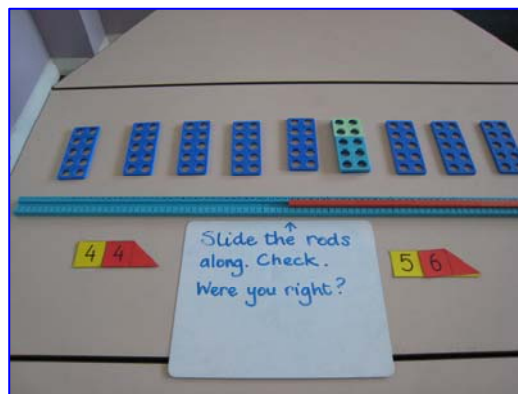
When both children have had a go, working together they write the 4 number sentences for their complements of a 100. They then make up a 'story' for a selected number sentence.

e.g.

I have a pink and white necklace made up of 100 beads. 56 are pink. How many beads are white?

$56 + 44 = 100$	$32 + 68 = 100$
$44 + 56 = 100$	$68 + 32 = 100$
$100 - 56 = 44$	$100 - 68 = 32$
$100 - 44 = 56$	$100 - 32 = 68$

I have 32 team points. How many more do I need to make 100?



## Multi-sensory features

### Warm up

Manipulation of bead string as bonds are chanted has visual, auditory and kinaesthetic elements (VAK). The hand-eye co-ordination needed to catch the ball or bean bag is the main 'fun', physical focus with an instant 'by heart' oral response to the bond.

### Main Teaching Activity

Various models / images such as, Numicon plates and rods, place value cards and number lines and tracks heighten awareness of the size of the numbers. Manipulating the models to find the complement to 100, describing and then recording the process creates a kinaesthetic, visual, oral and aural learning experience.

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Use knowledge of bonds to 10 and bonds of multiples of 10 to 100, to calculate complements of 2-digit numbers to 100

Explain processes

Derive addition and subtraction facts related to pairs of 2-digit complements to 100

### Other

Wave 3 children have exhibited gaps in knowledge of basic number sense and a multi-sensory approach has helped them to secure crucial understanding of numbers, number operations and knowledge of number facts. All the children have enjoyed working in small groups using a variety of models and images and linking language to their actions. Beads and cubes etc as well as Numicon plates and rods have heightened awareness through their structure and their colourful, visual and touch sense appeal. Number tracks and lines have helped children develop understanding of where numbers fit in the number system.

The Wave 3 children have also gained confidence when explaining to their peers how to use the Numicon plates to show different totals. Counting Tesco and Sainsbury vouchers has also been of benefit to the children, who have had enjoyable practice at counting in 1's, 5's, 10's and 100's and have a better idea of the size of numbers and what 8,592 of something actually looks like.

Children have developed more confidence in oral work when back in the class base. For some, the barriers are gradually being removed so that 'Maths' is no longer viewed quite so negatively. Each small, consolidated step has a carry over effect when engaged in using and applying mathematics (UAM) activities where children regularly derive responses to questions when they recognise sequences and patterns previously explored in a multi-sensory fashion.

