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Early Place Value

A Collaborative Guided Inquiry with Ann Baker

Series Introduction

Contents

Early Place Value

This series consists of six modules, each of which is matched to the Australian Curriculum: Mathematics. The modules are:

1. **Eight Strategy lessons** with extensive teacher notes,
2. **Five Mental Routines** with suggestions for a Vocabulary Wall for the associated mathematical terms for place value,
3. **Fourteen Problematized Situations** with associated Anchor Charts and Observation Schedules,
4. **Nine Number Talks** with teaching suggestions.
5. **Five Place Value Games**.
6. **Eight Assessment Activities** with record-keeping tables.

The material is also set within the context of an inquiry that will enable the teacher to show where the students started from and where they have reached in their exploration of place value.

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Overview

Place value is a lot more than teaching a set of ordered names to be matched to a series of columns (100s, 10s and 1s). Teaching place value for deep understanding is fundamentally different to 'traditional' content. It includes ideas of magnitude based on informed visual patterns and fluent counting strategies. Flexible grouping and recording quantities leads to understanding the importance of equal-sized groups (unitizing) and 2, 5 and 10 as countable units:

> "Now that I've grouped these in 10s, I can count in 10s (not 1s) and I can say how many lots of 10 there are."

Students need many experiences to help them arrive at an understanding of the usefulness of 10 as a countable unit.

Place Value Indicators

The next two slides give the indicators that ensure your students have a strong foundation for their understanding of, flexibility and confidence with, place value. The indicators are based on the Australian Curriculum: Mathematics and cover the requirements for Foundation to Year 2 students.

The Collaborative Guided Inquiry

The material is also set within the context of an inquiry that will enable the teacher to show where the students started from and where they have reached in their exploration of place value.

Place Value Indicators

Place Value Indicators						
1. Counts forwards and backwards to 120 from any starting number						
1.1. counts in 1s						
1.2. counts in 2s						
1.3. counts in 5s						
1.4. counts in 10s						
2. Counts and represents amounts (unitizing)						
2.1. groups in 1s						
2.2. groups in 2s						
2.3. groups in 5s						
2.4. regroups collections into 10s						
3. Number Recognition and writing						
3.1. writes numbers combining numerals correctly						
3.2. uses decade names to quickly locate numbers						
3.3. explains how numerals match quantities						
3.4. reads numbers written in numerals or words						
3.5. represents and explains the value of each numeral in a number						
4. Ordering and Sequencing						
4.1. orders and sequences counting numbers						
4.2. arranges numbers in ascending order						
4.3. arranges numbers in descending order						
4.4. fluent with, before, less than, after, more than, between						
4.5. bridges through 10s						
4.6. bridges through 100						

These indicators are provided as a separate file for printing and record-keeping as needed.

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Place Value Indicators

Place Value Indicators						
5. Describes and creates number patterns						
5.1. identifies increasing intervals in patterns						
5.2. identifies decreasing intervals in patterns						
5.3. creates, continues and describes patterns						
6. Models proportionally on an Empty Number Line (ENL)						
6.1. locates and places numbers on an ENL						
6.2. identifies referents or benchmarks to put on an ENL						
6.3. uses positional thinking to plot numbers on an ENL (closer to-than-)						
7. Partitions numbers						
7.1. uses the additive property of place value 136 is 30 and 6 more)						
7.2. explains and demonstrates what each numeral in a teen number represents						
7.3. knows that 10 is a countable unit						
7.4. uses the multiplicative property of place value (36 as 3 tens and 6 more)						
7.5. flexibly partitions, builds and describes numbers (36 can be 30+6, 20+16, 10+26, ...)						

These indicators are provided as a separate file for printing and record-keeping as needed.

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Introduction

Having an Impact?

John Hattie has coined the term 'know thy impact'. Teachers are more and more being expected to know if they are having sufficient impact on their students' learning. Teachers are also expected to involve students in knowing the learning intentions and to be involved in knowing how well they are meeting the success criteria. With this in mind, we have planned this mini-classroom based inquiry such that we can begin to collect data about our impact: what's working, what we can achieve and how we can share the learning journey with our students.

