



The Wilkie Way

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www.thewilkie.co.nz

Instructional Strategies for Mathematics Learning

In my work as a professional development provider for the teaching and learning of mathematics I spend quite a lot of my time working with teachers to explore and put into practice research based instructional strategies.

We then reflect on the effect on student learning and on both teacher and student attitude to mathematics. For many teachers it is slight tweaks to their current practice, for others it is a major change in practice. For most schools as a result of their new knowledge they choose to rethink their school curriculum for mathematics and make changes to their assessment practices. By improving the quality of the teaching and having student focused planning and assessment, student achievement data shows marked improvements.

So what are the instructional strategies that work?

Firstly it is having a shared belief about what mathematics is.

1. Mathematics is a foundation learning area that informs our decisions in multiple ways in all areas of our lives.
2. Mathematics connects school to everyday life, provides skills acquisition, and prepares students for the workforce.
3. It involves learning to problem solve, investigate, represent and communicate mathematical concepts and ideas and make connections to every day life.

Strategy One: Creating an inclusive classroom environment

The classroom environment should be a place where it is safe for ideas to be discussed, developed, debated and understood. Students themselves must become co-constructors of their knowledge through asking questions, justifying their work and communicating their ideas to each other as well as to the teacher.

Mathematical dialogue is of absolute importance

Strategy Two: Building strong foundations in the junior school

There is no age too early to learn mathematics. Pre schoolers are able to look for patterns and discuss similarities and differences in appearance and quantity. Young students bring more mathematical knowledge to school than is often recognised if the programme focuses only on number knowledge. Young learners are curious and playful when it comes to mathematics and learn by doing, thinking and talking. They do not memorize mathematics. During "play" they should be pushed to discuss mathematics, use appropriate mathematical vocabulary and extend their learning.

- Use problems that have meaning for young learners
- Allow for creativity
- Encourage and support different problem solving methods
- Scaffold
- Help with creating connections.

Strategy Three: Develop mathematically knowledgeable teachers

Teacher content knowledge plays an important role in student achievement. Teachers need to know mathematical content, underlying reasons behind the mathematics, learning progressions in mathematics and curriculum expectations.

Teachers have an obligation to continually develop their knowledge. There is a considerable amount of professional learning available on line through the members content area of the Wilkie Way website www.thewilkeway.co.nz and through <https://nzmaths.co.nz/> and the curriculum progress tools website <https://curriculumprogresstools.education.govt.nz/> Understanding progress - The Learning Progression Frameworks.

Strategy Four - Teach for conceptual understanding

Growing evidence is showing that students develop procedural fluency in mathematics but have difficulty with conceptual understanding.

Primary Schools have/are erroneously measuring progress only on procedural fluency which gives the appearance of progress but is not a sufficient basis for developing understanding for higher level mathematics and the transfer of mathematical ideas and concepts to the world outside of school.

(A recent study by Otago University found over 50% of students who had gained NCEA level two were functionally innumerate)

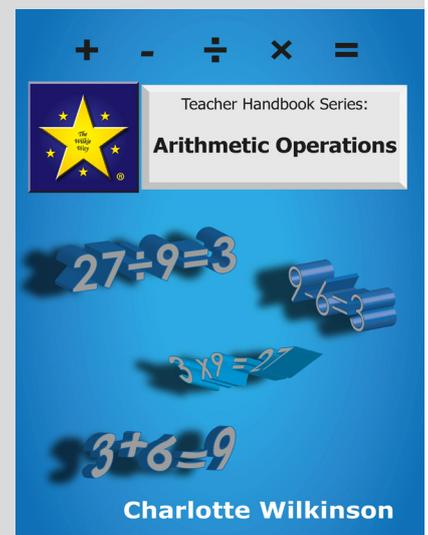
Strategy Five: Teach reasoning skills

This includes things like identifying similarities and differences, seeking patterns and relationships.

Strategy Six: Promote problem solving

Many “problems” given to students are result unknown arithmetic word problems with a single answer. These are little more than a way of practicing a procedure for a calculation. While arithmetic word problems have a place and should be used to help students generalise the properties of the four operations they need to include the full range of problem types.

(for further information see *Teacher Handbook Arithmetic Operations* available from the online store at: www.thewilkieway.co.nz)



Students also need access to more complex problems. Problems that have multiple solutions or multi step problems.

Problems that are complex and rich, allowing for multiple entry points, different approaches, scaffolding and engagement without an imposed procedural step to follow.

Strategy Seven: High expectations of all students

Having high expectation of all students in mathematics is at the core of good teaching. This means believing that all students can learn mathematics, that they should all be challenged to push themselves as far as they can go. Some students will find learning mathematics easier than others but this does not make them ultimately better at applying mathematics to their every day lives. Those who struggle to make sense of mathematics, with good teaching, will often develop a deeper conceptual understanding of the subject.

