

Mathletics

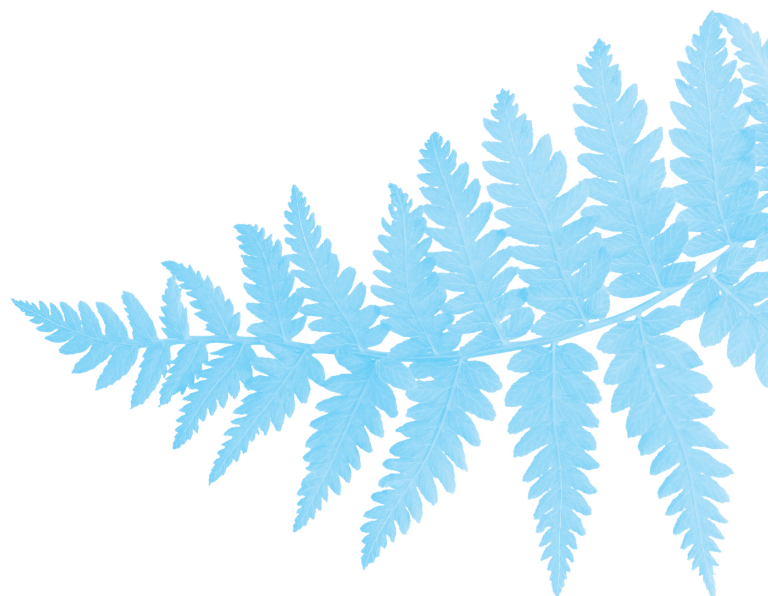
The Research and Pedagogical Foundations of the New Zealand Mathletics Programme

White Paper

MAY 2026



3P Learning
Better ways to learn



Overview

New Zealand schools are navigating one of the most significant periods of change in mathematics education in a generation. Recent international assessments, including PISA and TIMSS, have raised concerns about mathematics achievement, particularly in relation to equity, confidence, variation in achievement, and New Zealand's performance compared with higher-performing countries. In response, the Ministry of Education has refreshed the Mathematics and Statistics curriculum, with a clear emphasis on structured, explicit teaching.

This shift reflects evidence that effective mathematics learning is supported by teaching that is carefully sequenced, clearly modelled and deliberately cumulative. Rather than relying too heavily on students discovering key concepts for themselves, the refreshed approach places greater emphasis on explicit explanation, guided practice, review and consolidation, while still recognising the value of rich tasks, problem solving and mathematical discussion.

Structured Mathematics Teaching Designed Around How Students Learn Best

The New Zealand Mathletics Programme has been intentionally designed around the structured teaching principles embedded within the refreshed New Zealand Curriculum for Mathematics and Statistics and contemporary Science of Learning research.

The programme reflects the curriculum's emphasis on:

- explicit teaching
- carefully sequenced progression
- manageable learning steps
- cumulative review
- mathematical communication
- reducing cognitive overload through clear instructional design.

As the New Zealand Curriculum Mathematics and Statistics guidance explains, 'Explicit teaching is a structured, carefully sequenced approach to teaching.' The curriculum also emphasises: 'The sequencing of content is thought out and broken down into manageable steps.'

These principles sit at the heart of the Mathletics Programme, which is built around a cumulative model of learning in which concepts are introduced progressively, practised deeply and revisited over time. The result is a connected teaching and learning system that supports conceptual understanding, procedural fluency, reasoning, confidence and long-term mathematical success.

Carefully Sequenced Learning Progression

One of the strongest pedagogical foundations of the programme is careful sequencing. Research into mathematics learning and cognitive science consistently shows that students learn more effectively when concepts are introduced progressively and connected over time. The New Zealand Curriculum reflects this directly through its emphasis on structured progression, cumulative learning and carefully sequenced teaching.

The Mathletics Programme has been designed so students build understanding step-by-step before moving into more abstract application. For example, in the Year 4 Addition sequence, students do not begin immediately with a formal written algorithm. Instead, they first develop flexible mental strategies, understanding of number relationships, place-value knowledge, visual representations and regrouping using concrete materials. Only after this conceptual foundation is established do students move into formal written methods. This helps students understand why mathematical procedures work, not simply how to follow steps.

Learning in Manageable Steps

The programme is also built around the principle that students learn more effectively when new knowledge is introduced in smaller, connected chunks. This reflects research into Cognitive Load Theory and instructional design, including the work of John Sweller and subsequent Science of Learning research. The New Zealand Curriculum guidance specifically highlights the importance of reducing cognitive overload through carefully structured teaching.

