A resource for schools

How to accelerate mathematics

Te Tāhuhu o te Mātauranga
Ministry of Education

Evidence supports the use of a variety of effective teaching models and strategies to accelerate students' learning. This resource aims to discuss opportunities to accelerate mathematics in a secondary school setting.

What is accelerated learning?

- Accelerated learning is achieved through specific teaching strategies, learning conditions, or scaffolded supports that enable learners to acquire skills more rapidly than they would under 'usual teaching conditions.'[1]
- Accelerated learning differs from general classroom teaching and traditional forms of remediation, which often involve not using current year-level content with students to focus on filling gaps from previous years. In contrast, accelerated learning emphasises consistently providing students with appropriate and current year-level materials/tasks/assignments, supplemented with scaffolds to make the work accessible.
- Accelerated learning relies heavily on continuous monitoring of student progress against benchmarks and progress indicators, ensuring that the learning process remains aligned with year-level expectations.
- For more information on acceleration see: Accelerated Learning Resource.

This resource is based on the research report commissioned by the Ministry of Education and provided by the University of Canterbury. The full report can be found here: Accelerating learning in Oral language, Reading, Writing, and Maths. This report focuses on students with identified mathematical difficulties, such as dyscalculia, as well as those without a formal diagnosis but that still require targeted support to improve their mathematical skills.

[1] Accelerating learning in Oral language, Reading, Writing, and Maths. (Gillon et al., 2024, p. 13).

Common elements that facilitate accelerated learning

When planning an intervention programme to accelerate students there are several topic areas that need to be considered.

1. Explicit and systematic instruction

- Explicit and systematic instruction is highlighted as an important teaching approach. This includes teaching strategies such as front-loading small groups, so they are prepared for the universal classroom lesson, modelling, scaffolding learners' attempts, guided practice, and providing learners with immediate corrective feedback.
- Well-structured lesson plans, or detailed teaching guides, based on the research evidence, are common features of effective interventions.

2. Intensity and duration of support

- Small group interventions up to 4 or 5 times per week (with 20–30-minute teaching sessions) for a minimum of between 8–11 weeks were found to be effective for most learners.
- Longer interventions are not necessarily more effective than shorter length interventions but may have their place in more tailored interventions. Increasing intensity of teaching and longer interventions are necessary for children with more severe learning difficulties or complex learning needs.

3. Tiers of support

Multi-Tiered Systems of Support (MTSS) are advocated within the international scientific literature to ensure all children are successful in their learning. Three layers of learning support have been identified.

Tier 1	Universal (Te Matua)	This is evidence-based universal teaching for all children and involves strengthening inclusive environments, cultures, and practices, including teacher practice, curriculum design, and everyday routines and systems.
Tier 2	Targeted (Te Kāhui)	Targeted supports in small groups to accelerate learning for children identified as requiring additional teaching supports and to enhance children's participation, learning, and wellbeing.
Tier 3	Tailored (Te Arotahi)	Involves individualised support for children with greater learning challenges and provides more tailored supports to meet children's unique needs and contexts.

- The alignment of teaching strategies across these tiers of teaching may optimise children's learning potential, thus all tiers need to be considered when implementing an accelerated learning programme.

4. Incorporating technology

- Technology enhanced assessment and teaching approaches show promise. The Canterbury University study found that more research needs to be done in this area.
- Teaching that incorporates gamification can be effective, particularly for younger learners.

5. Professional Learning and Development

- Ongoing professional learning and development for educators is crucial to ensure the successful implementation of effective teaching strategies and is critical to the success of accelerated learning.
- It is important that this professional development is not in isolation, but that teachers are supported to integrate new learning into their daily teaching practices and have access to quality teaching resources.
- Ongoing professional learning and development to support educators is crucial to maintain the fidelity and effectiveness of interventions. Coaching of personnel has been shown to be particularly effective, when connected to the implementation of evidence-based specific mathematics programmes.

6. Culturally responsive teaching practices

- Researchers recognise the importance of culturally responsive teaching approaches, particularly in relation to supporting learners' engagement and motivation.
- Research on culturally responsive teaching practices in New Zealand schools emphasises the importance of integrating Māori knowledge and perspectives across the curriculum.
- The development of respectful relationships and partnerships with Pacific families and their communities is important in enhancing achievement for Pacific learners.

Year level suitability of learning content is essential across all year levels, from primary to secondary, ensuring that students build a strong foundation and progressively advance their mathematical understanding.[2]

[2] Accelerating learning in Oral language, Reading, Writing, and Maths. (Gillon et al., 2024, p. 57).

