The Impact of Numicon: An Australian Context

Pilot project

A Numicon pilot project was conducted in an Australian primary school in 2012, to explore the impact of Numicon on achievement in mathematics, particularly in the areas of number and algebra. The 12-month intensive implementation of the Numicon approach into the school included professional development that supported educators working with students in their first year of school. Data was gathered and analysed to determine the effectiveness of the Numicon approach on student achievement in an Australian context. Student achievement data for all Year 1 students was collected using the I Can Do Maths (ICDM) – Test A.

To download the full report, go to oup.com.au/numicon.

The results … a proven approach

**39%** of students in Cohort 2 achieved above average, high or very high scores, in comparison to **19%** of Cohort 1.

**20%** of Cohort 2 had high or very high scores in comparison to only **7%** of Cohort 1.

**48%** of boys in Cohort 2 achieved above average to very high scores, in comparison to **16%** of boys in Cohort 1.

Only **18%** of boys in Cohort 2 achieved below average to very low scores, in comparison to **30%** of boys in Cohort 1.

Cohort 1 (Year 1 students in 2012) had no prior use of Numicon and were used as the control group for this project.

Cohort 2 (Year 1 students in 2013) had been supported by the use of the Numicon teaching program for one school year.

For more information, visit oup.com.au/numicon  Email: numicon.au@oup.com
Numicon and the Australian Curriculum: Mathematics

Five reasons why Numicon supports the teaching and learning of the Australian Curriculum: Mathematics

• Supports students, through conversation, action and imagery, to engage in the mathematical actions described in the Australian Curriculum: Mathematics proficiency strands.

• Develops fluency by using visual imagery and practical application to support conceptual understanding.

• Provides opportunities for students to discuss and demonstrate their understanding with concrete materials.

• Develops students’ confidence to solve problems using real-life contexts that give every activity a purpose.

• Helps students to reason mathematically by encouraging them to notice relationships and make generalisations through the use of concrete objects.

Numicon in the Australian classroom

The Numicon key mathematical ideas and subsequent activities strongly support the teaching and learning as described in the Australian Curriculum: Mathematics Number and Algebra strand. The Numicon kits have been correlated at year level to the curriculum.
About Numicon

It all started with one question … “Why?”
In the 1990s, headteacher Romey Tacon asked the question many teachers were asking:

“Why do so many students find maths hard when they succeed in other subjects?”

Along with Dr Tony Wing, they looked at the way they were teaching and realised that they had been underestimating the difficulties students had in understanding abstract ideas without pictures to help them. The teachers set about exploring the impact of structured images on students’ understanding, and found that, with the use of these images, students made remarkable progress, and teachers’ subject knowledge and maths pedagogy improved.

Why can maths be so difficult to teach and to learn?
Maths involves abstract ideas, and explaining them to students is impossible unless they understand mathematical language.
Maths also involves spotting patterns and making generalisations. This requires understanding number relationships that are difficult to spot by just looking at numerals.
When teaching methods rely on students listening and working quietly without concrete materials, many students have difficulty knowing when to use their ‘classroom’ maths in a real-world context.

How does the Numicon approach tackle this?
The Numicon approach is multi-sensory, using concrete materials and focusing on action, imagery and conversation. The program of activities with Numicon Shapes helps students to understand number relationships, spot patterns and make generalisations.
The Numicon Shapes help students to communicate their ideas and thinking. This in turn helps teachers ‘see’ a student’s understanding.
Students are encouraged to work together on activities which emphasise applying understanding to solve problems.

For more information, visit oup.com.au/numicon Email: numicon.au@oup.com
Who Is the Numicon Approach For?

Discover a multi-sensory approach to teaching mathematics that raises student achievement and increases student and educator confidence.

Pre-school

Children’s early experiences of mathematics have a huge impact on their later achievement. Our resources for pre-school give children a sound start through playful and innovative activities.

In the 1st Steps with Numicon in the Nursery Kit, straightforward explanations and guidance is given throughout the Teaching Guide.

Foundation to Year 4+

The Numicon Firm Foundations Kit ensures students develop a secure understanding of the vital early ideas.

Numicon Kit 1 offers guidance on handling the transition from the foundation ideas to the introduction of many big ideas, which will form the basis for later work in Numicon Kit 2.

Numicon Kit 3 is the first kit that takes the Numicon approach into middle primary.

To challenge students even further, the Investigations with Numicon Teaching Guide can stretch the gifted and talented, from ages 7–11.

