Welcome

Numeracy Information Evening

Presented by
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AusVELS

• AusVELS incorporates the Australian Curriculum Foundation – Level 10 (F-10) for English, Mathematics, History and Science within the curriculum framework first developed for the Victorian Essential Learning Standards (VELS).

• It provides a set of prescribed content and common achievement standards.

• Schools use it to plan student learning programs, assess student progress and report to parents.
AusVELS

CONTENT STRANDS

Number and Algebra
  Number & Place Value
  Counting & Place Value
  Operations
  Fractions & Decimals
  Money & Financial Mathematics
  Pattern & Algebra

Measurement & Geometry
  Using Units of Measure
    Time
    Shape
  Location & Transformation

Statistics & Probability
  Geometric Reasoning
  Data Representation & Interpretation
  Chance
AusVELS

PROFICIENCY STRANDS

Understanding
Fluency
Problem Solving
Reasoning

• An integral part of the mathematics content across the 3 Strands
• Reinforce the significance of working mathematically
• Describe how the content is explored and developed
• Provide the language to build the developmental aspects of the learning of mathematics
Foundation
The common term agreed to by all States and Territories to refer to the first level of school.

Understanding includes connecting names, numerals and quantities

Fluency includes counting numbers in sequence readily, continuing patterns, and comparing the lengths of objects directly

Problem Solving includes using materials to model authentic problems, sorting objects, using familiar counting sequences to solve unfamiliar problems, and discussing the reasonableness of the answer

Reasoning includes explaining comparisons of quantities, creating patterns, and explaining processes for direct comparison of length
Level 1

The common term agreed to by all States and Territories to refer to the first level of school.

**Understanding** includes connecting names, numerals and quantities, and partitioning numbers in various ways.

**Fluency** includes counting numbers in sequence readily forwards and backwards, locating numbers on a line, and naming the days of the week.

**Problem Solving** includes using materials to model authentic problems, giving and receiving directions to unfamiliar places, using familiar counting sequences to solve unfamiliar problems, and discussing the reasonableness of the answer.

**Reasoning** includes explaining direct & indirect comparisons of length using uniform informal units, justifying representations of data, and explaining patterns that have been created.
Model of Gradual Release of Responsibility - Numeracy

The Lesson Structure

- Warm Up Activity – 5 to 10 minutes
- Introduction 5 to 10 minutes
- Independent or Group Work 30 Minutes
- Focus Group 15 Minutes
- Share/Reflection – 5 to 10 minutes
digit, number, one, two, three to twenty, ones place, tens place, bundling sticks, first, second, third to twentieth, counting on, counting back, hundreds place, thousands place, more, less, greater than, less than, digits (0123456789), before, after, patterns, skip counting, ordinal number, base 10 (units, longs, flats and cubes), numbers 0 to hundreds of thousands, decimals, tenths, hundredths, rounding, place value, tens of thousands place, number line, expanded notation, rounding, tenths, hundredths, thousandths, numbers from 0 to 1 million
Building up basic facts...

- Count on from larger number, *facts with 1, then those with 2, 3 and finally with 0*
- Using doubles (ten frames to visualise the thinking), *double 2 is 4 and counting on*
- Make to ten (buddy numbers, ten frames provide a good model) the *nine facts built up first, then the eights fact*...
Developing numeration...

- Introducing the numbers (one-to-one)
- Linking objects to number names and number symbols (subatising)
- Counting on and back
- Comparison (larger/smaller)
- Sequencing and number patterns (final digit – 5’s, 5 and 0)
- Ordinal number
- Ten as a new unit (composed of 10 ones are 1 ten)
- Multiples of ten
- Two-digit numbers
- Build up to the next multiple (10 tens are 1 hundred)
- Three-digit numbers
- Including zero (not nothing) and renaming (206 has 20 tens and 6 ones)
Teaching concepts...