Strategy Eight: Varied and ongoing assessment practices

Teachers should use varied types of assessment to improve student learning and reinforce that mathematics is more than just right answers.

Different kinds of assessment include:

- Assignments
- Day to day observations
- Conversations/conferences
- Demonstrations
- Projects
- Performances
- Paper and pencil tests

By using rubrics, success criteria, exit cards, journals and oral questioning, teachers can motivate students to learn and provide more immediate feedback. Feedback helps students track their progress, fix mistakes and extend learning.

Making an assessment decision against the aspects as set out in the learning progressions framework can be recorded in the PACT tool to track progress against the curriculum levels over time.

PACT is a reporting tool and will provide a school with different types of reports.

Schools wishing to consider pursuing facilitated professional learning for developing a mathematically inclusive curriculum can apply to be contacted in term three 2020. Send an email to charlotte@ncwilkinsons.com to be added to the list. I contact schools in order of receiving the application. My diary for 2020 is now fully booked.



Resources for Wilkie Way members
School subscription just \$275 p.a
contact charlotte@ncwilkinsons.com to subscribe by invoice
Individual subscription \$30 via paypal at www.thewilkieway.co.nz

Student resources:

- Over 250 problems and learning tasks for levels 1 - 4
- Over 150 knowledge building activities - place value, addition/ subtraction facts , multiplication & division facts, fractions
- Over 75 activities specifically for level 1
- 182 worksheets to support level 2 arranged into 26 mini workbooks around a specific learning area.
- A complete set of 12 workbooks for learning multiplication & division facts

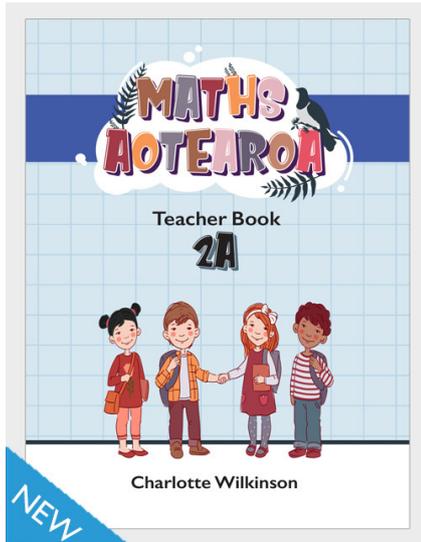
New Resources added regularly.
Follow wilkie way on facebook for immediate notification of new resources as they are added.

Teacher Professional Learning Resources:

- Powerpoint presentations - content knowledge, pedagogical practice plus more
- Learning progressions and making connections across learning progressions
- Guides for key ideas and concepts in measurement, geometry and statistics
- Planning templates
- Tracking progress templates
- Student profile templates
- Teacher guides for assessment screens

School subscriptions will also allow schools to access the digital marking facility for the assessment screens free of charge. (Available term 1 2020 by email to charlotte@ncwilkinsons.com)

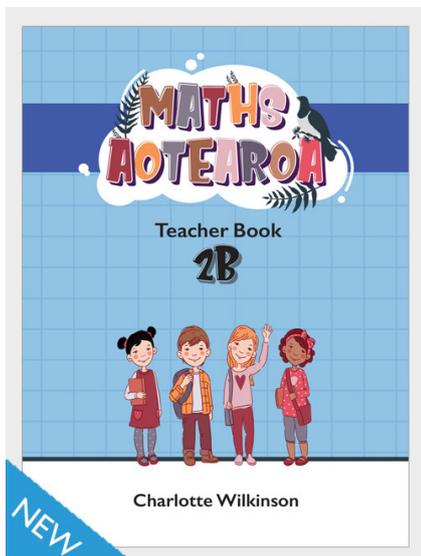
Available to order from www.edify.co.nz Hard copy and PDF ebook versions available.



Maths Aotearoa is the new, updated edition of the well-loved and trusted Pearson Mathematics series.

All Student Books and Teacher Books are being brought up-to-date to reflect developments in the New Zealand curriculum and include Learning Progressions for each unit, as well as concept development and key knowledge building for each chapter, along with:

- More teacher professional content knowledge building
- Figure it Out links added to each chapter throughout the Teacher Book
- Wilkie Way support material for each chapter
- Learning Outcomes shared in student language for each chapter in the Student Book.



The Wilkie Way Teacher Challenge

If 4 copiers can process 400 sheets of paper in 4 hours, how long does it take 8 copiers to process 800 sheets of paper?

Give a reasoned justification for your answer.

Answer to September challenge; Think simply

Can you make 100 using just four 9s

99 ⁹/₉