The Collaborative Guided Inquiry

An inquiry begins with important guiding questions. Two questions are outlined below but as you work with peers you may want to rewrite them to suit your own needs or interests. At least they will start the process.

Acknowledgement

Johnny and I would like to express our very sincere thanks to Caroline Swinburne for her support in the preparation of this series. “Caroline, thanks to your insights and comments; parts of the series that might have been incomprehensible are now accessible to all!”

ACARA: Numeracy Learning Progressions

The content of this series has been guided by the Australian Mathematics Curriculum, which sets broad goals for Early Place Value:

Foundation Year: Students count to and from 20 and order small collections.

Year 1: By the end of Year 1, students describe number sequences resulting from skip counting by 2s, 5s and 10s. Students count to and from 100 and locate numbers on a number line.

Year 2: By the end of Year 2, students recognise increasing and decreasing number sequences involving 2s, 3s and 5s.

Students count to and from 1000.

These goals are made more explicit in the Numeracy Learning Progressions (NLPs).

QuN5

Producing number names

counts to at least 20
continues a count from a number other than 1
counts forwards by tens to 100

Counting items

counts groups of up to 20 items

Numeral recognition and identification

points to the correct numeral in response to a verbal request, for numerals up to 20 as well as 30, 40, 50, 60, 70, 80, 90 and 100

QuN6

Producing number names

counts to at least 30
produces the number word just after a given number in the range 1–30 (without dropping back)
produces the number word just before a given number word in the range 1–30 (without dropping back)
counts forwards and backwards by tens to and from 100

(continued on the next page)

ACARA: Numeracy Learning Progressions

QuN6 (ctd)

Counting items

matches known numerals (to 20) to quantities

Numeral recognition and identification

identifies all numerals up to 30 as well as 40, 50, 60, 70, 80, 90 and 100 (is shown the numeral 17 and produces its name)

orders numbers to at least 20 (determines the largest number in a group of numbers selected from 1 to 20)

QuN7

Producing number names to at least 120

counts forwards and backwards to and from 120 and beyond

continues counting from any number up to 120 and beyond

counts forwards and backwards by fives

Grouping and counting items by tens

counts items in groups of twos, fives and tens

recognises that a count of one ten is the same as ten counts of one

Numeral recognition and identification

identifies numerals from 0 to at least 100

recognises a numeral from a given range up to 100

NPA4

Continuing number patterns

continues patterns where the difference between each term is the same number

describes rules for continuing patterns where the difference between each term is the same number

sequences numbers to identify a pattern or rule

Introducing number sentences

recognises the equals sign as meaning ‘is equivalent to’ or ‘is the same as’ not just ‘makes’ (recognises that 5 + 3 = 6 + 2)

finds missing values in a number sentence (5 + ? = 6 + 2)

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Questions to ask yourself

Question 1

To what extent does an emphasis on counting, unitizing and visualizing the magnitude of large collections help transition students to an understanding of 10 as a countable unit ?

Two Definitions

Examples of the *additive property of place value* are:

36 is 30 and 6 more; 14 is 10 and 4 more.

An example of the *multiplicative property of place* value is:

36 is 3 tens and 6 ones

Question 2

Does increased attention to the additive property of place value facilitate students' understanding and development of the multiplicative property of place value.

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Questions to ask yourself

What do we know about students and place value?

We know that some of our students:

- rote count successfully but do not consider where the number is in the counting sequence
  "Is it more than/less than/closer to …"
- have not made connections between parallel counting
  "If we put fingers up as we count in 10s, each finger represents a 10 and the number of fingers tells how many times we have counted by 10s. We are counting in I0s and 1s simultaneously."
- do not spot the patterns in counting sequences
  "If you start on 2 and count in 10s, all subsequent numbers in the sequence will end in 2."
- do not understand that the numerals 0 – 9 compose larger numbers and the placement of a digit in a number determines its value.
- do not think in positional a proportional terms about numbers and their placement on an Empty Number Line.

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The Learning Intentions

Intention 1

To use dialogue, visual images and matched labels and number sentences to encourage students to develop a deep understanding of flexible grouping based on the structure of place value

Intention 2

To develop pedagogy that promotes engagement with, and disposition toward, fluency and flexibility ii, and disposition toward place value as outlined in the ACARA: National Numeracy Learning Progressions.

