



Good Practice Guide

Good Practice Guide for Teachers

Making it Count: Teaching Maths in Years 1-3



EDUCATION REVIEW OFFICE
Te Tari Arotake Mātauranga



“If you know maths, you can do a lot of things. You can become anything!”

STUDENT



“Without maths you can't do anything! It's like an inspiration. Without numbers we can't measure. Maths is wonderful!”

STUDENT

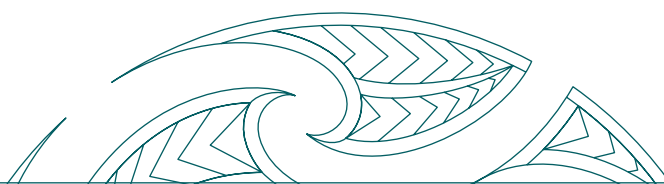


“When we are older we have to know everything! Maths warmups make your brain full of maths. Your mind needs to get full of maths to do it!”

STUDENT



Contents



Introduction	2
Part 1: Enablers for good teaching	4
Part 2: What is good practice for maths teaching in Years 1-3?	5
Practice area 1: Teachers use their understanding of assessment and how students learn maths to ensure they all progress	6
Practice area 2: Teachers use quality teaching practice in maths	9
Practice area 3: Teachers provide dedicated maths time every day so all students engage meaningfully in learning	13
Practice area 4: Teachers notice when students require extra support for learning and provide effective targeted teaching	18
Practice area 5: Teachers use tools and representations to express mathematical concepts	22
Practice area 6: The classroom learning environment encourages mathematical thinking, collaboration, and the enjoyment of maths	27
Practice area 7: Teachers make the most of moments throughout the day to highlight and use maths	31
Practice area 8: Maths classes reflect the cultures of their students and their families / whānau	35
Practice area 9: Teachers work in partnership with families / whānau to support maths learning	39
Conclusion	42
Useful resources	43





Introduction

The first few years of primary school are when crucial maths learning happens. Years 1-3 are when students develop the foundational maths skills and understandings that they need for future success. However, many students aren't as confident about maths as they could be.

ERO looked at good practice in the teaching of maths in Years 1-3. We used robust evidence to clarify 'what good looks like' for maths teaching in the early years of school, and how teachers can implement these practices in their classrooms.

Maths in early primary school matters

Studies show that Aotearoa New Zealand's maths achievement is an area of concern, and teacher confidence in maths is often lower than in other subjects. ERO surveyed new primary teachers in 2023, finding that nearly a quarter (24 percent) had felt 'unprepared' in their maths content knowledge when they first started in their role. This is a worry, as maths achievement is closely linked to later success across a range of positive life outcomes, like higher education achievement, better jobs, better income, and social mobility. This is what we all want for our children.

In the early years of primary school, teachers have the opportunity to set the scene for their young maths students. It is in these early years that students learn about the building blocks of all future maths learning, and develop their understanding of how capable they are as maths students. Maths learning builds on itself and gets more complex over a students' time in school, so getting the foundation right is really important. Any misunderstandings, poor self-belief, or lack of engagement in these early years sets a poor foundation for years to come.

ERO looked at maths teaching in Years 1-3

Maths is important. It is a building block of important life skills like problem solving, communication, and creative thinking. This guide is all about good maths teaching practice in the early primary years, where teachers have the opportunity to make a big difference in students' maths journeys.

ERO started this work with a deep dive into the evidence base, looking at a wide range of national and international research. Then we talked to teachers, school leaders, and students from 12 diverse primary schools. We wanted to hear about how they have put quality maths teaching practices into action.

This report shines a light on great maths teaching in early primary. The experiences that were shared with us, and the research evidence, affirm that great early maths teaching leads to great early maths outcomes – and more confident maths students going forward.

This guide has practical strategies for maths teaching in Years 1-3

ERO drew on robust global and local evidence and experts to find out what really makes a difference for Year 1-3 maths learning. We found that there are two key enablers, and nine key areas of teacher practice, that have the most powerful impact on student outcomes.

This guide draws on ERO's research report, *Making it Count: Teaching Maths in Years 1 to 3*, to set out the most important things for teachers to know about teaching maths in early primary school. These nine practice areas are lined up with what we learned from the schools we visited to show how these practices can be put into action in our classrooms.

This guide sets out:

→ Two enablers for great maths teaching practice

Enabler 1:	Teacher knowledge
Enabler 2:	School culture and a whole school curriculum

→ Nine practice areas

Practice area 1	Teachers use their understanding of assessment and how students learn maths to ensure they all progress
Practice area 2	Teachers use quality teaching practice in maths
Practice area 3	Teachers provide dedicated maths time every day so all students engage meaningfully in learning
Practice area 4	Teachers notice when students require extra support for learning and provide effective targeted teaching
Practice area 5	Teachers use tools and representations to express mathematical concepts
Practice area 6	The classroom learning environment encourages mathematical thinking, collaboration, and the enjoyment of maths
Practice area 7	Teachers make the most of moments throughout the day to highlight and use maths
Practice area 8	Maths classes reflect the cultures of their students and families/whānau
Practice area 9	Teachers work in partnership with families/whānau to support maths learning



Part 1: Enablers for good teaching

We found that there are two key enablers that need to be in place before teachers can do their best maths teaching.

Enabler 1:	Teacher knowledge
Enabler 2:	School culture and a whole school curriculum

1) What is important for teachers to know about maths?

Teachers need good maths content knowledge

Teaching maths requires an understanding of maths content that is *beyond* the level of the content being taught. Teachers need to properly understand the concepts and ideas that sit behind Year 1-3 maths, as well as the content that will be covered in the senior levels of primary school.

Teachers need good knowledge of how maths is learnt

Teachers are well set up to teach maths when they are clear and up-to-date about how maths learning works. This means learning about how children learn maths, how to teach specific aspects of maths to this age group, and how to recognise what progress looks like. Understanding typical maths progress helps teachers recognise learning and make good decisions about what should be taught next. The risk of using dated or under-informed practices is that they can result in students misunderstanding basic maths ideas (having misconceptions) – which will cause lots of problems for them later on.

2) How can the school culture and a whole school curriculum support effective maths practice?

The whole school curriculum can provide a clear, shared understanding of maths teaching

Effective school settings make deliberate moves to promote awareness of maths, demystify maths teaching, and show that maths is important. This includes outlining expectations for maths teaching and learning through their localised curriculum. Among other things, it should include clear statements about what good maths learning looks like, expectations for teachers' practice, and planning for how maths knowledge and competency is built over years at the school.

It is useful to have a culture of being open to learning, sharing, and improving

Teachers need regular opportunities to continue to learn about effective strategies and to reflect on which practices work best for each of their students. Good school systems for monitoring and analysing student progress are also important in understanding which aspects of their maths teaching are going well, and where teachers and leaders can target their efforts for improvement.



Part 2: What is good practice for maths teaching in Years 1-3?

The national and international research evidence base shows that there are nine key areas of practice where teachers can make a real difference for young maths students. These are set out with practical, real-life guidance and strategies in this section of the guide.

The nine practice areas are:

Practice area 1	Teachers use their understanding of assessment and how students learn maths to ensure they all progress
Practice area 2	Teachers use quality teaching practice in maths
Practice area 3	Teachers provide dedicated maths time every day so all students engage meaningfully in learning
Practice area 4	Teachers notice when students require extra support for learning and provide effective targeted teaching
Practice area 5	Teachers use tools and representations to express mathematical concepts
Practice area 6	The classroom learning environment encourages mathematical thinking, collaboration, and the enjoyment of maths
Practice area 7	Teachers make the most of moments throughout the day to highlight and use maths
Practice area 8	Maths classes reflect the cultures of their students and families/whānau
Practice area 9	Teachers work in partnership with families/whānau to support maths learning



Practice area 1: Teachers use their understanding of assessment and how students learn maths to ensure they all progress

1) Why is this important?

When teachers are clear about what a student knows and brings to their maths learning, it helps them to focus their teaching appropriately. Evidence shows that when teachers are confident about their role within their students' maths learning journey, they raise their expectations for achievement and better target their teaching to promote progress.

Good-quality assessment information provides a basis for planning next learning steps and adapting and targeting teaching – across the class and for individual students. Assessment helps teachers to set up expectations and goals for students, and plan purposeful learning steps which they can monitor to inform their decisions to move on. Assessing students' understanding and knowledge also helps teachers adapt their practice and understand how effective it is in promoting expected rates of learning and progress.

2) What does this area of practice involve?

This practice area is about teachers using their knowledge of students and about how maths concepts connect and build on each other, to line up learning experiences in a deliberate way. To do this, they purposefully find out what students know, and combine this with their knowledge about progression steps at their school. This information is used along with targeted assessment tasks and tools to identify what students know, how well they are progressing, and how teaching can best support their next learning steps. Teachers need to be explicit about what students should know and be able to do, so that they can develop specific goals with students.

The key teaching practices discussed in this section are:

- a) Teachers determine what students bring to their learning, and build on what they already know
- b) Teachers actively notice, recognise, and respond to students' progress as they engage in maths
- c) Teachers use assessment and progressions to plan for, document and monitor students' progress

a) Teachers determine what students bring to their learning, and build on what they already know

Teachers can assess what students already know through a variety of methods in a variety of contexts: from using formal assessment tools, to monitoring and observation during class. This will include providing a range of opportunities to learn about students' prior experiences, attitudes, and strengths in maths. Assessment information should be used to inform next steps for teaching and what students should learn next.

