Te Poutāhū
Curriculum Centre

KŌWHITI WHAKAPAE

Maths

Te Tāhuhu o te Mātauranga
Ministry of Education

Te Kāwanatanga o Aotearoa
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Contents

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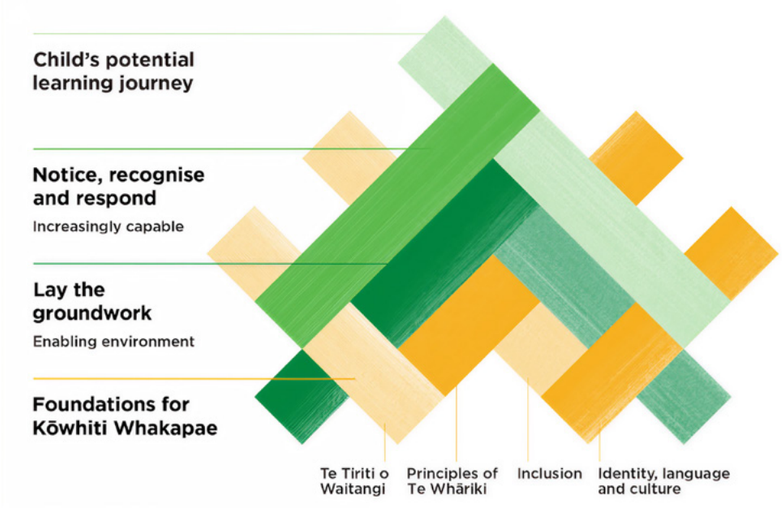
Introduction

Kōwhiti Whakapae is designed to help early learning kaiako strengthen planning, formative assessment, and teaching practice. This diagram shows the framework for Kōwhiti Whakapae and how it aligns with *Te Whāriki*.



Kōwhiti Whakapae is built upon the four foundations shown above. Together these foundations task kaiako with providing equitable opportunities for all mokopuna to thrive within individually and culturally responsive learning environments. For further information, see the book 'Using Kōwhiti Whakapae' or the Foundations page on Kōwhiti Whakapae online, or watch the 'About Kōwhiti Whakapae' video on the homepage.

Kōwhiti Whakapae supports kaiako to recognise children's capabilities and progress and to respond with effective practices in three areas of learning:

- Social & emotional learning
- Oral language & literacy
- Maths.

These areas are crucial for positive later educational and life outcomes. While children's progress will vary depending on their individual learning trajectories, typical characteristics and patterns can be observed over time. These characteristics and patterns provide the basis for practices and learning progressions within the three areas of learning.

There are four Kōwhiti Whakapae books in total. Three cover these areas of learning. A fourth book provides more detailed information about the overall Kōwhiti Whakapae resource, its foundations, and a guide for getting started with it. Using Kōwhiti Whakapae will help you to review and strengthen teaching and learning in these areas across the strands of *Te Whāriki*, understand and respond to children's progress over time, and support children's growing identity as learners.

Each area of learning guides you through a four-step process to help you:

- **Lay the groundwork** to create an enabling environment for all children
- **Notice and recognise** children's current capabilities and possible directions for learning
- **Respond** to scaffold, consolidate, or expand children's learning over time
- **Document** children's learning using assessment examples as a guide.

Maths

Kaiako strengthening children's knowledge and use of maths

Kia tuwhera tātou te kuaha o te ao pāngarau.
Together we open the door to the world of maths.

This book focuses on the area of Maths.

What does maths learning refer to?

Maths learning refers to the knowledge, skills, and attitudes related to spatial thinking, number and quantity, and patterns that children experience, explore, and use purposefully.

For further information, see this page on Kōwhiti Whakapae online.

Why is maths learning important?

Maths is important because maths thinking involves ways of representing the world, particularly in space, number, and measurement. By helping them make sense of the world, maths contributes to children being competent and confident learners and communicators.

For further information, see this page on Kōwhiti Whakapae online.

How is maths learning approached in Kōwhiti Whakapae?

Four interconnected mātāpono aronui (values) ground maths areas of Kōwhiti Whakapae. Capabilities for teaching and learning are grounded in these values and are integrated across four maths areas.

For further information, see this page on Kōwhiti Whakapae online.

There are four key sub-areas within maths:

- Te mokowā me te whakaine | Space & measurement
- Te tau me te whakaine | Number & measurement
- Te tauira me te pānga | Pattern & relationships
- Tūhuratia te pāngarau | Create & communicate maths.

The remainder of this book unpacks each of these areas using the four-step process described above.

TE MOKOWĀ ME TE WHAKAINE

Space & measurement

Through a range of experiences, children learn concepts and language related to shape, size, location, distance, and spatial visualisation.

Overview

What do ngā mātāpono aronui mean for this area?

Four interconnected mātāpono aronui (values) underpin each maths area in Kōwhiti Whakapae: Whatumanawa, Whare, Whānau, and Whenua.

For further information on how these values underpin space and measurement, see this page on Kōwhiti Whakapae online.

What are space and measurement?

Space and measurement include concepts and language about shape, size, location, distance, and spatial visualisation. Children learn about space through movement, imagination, and a range of experiences of different spaces from their perspective.

For further information, see this page on Kōwhiti Whakapae online.

How is this area woven through the strands of *Te Whāriki*?

Knowledge, skills, and attitudes associated with space and measurement are woven through all strands of *Te Whāriki* and are particularly evident in Mana reo | Communication and Mana aotūroa | Exploration.

For further information, see this page on Kōwhiti Whakapae online.

How do the foundations of Kōwhiti Whakapae impact on this area?

Kōwhiti Whakapae is built on four foundations: Te Tiriti o Waitangi; Identity, language, and culture; Inclusion; and the Principles of *Te Whāriki*. Together, these foundations impact teaching and learning about space and measurement.

For further information, see this page on Kōwhiti Whakapae online.

1 Lay the groundwork

Practices to whakaritea te pārekereke | prepare the seedbed for all children

Start by working with all the children in your setting. Create an environment that can support children to build skills related to space and measurement.

- Consider your current environment and how you could make it better.
- Talk to others about what you are already doing.
- Select practices that will be meaningful in your setting.

Exploring movement and location

Plan opportunities and challenges for mokopuna to experience, explore, and understand movement and location in their environment.

Why is this practice important?

When mokopuna experience and make sense of the spatial world around them, they then learn how people, places, and things are spatially related. They will do this at their own pace and in their own way.

Mokopuna bring knowledge and experiences of space, movement, and location from their home, whānau, and community contexts. They explore and make meaning when moving and positioning themselves within spaces. They also explore two-and three-dimensional spaces, and measurement through distance.

How to apply this practice in your setting

a. Connect with children to learn what they already know about movement and location, and engage with whānau on children's experiences of these concepts at home or in the community. Respect the cultural knowledge they bring.

b. Share with whānau the ways children experience movement and location within the setting (e.g., how they navigate indoor and outdoor spaces – large, small, open, or enclosed – and how they use or create 'pathways' between spaces).

c. Identify spaces in your setting that allow for playful exploration with movement or observation of location. How do children explore under, around, and through these spaces? Do they create real or imagined pathways or circuits? How do you as a team support this exploration?

d. Identify and plan for regular happenings that support the enjoyment and exploration of movement and position in culturally relevant ways (e.g., through waiata, kanikani, kapa haka, games for children to express movement with their bodies, or outings to familiar locations such as the park, bush area, or shops).

e. As a team, discuss ways of incorporating descriptive language or gesture in order to identify and model spatial features and positional language (e.g., big, small, under, over, near, a long way away, and next to).

f. Highlight spatial situations within stories, songs, games, or daily routines, and encourage children to notice different perspectives resulting from movement or location (e.g., "She's underneath, I wonder what she can see from there?").

g. As a team, identify opportunities for children to explore movement and location in routines and regular events (e.g., social and verbal exchanges, dance, games, and pathways between spaces), and plan ways to extend the range of these.

Shapes and how they are used in the environment

Support children's curiosity about and exploration of different shapes and how they are used in the environment.

Why is this practice important?

When children are curious about and explore shapes, they will try out how different shapes move or fit together. When investigating a spatial problem or posing questions, children use and test out how different shapes 'work' in a variety of situations, including how they can be combined with other objects. As part of this, they may develop working theories. Experimenting with shapes, including combining or splitting them up, helps children to structure and transform their spatial world.