Teaching methods

Explicit and systematic instruction providing clear, structured lessons that build progressively on mathematical concepts is essential for establishing a strong foundation in mathematics for all students. These are explained below:

Explicit instruction	Systematic instruction
Explicit instruction is a structured, systematic, and direct teaching methodology where concepts are clearly explained, modelled, and practised rather than discovered. It minimises guesswork by breaking complex tasks into small, manageable steps and guides learners until independent mastery is achieved. **Key characteristics** • Clear Objectives. Lessons begin by stating exactly what will be learned, why it is important, and how students know they will succeed (success criteria). For further details see Accelerating progress in literacy – Teacher guidance. • Step-by-Step Modelling. Teachers demonstrate the skill while "thinking aloud" so students see exactly how to perform the task. • Supported Practice. The process follows a strict *"I do it, we do it, you do it"* progression to reduce cognitive overload. • Immediate Feedback. Teachers monitor progress closely, offering immediate affirmative and constructive feedback.	**Systematic instruction** is a structured, step-by-step teaching method where skills are broken down into logical, manageable parts and taught in a deliberate progression from simple to complex. It ensures students master foundational building blocks before advancing to more difficult concepts. **Key components** • Logical progression. Skills are taught in an intentional order, with each new concept building on previously mastered material. • Scaffolding. Teachers provide strong support initially and gradually provide less support as the students gain independence (I do, we do, you do). • Generalisation and maintenance. Lessons often include continuous practice and review to ensure students retain the skill and can apply it in different contexts.

How do Systematic and Explicit instruction differ?
These two terms are often used together, but they refer to different aspects of teaching:

- Systematic dictates the **timing, order, and sequencing** of the curriculum (what gets taught and when).
- Explicit refers to **how clearly the concept is taught**. Teachers use direct explanations, clear demonstrations, and leave nothing to chance.

Accelerated learning interventions for mathematics

- To ensure that all students achieve proficiency in mathematics, especially those who struggle, targeted and evidence-based interventions are essential. Effective interventions can help bridge gaps in understanding, build foundational skills, and support students to develop the critical thinking and problem-solving abilities necessary for success in both academic and real-world contexts.

- Formative assessment to determine need is a vital part of accelerative practice prior to beginning a learning intervention and throughout. It is also important that student progress against benchmarks and progress indicators that are continuously monitored and adjustments made accordingly to interventions. The learning process should remain aligned with year-level expectations.

Evidence from research supports the use of a variety of teaching models to accelerate learners' mathematics learning. These include:

Mathematics accelerated learning interventions:	Further information
1. Small group instruction and peer-assisted learning teaching models	Incorporate peer-assisted learning strategies within or concurrent to small groups to enhance engagement and understanding. This method is a natural complement to mixed ability groups, promoting accelerated learning by enabling students to learn from each other and reinforce their own understanding through teaching peers.
2. Collaborative teaching and coaching models	Collaborative approaches involving multiple teachers or support staff are effective. The success of interventions heavily relies on the expertise and training of the people implementing them.
3. Frequent and sustained intervention sessions	Intervention sessions are critical to accelerate mathematics learning across all schooling levels, with more intensity needed as students' progress to more advanced mathematic topics. Effective interventions require sufficient frequency and duration. Intensive sessions conducted multiple times a week are more effective than less frequent sessions. Longer instructional hours lead to better outcomes. Ensure interventions are sustained over an extended period to allow students to internalise and apply new skills.

Mathematics proficiency encompasses various interconnected skills and knowledge areas that are foundational to student success. These key areas provide a clear framework for mathematical acceleration interventions:

1. **Numerical Operations:** Proficiency in basic number operations, including addition, subtraction, multiplication, and division, which are essential for building more advanced mathematical skills.
2. **Algebraic Thinking:** Understanding and working with variables, expressions, and equations, which are required to solve problems and understand relationships between quantities.
3. **Geometry, Measurement, and Spatial Reasoning:** Recognise shapes, understand spatial relationships, and apply measurement concepts to assess size, length, area, and volume, which are needed for both theoretical and practical problem-solving.
4. **Data Analysis and Probability:** Interpret data, understand probability, and make informed predictions, which are important in a data driven world.
5. **Mathematical Language and Communication:** Proficiency in reading, writing, and discussing mathematical concepts, which are all essential for deep understanding and effective problem-solving.
6. **Problem-Solving and Critical Thinking:** Apply mathematical knowledge to address complex challenges and make informed decisions.