Teaching that draws on the knowledge and skills students bring to school helps them see the relevance and practical uses of maths in their own lives. This includes building on students' intuitive and existing understandings about maths.

b) Teachers actively notice, recognise, and respond to students' progress as they engage in maths

Targeted observation and effective questioning helps teachers understand what and how students are thinking and progressing. This equips them to provide purposeful instruction and feedback that builds on student knowledge and addresses any misunderstandings. When selecting a task, teachers should consider its level of challenge so that they can be ready to notice, recognise, and respond to what students demonstrate about their understanding and knowledge as they engage in that task.

Effective questioning also helps teachers to learn about students' prior experiences, attitudes, and strengths in maths. For example, a teacher can encourage students to explain how they solved a problem, and prompt the student to make connections with a 'big idea' that the class is currently focusing on.

c) Teachers use assessment and progressions to monitor students' progress

It's important to keep in mind that assessment isn't all about tests. In addition to normed or standardised assessments, maths can be assessed through purposeful task-setting, discussions with students, observations of group work, and more. Teachers need a solid understanding of the range of formal and informal ways they can assess and monitor progress, to be able to make informed, timely teaching decisions.

Assessment decisions and records are most useful when teachers link them to their school's curriculum and progression steps. In practice, this involves teachers using and recording assessment alongside the school's expectations of progress. This helps teachers to monitor students' progress, motivate students, and know about the effectiveness of their teaching.

3) What does this area of practice look like in real life?

We talked to teachers and school leaders about the specific strategies that have worked well in their experience. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won't be the right fit for everyone. It's important to reflect carefully about which of these will benefit each school's unique community and context.

We heard from teachers and school leaders that it works well to

- ➔ **Talk to students about their experiences, attitudes, and strengths in maths.** Teachers also found it useful to speak to families, and to colleagues that have taught these students before.

- **Observe students' engagement and be ready to respond.** Teachers described how they take note of the knowledge or processes a student relies on when they approach a task or respond to a question.
- **Listen to students as they use equipment and talk to their peers.**
- **Check in with students through fast feedback techniques,** for example, through using their hands to give a thumbs up/down/hovering hand, or rating their understanding with one to five fingers.
- **Use records of progress, modelling books, and photographs to monitor maths learning.** These are sometimes annotated by students or their teachers, and provide evidence of progress.
- **Run assessments within the context of a planned maths lesson.** In one school, tasks are set as an individualised assessment task, and closely monitored by the teacher. The student is given materials they need and the question. The teacher checks they understand the task, and they are left to it.
- **Engage in regular moderation of assessments across the school.** We heard that these hui are a valuable opportunity to clarify and reinforce teachers' understandings about what each stage or level looks like.

4) Good practice example

In one school, teachers integrate assessment into their classroom programme. They use routines and activities to assess mathematical concepts and examine students' knowledge, understandings, and strategies while they solve problems.

In small collaborative groups where students work together and process their thinking out loud. While groups are engaged in their tasks, teachers observe, ask probing questions and encourage groups to explain their reasoning.

Teachers also regularly use Progressive Achievement Tests (Mathematics) for Year 3 students (PATs), Junior Assessment of Mathematics (JAM), and the Assessment Resource Banks (ARBs). They also create adapted assessment tasks that suit students' needs and the purpose. This includes providing timely feedback in the moment, affirming ideas specifically related to mathematical concepts and lesson learning outcomes, and looking for achievement against specific success criteria.

5) Reflective questions for teachers

- How do I find out what students already know and bring to the learning process, so that I can build on their current understandings?
- How can I provide opportunities for students to show what they know and celebrate their progress?
- How well do I understand my school's learning progressions, and how concepts and maths processes are expected to develop as students progress through school? How do I use these to show students' progress and determine next steps for learning?
- How do I know my students are progressing? What specific assessment tools are most useful in helping me to establish the rate of progress? How do I ensure I am using these tools accurately and effectively?



Practice area 2: Teachers use quality teaching practice in maths

1) Why is this important?

Teachers are not able to engage as capably in good maths-specific teaching practices without the basic ability to engage children in learning. Good quality teaching skills like scaffolding, explicit teaching, flexible grouping, and cognitive and metacognitive strategies matter for maths, just as they do for other subject areas. Teachers who demonstrate good quality general teaching skills in other learning areas are well on the way to being effective teachers of maths.

2) What does this area of practice involve?

This practice area is about making sure that effective teaching practices are the foundation for maths teaching practice. This means using deliberate, intentional teaching and organisational strategies that support students to focus, draw out their ideas, and support their progress. Teachers will draw on good questioning skills and use timely, specific, and actionable feedback. They recognise when to support or extend students, when to move on to new learning, and when to spend longer on an area to consolidate learning for all students in their class.

The key teaching practices discussed in this section are:

- a) Teachers provide scaffolding for students in maths
- b) Teachers use explicit teaching in maths
- c) Teachers use flexible grouping in maths
- d) Teachers provide a range of cognitive and metacognitive strategies in maths

a) Teachers provide scaffolding for students in maths

Scaffolding helps students move from current understandings to new learning. In maths this is important as students engage with the developing complexities of maths over time. Teachers actively monitor students as they engage in maths learning and look for ways to support their thinking. They might scaffold learning through questioning and prompts, modelling of processes, or providing supporting language and representations as students work through tasks.

b) Teachers use explicit teaching in maths

This is when teachers provide instruction or guidance to help students make sense of maths concepts, become more efficient in using maths strategies, or build their knowledge of maths procedures. Explicit maths teaching is about giving clear, concise instructions and support to help students know about the *how* and the *why* of critical maths skills, processes, and concepts.

c) Teachers use flexible grouping in maths

Teachers ensure students have opportunities to engage in maths tasks individually, in pairs, as a wholeclass, in self-selected or teacher-selected groups, and with peers that have a range of knowledge and skills. Teachers purposefully group students in various ways within a single lesson, depending on the task, existing social relationships, students' needs, and considering the benefits of working with a range of peers with diverse knowledge and skills.

d) Teachers provide a range of cognitive and metacognitive strategies in maths

This involves helping students to explain their thinking processes and strategies during tasks. 'Cognitive strategies' help students to tackle problems effectively by giving them a structure or thinking tools, such as concepts maps or guides, to support learning when a task cannot be completed through a simple series of steps. 'Metacognitive strategies' help them to think how they approach a problem and how they learn. They also help them review and understand how they get an answer to a maths problem, even if it's wrong. These are useful learning skills that can be transferred to new contexts and problems. These strategies also help the teacher to understand what the student knows and how confident they feel in approaching the task.

3) What does good practice look like in real life?

We talked to teachers and school leaders about the strategies that have worked well in their experience. No strategies are one-size-fits-all so all these strategies won't be the right fit for everyone – reflect carefully about which of these will benefit each school's unique community and context.

We heard from teachers and school leaders that it works well to...

- **Demonstrate to students how to solve a problem**, through deliberate teacher modelling. Teachers show students how to approach a maths problem by breaking the task down and identifying each step.
- **Organise students to work in a variety of groupings during a lesson**. For example, teachers use a range of different groups within one statistics-focused task. Students start off by working in pairs to create a graph, and then join with another pair to explain what their graph represents. Teachers prompt students to add to each other's ideas and ask questions. Students also compare their different methods for solving the problem.
- **Gradually withdraw support for an activity or add complexity as students engage**. For example, offering fewer instructions or prompts as students engage, and allowing students to make decisions about the approaches and representations to use when solving problems.

- **Prompt students make links to maths knowledge and concepts from prior learning.** For example, when students are sequencing two-digit numerals on cards, a teacher reminds students of the warm-up session when they had ordered numbers on a number line.
- **Focus closely on one particular maths procedure or skill in a maths session.** For example: A teacher works with a small group to continue previous work on ordering numbers and gives examples of sentences previously used, which connect with students' lives.
- **Monitor how students are supporting the learning of others.** The teacher observes the groups as they begin to engage with the task, watching for signs of a lack of confidence or focus. They move from group to group listening to how specific students are engaging and reminding students about how to engage with others' ideas.
- **Encourage students to think out loud as they work on a maths task, and explain their thinking to others.** For example, a teacher prompts a student to explain how he solved a problem.
- **Use structured frameworks to help students access and practice ideas.** See the box below for an example of a structured framework.

Example: A structured framework to encourage cognitive strategies

- Reading the problem. The student reads the problem carefully, noting and attempting to clear up any areas of uncertainty or confusion (e.g., unknown vocabulary terms).
- Paraphrasing the problem. The student restates the problem in his or her own words.
- 'Drawing' the problem. The student creates a drawing of the problem, creating a visual representation of the word problem.
- Creating a plan to solve the problem. The student decides on the best way to solve the problem and develops a plan to do so.
- Predicting/Estimating the answer. The student estimates or predicts what the answer to the problem will be. The student may compute a quick approximation of the answer, using rounding or other shortcuts.
- Computing the answer. The student follows the plan developed earlier to compute the answer to the problem.
- Checking the answer. The student methodically checks the calculations for each step of the problem. The student also compares the actual answer to the estimated answer calculated in a previous step to ensure that there is general agreement between the two values.