**materials**

- **language**
  - ten
  - 10 ten ones

- **symbol**
  - 10
Addition

Put with, makes, I had, I got more, now I have, x and x is, add, together, joined with, groups, combined, part, whole, zero to twenty, row, top, bottom, empty boxes (tens frame), same, larger, smaller, total, equal, and, altogether, joining, before, after, one more than, one less than, count on, addition, number sentence, equation, double, near double, plus, verbs that support addition word problems e.g. bought, gave, found, make etc. sum (in reference to the total but not as a name for an equation), digit, how much, plus, algorithm, repeated addition, odd and even, number sentence, equation, tenths, hundredths, decimal, decimal point, dollars, cents, more, plus, increase, renaming, no renaming, doubles, near doubles, expanding, split strategy, jump strategy, place holder, fractions, decimal places, numerator, denominator, common denominator, internal zeroes.
Developing the addition concept...

- Verbal action stories that involve joining
- Model with materials to show addition situations (ten frame, counters, counting frame, 100’s board)
- Language
- Emphasis part/part/whole
- Recording as *pictures – numbers - words*
- Gradually introduce symbol
- Match the *story – materials – symbol*
- Extend the thinking to include use of materials, language and recording of strategies (thinking in tens, renaming, flips and addition of more than two numbers)
Subtraction

take away, difference between, counting back, missing part, how many left?, greater/less than, subtract, minus, subtraction, algorithm, turn arounds, comparison, difference, how many more are needed?, how much more is needed?, reduce, minimise, how much is left?, compare, total, place holders, renaming, more than, verbs that support subtraction word problems e.g. stole, lost, reduced, took, leave.
Developing the subtraction concept...

- Verbal action stories that involve joining
- Model with materials to show addition situations (ten frame, counters, counting frame, 100's board)
- Language
- Emphasis whole/part/part (amount takeaway a part leaves a part)
- Recording as pictures – numbers - words
- Gradually introduce symbol
- Match the story – materials – symbol
- Extend the thinking to include use of materials, language and recording of strategies (thinking in tens, no renaming/renaming and addition of more than two numbers)
- Extend the thinking to include the link with addition
  
  \[
  3+9=12 \\
  12-3=9 \\
  12-9=3
  \]
Multiplication

group, groups of, equal, the same as, larger, smaller, largest, smallest, same, most, more, less, fewer, least, enough, not enough, too many, rows, how many, share, altogether, total, zero, one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty, naming groups (2 threes), bundles, equal groups, equal to, double, counting on, and, altogether, array, rows, repeated, addition, columns, commutative, associative, multiply, count by, multiplication, times, multiply, groups of, repeated addition, addition, equation, renaming, digits, estimation, array, rows, multiply, product,
Developing the multiplication concept...

• Activities that build on \textit{repeated addition} (3 bags with 2 apples in each, how many altogether? 2 and 2 and 2)

• Language

• Model with materials, focus on objects in \textit{arrays} to establish it as an operation independent of addition.

• When arrays are familiar show how it can be flipped to provide another fact (3\times4=12, 4\times3=12, linking the identical thinking)

• Facts are learned in the typical order of multiply by 1, 5,10, 2, 3 and 4 (counting patterns, doubles, flips)

• Recording as \textit{pictures} – \textit{numbers} - \textit{words}

• Gradually introduce symbol

• Match the \textit{story} – \textit{materials} – \textit{symbol}

• Extend the thinking to include use of materials, language and recording of strategies (thinking in tens, flips and multiplication of one-digit by one-digit with renaming)
<table>
<thead>
<tr>
<th>Division</th>
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<tbody>
<tr>
<td>share, divide, divided by, shared between, divided into, shared among, shared equally or evenly, split up, groups of, how many groups of, equal parts, distributed among, broken up into equal parts, goes into, sharing fairly, how much each receives, how many each gets, sharing, partition (Example of partition: If 9 toys are shared among 3 students, how many does each person get?), grouping, quotition (Example of quotition: How many groups of three can be made from a bunch of 12 flowers?), inverse of multiplication, remainder, halving.</td>
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</tbody>
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Developing the division concept...