Core teaching strategies that support accelerating mathematics

Teaching strategies	What does this mean?	Resources and further supports
Use explicit and systematic instruction: Provide clear, structured lessons that build progressively on mathematical concepts. This is essential for establishing a strong foundation in mathematics for all students.	• **Teach using clear structured lessons that progressively build on mathematical concepts.** Structured lessons with clear objectives, step by-step instructions, and regular reviews are essential across all year levels, from primary to secondary, to help students progressively build a solid understanding of mathematical concepts.	Resources: • Year 9 annual plan, unit and weekly plan exemplar. • Ministry-funded maths resources for Years 0–10.

	• **Provide explicit teaching of mathematical concepts.** Break down complex mathematical tasks into smaller steps and teach in real-life contexts. Explicit instruction is highly effective and involves: – segmenting complex skills – modelling content – structured prompting techniques – providing opportunities to respond with appropriate feedback – creating purposeful practice opportunities. Explicit mathematics instruction can be effectively delivered online. The flexibility of online platforms allows for personalised and targeted interventions that can support students struggling with specific mathematical areas. This approach is especially useful in situations where in-person instruction is not feasible, such as during periods of remote learning.	Further reading: • Structured approaches to maths teaching and planning. • Structured-approaches-to-maths - The New Zealand Curriculum. • Accelerating progress in maths and stats – Teacher guidance. • Numicon New Zealand.
Use of mathematical language: Employing precise mathematical language in instruction, supported by tools such as vocabulary walls and graphic organisers, enhances students' ability to articulate and understand mathematical ideas.	• **Teach and use mathematical language.** The teaching of precise mathematical language, including clear definitions, is essential for all year levels. Encouraging the use of mathematical language in classroom discussions enhances students' ability to communicate mathematical ideas effectively. Effective interventions have utilised mathematical vocabulary support such as vocabulary walls, cards, and graphic organisers.	Resources: • Venn diagrams | Assessment Resource Banks. • Word Walls: A Support for Literacy in Secondary School Classrooms. • Frayer Model - The Teacher Toolkit. • Vocabulary Frames. • Mix and Match.

	• **Teach the use of graphic organisers.** Graphic organisers are effective tools across various mathematical content areas, helping students visually organise their thoughts and strategies. Studies have shown that graphic organisers assist in problem-solving by helping students identify key information and apply learned strategies. Whether pre-prepared or student-generated, these tools enhance comprehension and facilitate the application of mathematical concepts, which supports accelerated learning by making complex information more accessible and manageable.	Further reading: • Strengthen vocabulary knowledge | Inclusive Education. • 7 Reasons to Switch from Worksheets to Graphic Organizers. • Support processing and organisation | Inclusive Education.
Representation of concepts: Utilising physical materials, visual aids, and number lines helps students bridge the gap between abstract concepts and practical understanding.	• **Teach using visual aids.** The concrete-pictorial-abstract (CPA) framework, which involves using physical objects followed by visual representations with the aim of transitioning to abstract concepts, is highly effective in helping students develop number sense and a solid understanding of mathematical concepts. Utilising physical objects like counters, and visual aids such as diagrams and charts enables students to visualise and understand abstract concepts, accelerating their learning. This approach continues to support understanding as students advance to more abstract mathematics in secondary school years. • **Teach using number lines.** Number lines are a powerful tool for facilitating the learning of various mathematical concepts and procedures, including whole numbers, fractions, and negative numbers. They help students develop a unified understanding of numbers and enhance their ability to visualise and solve problems. Number lines continue to be useful in secondary years for more advanced topics, such as operations, magnitude, elapsed time, graphing coordinates, and data analysis.	Resources: • Addition and subtraction on the number line | NZ Maths. • Numbers on the line. • Difficulty placing decimals on a number line. • Fractions on a number line. Further reading: • CPA Approach Explained | Learn the Concrete, Pictorial, Abstract Method. • Present information in different ways | Inclusive Education.