J. WRIGHT, INTERVENTION CENTRAL

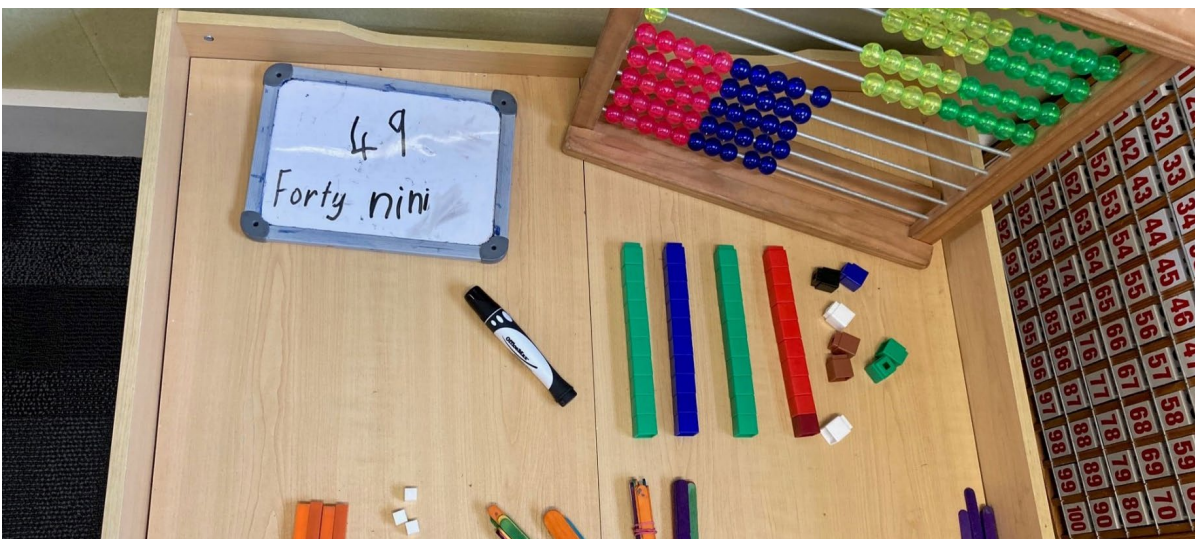
4) Good practice example

A Year 1 teacher supports students to talk aloud about their thinking and reasoning, as they work through the explicit teaching of a multiplication task.

A photograph of eight dice arranged in a pattern is presented to students on a large screen. The teacher asks students to explain how many dots they see using the phrase, "I notice that..." Then the rest of the class is asked whether they "agree" or "disagree." Each student has a different way of identifying the number of dots by picking up on different patterns. The teacher then prompts some students to explain why they agreed or disagreed. This develops into a thoughtful class discussion, with students practising maths vocabulary connected to multiplication and addition ('skip-count', 'lots of', 'groups of', 'plus', 'times' etc). This is enabled by a safe classroom environment and culture which supports risk-taking by students.

5) Reflective questions for teachers

- Which aspects of my teaching get the best response out of my students?
- Which good-quality teaching skills do I use in other learning areas that I can apply in maths time?
- How can I make connections between what students are learning now and prior learning?
- How can I better organise for learning and group my students more effectively? What is the best group size and mix of students' knowledge and skills for this particular activity?
- How can I differentiate my teaching more for my students to ensure it supports them to engage more fully and progress?
- How do I encourage my students to think about their learning? What strategies are most useful for helping students reflect on and share their learning?





Practice area 3: Teachers provide dedicated maths time every day so all students engage meaningfully in learning

1) Why is this important?

Focused daily maths time is needed for students to develop their foundational maths skills and knowledge. Studies show that students engage better in maths when they have daily exposure to maths instruction, practice, and opportunities for application and critical thinking.

“Routine and structure are important to kids.”

TEACHER

2) What does this area of practice involve?

This practice area is about providing daily opportunities to learn and practise maths. Daily maths should be timetabled, purposeful, and sequenced in a way that builds on existing knowledge and prepares students for further complexity. Within the time that is dedicated to maths, every effort should be made to maximise the time spent learning.

Daily maths involves a deliberate mix of:

- explicit instruction or opportunities to build new concepts and skills
- individual, pair, or group tasks that support students to practise new concepts and skills
- problem-based learning and more explorative maths tasks and games that support engagement, encourage critical thinking through wondering and questioning, and provide discussion opportunities to help teachers see how students are going and where to focus next
- opportunities to make connections and reflect on learning.

At this early stage of their maths journey, it is important students have sufficient time to interact with and familiarise with maths concepts. This involves providing students with learning experiences at a pace that challenges them and supports their continued progress.

The key teaching practices discussed in this section are:

- a) Teachers support students to learn, practise, create, and use maths daily
- b) Teachers show students how to use maths procedures and skills accurately, efficiently, and flexibly
- c) Teachers prompt students to talk about their maths ideas
- d) Teachers provide cognitively challenging maths activities

a) Teachers support students to learn, practise, create, and use maths daily

It is more effective for students when daily maths sessions are planned out to ensure that they encounter a variety of activities. These should help students experience the breadth and depth of maths, and to learn, consolidate, explore, and apply maths ideas. This can be done in a range of ways, but the key is to have a deliberate mix of instruction, practice, and exploration. Maths time should incorporate a selection of:

- predictable and engaging warm-ups
- instructional sessions
- whole class, group, and individual tasks that revisit and practice skills and knowledge
- maths games
- problem-based learning, including complex problems
- conversations about maths
- real-world, hands-on tasks.

“We really like to do maths, that's why we do it every day!”

STUDENT

b) Teachers show students how to use procedures and skills accurately, efficiently, and flexibly

Teachers need to provide multiple opportunities for students to build up their toolkit of strategies (flexible ways to solve a problem) and procedures for solving maths problems. These need to be based on good *understandings* of the strategies, rather than following rigid, step-by-step processes or learning a set of rules.

In practice, this means that teachers need to provide opportunities for students to learn new strategies and procedures, practise using them so that they become proficient, and apply them confidently in a range of contexts. This includes supporting students to make connections between strategies.

“When we go on the mat for learning, I like doing graphs and tally marks. I love how they add up together.”

STUDENT

c) Teachers ask questions to help students talk about maths ideas and clarify their thinking

Engaging in mathematical talk helps students to think critically and make sense of their own and others' ideas. It also supports teachers to monitor students' accuracy and complexity of maths thinking. That way, they can quickly respond to any misunderstandings that need to be corrected.

In practice, teachers have a key role in questioning students as well as facilitating a classroom full of maths discussion. This can be done by creating regular opportunities for conversations about mathematical ideas with individuals or small groups. Teachers might encourage students to ask questions, explain why they have come to a particular answer, or why they agree or disagree with others' ideas. Mutual respect and high expectations from the teacher are crucial for students to feel confident in contributing their thoughts and engaging with their peers' ideas.

d) Teachers provide cognitively challenging maths activities

Students benefit from maths tasks that make them engage in maths thinking where the answer is not obvious. This is often done through presenting maths problems to solve (either real-life or imagined) which take time and may require support from equipment, visual representations, and prompts from the teacher. These sorts of tasks, sometimes called 'challenging tasks' or 'rich tasks', offer useful stretch and engagement for all students.

“Children’s mana and self-esteem is uplifted when they can solve problems themselves.”

TEACHER

3) What does this area of practice look like in real life?

We talked to teachers and school leaders about the strategies that have worked well in their experience. We've collected their ideas and strategies here. It is important to reflect carefully about which of these will benefit each school's unique community and context. No strategies are one-size-fits-all so all these strategies won't be the right fit for everyone.

- **Use whole-class warm-up activities.** These activities are an opportunity to repeat, revise, and extend on the maths ideas in focus. A benefit is that even if some students are not fully confident in what they are doing, they will be exposed to ideas and concepts and be able to learn from their peers.
- **Divide the class to offer explicit teaching, independent work, and group work at the same time.** The class is divided so some students work with the teacher to solve a problem using new skills they are being explicitly taught. Other students work with buddies and use materials, or engage in small groups to solve maths problems or play maths games. The teacher rotates between sections of the class.
- **Set tasks that deliberately link to students' experiences or interests.** For example, the teacher introduces a problem where students imagine they are at a birthday party, and must figure out the best strategy to partition the birthday cake into 8 equal pieces.
- **Use carefully selected maths games for introducing and practising maths ideas.**
- **Explicitly teach maths words, and talk about the connections between them.** For example, one teacher asks her mixed class of Year 1 and 2s if anyone could explain the meaning of the word 'probability'. Some students respond using words they learnt previously: 'possibly' and 'probably'. The class's understanding of these similar mathematical words paves the way for their understanding of the new term 'probability'.
- **Ask questions with lots of possible answers.** For example, in a Year 1-2 class, a group of mixed-ability students are required to split a cake represented by a piece of paper into four parts. Confident students fold the paper over twice to ensure all parts are equal, and less confident students manually draw lines across the paper as they count 'four' pieces.
- **Connect 'maths time' with other curriculum areas.** See Practice area 7 for more about this.

4) Good practice example

Leaders and teachers in one school review their approach to maths across the junior school. They put strategies in place to ensure a consistent approach to prioritising and implementing maths. This includes a schoolwide discussion on topics, followed by planning sessions in the syndicate, with a strong focus on unpacking of maths concepts.

To strengthen their focus on maths, teachers establish a consistent 'maths time' at the start of each day, when they have noticed students are most engaged. All teachers work through agreed content, and undertake assessments at the same time at the end of a unit.

In their review, they also recognise that the areas of weakest performance (e.g. fractions) were being taught later in the year. To remedy this, fractions is brought to the start of the year so it has more focus and stronger effort.

5) Reflective questions for teachers

- How well do I provide my students with sufficient opportunities to learn? Do I ensure they encounter maths every day?
- How do I encourage them to be curious about and explore maths ideas? How can I help them use maths to explore situations and problems they encounter?
- How do I maximise the time allocated to maths so that students experience quality maths learning?
- When does the best learning happen in my maths programme?
- Who do I notice isn't enjoying maths, and how can I find out why?





Practice area 4: Teachers notice when students require extra support for learning and provide effective targeted teaching

1) Why is this important?

Foundational maths concepts and attitudes that are learnt during the first few years of school set students up for success – or struggle – for the rest of their maths journey, even into adulthood. Early experiences of maths leave lasting impressions and impact on students' ongoing interest and engagement. It is essential teachers are alert to early signs of difficulty or lack of engagement and act on these promptly.

