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Teaching & Learning Place Value

The teaching and learning of place value continues to be a big challenge for both teachers and students and as this is foundational to the understanding of numbers and building number sense, it is important teachers are highly knowledgeable in their own understanding, common misconceptions and sticking points that can go undetected. Students will not learn place value from a book or a website. It requires purposeful teaching.

1. Symbolic (linguistic understanding)

The position of the digit in a number describes the number of ones, tens (and hundreds) in a two or three digit number

The tens and ones columns cause more problems than the hundreds as the English language does not label the columns in the language used to describe the number.

As soon as you get to the hundreds column the word hundred is used labeling the digit. 200 Two hundred

Te reo Māori labels the tens column 20 rua te kau

Naming the order of the columns is the reverse of reading direction and young students need plenty of opportunity to see and order the column headings.

Practical tip: We often present them with base boards with the tens and ones columns set out, maybe we could give the base boards and the words tens and ones for them to correctly position on their boards at the start of any lesson. Do not use just T and O. Extend to 3 digit numbers.

When saying a number, the word 'and' only occurs between the hundreds and the tens columns which leads students in treating two digit numbers the same as single digit numbers. 236 Two hundred **and** thirty six

Early teaching of number will most likely focus on numbers 0 - 10 and some students generalise zero means nothing (and can therefore be ignored) and 10 is another digit just like the digits 0 - 9. Students continue to treat two digit numbers in the same way as single digit - represented by a number of ones. Using counters will reinforce the numbers as made up of groups of one.

This is a mis-conception created by some students and will need challenging to 'undo'. (Remember students construct their own learning and mis-conceptions cannot be totally avoided but recognise when they have occured)

Practical tip: Teacher vocabulary must distinguish between number and digit

The single digits (0 - 9) are also number.

The double digit numbers e.g.36: is made up of the digit 3 and the digit 6 (which also is the number 6 because of its position in the number 36)

The 3 is a digit, its number is 30 because of its position in the number 36

When we expand the number 36 we get two numbers 30 + 6

All numbers can be partitioned into smaller numbers; 30 + 6 is known as the standard partition.

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2. Grouping (Conceptual understanding)

Another common misconception is students do not hear the difference between 'one' and 'ones' or 'ten' and 'tens'

The plural of the number name implies we are talking about a group.

Look what happens to the letter "s" in the wording below

three groups of ten or three tens

Do not assume a student who can tell you 36 has 3 tens also understands 36 has three groups of ten. This is a multiplication concept – involving working with equal groups, how many are in the group, the number of groups and the total amount

This part of place value requires a student to be able to work with an equal group of ten, the number of groups and the total amount. – the ten times table

Understanding the importance of a group of 10 is fundamental to making sense of our man made BASE 10 number system.

The ones column creates a mathematically conceptual difficulty in that students do not consider groups of one

One is the multiplicative identity – when you multiply by one it does not change the number. The commutative property of multiplication says $1 \times 5 = 5 \times 1$ One group of 5 is the same as 5 groups of 1 but students only see the one group of 5

This limited understanding is compounded by everyday experiences of working in a group which does not include working as an individual.

Practical tip: Take your students outside to run around and when you blow the whistle shout a number (between 1 and 9) and students have to make themselves into groups of that number. When using the number one, students must remember to make groups of 1 not one group.

The digit zero is the most important feature in the number system, without it we do not have the number system.

Zero is not nothing – it is nothing of something If it doesn't represent something it does not meet the definition of a number.

1, 2, 3, 4, 5,..... form the set of natural numbers 0, 1, 2, 3, 4, 5 form the set of whole numbers Depending on the position of the zero in a number it has a value of zero ones, zero tens etc.

It is only when you get to a three digit number can you experience the idea of zero tens.



Many teachers have said students seem to get 2 digit place value but it all falls over when you get to three digit place value and you feel like you have to start again.

Practical tip: Pay close attention to the digit zero rather than dismissing it "as a place holder". Talk about its value in a number – its place value. Do not be afraid to venture into the hundreds column – it's linguistically easier than the first two columns.

Understanding the beginnings of place value require a lot of ideas, language and symbolics to come together.

Mathematics is abstract – we can only begin to make sense of it through material representations of the mathematical ideas.

A variety of Base 10 representations need to be readily available in every classroom and used to represent the ideas, supported by correct language and connected to symbolic representations.

Students need the opportunity to use materials:

- that build groups of ten (e.g. ice block sticks, unifix)
- that have a group of ten visually apparent (e.g. tens frames, numicon, animal strip)
- where the group of ten is implied by size/shape or label (dienes blocks, money notes)

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A. Complete the family of facts

2

1. 12 + 8 =

8 + 12 =

20 - 8 =

20 - 12 =

B. Expand these numbers

Due to a 33% increase in hosting costs I will have to increase prices from 1 August 2025 (Instead of 1 July 2025 as previously advertised)

Wilkie Way Maintenance

13 + 5

8 + 7 =

Over the last 5 weeks I have taken a break from delivering professional development in schools to focus on creating new resources.

I am pleased to announce the first 10 maintenance sheets (and answers) have now been uploaded for years three, four, five and six. These sheets are designed as maintenance and as such the work covered is from the previous year curriculum content.

Stduents should be able to complete the sheet independently. There will be times when something has "slipped their memory" a brief reminder should be sufficient. If however you find something is requiring more in depth teaching then it is important that this gap in their knowledge is addressed as soon as possible to ensure the next step can be built on.





The Wilkie Way