Problem-solving and fluency development: Instruction that emphasises word problems and integrates algebraic reasoning supports students in applying mathematics to real-world scenarios. This fosters deeper comprehension and problem-solving skills. Timed activities and structured practice are crucial for building automaticity in basic arithmetic, which frees up cognitive resources for more complex problem-solving tasks.	• **Teach how to solve word problems.** Providing deliberate instruction on solving word problems helps students apply mathematical concepts to real-world scenarios. Effective strategies involve teaching students to recognise and categorise problems based on their underlying structures and use real-world contexts and scenarios to make problems more relatable and understandable. Integrating algebraic reasoning further improves word problem performance. • **Teach using mnemonics.** Using mnemonics to help students remember steps for solving problems can support accelerated learning. Examples include acronyms like SOLVE (Study, Organise, Line up, Verify, Examine) and DISC (Discover, Identify, Solve, Check). These mnemonics guide students through problem-solving processes and have been shown to improve mathematical problem-solving skills. • **Teach using timed activities to develop automatic retrieval and confidence.** Teaching aimed at developing fluency and automaticity is particularly effective when combined with timed activities lasting **between 1 and 5 minutes**. These activities should be introduced after students have had ample practice with a concept, rather than during the initial introduction of new material. Timed activities help build automatic retrieval of basic arithmetic facts, which in turn frees up cognitive resources for more complex problem-solving. This approach is particularly beneficial for students who struggle with self-confidence or have complex learning needs, as it allows them to experience success in manageable increments, reinforcing their sense of competence.	Resources: • CUBES Math Strategy: A Step-by-Step Guide for Word Problems - Differentiated Teaching. • Math Problem Solving Strategies - Manoeuvring the Middle. • **The SOLVE Steps:** –**Study** the problem: Read the prompt carefully. Find out what the problem is asking you to find or do. –**Organise** the facts: Write down the given data, numbers, or conditions. Cross out any extra information that you do not need. –**Line** up a plan: Choose the correct operation, formula, or logical path to reach the goal. Decide the order of your steps. –**Verify** the plan with action: Do the math, carry out the steps, or execute the plan while writing down your work clearly. –**Examine** the answer: Check your work. Ask yourself if the final result makes sense logically and matches what the original question asked.

He Awa Whiria – Braiding the knowledge streams

He awa whiria is a metaphor for considering the relationship between Māori and non-Māori (predominantly Western) streams of knowledge. Understanding and knowing the learner's cultural and educational background as well as the integration of intervention strategies that address ecological and psychological influences on students' reading and writing development are important. Understanding these influences supports student motivation.

- Students learn more effectively when new information builds on their existing knowledge, particularly in mathematics. Teachers should consider students' knowledge from their whānau, and cultural backgrounds.
- Utilising Māori and Pacific cultural patterns in mathematics instruction can be effective for transitioning learners from pictorial to abstract representations of mathematical concepts. Additionally, linking mathematics instruction to cultural artefacts may improve motivation to learn.[3]
- Pacific students value practical examples, peer collaboration, effort, and family support in mathematics learning.[4]
- Confidence is the primary predictor of mathematics achievement, overshadowing interest and value.[5] Thus, the assumption that students must be inherently interested in mathematics to excel is not unreservedly supported by research. An important component of the updated Mathematics and Statistics learning area is helping students to develop positive relationships with maths. Feeling open-minded and positive supports learning and leads to greater confidence and success. For positive relationships with maths, the words students use about their learning affect their behaviours. This poster can be used in the classroom to remind students that mistakes can be useful learning, and that spending time and effort is part of the process.

By fostering an environment that integrates **cultural relevance** and emphasises **building competence and confidence**, educators can enhance both motivation and achievement in mathematics.

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[3] Accelerating learning in Oral language, Reading, Writing, and Maths. (Gillon et al., 2024, p. 60).

[4] Hill. J., Hunter. J., & Hunter, R . (2019). What do Pasifika students in New Zealand value most for their mathematics learning?. In P. Clarkson, W. Seah, J. Pang (Eds.), *Values and valuing in mathematics education*. ICME-13 Monographs. Springer, Cham. https://doi org/10 1007/978-3-030-16892-6_7

[5] Michaelides, M., Brown, G. T. L., Eklöf, H., & Papanastasiou, E. C. (2019). The relationship of motivation with achievement in mathematics. In, *Motivational Profiles in TIMSS Mathematics*. IEA Research for Education. https://doi org/10 1007/978-3 030-26183-2_2

How to create a lesson to support the acceleration of mathematics

- This lesson aims to demonstrate how to accelerate mathematics. The material chosen will be ‘at-the-level’ of the curriculum for this group.
- This lesson uses a systematic instruction approach and provides a logical progression and scaffolding. This lesson has been separated into the following manageable parts to reduce cognitive load and support motivation (as well as simplifying planning for the teacher):
    - 10 mins starter activity
    - 10 mins teaching time
    - 30 mins class activity (typically broken into 2-3 parts such as individual task, joint task, feedback)
    - 5-10 mins closing activity.
- This lesson also has clear explicit instruction goals that uses supported practice following the process of “I do, we do, you do”.