Closing the Gap Ages 6-11

It is well documented that students with special educational needs learn most effectively through multi-sensory teaching. The Numicon approach’s emphasis on doing and seeing alongside speaking and listening capitalises on students’ visual and kinaesthetic strengths. Closing the Gap with Numicon Kit has been specifically designed with this in mind.

Parent/Home Educators

For parents and carers who would like to support their child’s mathematics at home, the 1st Steps with Numicon at Home Kit covers pattern, number and very early addition. This kit is suitable for ages 3–5.

For more information, visit oup.com.au/numicon  Email: numicon.au@oup.com
## Numicon Kits

### What do you need to teach with Numicon?

Numicon kits comprise a teaching guide and the materials to teach key mathematical ideas within the areas of numbers and the number system, calculating and using patterns.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Kit contents</th>
<th>Year level/age</th>
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| 1st Steps with Numicon in the Nursery Kit | - 1st Steps with Numicon in the Nursery Teaching Guide (1)  
- Numicon Shapes (115)  
- Pegs (80)  
- Feely Bag (1)  
- Threading Laces (3)  
- Baseboards (2)  
- Picture Baseboard Overlays (2 sets)  
- Display Number Line (1) | Pre-school  
Ages 3–4 |
| Numicon Firm Foundations Group & One-to-One Kit | - Numicon Firm Foundations Teaching Guide (1)  
- Numicon Shapes (2 boxes) (160)  
- Pegs (160)  
- Baseboards (2)  
- Feely Bag (1)  
- Spinners (2)  
- Display Number Line (1)  
- Number Bond Baseboard Overlays (6)  
- Picture Baseboard Overlays (6)  
- Magnetic strip (for displays) | Foundation  
Ages 3–4 |
| Numicon Kit 1 Group & One-to-One Kit | - Numicon Kit 1 Teaching Guide (1)  
- Numicon Shapes (2 boxes) (160)  
- Pegs (160)  
- Baseboards (2)  
- Feely Bag (1)  
- Spinners (3)  
- Numicon Post Box (3)  
- Display Number Line (1)  
- 10s Number line (1)  
- Card 1-100 Number Track (1)  
- 0-100 Number Cards (1 pack)  
- Arithmetic Story Cards (1 set)  
- 0-100 cm Number Line (1)  
- Trays for Number Rods (1 set)  
- Magnetic strip (for displays) | Foundation/  
Year 1 |
| Numicon Kit 2 Group & One-to-One Kit | - Numicon Kit 2 Teaching Guide (1)  
- Numicon Shapes (2 boxes) (160)  
- Feely Bag (1)  
- Spinners (3)  
- Numicon Post Box (3)  
- Display Number Line (1)  
- 10s Number Line (1)  
- Card 1-100 Number Track (3)  
- 0-100 Number Cards (1 pack)  
- 0-100 cm Number Line (3)  
- Trays for Number Rods (1 set)  
- Number Track (3)  
- Magnetic strip (for displays) (1) | Year 1/Year 2 |

Email: numicon.au@oup.com
The materials and teaching guides included in all of the kits can be purchased separately. Conversion Kits are available so customers can build up the full teaching program without unnecessary duplication of resources and equipment. They provide just the teaching guides and resources not included in earlier class kits.

A full list and prices can be found from page 12.

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<thead>
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+ Numicon Kit 3 Teaching Guide with planning software (1)  
+ Numicon Kit 3 Activity Handbook (1)  
+ Numicon Shapes (2 boxes) (160)  
+ Pegs (80)  
+ Feely Bag (1)  
+ Counters (200)  
+ Spinners (4)  
+ Display Number Line (1)  
+ 10s Number Line (4)  
+ 0-100 Number Cards (1 pack)  
+ 1-100 cm Number Line (3)  
+ Number Rod Track (3)  
+ Baseboard Laminates (3)  
+ Extra 10-shapes (30)  
+ Extra 1-shapes (100) | Pre-school  
Ages 3–4 |
| Closing the Gap with Numicon Group & One-to-One Kit | Group Kit  
+ Closing the Gap with Numicon Teaching Guide (1)  
+ Numicon Shapes (2 boxes) (160)  
+ Pegs (160)  
+ Baseboards (6)  
+ Feely Bag (3)  
+ Spinners (6)  
+ Large Format Table-top Number Line (3)  
+ Number Bond Baseboard Overlays (6)  
+ Picture Baseboard Overlays (6) | Any year level after first year at school |
| Investigations with Numicon | Features ten open-ended investigations with a low threshold and high ceiling. All activities start with the use of Numicon Shapes or Rods to allow the majority of students to be involved. High-ability students can develop their skills by taking the investigations to higher levels. | Ages 8–11 |
| 1st Steps with Numicon at Home | ● Book of Activities (1)  
● Numicon Shapes (32)  
● Pegs (52)  
● Feely Bag (1)  
● Zig Zag Book (1)  
● Threading Laces (3)  
● Baseboard (1)  
● Numeral Cards 1-10 (1) | Ages 3–5 |
Teaching Support

The most important element of the core kits is the teaching guides.