- Introduced through everyday problems that involve *sharing*
- Introduced through the use of arrays

- Initially language of *sharing* should be used
- Model with materials
- Record as *pictures – numbers – words* (initially remainders)
- Gradually introduce symbol
- Match the *story – materials – symbol*
- Extend the thinking to include use of materials, more formal language and recording of strategies without/with remainders
Problem Solving Strategies

Make a table
- 4 legs
- 2 legs
- no legs
- cat
dog
boy
emu
snake

Make a list
- 4 dogs
- 3 cats
- 7 rabbits

Draw a picture/diagram

Act it out

Make a model

Identify a pattern
5, 10, 15, 20

Write a number sentence
3x4=12

Solve a simpler, related problem
102, 104 ???
2, 4, 6, 8, 10...

Guess and Check

Work backwards
Problem Solving Strategies...

• **Guess and check**: Students make a guess and then check the accuracy of their answer, they then refine their guess and check again. Develop their estimation skills and build on their ability to make reasonable guesses.

• **Act it out**: Students problem solve by acting this out in the same way as the use of concrete materials.

• **Draw a diagram**: The students will draw a diagram or use a chart.

• **Look for a pattern**: Using other strategies, such as guess and check students will identify patterns that suggest a pathway to a solution.

• **Work backwards**: Problems such as these enable students to work from, these tasks are valuable in enabling students to start with the answer and work back through their workings.
Problem Solving Strategies...

- **Make a table/list:** Organisation skills and data concepts are developed through this strategy.

- **Write a number sentence:** Here the students create algorithms in order to solve the set problem.

- **Make a model:** Using concrete materials to help visualise possible solutions.

- **Solve a simpler problem:** Substitute a number smaller in value to see if this works in the context of the problem being tackled.
Selecting a strategy...

Students will naturally select a method that reflects their preferred learning style.

It is through the ‘share and reflection’ lesson component that students are exposed and encouraged to select and trial different strategies.
Problem solving in the early years...

- I have some green teddy bears and some red teddy bears. I have 10 teddy bears altogether. How many teddy bears could be green and how many teddy bears could be red?

- If we were all asked to line up with a partner at the door would you all have a partner? Explain.

- Why are baseballs spheres and not cubes?

- I wrote down a number with a zero in it, but I cannot remember what it was. I know it was between 100 and 200.
Problem solving in the early years...

- The Purdey family has bicycles, tricycles, unicycles and four wheel pedal trucks. Celia counts 14 wheels. How many bicycles, tricycles, unicycles and four wheel pedal trucks could there be?

- Four people meet at the beach and all shook hands with each other once. How many handshakes altogether?

- I have five fish and got some more. How many fish might I have now?
How did you know to.....?
Can you tell me how you worked that out?
How did you do that?
Can you think of another way to do that?
What do you have to solve?
What happens if I change this here.....?
What could you do next?
Is there a quicker way to do that?
If you do it this way, do you think it will work?
How are these two problems the same and how are they different?
Can you see a pattern?
Tell me how you added that?
Is there a fast way to do that?
Share & Reflection

Examples of reflection sticks used by students in the classroom to facilitate the recording of their understanding.
TOP 10 TIPS

• Be positive about maths.
• Don’t tell. Let kids discover.
• Give kids think time. Let them process the information.
• When a child has given an answer tell them you’re pleased before you ask them to elaborate.
• Never let a chance go by. Make connections. ‘maths just makes sense’
Parent Helpers in the Numeracy Block.

Beware of making judgements
• All children can learn.
• Children learn at different rates and have different learning needs.

Retain Confidentiality
• The privacy of both parents and children must be respected at all times.
• Do not mention the names of children or teachers with whom you are working in front of your own children or other parents.
• Children can easily be hurt by apparently harmless remarks from their peers or other children.
Parent Helpers in the Numeracy Block.

Assisting in the classroom under the direction of the classroom teacher by: -

• Working with small groups of children.
• Providing a role model for learning.

Being a valued member of the school community: -

• Your support in the classroom will ensure that children remain on task while the teacher is working with other groups.
‘You know, when you break it all down, Maths is only here to help us make sense of the world’.

‘Maths isn’t hard, Maths makes sense’.

Rob Vingerhoets
Education Consultant in Numeracy