How to apply this practice in your setting

a. Take time to collaborate with children and their whānau to learn about children's experiences of shape at home or in the community, and respect the cultural knowledge and language they bring.
b. Share with whānau the ways that children experience and explore shape within the setting (e.g., through books, games, puzzles, art, blocks, family play, natural materials, and carpentry).
c. Identify and review resources to ensure that all children can access a range of culturally relevant materials that enable them to notice features and compare, rotate, flip, pull apart, or combine different shapes. Are resources displayed in an inviting and orderly way throughout the setting?
d. Create a range of opportunities for children to engage in construction and building experiences. Allow time and space for them to select, position, adapt, predict, and test out their ideas when exploring, investigating, or constructing with shapes. Invite them to revisit these experiences.
e. As a team, discuss ways of incorporating descriptive language or gestures for the names and features of shapes (e.g., pointy, round, and straight). Support children to communicate their thinking and experiences in a variety of modes (e.g., through gesture, movement, sign language, building models, or drawing).
f. Model, and encourage children to wonder and question, as they explore different shapes and objects that relate to their interests and investigations. Show them how some materials or shapes can be folded, moved, or reshaped (e.g., folding washing or paper, and reshaping sand, clay, or playdough).

Exploring connections between space and measurement

Create opportunities for children to experience and explore connections between space and measurement.

Why is this practice important?

When children explore movement, location, and shape, they can also explore measurement – distance, size, and quantity (e.g., when a tree is located close to the sandpit (distance), when same-shaped blocks are different sizes (size), and when different shapes are made from the same quantity of clay (quantity).

Exploring measurement expands children's understandings of concepts such as similarity and difference, length, height, and area. This helps them to classify, predict, share working theories, and solve problems.

How to apply this practice in your setting

a. Take time to engage with whānau to learn about children's experiences of measurement at home or in the community, and to respect the cultural knowledge they bring.
b. Share with whānau how children might explore and use measurement within the setting (e.g., during block construction, when baking, or when dancing close together or apart).
c. Identify and plan further opportunities to support the enjoyment and exploration of measurement in culturally relevant ways (e.g., navigating distance during siva dance, or measuring handspans between seeds when planting). How do you as a team draw attention to the measurement opportunities in everyday experiences or routines?
d. As a team, discuss ways of communicating about measurement aspects of movement, location, or shape, including introducing rich language (e.g., "Will the fabric stretch twice as far?").

2 Notice and recognise

Progress examples to help you notice and recognise a child's progress

Use the phases of progress (outlined below) to help you notice and recognise a child's progress.

- Draw on what you already know and what you've observed.
- Have discussions with the child, whānau, and colleagues.
- Use the practices (in step 3) to respond, based on what you notice.

Te korekore

Within an enabling environment, children are curious about and recognise shapes, objects, and movement.

- Children are curious about and respond to different shapes and objects in their environment, including in images, toys, nature, and cultural artefacts (e.g., tukutuku panels and tapa cloth).
- Children are curious about and explore shape using their senses. They recognise and respond to familiar shapes and objects.
- Children use their senses to explore and enjoy space and to join in experiences involving movement and actions. They respond to movement through space, both independently and with others.
- Children recognise and react to changes in position or distance between people and objects of interest. They investigate spaces of various sizes and shapes.

Te pō

Within an enabling environment, children explore, move, and use different shapes, and they experiment with moving themselves and objects in space.

- Children recognise shapes and objects in play, including familiar and repeated shapes in images, toys, nature, and cultural artifacts (e.g., tukutuku panels and tapa cloth).
- Children enjoy joining and separating shapes and objects in different ways. They explore how shapes move in space (e.g., they slide (translate), flip (reflect), and turn (rotate).
- Children explore repeated movements related to direction and location (e.g., forward, backward, over, and under). They copy and repeat a sequence of actions such as in waiata and dance. They start to recognise the positions of familiar people, places, and things in relation to themselves.
- Children explore position and distance between themselves, others, and objects through games and physical activities. They understand and begin to describe position (e.g., there, here, next to, behind, and in front). They playfully create new spatial arrangements, placing objects in different positions.

Te ao mārama

Within an enabling environment, children create new shapes and patterns by combining and moving shapes and constructions in space.

- Children explore a greater range of shapes and objects for different purposes. They notice and begin to select shapes based on similar features. They identify and describe differences and similarities in lines, shapes, and objects (e.g., straight or curved; circles or half circles).
- Children design and build constructions as part of games and play. They combine and break apart different shapes for a specific purpose (e.g., to build a whare or repeat a pattern). They use mathematical language to describe and compare features of shapes (e.g., bigger; more pointy) and may relate shapes to familiar objects.
- Children move confidently and intentionally in spaces and independently explore movement involving equipment such as slides or swings. They move themselves or objects to create combinations or patterns of movement, solve problems, and respond to directions from others.
- Children communicate their ideas about position and distance between people, places, and things. They give reasons for positioning objects, using directional language (e.g., runga/up, raro/down, roto/in, and waho/out).

Te ao hōu

Within an enabling environment, children design and create drawings and constructions using features of shapes, position, and space.

- Children select and move shapes and objects with intent, creativity, and purpose. They recognise and describe shapes in different positions, orientations, reflections, and sizes.
- Children use shapes and objects to create more complex constructions or patterns that, over time, they may extend in space or make more elaborate. They invite others to participate in building challenges, sharing materials and ideas. To plan and create constructions, they may use images, drawings, or digital tools and recount the process to others using spatial language to describe shape, position, etc.
- Children create sequences of movement with others. They support others to find and negotiate objects in space by providing instructions (e.g., verbal directions or picture clues).
- Children innovate and collaborate to explore position and distance between people, places, and things. They use the language of direction, distance, and position in games such as hide and seek. They follow instructions (spoken or visual) to locate objects, and they communicate location or position through drawings or maps. They use the language of comparison when communicating about space, position, movement, location, and measurement (e.g., "This is my highest jump.").

3 Respond

Practices to help you respond at different phases of progress

After you have assessed the phases of progress (in the previous step), use these practices to work one-on-one with a child based on what you've noticed.

Talk with others about what these practices might look like in your setting, and test your thinking by looking at adjacent phases.

Note that these practices are not exhaustive, and you might think of others.

Te korekore

Within an enabling environment, children are curious about and recognise shapes, objects, and movement.

Exploring movement and location

Plan opportunities and challenges for mokopuna to experience, explore, and understand movement and location in their environment.

a. Let mokopuna explore movement with their senses (e.g., by stretching or rocking together, and through actions such as rolling or throwing a soft ball).
b. Provide opportunities for mokopuna to join in with actions and movements alongside others (e.g., in kapa haka, siva dance, and games).
c. Model simple language or gesture related to movement and location, such as far, wide, tall, and very close (e.g., "You've crawled so far … right across the room.")

Shapes and how they are used in the environment

Support children's curiosity and exploration of different shapes and how they are used in the environment.

a. Provide resources that include various shapes and objects (e.g., balls, porowhita (circles), tapawhā rite (squares), tapatoru (triangles), manawa (hearts), and roimata (teardrops). Ensure that resources are safe for children to handle and explore.
b. Tune in to children's spoken and non-spoken cues about what resources or materials they want to access or use. Let children follow their own ideas when sorting, arranging, or grouping shapes.
c. Model excitement and wonder about shapes and their properties, and respond to children's exploration (e.g., "Yes, it's round. You made it roll."; "You're feeling the corner. It looks pointy.").

Exploring connections between space and measurement

Create opportunities for children to experience and explore connections between space and measurement.

a. Notice and support children's interest in aspects of measurement (e.g., through explorations with containers in sand and water play).
b. Present some materials in ways that highlight differences in size (e.g., shells arranged from small to large).
c. Draw attention to everyday measurement experiences through language or gesture (e.g., "Wow, your arms fit right around the tree."; "The container is half-full.").

Te pō

Within an enabling environment, children explore, move, and use different shapes, and they experiment with moving themselves and objects in space.