Activities for the Inquiry

Observations, work samples and anecdotes will be collected lesson by lesson so that we can examine our impact through ongoing formative assessment.

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Before getting started: A quick check

Before moving on to the actual focus and pedagogical content goals of this inquiry please look at the following question and notice how you go about answering it.

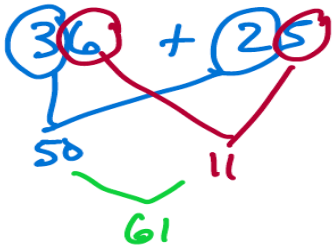
What different ways could you use flexible number splitting to add 36 + 25?

Possible Approaches

- **Traditional method, add the ones, regroup and add the 10s**

$$\begin{array}{r} 36 \\ 25 \\ \hline 61 \end{array}$$

- **Chunk it using the front end method**



- **Number split**

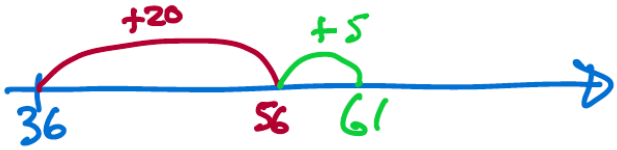
double 25 = 50

50 + 11 = 61

or 35 + 25 = 60

60 + 1 = 61

- **Number Split and use a number line**



The long-term goal is to be able to work flexibly with place value. How flexible is your own place value thinking?

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Early Place Value Picture Books

Here is a list of Early Place Value picture books that I have used with Foundation Year students. Hopefully, your library will have some of them and you'll be able to dip into them with your students.

Bardos, M., (2013) *100 Bears* Flying Fox Books

Carter, D., (2013) *100 Lift the Flaps and Learn to Count* Sterling Children's Books

Cave, K., (1991) *Out for the Count* Angus and Robertson

Child, L., (2015) *One Thing* Orchard

Cutler, M., (2000) *100th Day Worries* Simon and Schuster

Duke, S., (2012) *What's the Place Value?* Little World Maths

Franko, B., (2009) *Zero is the Leaves on the Tree* Tricycle Press

Graham, O., (2012) *When I dream of 1, 2, 3* Hinkler Books

Harris, T., (no date) *100 Days of School* Millbrook

Holub, J., (2012) *Zero the Hero* Henry Holt and Co

Lee, Chinlum (2001) *The Very Kind Rich Lady and her 100 Dogs* Candlewick

Lottridge, C.B., (2008) *One watermelon Seed* FitzHenry and Whiteside

Miranda, M., (2002) *Monster Math* Voyager Books

Neuschwander, C., (2009) *Sir Cumference and all the King's Tens: A Maths Adventure* Charlesbridge Maths

No Author (2014) *How to Draw 101 Monsters* Hinkler Books

Pallotta, J., (no date) *100 ways to get to 100* Scholastic

Pesenti , A and Bell, H., (2015) *Numerical St* New South Publishing

Pinches,E. J., (1993) *One Hundred Hungry Ants* Houghton Mifflin

Sayre, A. P. and J., (2003) *One is a Snail, Ten is a Crab* Walker Books

Schlein, K. (1996) *More Than One* Green Willow Books

Sebe M., (2014) *100 Hungry Monkeys* Kids Can Press

Sebe, M., (2010) *100 Animals on Parade* Gecko Press

Sebe, M., (2010) *Dinosaurs Galore* Gecko Press

Sebe, M., (2011) *100 Things* Gecko Press

Sloat. T., (1991) From One to One Hundred Puffin Books

Sparagna Lo Presti (2003) *A Place for Zero* Charlesbridge Maths

Stone, K. L., (2014) *Penguin Place Value* CreateSpace Independent Publishing Platform

Stone, K.L., (2016) *More Penguin Place Value* CreateSpace Independent Publishing Platform

Whaite, M., (2019) *100 Cats* Puffin

Whaite, M., (2018) *100 Dogs* Puffin

Wood, J.,(1994) *Number Parade* Frances Lincoln