These contain teaching guidance and activities, with step-by-step illustrated support and ideas to help children make connections and apply their understanding. The teaching guides include the following sections:

**Getting started**
A useful introduction for new users.

**Putting the approach into practice**
Supports teachers’ subject knowledge of key mathematical ideas. It also provides suggestions for teaching approaches, organisation and the learning environment.

**Activities**
Easy to follow and clearly illustrated step-by-step activities. The structure of the activities is explained in more detail on the next page.

**Planning support**
Easy-to-use, detailed and high-level planning sheets.

**Assessment tools/signposts**
A variety of tools to help monitor students’ progress including key questions and extension activities.

**Photocopy masters**
Photocopiable templates to support activities in the classroom.

The Numicon teaching materials are available to purchase separately.

For more information, visit [oup.com.au/numicon](http://oup.com.au/numicon)  Email: [numicon.au@oup.com](mailto:numicon.au@oup.com)
About the Numicon Activities

The teaching guides include comprehensive activity cards that support the use of the Numicon approach.

**Context**
The context details the learning objectives, suggested mathematical vocabulary and assessment focus.

**About the Numicon Activities**

**The title bar, colour-coded by strand, clearly indicates the key mathematical ideas, the broad scope of the activities, the strand and the activity number.**

**Finding how many without counting**

**Context**

Aims
- To reinforce understanding that arranging counters into patterns and groups is an efficient way to find out ‘how many’ without counting.
- To extend counting range.
- To introduce place value.

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

Assessment
Record of Progress: Numbers and the Number System 46, 48

**The Activities**

**Activity 1**
Have ready: Numicon Shapes 1-10 in order; a basket with 20 Pegs; Baseboard.

**Step 1**
Ask children to close their eyes and put some Pegs from the basket over the Baseboard. [Photo 1]

**Step 2**
• Children open their eyes. Ask them to rearrange the Pegs into the 10-pattern and the pattern for ‘whatever is left’ without counting.
• Children say how many Pegs there are from looking at the patterns. [Photo 2]

**Step 3**
• Children check the answer is correct by fixing the equivalent Shapes on top of the Pegs.
• Ask children to find the number on a number line (matching the Shapes to the Display Number Line if necessary). [Photo 3]

**Activity 2**
Have ready: Numicon Shapes; a basket with 20 Pegs.

**Step 1**
Show children a collection of up to 20 Pegs and ask them to think how many Pegs there are.

**Step 2**
Ask children to find the Numicon Shapes that show their estimation.

**Step 3**
Put the Pegs into two 10-shapes, ask children to say how many and check their estimate.

**Extension**

Mental arithmetic
Have ready: Pegs, Baseboard.
Ask children to estimate how many Pegs are on the Baseboard before arranging into patterns.

Independent practice

Working in pairs
Have ready: a basket with up to 30 Pegs, Baseboard, Numicon Shapes.
• Children practice the above activity.

Working in pairs
Have ready: baskets of 20 objects.
• Children take out a handful of objects and find out how many there are without counting, by arranging them into Numicon patterns.

**Key questions**

- Can children arrange objects into Numicon patterns without using the Baseboard?
- From looking at the patterns, can children say how many tens there are in the number they have made?

**Key mathematical idea**
Counting, Place value, Pattern

**Images**
Images provide extra support to follow the step-by-step activities.

For more information, visit oup.com.au/numicon Email: numicon.au@oup.com
Numicon Software for the IWB

Numicon IWB software is designed to enhance the multi-sensory Numicon program and offers educators a rich library of images and models to use in whole-class teaching.

Interactive workspaces and resources can be used to create dynamic sessions to introduce key mathematical ideas to the whole class. Interactive workspaces and resources include:

- Numicon shapes and rods
- scrolling number lines
- Numicon equipment such as pegs, spinners, dice and baseboards
- objects for counting
- number generators
- Hundreds, Tens, Ones, and multiplication grids
- hoops to use in sorting, division and fractions

... and more.