Exploring movement and location

Plan opportunities and challenges for mokopuna to experience, explore, and understand movement and location in their environment.

a. Encourage mokopuna to try new and different movements (e.g., rolling, swinging, jumping, and balancing). Use language or gesture to describe movement (e.g., forward, backward, high, low, curved, straight, far, and near).
b. Support mokopuna to think about position, movement, and location from a range of perspectives (e.g., "Our dance lines are close together."; "I must look huge to a slater."; "Our toy cars need a small garage.").
c. Support mokopuna to gain confidence in movement with other people or equipment (e.g., pekepeke (jumping) by themselves or assisted jumping with an adult).
d. Carefully introduce new or unfamiliar resources and equipment so that mokopuna are supported to explore their possibilities (e.g., using new outdoor play equipment for various purposes).

Shapes and how they are used in the environment

Support children's curiosity and exploration of different shapes and how they are used in the environment.

a. Introduce increased levels of complexity in resources, including shapes with different features (e.g., 2D shapes and solid 3D shapes of different sizes).
b. Encourage children to explore shapes by moving, turning, or flipping them. Introduce the idea of 'shape families' by inviting children to group shapes by a common feature.

c. Identify what children notice about a shape and their ways of trying out and responding when shapes do not fit together (e.g., finding shapes to fit in a puzzle). Comment on how a shape might fit when moved.
d. Ask open-ended questions and 'wonderings' about how children use resources when problem-solving, playing, or creating (e.g., "I wonder what might happen if ...?").

Exploring connections between space and measurement

Create opportunities for children to experience and explore connections between space and measurement.

a. Wonder aloud with mokopuna as they problem-solve (e.g., "I wonder if measuring the gap will help find what length of wood you need?").
b. Support mokopuna to try out their own ways of comparing distance and quantity or measuring (e.g., using string, big steps, or coconut shells).
c. Use the language of measurement when discussing interests and investigations with mokopuna (e.g., "Perhaps we need to measure the height to help us plan how to build it.").
d. Model describing the features of shapes when estimating or predicting whether a shape will fit in a particular space (e.g., "This piece has four straight sides, so I think it will fit.").

Te ao Mārama

Within an enabling environment, children create new shapes and patterns by combining and moving shapes and constructions in space.

Exploring movement and location

Plan opportunities and challenges for mokopuna to experience, explore, and understand movement and location in their environment.

a. Notice when children anticipate and follow familiar routines and activities, and use gestures or language to describe their movements or positions (e.g., "We're taking three steps forward; now we swing our arm in a circle.").
b. Scaffold support when perception of movement and position are needed at the same time (e.g., suggest, and direct children's attention to, looking ahead, left, and right at the same time as using equipment such as trikes and scooters to move about).
c. Recognise when children make choices and decisions in their exploration of space. Use wondering comments and questions (e.g., "What would happen if ...?") to encourage them to plan, predict, communicate, and test their ideas (working theories) when exploring new spaces or movements.
d. Encourage children's interest in problems of space or location within stories, songs, or daily routines. Pose problems or questions that could lead to further investigations (e.g., "The kai table feels more crowded today. How could we use our space so everyone can sit comfortably?").

Shapes and how they are used in the environment

Support children's curiosity about and exploration of different shapes and how they are used in the environment.

a. Provide variety within a type of resource so that mokopuna can notice its particular shape features (e.g., a shape with four sides).
b. Encourage mokopuna to follow their own ideas when sorting, arranging, or grouping shapes or objects and when designing constructions as part of their play.
c. Encourage mokopuna to collaborate and use a range of media and approaches to help them plan, predict, and estimate the resources needed when working on short-term projects.
d. Encourage conversations among mokopuna about the best use of shapes for their constructions and their reasons (e.g., "What if you needed to have...?"). Support them with additional materials where needed.

Exploring connections between space and measurement

Create opportunities for children to experience and explore connections between space and measurement.

a. Notice when children select resources to use as a measure. Invite them to share the reasons for their selections.
b. Encourage conversations among children about different ways of measuring (e.g., "How might you measure the length of material you'll need for the dress?"; "How might we measure the peas' growth?").
c. Extend the language of measurement and encourage children to use a range of media and approaches for measuring for a purpose (e.g., blocks, cups, feet, or measuring tape).
d. Wonder aloud to draw children's attention to the features of shapes to help solve problems (e.g., "I wonder if a piece with a straight edge might fit here?").

Te ao hōu

Within an enabling environment, children design and create drawings and constructions using features of shapes, position, and space.

Exploring movement and location

Plan opportunities and challenges for mokopuna to experience, explore, and understand movement and location in their environment.

a. Invite mokopuna to adapt spaces for shared movement activities such as dance, games, and play (e.g., by moving furniture in an indoor space).
b. Support mokopuna to involve others in their spatial activities, such as rearranging a room, and prompt or ask questions to help them to notice, predict, and experiment with changes.

c. Encourage mokopuna to create their own or shared movements (e.g., in dance or games) and to lead others in these movements.
d. Recognise when mokopuna persist in a range of movement experiences for extended periods. Increase the level of challenge by changing the space, involving more people, or encouraging mokopuna to combine movements together.

Shapes and how they are used in the environment

Support children's curiosity and exploration of different shapes and how they are used in the environment.

a. Invite mokopuna to help with systems for grouping shapes and everyday objects, so that others can easily access these resources.
b. Support mokopuna to take on larger, more long-term spatial projects (e.g., building a permanent ramp to slide vehicles down; creating and sewing a costume; or building a model of an imagined city).
c. Encourage mokopuna to share how they went about solving a problem and why they used the shapes and strategies they did (e.g., how they found a suitable shape to fit a required space).
d. Invite mokopuna to document their projects over time, including representing what they think a creation will look like and how they overcame spatial challenges.

Exploring connections between space and measurement

Create opportunities for children to experience and explore connections between space and measurement.

a. Support mokopuna to take a lead in helping others to measure for a purpose (e.g., during cooking, construction projects, or estimating whether furniture will fit a space).
b. Create opportunities for mokopuna to collaboratively design and make objects that require measurement (e.g., printmaking with a repeated pattern, or making picture frames).
c. Invite mokopuna to help plan an excursion in the local community, to excite and extend their exploration and language of measurement (e.g., planning the route, estimating the distance between important landmarks, and creating a map of the route).
d. Invite mokopuna to share how they have solved problems or made decisions based on their knowledge of shape and shape features.

4 Document

An example of how you could use Kōwhiti Whakapae to enhance your assessments and communication

In this section, an assessment example illustrates how you can use the information gathered in the previous three steps to enhance your documented assessments and communication. The example describes and tracks a child's learning progress over time in ways that inform ongoing planning. It also highlights the kinds of evidence, such as observations or conversations with whānau, that were used to support judgements and planning decisions. Finally, it shows how documentation can support conversations with children and whānau about a child's learning and progress.

After reading the example, think about how you currently document your planning and assessments and describe learning progress over time. Talk with team members and children's whānau to identify how your assessment documentation might better describe:

› a child's current capabilities, strengths, and interests, with evidence (Notice)
› a child's progress and possible directions for their learning (Recognise)
› how you will support the child to progress over time (Respond).

Assessment example: Tia connects with te taiao

This series of four stories follows Tia, who is four years old and attends her local kindergarten.

Tia lives with both her parents and her younger brother. Her mother is of South African descent and her father has whakapapa Māori. Tia has attended her local kindergarten since she was two and a half years old. Her pāpā often shares mātauranga Māori and tikanga Māori with the kindergarten kaiako and children.

These four stories focus on Tia and her developing knowledge about space and measurement, centred around the growth and tikanga of kai, agency, and advocacy for herself and mātauranga Māori. These stories highlight her connection and relationship with te taiao and follow her progress over time, leading to her teaching her younger siblings and friends at kindergarten. Tia's understanding of space and measurement in the realms of atua Māori and taonga Māori has supported her belonging and identity as Māori.

As you read the stories, you can find more information about how the kindergarten kaiako engaged with the 'Space and measurement' area of Kōwhiti Whakapae to support their practice and strengthen Tia's learning in relation to the Mana tangata | Contribution and Mana aotūroa | Exploration strands of *Te Whāriki.*

See the website for Kōwhiti Whakapae for the full sequence of learning stories.

This assessment illustrates Te mokowā me te whakaine | Space & measurement. To browse the complete suite of examples, see this page on Kōwhiti Whakapae online.

TE TAU ME TE WHAKAINE

Number & measurement

At an exploratory level, children begin using the number system to help arrange, count objects, and compare quantities for a purpose.