Students may not be engaged or making progress in maths for a range of reasons. It can be tempting to hope that students will catch up or re-engage on their own, or that things will click into place later on in their maths journey. However, students not finding success early with maths learning are at risk of missing important knowledge and understanding to build on as they move through school. Students who find success easily are also at risk, as they can lack motivation to engage in more complex maths if they have minimal experience of mathematical, productive struggle throughout their time in school. They should know that being stuck is normal and as an important part of mathematical problem solving.

An important consideration for teachers when working with students who are feeling overly or insufficiently challenged in maths, is students' self-beliefs and attitudes about maths. Students of *any* current ability level can be supported to hold positive and motivating self-beliefs meaning they are confident that they are capable of learning and improving at maths, and are motivated to do so.

2) What does this area of practice involve?

This practice area is about teachers targeting their teaching for individual students. Teachers need to understand any barriers to engagement and learning and find effective ways to work with students and the families to ensure they progress. Teachers recognise when to support or extend a student, when to move on to new learning, or when to spend longer on an area to consolidate learning for individual students. This requires a focused effort from the teacher and may include accessing additional expertise or resourcing.

The key teaching practices discussed in this section are:

- a) Teachers identify and monitor students who need additional support
- b) Teachers partner with others and are supported to implement targeted approaches
- c) Teachers support students with identified needs to access and engage through planned and targeted interventions
- d) Teachers support competent maths students through adding challenge and complexity

a) Teachers identify and monitor students who need additional support

Teachers need to actively look out for signs that students need targeted attention, and carefully consider what factors might be contributing to a lack of engagement or success. This may involve looking for patterns across other learning areas, talking with parents/whānau and other teachers, and looking at a range of information about the student to figure out next steps.

“[It is] really important that kids actually experience success.”

TEACHER

b) Teachers partner with others and are supported to implement targeted approaches

Partnering with students, their families, and specialist support staff is essential to ensure targeted teaching and any new approaches or interventions have the maximum chance of success.

Teachers who aren't sure where to seek guidance from, can prioritise seeking support for their immediate teaching and next steps. Teachers can talk to, for example:

- syndicate, curriculum, or senior leaders
- Resource Teachers: Learning and Behavior (RTL) staff, specialist support staff
- experienced colleagues
- maths specialist teachers
- regional Ministry of Education curriculum leads
- professional learning providers who specialise in maths.

c) Teachers support students with identified needs through planned and targeted interventions

Evidence shows that structured interventions and programmes can be effective. A large-scale analysis of the global evidence around maths teaching for ages 3-7 found that many children who need additional maths support can return to a typical learning trajectory, with varied teaching methods and targeted attention. This means that after a period of intervention and support, students soon return to the learning level of their peers. (See the box below for key features of good quality targeted support interventions.)

d) Teachers support competent maths students through adding challenge and complexity

Highly capable students are at risk of disengagement from learning – similar to their peers who need support to keep up. Students who demonstrate a very strong capability in maths require attentive and targeted support, so that they have equitable opportunities to *make progress* at school just like their peers.

“Without appropriate challenge, gifted students are ‘at risk’; they may demonstrate boredom, loss of interest in or commitment to mathematics, limited metacognition, and poor behaviour.”

DIEZMANN & WATTERS, 1997

Teachers need to be well-equipped and confident with a range of extra-challenge strategies to support these students to engage in maths learning alongside (rather than in isolation from) their peers. Some teachers will need support to build these practices, and may benefit from working with curriculum leaders or seeking external advice.

3) What does this area of practice look like in real life?

We talked to teachers and school leaders about the strategies that have worked well in their experience. We’ve collected their ideas and strategies here. It is important to reflect carefully about which of these will benefit each school’s unique community and context. No strategies are one-size-fits-all so all these strategies won’t be the right fit for everyone.

We heard from teachers and school leaders that it works well to...

- **Identify students for support through in-the-moment teaching interactions.** Teachers we spoke to use probing questions and are alert to how students engage as they work with larger groups.
- **Agree on goals for learning.** Teachers hold discussions with students and their parents/whānau to settle on areas for focus. This helps everyone to be clear about what support is being provided and why. This begins with discussions about identified needs and the assessments used to support this.
- **Support students to stay motivated.** Teachers focus on ways to make learning interesting, accessible and challenging for their students. They do this through the tasks they select, for example choosing ‘authentic’ and complex problems which are connected to the students’ world, or have an element of competition.
- **Offer students additional ‘workshops’ in class as a follow-up.** Teachers offer opportunities for students to stay back after mat time, join an additional workshop or have one-to-one teacher support if they choose to. The follow-up activity sometimes involves working more deliberately through the original task with added materials, explanations and diagrams.

- **Add challenge and complexity to classroom tasks.** Teachers find ways to modify or add challenge to class tasks for their high-performing students. For example: When doing a warm-up activity counting from 19, a teacher provides additional challenge by asking students to count from 119, or 3019. In a Year 2-3 class, a teacher asks students how they could estimate how many beads in a jar that was twice as big as the one they are currently seeing.

4) Good practice example

One school ensures they provide additional support or targeted teaching for all their students within the classroom by including teacher aides as part of their daily programme. The teachers aides participate in maths-focused professional learning sessions alongside teachers and are briefed daily about the maths ideas to be included in each lesson. This includes understanding the maths embedded in selected games, and how to highlight and support students to access these.

The teacher aides are active in the lessons, working alongside teachers to offer support to identified students in the context of the various parts of the programme. Sometimes this includes helping them to use materials to solve a problem, supporting them as they work alongside a partner or participate in a larger group. Teachers help students to use the knowledge they have, understand and use maths vocabulary, or learn how to play a game which supports their skill development.

5) Reflective questions for teachers

- Am I noticing disengagement, or lack of confidence or progress in any of my students?
- Do I know if this is because the student finds the maths learning too easy or too hard?
- If too hard – is there an alternative approaches, materials or representations I could try? Are there some negative learning experiences influencing their engagement, or learning needs or disabilities to take account of?
- If too easy – do students have enough opportunities to grapple with authentic, complex, or challenging tasks?
- Have I spoken to this student about what they think?



Practice area 5: Teachers use tools and representations to express mathematical concepts

1) Why is this important?

Tools and representations connect maths with the ‘real world’ at a crucial time. Maths is highly abstract, and students need good support to be able to make sense of these abstract ideas. Evidence shows that tools and representations help young students to build their mental models of key maths concepts and processes, by making connections to the physical (‘real’) world. For young students in particular, a hands-on approach is effective for understanding complex ideas.

The use of equipment, diagrams, and symbols connects to students’ experiences of play – for example, young students may first encounter maths representations as they explore blocks, group or categorise objects, or count fingers to show numbers. Using their bodies to physically interact with equipment or space helps them to make mental connections between maths concepts and their lived experience. In another example, physical movements such as jumping or stepping along a number line can help to build knowledge of number sequences, or make visible the processes of addition or subtraction – making it ‘real’.

Examples of tools and representations

There are a wide range of maths tools and representations available to teachers, including physical objects, visual representations, and symbols.

Physical objects can include:

- everyday objects from the student’s world (e.g., shells, stones, toy cars)
- specialised mathematics equipment (e.g., abacus, hundreds boards, place value blocks, fraction kits)
- grouped objects or structures for organising objects (e.g., bags of ten objects, tens frames, place value houses).

Visual representations use pictures to show maths ideas. These include diagrams, digital models, photographs, multiplication arrays, number lines, tables, graphs, digital models of 3-D shapes, probability tests etc.

Symbols (such as numerals, operation signs, fractions, equations) are abstract, containing hidden meanings and should be used alongside other tools and representations.

“The teacher lets us use materials like blocks and place value boards.”

STUDENT

“If you get stuck on things, [the teacher] gives us something to help us like a pattern we know, but have forgotten about. She shows us a way to work it out (or) she might give us materials to help us.”

STUDENT

2) What does this area of practice involve?

Tools and representations are used to help students understand important maths ideas. Teachers use a range of materials, specialised equipment, diagrams, and symbols as they introduce or reinforce maths concepts. They model how to use and apply tools and representations, supporting students to understand and express ideas related to the concepts being taught. An important aspect of this practice area is making sure that students develop familiarity with tools and representations and have regular access to a range of them to help solve tasks and explain their thinking.

The key teaching practices discussed in this section are:

- a) Teachers plan how to use tools and representations, based on a clear rationale
- b) Teachers make clear links between maths concepts and tools and representations
- c) Teachers encourage students to use or adapt tools and representations to express their maths ideas

a) Teachers plan how to use tools and representations, based on a clear rationale

Teachers' preparation for a maths teaching session needs to include careful identification of the best tools and representations for showing a maths idea. It is crucial that teachers are really clear about *how* and *why* specific tools and representations are used for particular lessons. Teachers need to also consider the limitations of their tools and representations so that they can use them in ways that won't be confusing for students. This involves drawing on subject knowledge expertise, gained through connecting with experienced peers and curriculum leaders, or formalised professional learning.

All of this means being prepared: planning ahead for the different materials that could be required, and anticipating the different ways students may use those materials. Doing this thinking ahead of time means teachers can be ready to respond in the moment, and expand on new ideas if students present them.

“We make do with what we have, even if it's a bucket of conkers.”

