The Wilkie Way

Newsletter November 2020

www.wilkieway.co.nz

Can do mathematics, Can understand mathematics

The pendulum on the best way to teach mathematics began 200 years ago through the publication of two opposing philosophies of teaching methods published just over 30 years apart.

Pike's publication written in 1788 was based on the belief that mathematics is about getting correct answers and students need to be able to recall facts and apply set procedures to familiar problems in everyday life.
The goal was to get answers correct, then all a student required was an instructional understanding that met the requirements of mathematics 230 years ago.

The text written by Colburn in 1821 stated the need for sequenced questions using concrete materials and to postpone practice until the student understands the mathematics.

In the 30 years between 1788 and 1821 the world had seen a huge change. The world was poised at the beginning of what is now termed the industrial revolution.
To create the "revolution" people who were able to think critically, creatively, strategically and logically were required.

No longer was the philosophy of the teaching process based on state a rule, give an example then complete practice exercises sufficient to develop the use of mathematics required to solve unfamiliar and yet to be invented problems.

Students whose school mathematical learning experiences have been limited to instructional understanding appear to make progress. They get more answers correct on tests. They learn facts by rote and can recall at speed, often used as a measure of mathematical success. However there is no real understanding which is one of the most frustrating and ultimately defeating experiences. Students often end up seeing themselves as no good at maths. Hence the myth arises that you are born with or without a maths brain. For many students this results in maths anxieties which are a very real barrier to mathematics learning.

Teaching that focuses on students understanding both what to do and why, results in transferable mathematics knowledge. As the new knowledge is connected to knowledge students already know the new learning is easier to remember. This type of understanding is one of the most intellectually satisfying experiences. However this type of understanding develops over time and becomes more complex as a student makes more connections between ideas.

There is a balance to be achieved between the extremes of the pendulum. Only providing students with challenging problems and not allowing time within the programme for learning specific procedures, mean students are never able to apply rules but must always reinvent the mathematics every time unnecessarily. Progress is slowed down and the likelihood of knowledge gaps increases leaving the opportunity to make necessary connections unlikely. These gaps impact on the development of conceptual understanding so students end up with an attitude that learning mathematics is a frustrating and ultimately defeating experience.

The one aspect both sides of the pendulum agree on is the need for practice but practice for improvement requires intrinsic motivation and the desire to improve.

Delaying the teaching of a procedure until a conceptual understanding is achieved is desirable as in the delaying of a standard algorithm and focusing on mental strategies to develop an understanding of how the number system works. However when mental methods of solving become an end in themselves they become just another procedure and may not contribute to a conceptual understanding of the number system at all. In a worst case scenario, they contribute to confusion and create mathematics anxieties.

Our mathematics curriculum document (page 26) states that mathematics is the exploration and use of patterns and relationships in quantities, space and time, and statistics is the study of patterns in data. It states the reason for studying mathematics is for students to develop the ability to think creatively, critically, strategically and logically. They learn to structure and to organise, to carry out procedures flexibly and accurately, to process and communicate information and to enjoy intellectual challenge.
This document points us firmly in the direction of teaching for a deeper understanding.

Teaching for this kind of understanding takes time and a teacher with a conceptual understanding of the mathematics. Teachers are also the result of an education system that for many left them with an instructional understanding of mathematics. Most teachers state they can do mathematics, many have secondary qualifications in mathematics but that does not necessarily mean they have a conceptual understanding of the mathematics required to enable them to assist students to make connections that they themselves may not yet have made.

This is especially true for the early levels of mathematics as many of the foundation stages of concepts are in the unconscious and often not even recognised as early mathematical conceptual building blocks. Connecting these ideas is how concepts deepen and expand and become more complex. If early ideas are missing then further development is impossible.