Overview

What do ngā mātāpono aronui mean for this area?

Four interconnected mātāpono aronui (values) underpin each maths area in Kōwhiti Whakapae: Whatumanawa, Whare, Whānau, and Whenua.

For further information on how these values underpin number and measurement, see this page on Kōwhiti Whakapae online.

What are number and measurement?

Number and measurement involve using the number system for purposeful activity with objects and quantities. The regularity and structure of the number system help us arrange and count objects and compare quantities at a rich exploratory level in the early years.

For further information, see this page on Kōwhiti Whakapae online.

How is this area woven through the strands of *Te Whāriki*?

Knowledge, skills, and attitudes associated with number and measurement are woven through all strands of *Te Whāriki* and are particularly evident in Mana reo | Communication and Mana aotūroa | Exploration.

For further information, see this page on Kōwhiti Whakapae online.

How do the foundations of Kōwhiti Whakapae impact on this area?

Kōwhiti Whakapae is built on four foundations: Te Tiriti o Waitangi; Identity, language, and culture; Inclusion; and the Principles of *Te Whāriki*. Together, these foundations impact teaching and learning about number and measurement.

For further information, see this page on Kōwhiti Whakapae online.

1 Lay the groundwork

Practices to whakaritea te pārekereke | prepare the seedbed for all children

Start by working with all the children in your setting. Create an environment that can support children to build skills related to number and measurement.

- Consider your current environment and how you could make it better.
- Talk to others about what you are already doing.
- Select practices that will be meaningful in your setting.

Number awareness and enjoyment

Foster an awareness and enjoyment of number that includes measurement and its uses.

Why is this practice important?

Experiencing number as a concept supports children to use numbers to express and compare quantities and to enjoy using number patterns (e.g., counting). As they explore and recognise the structure and regularity of the number system, they become confident in using numbers and counting to participate in number and quantity experiences in the wider world. Interest in the variation of number supports them to understand that number is expressed and used differently across countries, cultures, and generations.

How to apply this practice in your setting

a. Take time to engage with whānau and learn about children's experiences of number and measurement at home or in the community. Reflect these experiences in your setting where possible.

b. Be attuned and responsive to how children express their interest in number or counting (e.g., with gesture, language, imitation of movements, or rhythm). Share what you notice with whānau and your team.

c. Identify and build on number-related experiences in the setting – for example, action songs, books, sand and water play, and counting as part of everyday tasks (e.g., preparing paints ("How many jars will we need?"), cooking, and measuring ingredients).

d. Plan ways of incorporating number and number patterns within waiata, chants, sāsā, haka, dance, and movement (e.g., counting the beat, clapping rhythms, or counting "Tahi, rua, toru, whā" to start waiata).

e. As a team, discuss how to intentionally communicate about number and quantity with children (e.g., thinking aloud, saying "One for everyone!", "Walking in twos.", "Bigger", "Smaller", "Heavier", "First", and "Second").

Exploring number through children's interests

Support mokopuna to use number to explore their interests or for specific purposes.

Why is this practice important?

When mokopuna are curious and creative with number and measurement through their interests, they are more likely to find using number exciting and fun. They bring knowledge about number from their whānau and community, which supports their participation in social and cultural number-related experiences connnected with their daily life. By participating in a range of number activities for a purpose, they learn social and cultural practices (e.g., counting, grouping, and measuring).

How to apply this practice in your setting

a. Connect with whānau and others in your team to understand children's interests that have potential to involve number and quantity. Brainstorm as a team how you can use this understanding to support children to expand their exploration and knowledge through these interests.
b. Provide number-related materials to help children expand their exploration and knowledge of number and quantifying, such as: shells and nested containers for grouping, counting, or measuring; blocks for combining and dividing; and informal measures such as string and formal measures such as rulers for measuring.
c. Pose questions and wonderings to help children use number or measurement when developing working theories (e.g., "I wonder which plant had the bigger seed?").
d. Identify purposeful activities that have the potential to involve number and quantifying. Invite children to participate in or lead these activities (e.g., counting the number of people on an excursion; checking the level in an outdoor water tank; measuring ingredients for paints; and setting places at the kai table).
e. When appropriate, model how numbers can be organised (structured) in different ways using materials related to children's play interests (e.g., group objects in pairs, or place them in matching lines). Draw attention to these structures (e.g., "Oh, the buckets and spades are in pairs.)"
f. Use number-related language in relation to children's interests or purpose (e.g., "If we quarter the orange, then the four of you can have a piece each."; "Do you think we need fewer steps in this dance to make it easier to remember?").

Exploring and using number together

Support mokopuna to collaborate when exploring and using number.

Why is this practice important?

When mokopuna work together to use number and measurement to explore their interests and solve problems, they are also working together to make sense of the wider world. Collaborating also engages them in thinking critically as they predict, test ideas, and develop working theories. Posing questions related to number (e.g., "How many/E hia?" (quantifying); "Which has more?" (comparing); "Which is bigger/He aha te mea nui?" (measuring)) encourages mokopuna to use number in purposeful ways.

NUMBER & MEASUREMENT | LAY THE GROUNDWORK

How to apply this practice in your setting

a. Provide a wide range of materials and sufficient space and time to support collaboration when exploring number, counting, and measuring (e.g., collections of the same resources, a variety of materials for measuring (e.g., string and rulers), and enough space for sustained exploration).
b. Suggest and model ways for children to invite others to join them in exploring and solving number-related problems (e.g., "You could ask Hana to hold the end of the tape measure.").
c. Encourage mokopuna to describe or explain their thinking about number-related aspects of their play using a variety of modes (e.g., speaking, sign language, alternative and augmentative communication (AAC), gesture and movement, and artworks).
d. Highlight number patterns within shared experiences (e.g., helping mokopuna to organise themselves into pairs for excursions; giving two poi to each person, or clapping to identity beats in a dance).

2 Notice and recognise

Progress examples to help you notice and recognise a child's progress

Use the phases of progress (outlined below) to help you notice and recognise a child's progress.

- Draw on what you already know and what you've observed.
- Have discussions with the child, whānau, and colleagues.
- Use the practices (in step 3) to respond, based on what you notice.

Te korekore

Within an enabling environment, children experience and recognise simple groupings of objects and quantities.

- Children enjoy number-rich experiences, including sharing stories, rhymes, and waiata. With support, they notice and recognise number patterns in everyday routines and experiences (e.g., pairs of objects).
- Children begin to recognise and respond to language, gestures, and images related to number, number patterns, and quantities.
- Children notice arrangements of small groups of objects and playfully rearrange them.
- Children notice and respond to changes in quantities during play (e.g., with sand and water).

Te pō

Within an enabling environment, children explore and express early number concepts, groupings of objects, and quantity.

- Children playfully join in number-rich experiences, including sharing stories, rhymes, and waiata. They recognise how number patterns (e.g., pairs of objects) are used to make sense of and organise things in everyday routines and experiences.
- Children begin to use language for comparing objects and quantities (e.g., 'more' and 'same'). They enjoy playing with number names and may repeat number sequences from stories and routines, or invent their own.
- Children explore combining and dividing objects for a purpose.
- Children explore how they can transform quantities – including dividing, adding, and changing size and shape – while using resources such as playdough, sand, and water.

Te ao mārama

Within an enabling environment, children create and describe groupings of objects, including using simple numbers.

- Children predict and describe number patterns in stories, rhymes, and waiata, and they may create their own. They estimate or count during everyday experiences and routines.
- Children enjoy using the language of numbers, counting, and repetition and continue to be playful with number names. They create ways of drawing small quantities using pictures, tally marks, or number symbols. They investigate how number symbols are used in everyday routines and experiences.
- Children begin to recognise patterns of small numbers of objects, such as two or three dots on dice or dominoes. They compare groups of objects using strategies such as arranging in lines and sharing out equally, and they use number symbols in their play.
- Children use descriptive language to articulate comparisons such as 'nearly the same' and 'heaps more'. They explore and describe combining and dividing different quantities by length or volume, using language such as half, less, more, and double.

Te ao hōu

Within an enabling environment, children innovate and create combinations of objects and use counting purposefully.