# Continuation Wave 3 Mathematics LA Case Study

## Multisensory Approaches to Mathematics for Wave 3 Intervention

School: Windhill Primary School Date: 11/06/08

Headteacher: Ms J Guy Lead person: V Riley

Written by: Veronica Riley, Lynda Booth

<p>Mathematics focus</p> <p>Knowing and using addition and subtraction number facts for each number to 10</p>	<p>Please tick as appropriate:</p> <p>Class work</p> <p>Group work <input checked="" type="checkbox"/></p> <p>Paired work</p> <p>Individual work</p>
<p>Objectives</p> <p>Y1 To recall addition facts for 10.</p>	
<p>Resources</p> <p>Numicon number shapes 1-10</p> <p>Pegs</p> <p>Feely bag (extension)</p>	
<p>Activity</p> <ul style="list-style-type: none"><li>• Introduce the 10 shape –</li><li>• What is this shape? Count the holes. What number is this shape?</li><li>• Ask each child to find the 10 shape, count its holes and name it by its number name.</li><li>• Ask, "How can we make 10 again using two other shapes?"</li><li>• As children are working, encourage them to describe their combinations to 10, and to compare shapes, see the differences and talk about what they notice.</li><li>• Introduce Numicon pegs.</li><li>• Ask children to check their two shapes are equal to the 10 shape, by using pegs to build the two shapes vertically on top of the 10 shape.</li><li>• Ask children to say the number sentence that describes their two shapes that total 10, e.g. three add seven equals the 10 shape.</li></ul> <p>Extension</p> <ul style="list-style-type: none"><li>• This extension activity is reinforcement of experience of making pairs of numbers that total 10 and encourages the development of mental imagery and rapid recall.</li><li>• Ask a child to choose a Numicon shape and put it in the feely bag.</li><li>• Pass the bag to another child.</li></ul>	

- The second child feels the shape in the bag and says that number name.
- The child identifies the number that goes with the number in the bag, to total 10, and says the number sentence.

#### Variations

- Start with a different Numicon shape and explore the relevant addition facts, e.g. four add two equals the six shape.
- Focus on the related subtraction facts, e.g. three from the ten shape leaves seven.

#### Multi-sensory features

Kinaesthetic – manipulating the Numicon shapes to demonstrate and feel pairs of numbers that total 10

Visual – seeing pairs of numbers that total 10

Oral/aural – saying the number sentence alongside the kinaesthetic and visual activity

Learning outcomes – mathematical; personal qualities e.g. confidence, attitude

Know pairs of numbers that total 10, and numbers up to 10

Say number sentences for pairs of numbers that total 10, and numbers up to 10

Explain work in small group setting

Work as a team

Have a caring attitude to one another

#### Other

Small group work (maximum 6 children) boosts confidence.

Children love the Numicon equipment.

Using Numicon in conjunction with other schemes, such as 'Monster maths' is favourable.

# Other multi-sensory learning activities

Below are a few ideas for complementary multi-sensory learning activities. Considering truly multi-sensory activities, as opposed to practical or dialogic activities, important as they are, has been a focus of the case study. The following are useful references for starting points for developing and enhancing a multi-sensory learning and teaching approach to mathematics.

Using models and images to support mathematics teaching and learning in Years 1 to 3:  
CD-ROM DfES 0508-2003 GCDI; posters DfES 0508-2003 GI-6

Sharing success in mathematics

An Educational Visit to Hungary, 26 May – 1 June 2001, Teaching Calculation

[www.doncasterlea.org.uk](http://www.doncasterlea.org.uk) Primary Strategy, Mathematics support materials, Resources,  
Mathematical toolboxes for Y1 – Y6

A collection of mathematical models and images for place value

A reference collection available to view from the LA Primary Mathematics Team

A collection of multi-sensory mathematics activities for wave 3 intervention devised by participants of the LA Inclusion Manager / SENCo liaison meeting on 20<sup>th</sup> November 2008.

## Actions for Numbers

### Equipment

Washing line 1 – 20

### Instructions

1. Choose a child to point to a number on the washing line.
2. Give the child an action to do that many times e.g. they point at 4, and the action you give is jumping. The child must jump four times. The whole class counts aloud to make sure that the count is correct.
3. The child unpegs that number card and takes it. The whole class draws that number in the air.
4. Choose another child to point at a different number on the line. Give a different action e.g. clapping hands. The child can then take the number card while the whole class draws the relevant number in the air.
5. Continue until all the numbers are removed.
6. Choose two or three other children to peg the numbers back up.  
How far can the class count in unison while they do this?