Time	Activity	Teaching instruction	Why this activity?	How does this support mathematics acceleration?
10mins	Starter Activity – **Timed activity (Quick-10)**	Prepare a set of 10 basic facts maths questions that are at the level of the group. Most should be accessible with a few that are challenging. Include a few equations but also include a few that use words such as ‘multiply’ and ‘equals’, rather than symbols. Include two longer word problems for a challenge.	Teachers will want to reinforce basic facts knowledge, and this is a ‘fun’ way to do that. Using words instead of symbols helps to build student mathematical vocabulary. Making these questions ‘doable’ with a couple of challenges will build students’ competence and confidence.	• Timed activities help build automatic retrieval of basic arithmetic facts, which in turn frees up cognitive resources for more complex problem-solving.

	This activity will be familiar to students as it is used often by the teacher, but with different questions.	Put the quick-10 on the board and students have 5 minutes to complete. Display a timer so they can record their time. Students can compare their time with past attempts. Ask students to share their answers with a partner or small group and discuss any that differ, deciding together what the correct answer is. Feedback correct answers with the class.	Discussing answers with peers enables students to learn from each other and reinforces their own understanding through teaching peers. Feeding back the answers allows the teacher to correct misconceptions immediately.	• This also allows students to experience success in manageable increments, reinforcing their sense of competence. • Immediate corrective feedback is given.
10mins	Teaching Activity – **Explicit teaching**	Put your advanced organiser on the board. Talk the students through the lesson objectives and what they will learn. Explicitly teach the mathematical content knowledge students require for this lesson. This involves step-by-step modelling where you will demonstrate the skill while "thinking aloud" so students see exactly how to perform the task. For the purposes of this lesson, the content taught would be the theory of calculating a percentage. Provide definitions of any specific language students will encounter this lesson and put the words on the classroom vocabulary wall.	Lessons should have clear objectives that state exactly what will be learned, why it is important, and how students know they have succeeded. Content needs to be intentionally taught and not left to chance. Teaching the correct mathematical vocabulary, and encouraging its use in the classroom, contributes to student understanding and helps them to understand written tests such as the Numeracy Common Assessment Activity.	• Lessons should have clear objectives and students should know what success in a lesson looks like. • Explicit teaching ensures concepts are clearly explained, modelled, and practised rather than discovered. It minimises guesswork by breaking complex tasks into small, manageable steps. • Using precise mathematical language in instruction, supported by tools such as vocabulary walls, enhances students' ability to articulate and understand mathematical ideas.

30mins	Class Activity – **1. Modelling**	• "I Do" – Provide a percentage to be calculated. Provide a real-life context, giving life and meaning to your calculation. Think aloud and solve the problem, teahcing the steps that students need to use to solve for an answer. • "We do" – Choose a second percentage to be calculated. Ask the class what you need to do first. Continue to ask them for the next steps unitl the problem is solved, correcting any misconceptions and thinking aloud as you go. Guide the class to the correct answers with Questioning.	Modelling a task cuts down on all the talk from students asking, 'What do we do?' If you show them what to do, check they have the right idea, and then slowly release them to work by themselves, there is more chance of a task being successful and the skills being learnt. Providing a real-life context increases motivation and helps students to understand why learning this skill is necessary for them.	• Explicitly teaching students the strategies that help them to understand what they read supports their comprehension. • Break down complex mathematical tasks into smaller steps and teach in real-life contexts
	2. Practice **3. Peer teaching**	• "You do" – Students complete the task individually. Provide a group of problems that follow the same steps for students to calculate on their own. • Ask students to come to the board and 'teach the class' how they worked out their answer. For a less confident class you may choose to do this in small groups rather than as a class. Discuss answers and question as you go, correcting any issues you see. • If there is time, provide students with a simple word problem that practises the same mathematical knowledge. They can choose to work in pairs/small groups or individually.	Discussing answers with peers enables students to learn from each other and reinforces their own understanding through teaching peers. Practising word problems strengthens their numeracy ability. This will help students to unpack written tests and is best done in context of learning the mathematical knowledge.	• Providing a slow-release strategy of 'I do, we do, you do' helps to build student confidence and self-reliance. • Incorporate peer-assisted learning strategies within or concurrent to small groups to enhance engagement and understanding. • Generalisation and maintenance. Lessons often include continuous practice and review to ensure students retain the skill and can apply it in different contexts.

5-10 mins	Closing Activity – **Revisit**	Go through the lesson objectives with the class to ensure they have been met. Once all books are away, and covering any visible definitions, revise the vocabulary from the lesson by asking student volunteers to define the words that were taught at the start of the lesson.	Showing the students that they have met the objectives of the lesson allows them to feel success and gain confidence. Reviewing what has been taught helps to embed the knowledge.	• Regular reviews are essential across all year levels, from primary to secondary, to help students progressively build a solid understanding of mathematical concepts.