An individual set of 1-10 Shapes can be purchased. To ensure a truly multi-sensory lesson when using the software or working as a whole class, give each student a set of Numicon 1-10 Shapes, which they can hold up in response to questions.
Numicon Professional Development

Building confidence and subject knowledge

Our accredited consultants are all experienced teachers. They offer a range of training and support to get educators started using Numicon by developing subject knowledge and building confidence in the teaching of mathematics. Educators will be encouraged to reflect on their pedagogy and practice. We will ensure that they feel inspired, confident and ready to start using Numicon straight away, either in class, with small groups, or one-to-one.

Numicon professional development sessions will:

- provide an opportunity to explore the Numicon resources
- discover the impact of imagery
- model mathematical conversations.

Training options

In-school training

- There are a range of in-school training options to suit the needs of your school and your staff.
- Session can be delivered as full-day, half-day or staff meeting sessions.

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Central training

- Introduction to Numicon full-day training sessions are offered regularly throughout the year. For session dates in your state, go to oup.com.au/numicon.
- Workshops are kept small (up to 30 participants, who work in small groups) in order to maximise hands-on practice, discussion and reflection.
- Our Numicon professional development sessions are designed for classroom educators, school and curriculum leaders, learning support teams, mathematics/numeracy consultants and coaches, and parent groups.

Contact a Numicon consultant

For advice about your resource and professional development requirements and to obtain the full list of prices, contact your local consultant:

**Victoria:** Rachel Kennedy
numicon.vic@gmail.com

**Queensland:** Sarah Hart
numicon.qld@gmail.com

**Western Australia:** Jo Howat
numicon.wa@gmail.com

**Australia-wide:** Julie Baillie
numicon.au@oup.com

Online support

To learn more about Numicon, visit oup.com.au/numicon and view the online videos and support materials.

For more information, visit oup.com.au/numicon Email: numicon.au@oup.com
Numicon Materials

All Numicon equipment and materials are available separately, making it easy to customise your requirements or replace kit components as required. Not all materials are components of the kits but we recommend some ‘must haves’ for your classroom items, like the Numicon pan balance for showing equivalence, and number rods for larger numbers.

Number lines, tracks and number rods

The Numicon Number Lines are integral to many of the Numicon activities and help to raise the profile of numbers in the classroom. Number rods provide another format of structured imagery to help enrich number understanding. Number rods can be used in picture and pattern making and alongside Numicon Shapes. The colours of Numicon Shapes and number rods are deliberately different because it is not helpful for children to associate a number with any one colour. The rods are not graduated so they can be seen to represent different numbers in different situations. The possible values of number rods are seen when they are placed in relation to each other.

- **Display Wall Number Line**
  Each number 0–21 is marked with its Numicon Shape (real size), numeral and number word. Printed on card.

- **Large Format Table-Top Number Line**
  Table-top version of the Display Number Line, with shapes and numbers from 0–21. The Numicon Shapes are large enough for students to tell them apart in matching activities.

- **Table-Top Number Lines**
  A smaller version of the Display Number Line – ideal for students who appreciate discreet support. Printed on card. Set of 5.

- **10s Number Line**
  Numicon 10-shapes (real size) displayed end-to-end with marked multiples of 10 from 0–100. Use with Numicon Shapes in counting and arithmetic.

- **1-100 cm Number Line**
  Decade sections shown in red and blue with numerals 0–100 marked beneath in centimetre intervals. Can also be used with number rods which are centimetre-scale. Set of 3.

- **0-100 Numeral Cards**
  One-sided 0–100 Numeral Cards. Useful for generating numbers. Each pack contains 9 blank cards.

- **Card 1-100 Number Track**
  Ten lengths of card, with ten numerals on each from 1–100. Each decade section can be arranged horizontally or as an array to show connections and patterns between numerals.

- **Zig Zag Book**
  A beautifully illustrated number line from 1–10 with numerals, Numicon Shapes and pictures. Perfect for small hands to use as a counting book to connect the Numicon Shapes to arrangements of objects.

- **Number Rod Trays 1-10 and 20**
  These stacking, coloured trays match the number rods. Useful for building number bonds and pattern making. The 20-tray gives a picture of numbers and number relationships to 20.

- **1-100cm Number Rod Track**
  Useful for teaching place value, partitioning, multiplication and division. Decade sections fit together to total 100 cm. The track is grooved to take number rods.

- **Cuisenaire Number Rods – Large Set**
  306 coloured number rods (centimetre-scale). Lengths 1 cm–10 cm. Includes durable plastic storage tray.

- **Cuisenaire Number Rods – Small Set**
  126 coloured number rods (centimetre-scale). Lengths 1 cm–10 cm. Includes durable plastic storage tray.