Sample number line activities, Guide for your professional development Book 2, p113

# Decimal Display

## Equipment

Decimal number cards to one or two places

Base ten

Place value boards, TU.t or TU.th

Place value cards, TU&t or TU&h

Blank number line, whiteboard pens and rubbers / pencils and rubbers

## Instructions

1. Decimal display is an activity to help children develop an understanding of the size of decimals, the values of each digit and the position of the number on the number line.
2. Establish that the flat represents one whole so the long and cube represent one tenth and one hundredth respectively.
3. Ask children to read a decimal number such as 3.4 and show it with base ten on the place value board. Then children represent the number with place value cards.
4. Ask children to describe the value of each digit.
5. Ask children to mark the position of the number on an appropriate number line, eg 100 divisions with only 0 and 10 labelled.

## Variations

- Children can be asked to represent each decimal fraction using extra different equipment, e.g. a calculator, on a decimal grid such as 0 – 10 in tenths.
- Challenge children to use the equipment to add or subtract 10, 1, 0.1 or 0.01, or to multiply or divide by 10 or 100, and explain the process.
- Challenge children with decimals to two or three places adapting the equipment accordingly.

# Human Clock

## Equipment

Large number cards 1 – 12

Long pointer for the hour hand ) optional

Short pointer for the minute hand ) optional

## Instructions

1. Do this in a good space such as the hall.
2. Twelve children each have a number card and stand/sit in a circle to represent a clock face.
3. Two children stand/sit in the middle of the circle to represent the hands. They either stretch out an arm, one fully and the other just from the elbow, or have a pointer, one long and one short.
4. Give the children oral with written times to illustrate and describe where their arm is pointing.

### Variations:

- Use only written times for instructing the time to be shown on the clock.
- Give follow-on instructions to illustrate the passage of time such as:
  - One hour later.
  - Half an hour before.
  - 20 minutes after ....
- Children show the times to match a story/word problem, e.g.
  - At 10 o'clock Sam goes to the shop.
  - Walking to the shop takes 10 minutes.
  - Sam chooses a comic and a bag of sweets in 3 minutes.
  - It takes 2 minutes for him to pay.
  - On the way home Sam meets his friend Ben.
  - They play on Ben's bike for 20 minutes.
  - What time does Sam get home?

## Keep Fit Numbers

### Equipment

Washing line 1 – 20

### Instructions

1. Do this in a good space such as the hall. Children should sit so that they can stretch out their legs in front of them. They start with their knees bent and their legs pulled in.
2. The teacher points to a number on the line and the class says the number name. The children must all 'make' that number using their fingers and (if necessary) their toes, e.g. point to 14, the children stretch out their legs to 'make' 10 and hold up 4 fingers, 10 and 4 makes 14.
3. For the teacher pointing at 8, the children would withdraw their legs (no tens in 8) and hold up 8 fingers. (The rapid stretching and withdrawing of legs is why this is called keep fit maths!)
4. A child can be appointed to be the pointer and to choose different numbers on the line.

### Variations:

- Point to a number without saying it for instructing children the number to 'make'.
- Point to a number and then, when the children have all 'made' it correctly, ask them to write the appropriate number symbols in the air.
- Point to a number and then, when the children have all 'made' it correctly, ask them to add or subtract a number of units, e.g. point to 18 and then ask them to take away 5. They must fold down five fingers. What number remains? Ten toes and three fingers 'make' 13. Do this for addition or subtraction.

Sample number line activities, *Guide for your professional development Book 2*, p113



# Multiplying by Ten, One Hundred ...

## Equipment

Large labels for digit values, e.g. TTh Th H T U t h th

Large decimal point or football

Large digit cards 0-9 or football shirts numbered 0 to 9, several for each digit, particularly zero

Large instruction cards, e.g.  $\times 10$ ,  $\times 100$ ,  $\times 1000$ ,  $\div 10$ ,  $\div 100$ ,  $\div 1000$

Blu-tac

Base ten equipment (optional)

Chairs (optional)

## Instructions

1. You need space in front of a wall to set up this activity.
2. Display the column headings for digit values and the decimal point, in order, on the wall. Place a chair for each column (optional).
3. Give a start number. Ask children to choose a digit card and stand/sit in the appropriate column to show that number, e.g. 264.
4. Show an instruction card, e.g.  $\times 10$ . The children move to show the new number, i.e. 2640. Extra children collect and show zero cards as necessary. The children say the relevant equation to describe the process, i.e. "Two hundred and sixty four multiplied by ten is two thousand six hundred and forty."