As the guidance explains – ‘Explicit teaching takes account of cognitive overload.’

The programme supports this by focusing lessons on one key mathematical idea at a time, using clear worked examples, gradually increasing complexity and revisiting learning over time. This helps students process new learning more effectively, sustain attention, build confidence and experience success before moving into more complex application.

Importantly, learning is revisited and reinforced across workbook tasks, classroom discussion, online practice and assessment opportunities throughout the term.

Explicit Teaching and Gradual Release

The Mathematics Programme was designed to support excellent teaching. It supports professional judgement rather than a script to follow, with teachers remaining central to the modelling, questioning, responding and adapting that great mathematics teaching requires.

The programme uses a structured explicit teaching model supported by gradual release of responsibility. Lessons follow a clear instructional sequence:

- teacher modelling (‘I Do’)
- guided practice (‘We Do’)
- independent application (‘You Do’).

This approach aligns closely with evidence-based explicit instruction research, including the work of Rosenshine and Archer. The New Zealand Curriculum guidance similarly emphasises clear modelling, guided practice, checking for understanding and cumulative review.

Daily lesson plans therefore provide teachers with worked examples, questioning prompts, mathematical vocabulary, sentence stems, discussion opportunities and assessment checkpoints. This structure helps reduce planning burden while supporting high-quality mathematics instruction across classrooms.

Concrete, Visual and Abstract Understanding

Visual models and mathematical representations play a central role throughout the programme. Students regularly work with number lines, place-value materials, diagrams, measurement models, visual representations, and concrete materials. Research in mathematics education consistently shows that students develop deeper understanding when they move from:

concrete → visual → abstract representations

The programme therefore intentionally supports students to see mathematical relationships, visualise strategies, explain reasoning and connect concepts to formal written methods. For example, before students use formal regrouping in algorithms, they physically and visually model trading with base-ten blocks. This helps students understand what regrouping represents mathematically, rather than memorising a disconnected procedure.

Retrieval, Reinforcement and Long-Term Learning

Research into memory and learning demonstrates that students retain knowledge more effectively when concepts are revisited and applied regularly over time. The New Zealand Curriculum guidance similarly references cumulative review, revisiting prior learning, spaced practice, and reinforcement.

The programme supports this through multiple features: cumulative workbook practice, repeated strategy application, online reinforcement, checkpoints, discussion activities, and quick retrieval opportunities. The online component strengthens this by providing immediate feedback, additional independent practice, differentiated reinforcement and visibility into student progress.

Together, the workbook and online programme create a connected learning cycle, where students are taught, guided, supported, reinforced and assessed, and then revisit concepts over time.

Mathematical Communication and Reasoning

The refreshed New Zealand Curriculum places strong emphasis on students communicating mathematical thinking, explaining their reasoning, and engaging in mathematical discussion. The Mathletics Programme supports this through mathematical vocabulary, sentence stems, reasoning prompts, discussion questions and opportunities to justify strategies and solutions.

Students are encouraged not only to solve problems, but to explain how they solved them, why a strategy works and which methods are most efficient. This creates classrooms where mathematics is visible, discussed and deeply understood.

Teaching Mathematics in Aotearoa New Zealand

The refreshed New Zealand Curriculum is grounded in Te Tiriti o Waitangi and a commitment to ensuring that all students, including Māori and Pacific learners, experience success in mathematics. The New Zealand Mathletics Programme has been developed with this commitment in mind.

Structured, explicit teaching has strong equity foundations because it makes mathematical thinking visible. Students access the curriculum with greater confidence when key concepts are clearly modelled, vocabulary is explicitly taught, and learning is broken into manageable steps. This is particularly important for students who may need additional support to build strong foundational number knowledge, mathematical language or confidence as learners.

Explicit teaching does not mean narrow or disconnected teaching. In Aotearoa New Zealand classrooms, it sits alongside culturally responsive practice, strong relationships and meaningful learning contexts. Teachers can connect mathematical ideas to students' lives, local places, classroom experiences, patterns, measurement, games, environmental data, and real-world problem solving that reflects the diversity of their communities.

The programme provides a clear and structured pathway for learning, while still allowing teachers to bring the responsiveness, cultural knowledge and professional judgement that make mathematics meaningful. Teachers can incorporate te reo Māori mathematical vocabulary, encourage collaborative reasoning, and create opportunities for students to explain, justify and share their thinking.