TEACHER AT A RURAL SCHOOL

b) Teachers make clear links between maths concepts and tools and representations

Students benefit from teachers being explicit about how tools and representations should be used. This will often begin with modelling and clear instructions from the teacher. Regular use and follow-up sessions can support students to understand the purpose and use of materials and make connections between concepts. Making maths equipment available for students to access independently can also support students to build their familiarity with how they can be used.

c) Teachers encourage students to use or adapt tools and representations to express their maths ideas

Students deepen their maths knowledge when they make connections between different tools and representations. For example, there are different representations of a number: the digit '4', or written out 'four', or represented with counters '....'. Exploring these ideas through representations helps students to make connections between the different experiences and grow a fuller understanding.

Initially, a student might express their understanding of a concept by drawing, or by using their fingers. As they grow more familiar with more tools and representations, they have a broader range of options for expressing and exploring maths ideas. Deliberate teacher support helps students to get the most out of materials.

“Materials, materials, materials! It’s really important that we have things that are tactile, that are very well-known to the children.”

TEACHER

3) What does this area of practice look like in real life?

As part of this study, we talked to teachers and school leaders about the specific strategies that have worked well in their classrooms. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won’t be the right fit for everyone. It’s important to reflect carefully about which of these will benefit each school’s unique community and context.

We heard from teachers and school leaders that it works well to...

- **Have a wider than necessary range of tools ready, so that lessons can be adapted in response to students.**
- **Share knowledge with other teachers about limitations of tools and materials, to support consistency across classrooms.** One school has developed a ‘guide’ for teachers. It includes sections on how to use materials, which tools are best for specific topics or concepts (e.g., fractions), and the benefits of using each of the materials for young students.

- **Introduce tools and equipment in other contexts** (e.g., construction, games, or other play-related activities). Teachers introduce materials in independent play or group activities, for example sorting shells by colour or size during a game, before using them to demonstrate addition or subtraction in an explicit teaching session.
- **Use digital tools to support individual or peer learning.** Students access individual digital devices for independent or small group activities. They continue to work on a task independently or in pairs, similar to a worked example, but without direct support from the teacher. This enables students to apply and practise new learning, and consolidate ideas.
- **Show students how to use different materials to support their thinking.** For example, a teacher demonstrates to students how to use their hands to show 7, and make connections to 'flystrips' to show $5 + 2$.
- **Use memory games to engage students in maths ideas.** For example, one Year 1-2 group works with the teacher who shows an image of gingerbread men on the screen for 5-10 seconds before it disappears. Each gingerbread man has two buttons. The students are then asked to "turn and talk" to their buddies. Questions for students include, "How many gingerbread men were there? How did you get that answer? How many buttons were there? If there was another gingerbread man, how many buttons would there be?"
- **Use large screens to quickly access and share symbols and images.** Many classes use large screens to show photographs or images for whole-class and small group activities. In other classes, the large screen is used in a warm-up activity where students are asked to explore number or spatial patterns in photographs, with teachers asking, "What do you notice?"

4) Good practice example

In a warm-up activity, a teacher moves between different representations to illustrate underlying place value concepts in the number 34. Initially she uses an abacus with the class to support the count to 34. She then shows the class that there are three rows of 10 and four ones on the abacus, and then switch to show that similar patterns exist on the hundreds board.

Later, in response to a student's question, she uses sticks and bundles of ten to count out the number. These materials are then used alongside place value charts to reinforce the ideas being discussed.

In a follow-up activity, students work in small groups with a wide range of materials (such as number lines, bundles of sticks, place value blocks, place value houses, equations) to show the 'number of the day' (34) on a laminated chart.

5) Reflective questions for teachers

- Am I confident about which representations and materials are most accurate in illustrating a concept and minimise the opportunity for developing misconceptions? Do I need to seek support?
- When preparing a lesson, do I always think carefully about which equipment would best show the idea I am trying to get across? How about planning for other concepts that I can reinforce or introduce?
- Do my students have regular access to a range of materials, to support their thinking when working on tasks? Are they encouraged to illustrate their thinking with these materials?
- Do students have opportunities to explore new materials, before using them in a maths task?
- After lessons, do I deliberately reflect about which tools and representations seemed to resonate best with students? What additional materials or representations could we use next time?





Practice area 6: The classroom learning environment encourages mathematical thinking, collaboration, and the enjoyment of maths

1) Why is this important?

The way the classroom and class culture are set up matters. Classroom environments can encourage – or discourage – engagement and learning, setting the scene for each maths lesson. This is true of both through the physical environment (how the classroom is arranged) and the emotional environment (whether learning about and discussing maths feels safe and inviting). Some of the ways that the physical and emotional environment of maths classrooms make a difference are:

- Attitudes to maths and the way students view themselves as maths students, are a big part of maths learning success. When teachers purposefully build a culture where *building understanding* is valued more than being correct, students are supported to see that not knowing and making mistakes are normal parts of maths learning. This increases their confidence and engagement in maths.
- Working through maths ideas with peers is a highly effective way of building and extending maths understandings. It's important that peer discussions are encouraged through as many strategies as possible, including physical prompts like seating arrangements, and non-physical prompts like agreed ways to respectfully debate maths ideas.
- The availability and accessibility of maths tools and representations is a key part of early maths learning (see Part 5 for more on this). Students benefit from classrooms that have a lot of maths materials for students to see and explore.

2) What does this area of practice involve?

This practice area is about teachers understanding their students well, and taking action to set up a classroom that will best support their maths engagement. This involves physical set-up (the classroom itself) as well as emotional and behavioural set-up (behaviours, values, and rules). For example, teachers might talk explicitly about rules and expectations for respectful maths debate, and provide opportunities for all students to talk about maths with (and learn from) their peers, participate in discussions, and record and communicate their ideas.



The key teaching practices discussed in this section are:

- a) Teachers learn about students and their attitudes to maths
- b) Teachers build a classroom culture that encourages engagement in maths learning
- c) Teachers organise the classroom environment to encourage engagement in maths learning

a) Teachers learn about their students and their attitudes to maths

The research evidence shows that maths teaching is strengthened when teachers have a trusting relationship with students and know about their lives, interests, and strengths. This enables teachers to pitch learning activities and support at the appropriate level, and to use meaningful contexts for tasks.

In a maths context, an important part of getting to know students is getting to know their view of themselves as maths students. This is sometimes called their ‘self-concept.’ Students are most motivated when they see maths as manageable and interesting, and view themselves as capable of learning and improving at maths – no matter their current ability level. Teachers can have targeted conversations with students about how they view maths to understand whether students need extra encouragement, extra confidence-building, or extra challenge.

“Sometimes I get the answers and sometimes I don’t. It means I’m learning!”

STUDENT

b) Teachers build a classroom culture that encourages engagement in maths learning

When maths sessions regularly result in a student feeling embarrassed, frustrated, or overwhelmed, it’s unlikely that they will develop a positive sense of themselves as capable and motivated maths students. Teachers can promote positive maths engagement by establishing ways of working that are encouraging for students. This includes providing opportunities for students to:

- support peers, and be supported by peers, to solve maths problems
- use respectful language to participate positively in maths discussions and debate
- know which maths tasks encourage being active, loud, or silly with peers
- celebrate mastering new skills
- encounter new and open-ended maths activities that affirm that being unsure and not knowing are normal parts of maths learning
- build perseverance and resilience in maths contexts.

Classroom rules and expectations should support engagement with maths learning. For example, expectations for positive maths debate and discussion can be displayed in the classroom and regularly revisited with students.

Teachers might model and encourage students to use phrases with peers that affirm ‘having a go’ or ‘great thinking,’ more than having the ‘right answer’. Group and whole-class activities can provide opportunities for less confident students to voice their maths ideas, and have roles for all students that offer a sense of success and encourage them to develop perseverance and resilience as they engage in maths.

“[We] build a culture of trying new things, and building off each other’s thinking.”

TEACHER

c) Teachers organise the classroom environment to encourage engagement in maths learning

The physical environment is a powerful tool that teachers can use to stimulate maths learning and engagement. This might involve setting up inviting maths activities, displaying maths concepts and ideas on the walls, or rotating a range of hands-on maths materials and games for students to freely explore. Teachers can also support peer-to-peer learning through purposeful seating arrangements (for example, mixing stronger maths students with those who need more support), and making rules and expectations visible to all students. This practice also involves considering how the classroom, furniture, and equipment can be arranged to ensure the inclusion of disabled students.

3) What does this area of practice look like in real life?

As part of this study, we talked to teachers and school leaders about the specific strategies that have worked well in their experience. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won’t be the right fit for everyone. It’s important to reflect carefully about which of these will benefit each school’s unique community and context.

We heard from teachers and school leaders that it works well to...

- **Draw on students’ current interests to inform maths activities.** For example, an interest in toy cars is used to help with sorting, grouping, sequencing into patterns and lining up to compare the number in each group or to make graphs.
- **Invite students to help set up for maths time.** This helps students to feel more ownership of maths activities, and also give students an opportunity to explore and ask about maths materials in a one-to-one context.
- **Deliberately match students through seating or grouping, and actively monitor maths group-work dynamics.** Teachers observe maths group tasks, with particular attention paid to whether some students are doing more of the work while others are less engaged.
- **Regularly ask questions that have no wrong answers.** Open activities or questions like ‘What do you notice...?’ invite students’ participation. Ensuring students understand that there are no ‘wrong’ answers means students engage more freely in exploring the maths ideas.

- **Help students to make decisions about their learning through self-regulation strategies**, by:
 - inviting anyone who is still unsure about the maths task to stay behind for further support when others leave the mat to go and do individual work
 - getting students to use hand signals – for example, using thumbs to indicate how they feel about their confidence to tackle a maths problem. Teachers can then offer support to those with thumbs down as a priority, and facilitate peer support for those with sideways thumbs
 - encouraging students to choose a follow up task which helps them practise the aspect of maths learning that they feel they need to focus on.
- **Rotate maths materials and equipment to invite students' interest.** Changing materials over regularly, and changing their position in the classroom, keeps maths areas looking interesting. Introducing natural materials (stones, shells, etc.) and high interest objects and toys is also useful.
- **Include maths-focused and maths-related books on bookshelves and displays.** Classroom book displays prominently feature stories involving measurement, counting, addition and subtraction, and searching for largest, smallest, widest, etc. objects or animals.