- Children are playful and innovative using numbers and number patterns. They count for a purpose during play or in response to questions such as "How many are there?" and "Is there enough?", matching number to amount or quantity. They enjoy purposeful estimation and comparison (e.g., working out how objects can be shared fairly).
- Children enjoy and confidently use mathematical language to count, estimate, predict, and measure as part of play, everyday routines, and experiences. They ask questions relating to number and number patterns. They support others to use numbers (e.g., counting in to start waiata, counting pairs, or counting forwards and backwards for fun).
- Children group small numbers of objects (e.g., pairs or groups of five) to calculate 'how many'. They begin to recognise familiar patterns of objects and, for small numbers, identify how many without counting (subitising). They create different ways of combining two groups (e.g., matching or stacking) in order to calculate, compare, and check.
- Children understand that measuring quantities is useful or necessary in particular activities (e.g., cooking or sharing resources fairly). They use informal and formal methods (e.g., string or 'giant steps; a cup or tape measure) for measuring. They invite and support others to join in measurement activities.

3 Respond

Practices to help you respond at different phases of progress

After you have assessed the phases of progress (in the previous step), use these practices to work one-on-one with a child based on what you've noticed.

Talk with others about what these practices might look like in your setting, and test your thinking by looking at adjacent phases.

Note that these practices are not exhaustive, and you might think of others.

Te korekore

Within an enabling environment, children experience and recognise simple groupings of objects and quantities.

Number awareness and enjoyment

Foster an awareness and enjoyment of number that includes measurement and its uses.

a. Encourage mokopuna to participate in number- or measurement-related action songs, chants, poems, and stories (e.g., 'Five Little Ducks' (number) or 'I blew a bubble' (measurement). Seek ideas from whānau.
b. Model being playful with numbers in rhymes and games – for example, by introducing very large numbers that amaze and delight mokopuna.
c. Provide opportunities for mokopuna to notice changes in quantity (e.g., through water play with different-sized containers, or by comparing changing quantities in a sand timer). Comment or ask open-ended questions to support such exploration.
d. Display materials so that mokopuna are prompted to notice and rearrange small groups of objects (e.g., three small bowls, filled with four blocks, four plastic animals, and four shells respectively).

Exploring number through children's interests

Support mokopuna to use number to explore their interests or for specific purposes.

a. Provide number-rich experiences that relate to children's interests (e.g., storybooks, rhymes, waiata, and cooking).
b. Use language, gestures, and images that respond to the interest children show in number, number patterns, and quantities (e.g., hand gestures to suggest 'little', 'lots', or 'more' as children fill cups of water at kai time).
c. Intentionally arrange or group materials that relate to children's interests (e.g., display dinosaurs by colour, blocks by shape, or fabrics by texture). Notice and comment on how children rearrange or regroup these.

Exploring and using number together

Support mokopuna to collaborate when exploring and using number.

a. Create opportunities for small groups of children to enjoy number-rich experiences (e.g., chants, waiata, and books that include different cultural ways of expressing number).
b. Encourage children to share ideas or gestures that represent number, number patterns, or quantities (e.g., "What does tiny look like?"; "Can you be enormous?"; and "How full do you think this is?").
c. Draw children's attention to changes in quantities in their environment (e.g." This puddle is bigger today because of all the rain.").
d. Intentionally group materials so that there are sufficient quantities for children to enjoy working alongside peers to explore and rearrange the groups. Draw attention to their actions using verbal commentary or 'sports-casting' (e.g., "You've put all the small red blocks together over here.").

Te pō

Within an enabling environment, children explore and express early number concepts, groupings of objects, and quantity.

Number awareness and enjoyment

Foster an awareness and enjoyment of number that includes measurement and its uses.

a. Encourage mokopuna to notice number patterns in songs, stories, and everyday life (e.g., 'The Very Hungry Caterpillar'/'Te Anuhe Tino Hiakai', with its growing number pattern; pairing plates and cups; and counting numbers of steps when walking).
b. Use language playfully to communicate about numbers of objects or measures and quantities (e.g., counting in "Tahi, rua, toru, blast off!", or counting jumps during dance or games).
c. Use number-related language to compare objects and quantities (e.g., more, same, and heavier).
d. Support mokopuna to transform materials by dividing, adding, or changing their size. Model and describe sameness and difference (e.g., compare length of rolls of playdough or strands of harakeke when placed side by side).

Exploring number through children's interests

Support mokopuna to use number to explore their interests or for specific purposes.

a. Provide numerous objects and shapes that relate to children's interests and that they can combine and divide (e.g., colourful magnetic or felt shapes). Children interested in family play may enjoy joining and separating nested bowls or grouping items in bowls.
b. Draw children's attention to number patterns relating to their interests (e.g., the number of repetitions of a pattern on an insect's wings, or its pairs of legs).
c. Introduce language for comparing objects and quantities related to children's interests (e.g., for children who are curious about insects, introduce words such as small, medium, huge, many, few, smallest, and biggest).
d. Model how the structure of a number pattern can provide information needed for a purpose (e.g., by arranging shoes into pairs to find a missing shoe).

Exploring and using number together

Support mokopuna to collaborate when exploring and using number.

a. Model the use of mathematical language purposefully (e.g., "I wonder why this tree has fewer and smaller apples than the other tree?"). Tune into children's working theories, using maths language to support and extend their thinking.
b. Provide materials and contexts that encourage group play involving number or measurement (e.g., materials for digging holes or making mountains in the sandpit). Support this play with questions and wonderings to encourage children's thinking.
c. Provide sufficient materials for children to work together when creating number patterns or transforming items (e.g., by dividing, adding, or changing size or shape). Ensure there are sufficient loose parts for small groups of children to work together.
d. Support children to share their perspectives (e.g., by wondering together about similarities and differences in the length of leaves or children's feet).

Te ao mārama

Within an enabling environment, children create and describe groupings of objects, including using simple numbers.

Number awareness and enjoyment

Foster an awareness and enjoyment of number that includes measurement and its uses.

a. Invite children to predict and describe number patterns (e.g., pause when reading stories or rhymes such as 'Ten Apples Up on Top', so they can notice the number pattern and possibly predict the next number).

b. Continue to use playful, descriptive language when counting and using numbers (e.g., "heaps more", "nearly the same", or "giant steps"). Make up rhymes or games such as "One, two, three, catch a flea. Four, five six, pick up sticks." or "The bubble gets bigger, bigger, bigger … POP!"
c. Support children to notice number symbols in everyday life, and discuss their meaning with them (e.g., tally marks, number symbols on a sunblock chart, and numbers on letterboxes, clocks, or digital devices).
d. Provide resources that encourage children to recognise patterns of small numbers of objects (e.g., the difference between two and three dots on dice and dominoes). Let children incorporate these resources into their everyday play in creative ways.

Exploring number through children's interests

Support mokopuna to use number to explore their interests or for specific purposes.

a. Encourage mokopuna to predict, use, and describe number patterns through their interests (e.g., mokopuna who enjoy kapa haka may like to organise people into rows).
b. Notice and provide opportunities for mokopuna to arrange objects in ways that make it easy to visually recognise small numbers without counting them (e.g., lining up paint pots in a row for one brush to be added to each pot).
c. Comment when mokopuna begin combining and dividing different quantities for a purpose. Use and extend language over time (e.g., double or triple).
d. When appropriate, model the use of number structure for a purpose (e.g., arranging objects into groups). Invite mokopuna to share what they notice and how they might find out how many objects there are altogether.

Exploring and using number together

Support mokopuna to collaborate when exploring and using number.

a. Create opportunities for mokopuna to work together to explore increasingly sophisticated patterns involving small numbers of objects, images, or sounds (e.g., designing an animated film that creates moving patterns from small numbers of innate objects).
b. Support mokopuna to collaborate as they plan and predict number patterns (e.g., "How many might we need?"). Provide scaffolding by breaking big challenges down into smaller achievable steps (e.g., "That's a big job. What could we do first?").
c. Invite and prompt mokopuna to recognise number symbols in their environment and to discuss and debate as they make sense of them (e.g., on labels, birthday dates, on calendars, on clocks, and in pretend play such as shops).
d. Create collaborative ways for mokopuna to increase their understanding of relative size, number, or quantity. For example, encourage them to share and test their ideas with each other about the relative size of some hills (e.g., by looking at them from different angles or examining photos or illustrations).

Te ao hōu

Within an enabling environment, children innovate and create combinations of objects and use counting purposefully.