In this way, the Mathletics Programme supports a mathematics classroom where learning is clear, connected and inclusive. The structure helps ensure that all students can access important mathematical ideas, while the teacher brings those ideas to life in ways that reflect the learners, languages, cultures and community of their classroom.

Supporting Every Learner

New Zealand primary classrooms are wonderfully diverse in culture, language, prior experience and learning need. The structured approach at the heart of the Mathematics Programme is not a one-size-fits-all model but a framework that supports teachers to meet that diversity effectively.

Research into explicit instruction consistently shows that structured, carefully sequenced teaching particularly benefits students who might otherwise fall behind:

- Students who are new to English
- Students with learning differences
- Students who have experienced disrupted schooling
- Students who have not yet developed strong foundational number knowledge.

The achievement gap shrinks when new learning is broken into manageable steps, vocabulary is explicitly taught, worked examples are clear, and concepts are revisited over time.

The programme supports differentiation in practical ways:

- Lesson structures allow teachers to work with small groups while others work independently.
- Checkpoint questions quickly identify students who need consolidation before moving forward.
- The online component provides differentiated practice and gives teachers visibility into individual student progress, making it easier to respond to what students actually need.
- For students who need extension, the programme's emphasis on reasoning, explanation and mathematical communication means there is always a deeper layer to explore — not just more problems but richer thinking.

A Connected Mathematics Teaching and Learning System

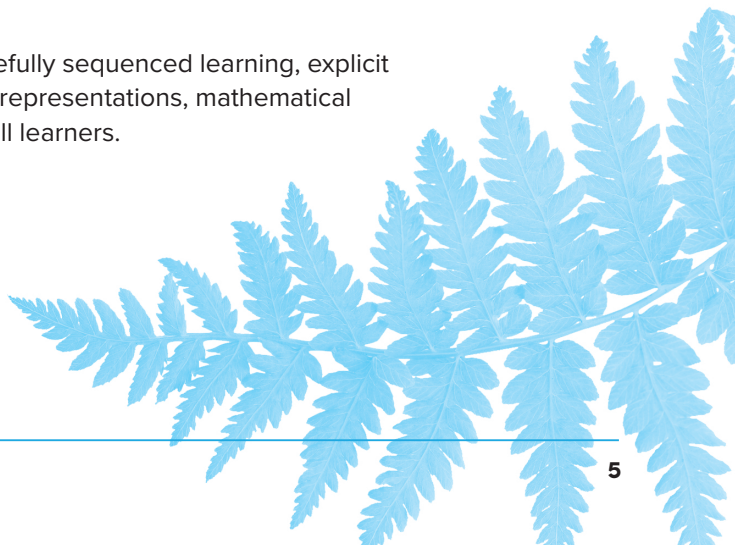
The New Zealand Mathematics Programme is a connected mathematics teaching and learning system designed around contemporary evidence about how students learn mathematics most effectively. By combining carefully sequenced progression, manageable learning steps, explicit teaching, visual models, retrieval and reinforcement, workbook application, mathematical discussion and online feedback and reporting, the programme supports schools to deliver structured, engaging and effective mathematics instruction from Years 0–8.

Most importantly, it supports teachers to provide mathematics learning that is **clear, connected, cumulative and designed for lasting understanding**.

Bibliography: Selected Research and Curriculum References

The design of the New Zealand Mathematics Programme is informed by the refreshed New Zealand Curriculum for Mathematics and Statistics, along with research in cognitive science, explicit instruction, mathematics education, retrieval practice, classroom dialogue and culturally responsive pedagogy.

This research base supports the programme's emphasis on carefully sequenced learning, explicit teaching, manageable learning steps, cumulative review, visual representations, mathematical reasoning, teacher-led discussion and equitable outcomes for all learners.



New Zealand Curriculum and Ministry of Education Guidance

New Zealand Ministry of Education. *Te Mātaiaho: The Refreshed New Zealand Curriculum.*

Provides the broader curriculum framework for teaching and learning in Aotearoa New Zealand, including the principles, values and expectations that guide curriculum design.

New Zealand Ministry of Education. *Mathematics and Statistics Learning Area, Years 0–8.*

Outlines the refreshed Mathematics and Statistics learning area, including the progression of mathematical knowledge, practices and competencies across Years 0–8.

New Zealand Ministry of Education. *Structured Approaches to Maths Teaching and Planning.*

Supports the use of explicit teaching, careful sequencing, manageable learning steps, guided practice, review and consolidation in mathematics teaching.

Science of Learning and Cognitive Load

Sweller, J. *Cognitive Load Theory.*

Informs the programme's focus on reducing unnecessary cognitive load by introducing new learning in manageable steps, using clear worked examples and avoiding overload.