4) Good practice example

In a Year 1 class, the teacher deliberately establishes and models a set of agreed expectations that promote positive classroom behaviour during maths learning.

She regularly talks to her students about a set of cards which describe rules and expectations for working together in maths class, tackling maths problems, or sharing maths ideas. Although the students have been at school for less than a year, they are familiar with these protocols, and refer to the rules and ideas in the cards as they engage in maths activities.

The teacher models expectations as she works with a small group on the mat. Their activity results in some in-depth discussion about the difference between objects, which the teacher recognises as an opportunity for respectful maths debate. A student asks how one object was a cylinder and not a circle. The teacher asks the group: “He said these are circles – who agrees?”

5) Reflective questions for teachers

- How does my maths classroom provide a safe environment for students to share and exchange thinking and ideas? How do I respond to students' incorrect responses?
- What are my own attitudes to maths? How do I model positive engagement in maths?
- How do I support students to enjoy and engage in maths, even when they are not sure of the 'right' answer?
- How do I ensure maths tasks are accessible to all my students and they are able to participate meaningfully?



Practice area 7: Teachers make the most of moments throughout the day to highlight and use maths

1) Why is this important?

Regularly highlighting maths concepts in contexts that *aren't* maths sessions helps students to see the 'hidden maths' that is all around, which can ignite their interest, curiosity, and engagement in maths learning. When maths keeps popping up in everyday activities, like routines and other subject areas, this demonstrates the relevance and application of maths throughout students' lives. This practice also provides additional, meaningful opportunities to practise maths skills.

2) What does this area of practice involve?

This practice area is about teachers strengthening students' understandings of maths by highlighting all the ways that maths ideas are relevant within the students' world. This can occur in planned or spontaneous ways, within the range of everyday activities that take place in a school day, including routines, play, and other curriculum areas. Teachers can add value and complexity to all sorts of contexts by providing questions or prompts, encouraging problem-solving, and reinforcing mathematical vocabulary.

The key teaching practices discussed in this section are:

- a) Teachers plan how maths ideas are incorporated into a range of activities
- b) Teachers make links to maths when teaching other curriculum areas
- c) Teachers find spontaneous ways to bring maths concepts into play and routine tasks

a) Teachers plan how maths ideas are incorporated into a range of activities

With careful planning, teachers can deliberately weave current or prior maths learning into a wide range of school contexts. Year 1-3 classroom activities are full of opportunities for highlighting maths ideas, including beginning of the day activities (counting how many students are present, tallying or graphing modes of travel to school, colours worn, etc.) and shared reading of picture books where teachers can surface maths ideas. Taking an intentional, planned approach to revisiting maths in small ways throughout the day ensures that students have plenty of exposure to maths ideas.

b) Teachers integrate maths learning when teaching other curriculum areas

Incorporating maths ideas into other curriculum areas like science, social studies, writing, and the arts helps students practise and make sense of maths concepts.

It's useful to take a deliberate, planned approach to maximising the possibilities embedded within the associated curriculum area, so that teachers can purposefully make connections to maths ideas in ways that are clear to students. Students can then link back to their knowledge and prior learning. This is an effective way to keep students practising and seeing maths throughout the day.

“Maths links to everything, like science.”

STUDENT

“I believe in integrating maths into your other areas, because that's something that is really crucial. That kids see it as having value when it's not necessarily in the lead, it's not maths time.”

TEACHER

c) Teachers find spontaneous ways to bring maths concepts into play and routine tasks

Teachers can make the most of daily routines and play activities to highlight and use maths. This means being alert to the maths concepts or vocabulary that can emerge as students engage in routines and play, and being ready to prompt students to extend their thinking or make connections.

For example, students playing board games with evenly spaced number sequences provide opportunities to explore counting forwards and backwards, patterns, addition and subtraction, or place value ideas. Sorting groups of objects is an important way to engage with mathematical concepts such as geometry (identifying characteristics of shapes), statistics (organising into groups and making comparisons), and algebra (making sequences and repeated patterns).

“Children become familiar with concepts without realising it's maths... Kids say ‘I can't do maths’, and I always say, ‘Of course you can do maths! You've turned up at school and you know what day of the week it is!’”

TEACHER

3) What does this area of practice look like in real life?

As part of this study, we talked to teachers and school leaders about the specific strategies that have worked well in their experience. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won't be the right fit for everyone. It's important to reflect carefully about which of these will benefit each school's unique community and context.

We heard from teachers and school leaders that it works well to...

- **Build on current events and celebrations.** In one school, during NZ bird week, they predict and then undertake observations where they count birds in their school and make a tally chart. This is undertaken annually, and the class compares results with previous years. This activity links to skills of estimation and counting and builds students' understanding of aspects of statistics.
- **Integrate maths concepts with physical education (PE).** P.E. is a particularly effective context for exploring maths, as it offers whole-body contexts for making abstract maths concepts feel physically 'real' to students. At one school during a P.E. lesson, numbers are put under spaced-out cones on the school field. Students have to find the biggest numbers they can, and then get into a line from smallest to biggest.
- **Be ready to spontaneously blend maths talk into other curriculum learning areas.** A teacher observes Year 1 students making colour patterns during arts and craft. She draws alongside one student and describes the pattern she is making. She talks about the pattern as a sequence and asks the student to guess the next in the pattern. She uses algebraic symbols to talk about the pattern. She also clarifies the mathematical content of the conversation, affirming, "That is very clever maths!"
- **Work with colleagues to brainstorm the maths opportunities within different topics.**
- **Use routines as opportunities to count or talk about sequences and patterns.**
- **Use counting and countdowns when students move between activities.** For example, students quickly getting to the mat before a countdown ends.
- **Seize the moment when numbers are mentioned in books.** In one class a reading text refers to one million CDs were being sold worldwide. The teacher asks the students to discuss what this means, and then explores these ideas, writing the number and discussing how it relates to other numbers (bigger than, smaller than, the numbers before and after etc.)

4) Good practice example

Two teachers work together in a Year 2-3 class to purposefully integrate maths with science, enriching the learning in both curriculum areas.

During a discussion, these teachers recognise how maths naturally fits into their planned science topic – examining the solar system. They plan a range of maths-related solar system activities, such as finding out the distances between planets, and recording the distance measurements. Students explore orbit and rotation cycles, and looking at how many days it takes the earth to orbit the sun. They also discuss aspects of multiplication and proportionality, like how many times the earth can fit into the sun.

Another of these teachers' science-maths integration units is focused on shadows. Students spend a day measuring and recording the length of their own shadows as the day progresses. Prior to the measuring activity, the class has practised measuring different objects accurately, and discussed what they thought might happen – predicting whether the measurements would change and if they would get longer or shorter.

Students work together to measure their shadows every hour (six time points throughout the day), and mark the changing lengths of their shadows with chalk as well as recording the measurements in notebooks. This activity is used to reinforce the science ideas being explored about the daily rotation of the earth, as well as building measurement skills. The students complete the activity in groups of three, which provides less confident students with support to undertake the task, and an adult also checks the accuracy of the measurements. The measurements are then collated, analysed in a class discussion, and displayed in a bar graph which they design together. As a class, they talk about why they use a bar graph and how it helps with this subject and to express their ideas. The learning activity is then captured in photos and text and displayed on the wall.

5) Reflective questions for teachers

- What opportunities are there in my daily class routines to practise maths skills, develop maths knowledge, or make links to mathematical ideas?
- In what ways do I weave maths into other curriculum area learning? How could I do this more often? In what ways do I weave maths into other curriculum area learning? How could I do this more often?
- Would it be useful to map out my daily activities and plan for more intentional weaving of maths throughout the day?
- Am I aware of which maths games are available to me, and how they can link to my planned maths learning? What other classroom resources could I use to promote mathematical thinking and skills?



Practice area 8: Maths classes reflect the cultures of their students and their families / whānau

1) Why is this important?

Students find maths more relevant and interesting when maths tasks are clearly linked to their culture, language, and home experiences. In maths contexts, this is about connecting problems, tasks and materials to students' everyday lives at home and in the community. As well as supporting interest and engagement, using familiar contexts also reduces the 'cognitive load' for students: all their focus can be on understanding the maths problem – rather than *also* trying to make sense of an unfamiliar context.

Reflecting cultural aspects also helps to communicate to students a key aspect about the nature of maths – maths is embedded in and relevant to every culture. This can help to strengthen their sense of identity as successful maths students.

“If a child knows about something, then they can relate a maths problem back to themselves.”

TEACHER

“Children see that their cultural backgrounds are powerful, and that maths is all around them in their lives.”

TEACHER

2) What does this area of practice involve?

This practice area is about teachers making the most of maths lessons by reflecting the cultures and home experiences of their students. This can be through the choice of tasks, the scenarios used for problem solving, or the materials used in teaching and learning. Teachers can draw on their knowledge about students' cultures and home contexts in their decision-making about how to organise their class, how they support classroom interactions, and how they use resources to present maths ideas to their students.