Number awareness and enjoyment

Foster an awareness and enjoyment of number that includes measurement and its uses.

a. Draw attention to numbers and number patterns in children's play and help children to use them in innovative ways (e.g., in shopping games use prompts such as "What could we use for money?" and "Shall we wrap up items in pairs?").
b. Encourage children to recognise ways in which counting, estimating, predicting, measuring, or comparing can be used for a purpose. For example, support them to work out ways of sharing a number of objects fairly, or ask open-ended questions to help them estimate quantity (e.g., "Will that nail be long enough to go through your wood?" or "How many nails will you need?").
c. Demonstrate the importance of measuring quantities in daily life (e.g., involve children in measuring quantities for cooking or measuring lengths in carpentry). Model the use of formal language (e.g., "One tablespoon/Kotahi te pūnu nui" or "This is 30 centimetres long.").
d. Create opportunities that require children to group small numbers of objects (e.g., when preparing vegetables for a hangi, ask "How much/E hia ngā kūmera rīwai (potato), paukena (pumpkin), and kāpeti (cabbage) do we need for each hangi whānau pack?").

Exploring number through children's interests

Support mokopuna to use number to explore their interests or for specific purposes.

a. During play, support mokopuna to explore ways of using number for a purpose (e.g., when making garages for cars, encourage mokopuna to explore the number of cars that will fit).
b. Encourage mokopuna to test their ideas and working theories by estimating, counting, or measuring during an activity (e.g., when building a fort). Use strategies such as wondering, open questions, or comments to provide support (e.g., "Do you think it will fit? How can you find out?").
c. Recognise situations when mokopuna confidently use language and symbols to represent number and counting. Plan opportunities to extend this in meaningful ways that interest them, while still having fun (e.g., sharing maths thinking from a small group with a larger group).

Exploring and using number together

Support mokopuna to collaborate when exploring and using number.

a. Initiate opportunities for children to share their thinking when they collaborate over investigations (e.g., support them to discuss how they went about finding 'How many?' or 'Which is larger or smaller?'). Model and support the language of comparison (e.g., less/iti iho, more/nui atu, smaller/iti rawa, and larger/nuinga).
b. Provide sustained opportunities for children to recognise familiar patterns for small numbers (one to six) so that they recognise the pattern without counting (subitising) (e.g., when playing board games using dice, ask children how they know the numbers on the dice).
c. Identify opportunities where children can combine groups of objects or share out quantities of objects. Notice their methods for sharing (dividing) equally, and invite conversations about how they can tell if objects have been shared fairly or equally.
d. Invite children to describe or show how they might answer number-related questions (e.g., "How many altogether?" or "How can we divide this among three people?"). Open up opportunities for prediction, testing estimates, and reflecting on their decisions with each other.

4 Document

An example of how you could use Kōwhiti Whakapae to enhance your assessments and communication

In this section, an assessment example illustrates how you can use the information gathered in the previous three steps to enhance your documented assessments and communication. The example describes and tracks a child's learning progress over time in ways that inform ongoing planning. It also highlights the kinds of evidence, such as observations or conversations with whānau, that were used to support judgements and planning decisions. Finally, it shows how documentation can support conversations with children and whānau about a child's learning and progress.

After reading the example, think about how you currently document your planning and assessments and describe learning progress over time. Talk with team members and children's whānau to identify how your assessment documentation might better describe:

- a child's current capabilities, strengths, and interests, with evidence (Notice)
- a child's progress and possible directions for their learning (Recognise)
- how you will support the child to progress over time (Respond).

Assessment example: Maia's growing sense of belonging

This set of three stories focuses on Maia, who is two years old and attends an early learning centre.

Maia is the middle child and has two brothers. Her family value their Māori and Samoan whakapapa and are committed to ensuring that their children are able to participate in all aspects of their languages, cultures, and identity. They strongly connect with te ao Māori and te reo Māori is prioritised in the home. Waiata, haka, dance, and musical instruments are very familiar to Maia. Kaiako have learned from her family about her strong musical interest at home and have noticed her musical exploration of materials within the early learning setting.

The three stories capture Maia's interest in sounds, music, and number as she connects with the haka actions most familiar to her. They also illustrate Maia's enjoyment in exploring and making sounds with objects in her learning environment.

As you read the stories, you will find more information about how the centre engaged with the 'Number and measurement' area of Kōwhiti Whakapae to support their practice and strengthen Maia's learning in relation to the Mana reo | Communication and Mana aotūroa | Exploration strands of *Te Whāriki*.

See the website for Kōwhiti Whakapae for the full sequence of learning stories.

This example illustrates Te tau me te whakaine | Number & measurement. To browse the complete suite of examples, see this page on Kōwhiti Whakapae online.

TE TAUIRA ME TE PĀNGA

Pattern & relationships

In art, construction, routines, and playful experiences, children notice, create, and use the regular structure of pattern to foster prediction.

Overview

What do ngā mātāpono aronui mean for this area?

Four interconnected mātāpono aronui (values) underpin maths learning in Kōwhiti Whakapae: Whatumanawa, Whare, Whānau, and Whenua.

For further information on how these values underpin pattern and relationships, see this page on Kōwhiti Whakapae online.

What are pattern and relationships?

Pattern and relationships involve noticing, creating, and using patterns for purposeful experiences. Maths patterns are based on a regular structure that fosters prediction. Patterns are evident in art, design, construction, daily routines, and playful experiences.

For further information, see this page on Kōwhiti Whakapae online.

How is this area woven through the strands of *Te Whāriki*?

Knowledge, skills, and attitudes associated with pattern and relationships are woven through all strands of *Te Whāriki* and are particularly evident in Mana reo | Communication and Mana aotūroa | Exploration.

For further information, see this page on Kōwhiti Whakapae online.

How do the foundations of Kōwhiti Whakapae impact on this area?

Kōwhiti Whakapae is built on four foundations: Te Tiriti o Waitangi; Identity, language, and culture; Inclusion; and the Principles of *Te Whāriki*. Together, these foundations impact teaching and learning about pattern and relationships.

For further information, see this page on Kōwhiti Whakapae online.

1 Lay the groundwork

Practices to whakaritea te pārekereke | prepare the seedbed for all children

Start by working with all the children in your setting. Create an environment that can support children to build skills related to pattern and relationships.

- Consider your current environment and how you could make it better.
- Talk to others about what you are already doing.
- Select practices that will be meaningful in your setting.

Patterns in the wider world

Support children to recognise, enjoy, and respond to patterns in their wider world.

Why is this practice important?

Drawing children's attention to the variety of patterns in the environment stimulates their awareness and interest in patterns. Patterns involve repetition and might be physical, social or related to time. An awareness and interest in the mathematical features of patterns such as repeated elements and regular structures, helps children enjoy and respond to patterns in daily routines, art, and music etc., and to use patterns to investigate and understand the wider world.

How to apply this practice in your setting

a. Take time to understand from children what they already know about patterns. Engage with whānau to learn about children's experiences of patterns at home or in the community (e.g., of cultural patterns and their meaning).
b. Learn about the cultural significance of a pattern or object before exploring its maths features (e.g., explore the significance of kōwhaiwhai or tapa patterns with children before looking at the symmetry of their shapes).
c. Reflect children's cultural patterns in your setting's resources and regular events (e.g., beat and rhythm using rākau sticks, or patterns in Celtic art).
d. Provide experiences that illustrate pattern regularity, repetition, and structure in different modes (e.g., visual patterns in natural materials, art, puzzles, and clothing; sound patterns in waiata, drumming, clapping, and chants; and movement patterns in dance, daily routines, and action songs).
e. Share with whānau how children experience pattern within the setting.

Adapting and creating patterns

Support mokopuna to use and adapt familiar patterns and to create new patterns.

Why is this practice important?

When mokopuna notice each part of a pattern and how these parts fit together (e.g., the same feature might increase in size or be in a different position), they are able to adapt familiar patterns and create new patterns. Using, adapting, and creating patterns helps mokopuna to use maths to investigate, problem solve, and make sense of their world. Adapting and creating patterns can also support them to understand and adapt patterns in their everyday life.