## Variations

- Children can wear appropriately numbered football shirts instead of holding number cards and a football can be used to represent the decimal point.
- *(Adrian Fearn's idea)*
- For appropriate numbers and instructions, children can use base ten equipment as they do this activity.
- The 'thousand' block can be used to represent one. The flat, long and small cube would be a tenth, hundredth and thousandth respectively.

# Musical Numbers

## Equipment

Music

Large number cards (optional)

Washing line (optional)

## Instructions

You need to be in a large space.

Play and stop the music.

When the music is playing, children move around the room.

When the music stops, ask the children to get into groups containing a particular number of people.

Each time the children are in groups of the appropriate size, ask them to say and draw the number in the air.

## Variations

Instead of saying the number of people that need to be in each group show a number card; indicate a number on the washing line, or describe a number, e.g.

"The number one more than six."

"The number between three and five."

"Any even number."

Children can be asked to form groups for the particular number with everyone arranged in the pattern of the Numicon shape.

When the children are in groups of the appropriate size, ask them to make statements about the number.

# Noises

## Equipment

An instrument which makes a loud sound to make Hundreds noises, another suited to medium-sized Tens noises, and a third instrument with a soft sound, to play little Ones noises

Base ten

Place value mats

and / or

Place value cards

## Instructions

1. Make some Hundreds sounds: BOOM BOOM
2. Now make some Tens sounds: DING DING DING DING DING
3. Now make some Ones sounds: TISH TISH TISH
4. Children listen to the sounds and make the three-digit number with the base ten on their place value mat and / or with place value cards: 253 in this example.
5. Children say the number name.

Idea adapted from BEAM "Stand up" book

# Partner Numbers

## Equipment

Music

Number cards

Numicon or other structural equipment (optional)

Container for spare number cards, Numicon or other structural equipment

## Instructions

1. You need to be in a large space.
2. Each child chooses a number card.
3. When the music is playing, the children move around the room.
4. When the music stops, give a rule, e.g. "Your number cards must total an even number."
5. The children find a partner so that together their number cards meet the rule, e.g.
6. 4 and 8 are partners.
7. Allow 'left over' children to exchange their number cards from the 'pool' so they can make a pair.
8. Each time the children have found a partner, ask them to make a statement, e.g.
9. "Four and eight total 12. 12 is an even number."

## Variations

- Children use Numicon instead of number cards.
- Give rules for groups of three or more.

# Pegboard Tables

## Equipment

Pegboards

Pegs

## Instructions

1. Pegboard Tables is an activity to help children develop the number sequence for a multiplication table with understanding of the related language.
2. With the child, put out a row of three pegs and comment, "There is one lot on three," or "There is one row of three."
3. Ask the child to continue making rows of three and give a running commentary. Ask questions such as, "How many lots of three have you made?" "How many pink lots of three?"
4. Play 'Stop Me', i.e. count the pegs stressing the multiples of three. Ask the child to stop you when you have counted a number of threes such as four lots of three. Change the language to, "Stop me when I have reached four threes."

## Variation and follow-up

- Children use real equipment, e.g. pairs of teabags for the 2x table, pictures or other structured equipment such as Numicon shapes or sticks of Unifix, instead of pegs and pegboards.
- Alongside 'Stop Me', illustrate the multiples of three on a counting stick and do activities using the related language.

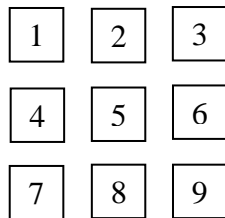
# Remembering Addition Pairs to Ten...