The key teaching practices discussed in this section are:

- a) Teachers demonstrate and help all students explore connections between maths and te ao Māori
- b) Teachers ensure maths tasks include contexts, content, or approaches that are culturally relevant to students
- c) Teachers use the classroom environment to promote interest in maths through cultural contexts, symbols, materials, and artefacts

a) Teachers demonstrate and help all students explore connections between maths and te ao Māori

Teachers in Aotearoa New Zealand teach in a bicultural context. It is expected and normal that teachers will have knowledge and skills in te reo me ngā tikanga Māori, and enact Te Tiriti o Waitangi in all teaching and learning interactions. This supports all students to make sense of maths in relation to their own lived context as students in Aotearoa New Zealand, and supports Māori students to make useful links between maths concepts and their culture, language and identity. In a maths context, teachers do this by, for example:

- linking maths concepts to components of Māori culture and language
- supporting students to engage with Māori culture and language components, and then finding ways to integrate maths learning
- situating maths learning within physical or practical cultural activities
- ensuring Māori students have opportunities to lead in maths contexts
- working closely with whānau Māori to define and refine teaching and learning practices, with a focus on collaboratively supporting the maths learning of their child.

b) Teachers ensure maths tasks include contexts, content, or approaches that are culturally relevant to students

Students feel more connected to their learning when they see their home lives and cultural contexts reflected in what and how they learn. Teachers can help students to connect to their maths tasks by situating them in familiar cultural rituals, languages, or cultural events.

“In summary: introduce the context in the real world, locate it with the children, then add the maths.”

TEACHER

c) Teachers use the classroom environment to promote interest in maths through cultural contexts, symbols, materials, and artefacts

Incorporating visible connections to students' cultural contexts help to make maths learning relevant to students. Teachers might do this through, for example, classroom wall displays or by incorporating symbols and artefacts as materials alongside maths ideas. It is important to first work with students and families to understand the meaning, history, and value of artefacts before using them for maths.

3) What does this area of practice look like in real life?

We talked to teachers and school leaders about the specific strategies that have worked well in their experience. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won't be the right fit for everyone. It's important to reflect carefully about which of these will benefit each school's unique community and context.

We heard from teachers and school leaders that it works well to...

- **Use the detail within te reo Māori to reinforce maths concepts.** For example, teachers use te reo Māori words to reinforce place value concepts – “tekau ma rua” for 12 shows it is made up of 10 + 2, or to discuss a shape's attributes – “tapa-wha” for square emphasises the four (wha) sides. Teachers also regularly use te reo Māori kupu for colours, and when counting or reading numbers.
- **Share resources that are culturally relevant across the teaching team.** In one school, teachers use exemplars of maths problems which relate to the main cultures in their school, and translate key maths concepts in students' home languages.
- **Link maths learning to cultural stories.** This involves using news stories, events, legends, myths, or historical contexts, as a platform to discuss and illustrate maths concepts. For example, teachers use journal stories about hangi, turangawaewae, tivaeva, or picture books with cultural contexts to start conversations that lead into culturally-relevant maths problems.
- **Display cultural artefacts that have patterns.** Some classes use wall and table displays, for example siapo mats and tapa cloths with patterns that illustrate geometry and algebra concepts. Teachers reference these mats and cloths during maths lessons, and students refer to them to identify repeated patterns or shapes. These can also be used as a springboard for 'maths talk' about patterns. For example, to find out how many leaves a pattern will have when turning a cushion design into a larger quilt, students can find a rule for the number of leaves at any position in a tivaevae pattern and use the rule to make predictions about how many leaves will be in the larger quilt.
- **Use community cultural events or practices as maths contexts.** One teacher uses the regular community market stalls to make links to maths ideas. Other teachers shared that using examples or photographs of preparation for culturally based events such as hangi or umu can generate rich contexts to engage in maths – measuring, multiplication and division, and more.

4) Good practice example

In one school with high numbers of Pacific students, teachers focus on selecting contexts that will be familiar to students. They make frequent use of foods and social events that are relevant to the Pacific communities on their roll.

Cultural artefacts such as celebratory 'lolly lei' are used for exploring counting, multiplication or patterning. Teachers note that they discuss ways to ensure that such artefacts are used respectfully, often using photos or other materials to represent items, rather than the items themselves.

One maths unit is around panekeke (Samoan pancakes) which are well known to many of their Pacific students. When first introducing the topic, they hold a free-flowing conversation with the students about panekeke, "to ground the maths in the students' homelives." They ask, "Who has had it, how do they make it, where do they get it from?" The discussions then move into maths ideas: measurement, fractions, addition, and multiplication (quantities and ratios of people and pancakes) all in the context of mixing, baking, and eating panekeke.

They also undertake a similar process with White Sunday. They use this to surface hidden maths in the day – for example the different numbers of groups attending, and the quantities of supplies for meals etc. The context of White Sunday is also used for setting maths word problems, for example: Nearly all of Sione's aiga attended White Sunday at his church last week. Here are the different people in his family (using photographs or diagrams). How many altogether? Half of the 150 people at the church were children – how many children were there?

5) Reflective questions for teachers

- How much do I know about the cultural contexts and knowledge my students bring to the learning process? How do I find out more?
- What are the deliberate ways in which I incorporate the cultures, contexts and cultural knowledge of my students into maths?
- How do I ensure my teaching approaches are inclusive of all my students and respond to their cultural identities? How do I know if I'm successful?
- How could I ensure I use cultural artifacts appropriately and respectfully for maths tasks?



Practice area 9: Teachers work in partnership with families / whānau to support maths learning

1) Why is this important?

Learning-focused relationships with families/whānau have a positive impact on students' learning outcomes. In a maths context, these partnerships can make a big difference. As this report outlines, it's important for young students to:

- see themselves as capable maths students
- experience maths concepts and ideas in a range of contexts
- have opportunities to practise and use maths in ways that feel relevant to them.

Strong home-school partnerships help with all of these. Teachers can work with families/whānau to ensure that students benefit from shared, positive messages about their maths capability and the value of maths learning. (Hopefully moving away from narratives of “hating maths” or “maths just being for some people.”) Sharing information and resources related to current maths teaching helps ensure that there are meaningful maths activities and discussions happening across the home and school settings as well as reinforce and embed the learning occurring in the classroom. Teachers working in partnership with families/whānau offers students a well-aligned maths programme beyond the classroom.

2) What does this area of practice involve?

This practice area is about teachers working closely with families/whānau to maximise maths teaching and learning. This includes finding opportunities to learn about maths practices within home contexts, showing or talking with families/whānau about what maths looks like in their child's classroom, and offering ideas and resources so that they can support their child with maths in their home and community.

The key teaching practices discussed in this section are:

- a) Teachers talk about maths learning with families/whānau
- b) Teachers provide maths information and resources to families/whānau to reinforce what is being learnt in the classroom

a) Teachers talk about maths with families/whānau

Teachers need to take an active role in developing relationships with families/whānau that include a focus on supporting maths learning. This requires teachers to take time to understand the maths experiences and practices of families/whānau, talk through any questions they may have, and agree on shared messages about maths learning. When maths is a regular topic of conversation, it's easier for parents and whānau to remember the value of at-home maths talk and maths experiences.

b) Teachers provide information and resources to whānau/families

Teachers can support students' maths achievement by actively encouraging maths learning at home. Teachers might provide facts or tips about doing maths, or activities and games. In the early years of school, it's important to focus on activities that families/whānau and their children can do together.

It's useful to share ideas that capitalise on the learning opportunities that are already happening within their usual family/whānau activities and local community. This can involve discussing how to 'see' or practise maths in everyday routines, such as brushing teeth. Home maths activities help to deepen maths understandings through authentic experiences, and offer opportunities for experiencing enjoyment with maths. Providing suggestions and activities to families/whānau can also mean that the same language and resources are being used across both settings, which reinforces maths language for students.

3) What does this area of practice look like in real life?

We talked to teachers and school leaders about the specific strategies that have worked well in their experience. We have collected their ideas and strategies here.

Keep in mind that no strategies are one-size-fits-all, and some of these won't be the right fit for everyone. It's important to reflect carefully about which of these will benefit each school's unique community and context.

We heard from teachers and school leaders that it works well to...

- **Use a combination of formal and informal settings for maths conversations.** Teachers kōrero with families/whānau about maths at formalised events (such as parent-teacher meetings) and informal school or sporting events, as well as impromptu conversations at the beginning or end of the day.
- **Keep whānau updated about the maths programme through schoolwide hui.** Schools that we visited do this in various ways, often through presentations to families/whānau. These are sometimes led by school leaders or external experts.
- **Provide opportunities for families/whānau to contribute resources and expertise to the maths programme.** Teachers spoke about ways in which they invite parents to support their maths programme through contributing cultural artefacts, sharing how they use maths within their work, talking to students about a cultural event as a context for learning (e.g. preparing food for a social gathering), and acting as parent helpers for students within class maths time.
- **Invite families/whānau into maths classes.** Some schools hold open days for whānau to attend during maths time. These sessions demonstrate how teachers and students use equipment, how students work together, the role of games as part of a teaching session, and how teachers provide explicit teaching.

- **Develop ‘home kits’ for families/whānau to use with their children.** In one school, this was a practice that started during Covid-19 lockdowns, and was retained when teachers noticed the positive impacts. Maths home kits are regularly compiled, which include a list of suggestions for activities and games to play as a family/whānau, and which relate to current classroom maths learning.

4) Good practice example

At one school, with a high Pacific population, teachers work with their parents, whānau and aiga in a range of ways to promote their interest and engagement in maths.

Teachers provide afternoon and evening maths workshops, after checking with families/whānau/aiga about their preferred times. These workshops relate to a current maths focus, such as fractions. The workshops include demonstrations of fraction activities and equipment as well as ideas for learning about fractions at home. Teachers provide printouts of activities and fraction boards for home use.

At school meetings the school sets up a stall which displays maths learning, videos of learning sessions, and copies of tasks and games for parents to take home.