Kirschner, P. A., Sweller, J. and Clark, R. E. *Why Minimal Guidance During Instruction Does Not Work.*

Supports the importance of teacher guidance, modelling and structured instruction, particularly when students are learning new or complex content.

Willingham, D. T. *Why Don't Students Like School?*

Provides evidence about how students learn, remember and transfer knowledge, including the importance of attention, prior knowledge and practice.

Deans for Impact. *The Science of Learning.*

Summarises key findings from cognitive science and classroom learning, including the role of prior knowledge, memory, practice and feedback.

Explicit Instruction and Structured Teaching

Rosenshine, B. *Principles of Instruction.*

Supports the use of explicit modelling, small steps, guided practice, checking for understanding, review and independent practice.

Archer, A. and Hughes, C. *Explicit Instruction: Effective and Efficient Teaching.*

Informs the programme's use of clear explanations, worked examples, guided practice, questioning and gradual release of responsibility.

Engelmann, S. and Carnine, D. *Theory of Instruction: Principles and Applications.*

Supports the value of carefully sequenced instruction, clear teacher modelling, cumulative practice and carefully designed instructional examples.

Sherrington, T. *Rosenshine's Principles in Action.*

Provides practical classroom applications of Rosenshine's principles, including modelling, questioning, checking for understanding, review and guided practice.

Mathematics Education and Representation

Bruner, J. S. *Toward a Theory of Instruction.*

Provides the theoretical basis for using enactive, iconic and symbolic representations in learning. This supports the Mathletics Programme's use of concrete materials, visual models and abstract symbols to help students build connected mathematical understanding.

Education Endowment Foundation. *Improving Mathematics in Key Stages 2 and 3.*

Provides evidence-informed guidance on improving mathematics teaching, including the use of representations, problem solving, fluency, reasoning and targeted support.

Feedback, Practice and Long-Term Learning**Hattie, J. *Visible Learning.***

Supports the importance of teacher clarity, feedback, assessment and visible progress in student learning.

Agarwal, P. and Bain, P. *Powerful Teaching: Unleash the Science of Learning.*

Supports the use of retrieval practice, feedback and regular review to strengthen memory and help students retain knowledge over time.

Brown, P., Roediger, H. and McDaniel, M. *Make It Stick: The Science of Successful Learning.*

Supports the importance of spaced practice, retrieval, interleaving and effortful learning.

Dunlosky, J. *Strengthening the Student Toolbox.*

Provides evidence on effective learning strategies, including retrieval practice and spaced review.

Mathematical Communication and Reasoning**Mercer, N. *Words and Minds: How We Use Language to Think Together.***

Supports the role of talk, reasoning and collaborative discussion in developing deeper understanding.

Chapin, S., O'Connor, C. and Anderson, N. *Classroom Discussions: Using Math Talk to Help Students Learn.*

Supports the use of mathematical discussion, sentence stems, reasoning prompts and student explanation.

Cultural Responsiveness and Equity**New Zealand Ministry of Education. *Te Whāriki: He Whāriki Mātauranga mō ngā Mokopuna o Aotearoa: Early Childhood Curriculum.***

Provides foundational principles for early learning in Aotearoa New Zealand, including empowerment, holistic development, family and community, and relationships. While Te Whāriki is an early childhood curriculum, these principles reflect a broader commitment to inclusive, relationship-centred and culturally responsive education.

Bishop, R., Berryman, M., Cavanagh, T. and Teddy, L. *Te Kotahitanga: Addressing Educational Disparities Facing Māori Students in New Zealand.*

Supports the importance of culturally responsive, relationship-based teaching practice in New Zealand classrooms. This work highlights the importance of student voice, respectful learning relationships and teacher practices that support Māori students to experience success.

Alton-Lee, A. *Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis.*

Provides New Zealand-based evidence on teaching practices that improve outcomes for diverse learners. This source supports the Mathematics Programme's equity foundations, including the need for clear, responsive teaching that recognises students' prior knowledge, identity, language, culture and learning needs.

Hunter, R., Hunter, J., Anthony, G. and McChesney, K. *Developing Mathematical Inquiry Communities: Enacting Culturally Responsive, Culturally Sustaining, Ambitious Mathematics Teaching.*

Supports the use of mathematical discussion, collaborative reasoning, student explanation and culturally responsive classroom talk. This source is particularly relevant to the Mathematics Programme's emphasis on mathematical communication, reasoning and rich classroom dialogue.