For more information, visit [oup.com.au/numicon](http://oup.com.au/numicon) Email: numicon.au@oup.com
Arithmetic practice

At each stage students enjoy repeating Numicon games and activities independently. In doing so, they often make new discoveries. Repetition and practice helps students to learn number facts and build their fluency and confidence.

Post Box
Students take turns to ‘post’ questions and ‘post back’ answers. Use in conjunction with Numicon Kits 1 and 2. Set of 3.

Arithmetic Story Cards
Pictures arranged in Numicon 1-10 patterns. Useful as prompts for creating addition and subtraction stories.

Set of 1-10 Numicon Shapes
Use in whole-class sessions. Each set comes in a plastic box and ideal to add to student booklist.

Number Bond Baseboard Overlays
Students match Numicon Shapes to create number combinations to 10. Set of 6.

Spinners
An alternative to dice. The two spinners in each set come with overlays showing Numicon patterns and numerals. Additional overlays, such as +10, -1, stop, go, are available in the Teaching Guides to photocopy.

Numicon Dice
Set of 4 with numerals, Numicon patterns and mathematical symbols + and -.

Pan Balance
Use to teach equivalence and reinforce number facts with Numicon Shapes and number rods. By combining shapes on one side, they balance the combined total on the other.

Box of 80 Numicon Shapes
Each box contains ten of each Shape 1, 2, 3, 4, 5, 10 and five of each Shape 6, 7, 8, 9.

Picture and pattern making

Picture and pattern making familiarises students with the Numicon Shapes and colours. During play, students see and use the number relationships represented by Numicon patterns. Making patterns and sequences helps students develop important sequencing and prediction skills leading to generalisations.

Picture Baseboard Overlays
Six double-sided overlays give opportunities for matching, ordering and pattern making. Features fun animal and transport images.

Baseboard
Plastic square with 10 x 10 raised circles for placing Numicon Shapes and overlays on. Also a base for building towers of number facts or making patterns with the Numicon pegs.

Feely Bag
This cotton fabric bag assists in developing visual imagery of a number as represented by a Numicon Shape. Its versatility leads to numerous multi-sensory experiences and activities.

Coloured Pegs
Pack of 80 coloured pegs that fit into the Numicon Baseboard and Shapes. Used in pattern making activities. Each pack has an even assortment of red, yellow, green and blue.

Black and White Pegs
For use with students for whom colour may provide a distraction. Pack of 80.

Coloured Counters
Counters for use with Numicon Baseboard Laminates and pattern making. Packs of 200 in assorted colours of red, yellow, green and blue.

For more information, visit oup.com.au/numicon  Email: numicon.au@oup.com
## NUMICON KITS

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<td>9780198486886</td>
<td>1ST STEPS WITH NUMICON AT HOME</td>
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* A conversion kit supplies the teaching guide and materials for the new kit that were not in the previous kits. This avoids unnecessary duplication of kit materials.

## NUMICON INTERACTIVE WHITEBOARD AND TEACHING RESOURCES

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## SUPPLEMENTARY NUMICON RESOURCES

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**TOTAL:** **A$**

**+ HANDLING & FREIGHT:** **A$12.50**

**AMOUNT PAYABLE:** **A$**

† The recommended retail prices include GST, are correct at time of printing and are subject to change without notice.

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**School Order Number:** _______________  **Date:** _______________

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With new resources and research being added frequently, the website is your hub of information on multi-sensory maths!

About the Numicon Project

The Numicon Project is a collaborative endeavour to facilitate children’s understanding and enjoyment of maths. The Project was founded in the daily experience of intelligent children having real difficulty with maths, the frequent underestimation of the complexity of the ideas that we ask young children to face, and a recognition of the importance of maths to them and to society as a whole.

We appreciate the complexity of these early number ideas and seek to foster the self-belief necessary to achieve in the face of difficulty; we are not about ‘making maths easy’.

We believe that the combination of action, imagery and conversation helps children to structure their experiences, which is such a vital skill for both their mathematical and their overall development.

By watching and listening to what children do and say, we and many others are finding that our developing multi-sensory approach provides learners with the opportunity to play to their strengths, thereby releasing their potential to enjoy, understand and achieve in maths. This enjoyment in achievement is also shared by teachers and parents.

We strive to support teachers’ subject knowledge and pedagogy with teaching materials, professional development and on-going feedback as we continue to develop a better understanding of how we can work together to encourage all learners in the vital early stages of their own mathematical journey.

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