Open days are held where families/whānau are invited in to observe maths in action. Teachers provide take home packs of related maths activities for families/whānau. These include:

- copies of tasks being used in the maths sessions
- laminated hundreds boards
- games and activities to do at home.

Individual learning reports to families/whānau include specific suggestions for “Ways to help at home”.

A school holiday programme, run with professional learning experts, includes a strong focus on maths activities. This helps to promote interest, enjoyment and raise the profile of maths for their students and families.

5) Reflective questions for teachers

- In what ways do I support families/whānau to know about the maths learning and progress of their child?
- Do I know how my students’ families/whānau feel about maths? What questions could I ask?
- How can I support families/whānau to make connections to maths through authentic home contexts? Would they appreciate more or clearer guidance?
- How can I draw on the knowledge and expertise of families/whānau for supporting my maths programme?
- What resources can I provide for families/whānau to help them connect with the maths learning that’s happening in the classroom?



Conclusion

Maths teaching in Years 1-3 matters

Not all teachers are confident about teaching maths. However, there is lots of evidence and research we can draw on that clarifies what works well for young maths students. This research collates what we know from the evidence base, and lines it up with stories and strategies from real classrooms that are putting evidence-based practices into action.

There are nine key areas where teacher practice can make a real difference for maths learning

The national and international research evidence base shows that there are nine key areas of practice that make a real difference for young maths students. These are the most powerful ways that Year 1-3 teachers can set their students up for a successful maths learning journey.

- 1) Teachers use their understanding of assessment and how students learn maths to ensure they all progress
- 2) Teachers use quality teaching practice in maths
- 3) Teachers provide dedicated maths time every day so all students engage meaningfully in learning
- 4) Teachers notice when students require extra support for learning and provide effective targeted teaching
- 5) Teachers use tools and representations to express mathematical concepts
- 6) The classroom learning environment encourages mathematical thinking and the enjoyment of maths
- 7) Teachers make the most of moments throughout the day to highlight and use maths
- 8) Maths classes reflect the cultures of their students and their families/whānau
- 9) Teachers work in partnership with families/whānau to support maths learning.

Actions that prioritise maths add up

Great maths teaching starts with teachers *valuing maths*. When maths is prioritised, this is visible through teacher actions like dedicated daily maths time, weaving maths learning throughout other curriculum areas, purposeful use of maths talk, linking students' interests and cultures back to maths ideas, and making great tools and materials available and well understood. This all starts with clear messages from teachers: that maths is important, maths connects to their world, maths is fun and interesting, and maths is for everyone.



Useful resources

ERO's research report, *Making it Count: Teaching Maths in Years 1 to 3*, expands on this guide with even more research, strategies, and simple explanations of what matters most in early maths teaching. The report and summary can be downloaded for free from ERO's website, www.evidence.ero.govt.nz.

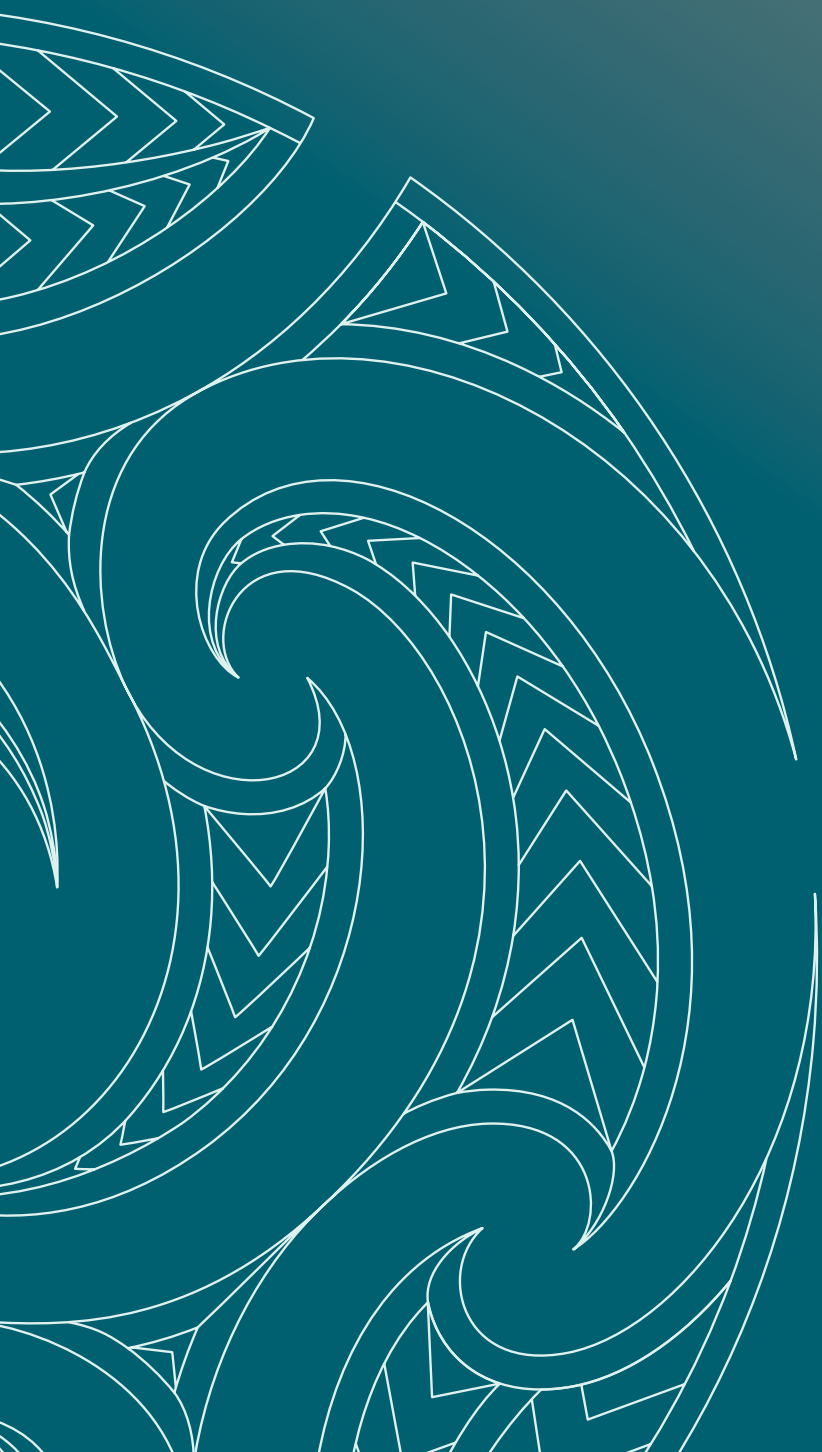
- Main report: <https://evidence.ero.govt.nz/documents/making-it-count-teaching-maths-in-years-1-to-3>
- Summary: <https://evidence.ero.govt.nz/documents/making-it-count-teaching-maths-in-years-1-to-3-summary>

In addition to ERO's report and guide, there are a range of resources available for teachers interested in improving their teaching of maths in Years 1–3. Some useful links are listed below. Leaders and teachers can also seek support and resources from their regional Ministry of Education office.

- Tāhūrangi – New Zealand Curriculum resources: <https://newzealandcurriculum.tahurangi.education.govt.nz/>
- For principals – the Ministry's *Leading mathematics teaching and learning in Years 1–8: What principals need to know and be able to do*: https://nzcurriculum.tki.org.nz/content/download/169510/1250686/file/CO3072_Maths_Principals_011-web.pdf
- The Education Hub, NZ: <https://theeducationhub.org.nz/?s=math>
- NZMaths (note that some material is migrating to the Tāhūrangi site): <https://nzmaths.co.nz/>
- *Teaching Primary School Mathematics and Statistics: Evidence-Based Practice* by Robin Averill and Roger Harvey: [Teaching Primary School Mathematics and Statistics: Evidence-based Practice | New Zealand Council for Educational Research \(nzcer.org.nz\)](https://www.nzcer.org.nz/evidence-based-practice/teaching-primary-school-mathematics-and-statistics-evidence-based-practice)
- ERO's *Practical guide for teachers: What quality teacher aide practice looks like* (particularly the section on 'delivering structured interventions'): <https://evidence.ero.govt.nz/documents/a-practical-guide-for-teachers-what-quality-teacher-aide-practice-looks-like>
- *Improving mathematics in the early years and Key Stage 1*, from the Education Endowment Foundation in the UK: https://d2tic4wvo1iusb.cloudfront.net/production/eef-guidance-reports/early-maths/EEF_Maths_EY_KS1_Guidance_Report.pdf?v=1699919581
- 'Learning trajectories' early years resources: <https://www.learningtrajectories.org/math/learning-trajectories>
- Resources from the National Council of Teachers of Mathematics, a worldwide network based in the USA: <https://www.nctm.org/classroomresources/>
- Resources from the NRICH Project, at the University of Cambridge: <https://nrich.maths.org/8495>

We appreciate the work of all those who supported this research, particularly the teachers, school leaders, and students who shared with us. Their experiences and insights are at the heart of what we have learnt.







EDUCATION REVIEW OFFICE
Te Tari Arotake Mātauranga
www.ero.govt.nz



**Te Kāwanatanga
o Aotearoa**
New Zealand Government

Good Practice Guide for Teachers. Making it count: Teaching maths in Years 1-3.

Published 2024 © Crown Copyright

Digital: 978-1-991126-00-9 Print: 978-1-991126-01-6

Except for the Education Review Office's logo used throughout this report, this copyright work is licensed under Creative Commons Attribution 3.0 New Zealand licence. In essence, you are free to copy, distribute and adapt the work, as long as you attribute the work to the Education Review Office and abide by the other licence terms. In your attribution, use the wording 'Education Review Office', not the Education Review Office logo or the New Zealand Government logo.