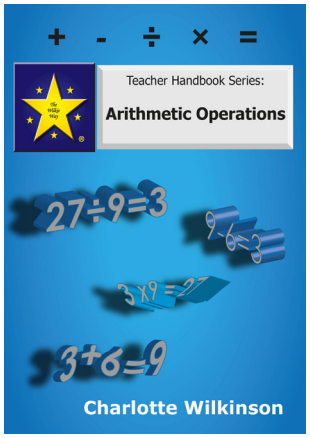
Without ongoing professional learning over time to meet individual teacher's learning needs their development of mathematical conceptual understanding will be limited and therefore real understanding for all students in all schools will never be achieved and thus the level of numerate adults required for our rapidly changing future is compromised. Learning in a collegial setting is paramount, and the learning must be directly related to their current job. This cannot be "fixed" in initial teacher training but recognise and accept that it requires on going professional learning.
If real change is to happen then schools need to look at how they meet the learning needs of their teachers.

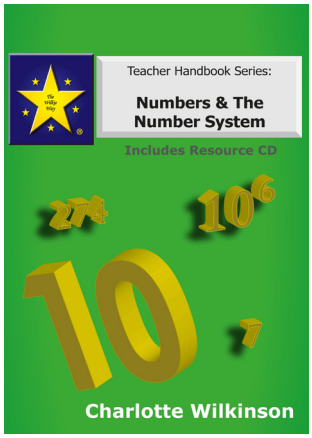
Thinking about Mathematics Professional Learning for 2021

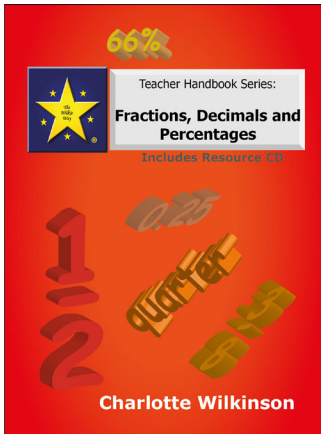
Applied or applying for central funding? Charlotte is an accredited facilitator (#654) and can deliver centrally funded PLD, school funded or a mixture of both.

Contact Charlotte now by email charlotte@ncwilkinsons.com (027 3443963) to discuss your requirements.

Background reading to develop your conceptual understanding with direct links to classroom practice, class activities, student resources.
Available from www.wilkieway.co.nz online store $50.00 each or all three for $135.00







Resources for Wilkie Way Members

Subscriptions purchased at the online store at www.wilkieway.co.nz

Individual $45 - paid via paypal

NZ School paid via invoice - complete form at online store

Up to 100 students $150+GST

101 - 300 students $250 + GST

300+ students $350 +GST

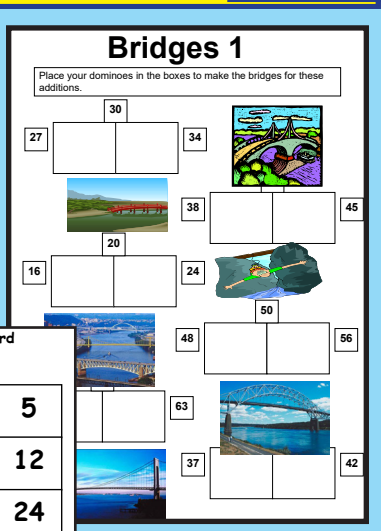
Non NZ School $400 - paid via paypal

What is new for WIlkie Way members:

Student Resources:

- **Place Value**

I have created a new folder called **Games -** along with the games that appear in the teen ty folder under level 1 - 2 I have added the games Bridges 1 and Bridges 2 - played with dominoes to bridge the tens number.



- **Addition & Subtraction**

Level 3 Maintenance game - Poison 18

- **Multiplication & Division**

Level 3 Maintenance game - Multiplication Madness

- **Graduated Problems on a Theme**

Problems with Houses (corrected version)

Teacher Professional Resources

- **Assessment**

Both the Odd and Even year updated versions of the teacher guides for Mathematical Knowledge & Skills Assessment Screens

Multiplication Madness Game Board

A game for 2 players

1	2	3	4	5
6	8	9	10	12
15	16	18	20	24
25	27	30	32	36
40	45	48	50	54
60	64	72	75	80
90	96	100	108	120
125	144	150	180	216