How to apply this practice in your setting

a. Encourage children to experiment with a range of resources for pattern making (e.g., uku/clay, harakeke, kitchen play equipment, tiles, collage materials, geometric puzzles, and blocks).
b. Model ways of recognising and adapting repeating elements in patterns for a purpose. Use the language of sameness and difference to focus on repeated elements (e.g., 'black, red, white; black, red, white', or spirals sequenced from small to large).
c. Encourage children to be curious about and creative with patterns (e.g., ask 'I wonder...' questions to encourage them to predict, continue, extend, or correct a repeating element in a pattern).
d. Support individual and shared patterning experiences over time. These could involve large or continuous patterns and a range of designs related to children's identity, language, and culture.

Exploring relationships within patterns

Create opportunities for children to explore relationships within patterns.

Why is this practice important?

When children recognise how features of a pattern relate to each other (e.g., repeating shapes, colours, sounds, or movements), then they are better able to predict, select, make, or adapt the next part of a pattern. This helps them to use and create patterns to investigate their world and to problem solve.

How to apply this practice in your setting

a. Provide opportunities for children to experience multiple modes of patterns (e.g., music, shape, colour, and dance) and relationships among these (e.g., between the beat of a waiata and corresponding actions).
b. Encourage children to think about specific features of familiar patterns and the relationships between these features (e.g., washing hands and saying karakia kai before eating).
c. Model being playful with patterns (e.g., when grouping or sequencing objects according to size or colour, suggest regrouping according to an unexpected feature such as texture).
d. Using a range of patterns constructed with different materials or represented in different ways, foster working theories about sameness and difference.

Notice and recognise

Progress examples to help you notice and recognise a child's progress

Use the phases of progress (outlined below) to help you notice and recognise a child's progress.

- Draw on what you already know and what you've observed.
- Have discussions with the child, whānau, and colleagues.
- Use the practices (in step 3) to respond, based on what you notice.

Te korekore

Within an enabling environment, children enjoy and respond to patterns.

- Children respond to patterns they experience through familiar routines and their senses (e.g., in dance, waiata, games, images, and nature).
- Children begin to anticipate and recognise regular patterns in a range of contexts.
- Children enjoy the regularity and repetition of patterns. They recognise, copy, and repeat simple patterns in rhymes, song, dance, movement, and stories.
- Children begin to express a preference for particular objects, shapes, and natural materials.

Te pō

Within an enabling environment, children explore repetition and create patterns using familiar materials.

- Children explore and copy simple repeating patterns through playful participation in routines and experiences (e.g., waiata, rhymes, dance, games, and shared books).
- Children notice and communicate about specific patterns in their environment (e.g., the stripes on a T-shirt, kōwhaiwhai, or leaf veins).
- Children recognise relationships in pattern, including sameness, difference, and repetition, and begin to make predictions about how patterns might continue.
- Children create simple patterns with a range of familiar objects, shapes, and natural materials.

Te ao mārama

Within an enabling environment, children create a range of patterns using different materials and for a range of purposes.

- Children express themselves through patterns using language, sounds, and movements. They recognise patterns associated with time, nature, seasons, and routines.
- Children create patterns in a range of contexts using different objects, materials, and spatial arrangements.
- Children use pattern relationships, including sameness and difference, to sort a collection of objects in ways that reflect simple repeated patterns and sequences. They recognise sameness in patterns and can describe how they have organised objects to make a pattern.
- Children create or re-create specific patterns in their play, including those with a repeating element (e.g., in a string of beads, or in paintings that have repeated colours or shapes). They communicate about and describe their patterns.

Te ao hōu

Within an enabling environment, children design, create, adapt, extend, and communicate patterns using a range of materials and in different contexts.

- Children recognise, design, adapt, and create increasingly complex patterns in familiar music and dance. They become aware of experiences related to longer patterns of time (e.g., the Matariki cycle or the seasons), alongside maths systems or symbols used in calendars, graphs, and timelines.
- Children confidently explain patterns during shared activities such as collage, drawing, and games. They collaborate with others in patterning experiences.
- Children recognise the repeated parts of patterns that they have designed and created. They can recognise relationships in patterns to predict, continue, and extend a range of patterns, including complex patterns in different contexts.
- Children collaborate to pose and solve problems about patterns. They are playful and inventive when using patterns for a purpose, including creating or recreating different representations of a range of patterns.

3 Respond

Practices to help you respond at different phases of progress

After you have assessed the phases of progress (in the previous step), use these practices to work one-on-one with a child based on what you've noticed.

Talk with others about what these practices might look like in your setting, and test your thinking by looking at adjacent phases.

Note that these practices are not exhaustive, and you might think of others.

Te korekore

Within an enabling environment, children enjoy and respond to patterns.

Patterns in the wider world

Support children to recognise, enjoy, and respond to patterns in their wider world.

a. Encourage mokopuna to respond to patterns in familiar routines and sensory experiences (e.g., playfully encourage participation in action songs with repeating parts). Wonder aloud about sameness and difference in objects and shapes, including in natural materials.
b. Provide cues and other prompts to help mokopuna anticipate routines or other patterns (e.g., use a regular sequence of actions to signal the beginning of lunch).
c. Notice when mokopuna show interest in patterns through art, block play, sand play, poi, siva dance, etc. Respond with language or gestures that highlight features of the patterns (e.g., repeating colours, shapes, movements, or sounds).

Adapting and creating patterns

Support mokopuna to use and adapt familiar patterns and to create new patterns.

a. Provide materials that support children's interest and encourage them to participate in pattern making (e.g., objects that can be grouped or sequenced, such as bowls that fit inside each other, and pretend food or cars that can be grouped by shape, type, or colour).
b. Playfully invite children to repeat and change the pattern of a familiar dance, waiata, or action song.
c. Create opportunities for children to imitate, continue, or extend existing patterns (e.g., invite them to invent parts for a repeating clapping game, an action song, or a siva dance).

Exploring relationships within patterns

Create opportunities for children to explore relationships within patterns.

a. Notice and respond when mokopuna use regular structures to group objects (e.g., by placing objects in pairs or rows).
b. Encourage mokopuna to notice specific features of patterns and their relationships that are part of their regular routines (e.g., "After kai I put my soft toy in bed, go to the wharepaku, and get my blanket.").
c. Support mokopuna to notice relationships between patterns in play equipment (e.g., puzzle pieces that match by colour and shape (sameness) or by colour but not shape (sameness and difference).

Te pō

Within an enabling environment, children explore repetition and create patterns using familiar materials.

Patterns in the wider world

Support children to recognise, enjoy, and respond to patterns in their wider world.

a. Provide opportunities for children to copy simple repeated patterns that they enjoy (e.g., by pairing shoes, sequencing materials with the same features but different sizes, singing waiata with repeating sections, or emphasising repetition in books).
b. Focus attention on the regularity and repetition of specific patterns and the features of these patterns (e.g., stripes on T-shirts, kōwhaiwhai, leaf veins, and corners of triangles).
c. Introduce a mix of new and unfamiliar resources to explore increasingly complex patterns (e.g., weavings, geometric puzzles, bells (sound), and dominos with groups of dots).

Adapting and creating patterns

Support mokopuna to use and adapt familiar patterns and to create new patterns.

a. Offer sustained opportunities for children to investigate patterns in your setting or community (e.g., patterns within kōwhaiwhai, on tivaevae, pāreu, or lavalava, or in paving stones, mosaics, or tiling).
b. Invite mokopuna to predict the next piece of a pattern and to share their perspective on a pattern. Ask "What are the repeating elements, and do they change?" Encourage them to use comparative language (e.g., small, bigger, same, and different).
c. Encourage mokopuna to think about features of familiar patterns and their purpose. Work with mokopuna to adapt patterns for a purpose (e.g., adapt the arrangement of kai tables, chairs, plates, and cups to suit the number of people joining in).

Exploring relationships within patterns

Create opportunities for children to explore relationships within patterns.

a. Focus on children's play preferences when noticing or responding to their pattern interests (e.g., is a child grouping toy animals by type, colour, size, or some other way? Is the grouping/structure related to their play interest?).
b. Acknowledge repetitive elements of patterns that may seem incidental to a child's main play purpose (e.g., decorative patterns added to a construction of blocks or sand).
c. Ask open-ended questions to support children's exploration of sameness and difference as they investigate, problem solve, play, create, or build (e.g., "How else might that fit? I wonder what might happen if you …").

Te ao mārama

Within an enabling environment, children create a range of patterns using different materials and for a range of purposes.