## Equipment

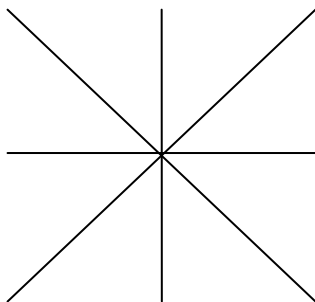
1-9 number cards

## Instructions

1. Children arrange the number cards in front of them on the desk as shown below:



2. Children investigate the position of each card in the pairs of numbers that total ten. They notice that each card in a pair is at one end of an arm of an eight pointed star, and five in the middle needs its 'twin' to total ten.

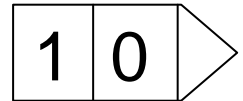


3. Children practise showing the second number to total ten with 1-9 cards arranged as above using the "star pattern" and saying the number sentence.
4. The teacher says a number from 1 to 9 and the children respond by showing the second number to make a total of ten, or both cards, and saying the number sentence.
5. To support moving from working practically with the cards to working entirely mentally, children can arrange the cards face down on the table, or arrange the cards and then close their eyes and work orally.
6. Later, whenever children need to recall these number facts, they are encouraged to visualise the arrangement of the 1-9 cards and "star pattern."

Idea suggested by Liz Kent, Stirling Primary School

### Variations

- Pairs to twenty can be learned by giving the children a place value 'ten' card
- to place under one of the 1-9 cards.
- Idea suggested by Sue Felton, Shaw Wood Primary School
- Numicon shapes can be used instead of the number cards.
- Pairs to 100, 1000, 1, 0.1 can be learned using cards with multiples of ten or one hundred, or decimal notation for tenths or hundredths, e.g. 0.1, 0.2... 0.9 for pairs to 0.1.
- Pairs to £1, 1m, 1kg, 1l can be learned, e.g. using 10p, 20p,... 90p for pairs to £1.



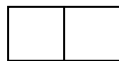
# Representing Numbers in Lots of Different Ways

## Instructions

Generate a number using dice.

Represent with:

number cards 3 5



place value (arrow) cards

Unifix cubes – individual and sticks of ten

Unifix notation cubes

Numicon shapes

base ten

ten cards and one cards



on a beaded abacus

on a bead string / bar

on a number line

on a 100 square / board

on a place value chart

on a spike abacus

in a calculator display

as a calculation  $30 + 5$

Say the number and draw it in symbols in the air.

## Classroom organisation and management

- Equipment can be passed from child to child after a few numbers have been represented.  
or
- Equipment can be arranged in the classroom and children move around after a few numbers have been represented.

# Same Then Different

## Equipment

Set of 3D shapes

## Instructions

1. Same Then Different is an activity for a pair or small group of children.
2. One child chooses two 3D shapes and states something which is the same about the shapes, e.g. both shapes have flat faces. The child passes the two shapes to his / her neighbour.
3. The child now holding the shapes, states something which is different about the shapes, e.g. only one shape has some square faces, and then passes the two shapes to his / her neighbour.
4. The children continue to pass the shapes around the group and make statements about them alternating between statements that describe a property common to both shapes, and statements that describe a difference between the two shapes.

## Variations

- Limit the statements to either common properties or differences.
- Use only one shape and alternate between statements which are true and not true about the shape.
- With younger children conduct the activity as a whole class carpet activity using one shape. Children volunteer to hold a shape and say something about it.
- Use 2D shapes.

# String Shapes

## Equipment

Lengths of string each one tied to make a loop

## Instructions

1. You need to be in a large space.
2. Organise the children into small groups, about three or four.
3. Give each group of children a loop of string.
4. Ask the children to make a 2D shape, e.g.
5. rectangle, octagon, circle, a quadrilateral with a right angle, isosceles triangle.
6. Each time the children have made a shape, ask them to talk about it.