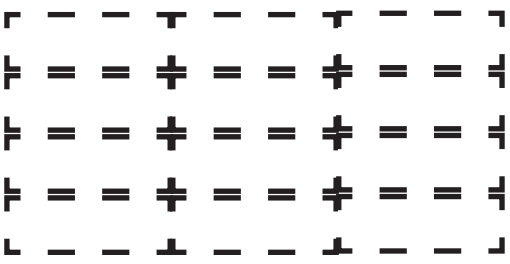
Rules: You will need three 1 - 6 dice and 20 counters each. (Use a different colour each)

Takes turns to roll all 3 dice. Find the product of the 3 numbers and cover the number on the game board.
If it is already covered miss a turn or if it is your opponent's counter you could play replace their counter with yours. (Decide which rule you are playing before you start the game)
First player to get four counters in a row is the winner.

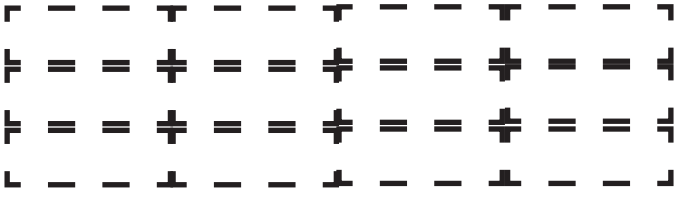
The Wilkie Way Teacher Challenge

How can you cut along the dotted lines on shape one, making only two pieces so that you can fit the two pieces together to make shape two.

Shape one



Shape two



It is time to order Assessment Screens for 2021

Normal price for Pack of 35 student booklets + a teacher guide is $120.00

By pre-ordering I can offer a substantial discount through bulk printing:

A single pack for $100
Two packs of same level $175
Three packs of same level $225
Four packs of same level $300
Five packs of same level $350
Additional packs at same level $70 per pack.

For small schools who only have a few students at each level a pack of 5 student booklets at a level + teacher guide is available for $25

Want to know more about the assessment screens?

Join Charlotte for a presentation and question and answer session via Zoom on

Monday November 16th 3.15pm - 4.15pm or Tuesday November 17th 3.15 - 4.15pm

Please send email to charlotte@ncwilkinsons.com to register for this free presentation.

Use to identify a student's strengths and weaknesses in their mathematical knowledge and skills to enable targeted personalised teaching and ensure progression in thinking mathematically.

Screening	Level 1	Level 2	Level 3	Level 4
Whole number place value	Counting Sequences 1 after/before 10 more/less	Column names Additive structure Importance of 10 x Structure Rounding	Column names Larger numbers - use of zero Repeated x structure Rounding	Larger numbers - use of zero Repeated x structure Rounding x/÷ by tens Standard form
Addition & Subtraction	Doubles, 5+, within 10, 10+ +/- tens Additive structure of PV	Basic facts to ten, Basic facts to 20, Double digit +/- single digit Double digit +/- double digit	Recall of +/- facts. Use of signs & symbols in a linear equation Mental & Recorded strategies Estimation	Flexibility - rounding & compensating Written algorithms (inc. decimals) Inverse relationships Estimation
Multiplication & Division	Counting sequences 2s, 5s, 10s Equal sharing/ grouping PV groupings of 10 x2 x5 x10	Equal grouping/equal sharing Understanding × as repeated addition Array representation Understanding of ÷ Basic x facts	Recall of x/÷ facts Double digit by single digit multiplication Division of double or triple digit by single digit	Factors & Multiples Flexibility using PV Double digit x single digit Double/triple digit ÷ by single digit Double digit x double digit Estimation
Fractions	not assessed	Unit fraction - shape Unit fraction of a set Counting in halves Fractions as a result of sharing Fraction of a number	Fraction of a shape Fraction of a set Fractions as numbers Equivalent fractions Connecting fractions x/÷	Connecting fractions, x/÷ multiplication & division Equivalent fractions Fractions on a number line Addition/Subtraction of fractions
Decimals & %	not assessed	not assessed	Column names Ordering Multiplicative structure Common fraction decimal conversion Common fraction percentage conversions	Ordering Repeated multiplicative structure Fraction/decimal conversions Fraction/percentage conversions Mental addition/subtraction