Patterns in the wider world

Support children to recognise, enjoy, and respond to patterns in their wider world.

a. Continue to expand the range of modes for exploring patterns (e.g., games that repeat actions, group materials, or involve sequences; printmaking; clay-marking).
b. Invite children to share what they know about patterns that interest them, and sustain conversations about specific aspects of the patterns.
c. When children create or copy a pattern that is important to them, provide a range of media for them to record it (e.g., paint and paper for drawing, and digital devices for photographing or videoing).

Adapting and creating patterns

Support mokopuna to use and adapt familiar patterns and to create new patterns.

a. When children are following a pattern of interest, listen, observe, and ask questions to learn more about how they 'see' or view the pattern. What are their working theories? Then use "I wonder if …" questions to prompt further pattern making.
b. Allow time and space for pattern making (e.g., extending a pattern of blocks around a chair and across the floor). Find ways for children to return to their patterns over time (e.g., by recording or storing the patterns).
c. Invite and support children to show and explain their patterns to others, including whānau.
d. Provide specific feedback about children's persistence and their use of patterns to problem solve.

Exploring relationships within patterns

Create opportunities for children to explore relationships within patterns.

a. When children notice relationships between features of patterns, encourage them to experiment and share their ideas with others (e.g., "When I spin my hand faster, the poi goes faster"; "The more I run, the more puffed I get.").
b. Wonder aloud to prompt children's thinking about possible connections between sounds, movements, and/or visual patterns.
c. Highlight repeated elements of patterns by revisiting smaller elements or by describing different ways in which the elements repeat.

Te ao hōu

Within an enabling environment, children design, create, adapt, extend, and communicate patterns using a range of materials and in different contexts.

Patterns in the wider world

Support children to recognise, enjoy, and respond to patterns in their wider world.

a. Support children to contribute to and lead routines based on patterns (e.g., repetitive aspects of daily routines, or celebrations of seasons and annual festivals).
b. Initiate opportunities for children to demonstrate and explain familiar patterns to peers, and listen to others share what it is about patterns that interests them.
c. Support children to playfully extend their pattern activities and to introduce challenges (e.g., using a pattern for a new purpose).

Adapting and creating patterns

Support mokopuna to use and adapt familiar patterns and to create new patterns.

a. Create opportunities for shared experiences with patterns (e.g., in art, music, or construction). Over time, support mokopuna to expand large or continuous patterns that reflect a range of cultural features (e.g., visual designs, or beats in music).
b. Encourage mokopuna to look for patterns as part of their investigations or problem-solving activities. If relevant, revisit previous pattern making using narratives, photos, drawings, or documentation.
c. Co-construct with mokopuna simple techniques for using materials to make patterns in creative ways (e.g., turning or flipping a shape).
d. Initiate opportunities for mokopuna to demonstrate and explain familiar patterns to peers and to listen to others share and show their patterns. Support them to extend their explanations, modelling ways of asking questions about others' patterns.

Exploring relationships within patterns

Create opportunities for children to explore relationships within patterns.

a. Support children to break big challenges down into smaller, achievable steps that use patterns (e.g., by using a stamp or template, or by drawing or making a section of a pattern for a construction and then copying/repeating it).
b. Support children to recognise when maths patterns (e.g., within the number system or ways of measuring) provide consistent patterns that can be used within an investigation.
c. Identify opportunities for children to draw or paint pictures that represent patterns they have constructed. Use these drawings and/or children's choice of digital media to document the pattern creations for later revisiting.

Document

An example of how you could use Kōwhiti Whakapae to enhance your assessments and communication

In this section, an assessment example illustrates how you can use the information gathered in the previous three steps to enhance your documented assessments and communication. The example describes and tracks a child's learning progress over time in ways that inform ongoing planning. It also highlights the kinds of evidence, such as observations or conversations with whānau, that were used to support judgements and planning decisions. Finally, it shows how documentation can support conversations with children and whānau about a child's learning and progress.

After reading the example, think about how you currently document your planning and assessments and describe learning progress over time. Talk with team members and children's whānau to identify how your assessment documentation might better describe:

› a child's current capabilities, strengths, and interests, with evidence (Notice)
› a child's progress and possible directions for their learning (Recognise)
› how you will support the child to progress over time (Respond).

Assessment example: Felix's love of animals

These three stories are about Felix, who is 22 months old and attends Playcentre two days a week.

Felix is an only child and lives with his two Dads, Mike and Ari. Mike is of English descent and moved to Aotearoa 10 years ago, and Ari is a fifth-generation, Pākehā New Zealander.

The three stories focus on Felix's explorations of pattern. They were written by Maia, one of the duty parents at the Playcentre. They show how Felix is supported to learn over time through exploration and play and by interested adults who offer ideas and encouragement.

As you read the stories, you will find more information about how the Playcentre parents engaged with the 'Pattern and relationships' area of Kōwhiti Whakapae to support their practice and strengthen Felix's learning in relation to the Mana reo | Communication, Mana whenua | Belonging and Mana aotūroa | Exploration strands of *Te Whāriki*.

See the website for Kōwhiti Whakapae for the full sequence of learning stories.

This assessment illustrates Te tauira me te pānga | Pattern & relationships. To browse the complete suite of examples, see this page on Kōwhiti Whakapae online.

TŪHURATIA TE PĀNGARAU

Create & communicate maths

As children construct, model, draw, or create symbols, they are involved in processes that represent maths thinking.

Overview

What do ngā mātāpono aronui mean for this area?

Four interconnected mātāpono aronui (values) underpin maths learning in Kōwhiti Whakapae: Whatumanawa, Whare, Whānau, and Whenua.

For further information on how these values underpin creating and communicating maths, see this page on Kōwhiti Whakapae online.

What is creating and communicating maths?

Creating and communicating maths refers to processes that represent mathematical thinking. This includes creating constructions or models and drawing or creating symbols. All of these are different ways of communicating mathematical thinking.

For further information, see this page on Kōwhiti Whakapae online.

How is this area woven through the strands of *Te Whāriki*?

Knowledge, skills, and attitudes associated with creating and communicating maths are woven through all strands of *Te Whāriki* and are particularly evident in Mana reo | Communication and Mana aotūroa | Exploration.

For further information, see this page on Kōwhiti Whakapae online.

How do the foundations of Kōwhiti Whakapae impact on this area?

Kōwhiti Whakapae is built on four foundations: Te Tiriti o Waitangi; Identity, language, and culture; Inclusion; and the Principles of *Te Whāriki*. Together, these foundations impact teaching and learning about creating and communicating maths.

For further information, see this page on Kōwhiti Whakapae online.

1 Lay the groundwork

Practices to whakaritea te pārekereke | prepare the seedbed for all children

Start by working with all the children in your setting. Create an environment that can support children to build skills related to creating and communicating maths.

- Consider your current environment and how you could make it better.
- Talk to others about what you are already doing.
- Select practices that will be meaningful in your setting.

Supporting maths exploration and investigation

Create an environment that supports curiosity, exploration, and investigation related to maths.

Why is this practice important?

An environment that encourages children's curiosity about and exploration and investigation of maths supports them to develop their maths working theories and ways of understanding the world. Children's explorations with maths might lead them to solutions (e.g., a construction or completed pattern) or generate further pathways to explore. For some children, the predictability and consistency of concepts such as number, shape, and pattern are reassuring and bring them a sense of security and meaning.

How to apply this practice in your setting

a. Work with whānau to learn about children's experiences of maths at home or in the community. Create an enabling environment in your early learning setting that connects with these experiences.

b. Create provocations that encourage children to pose problems and generate and refine working theories (e.g., display unfinished weaving to invite children to continue, change, or complete its pattern; provide images of tall or patterned buildings near the block area to provoke curiosity; or display lavalava/pareu/sarongs to create interest in the art of stencil painting).

c. Support children to pose their own spoken or non-spoken questions (e.g., a child's actions may provide clues about their wonderings. Demonstrate ways of posing questions (e.g., through commentary or by asking "I wonder if …?", "I'm puzzled about …", "What do you think?", or "He aha ōu whakairo?").

d. Use specific maths language and gesture where appropriate (e.g., the order of a pōwhiri, the number of people who do the karanga (call) and whaikōrero (speeches), and the different sizes of carvings and tukutuku panels).

e. Create contexts that enable individuals or groups to extend their explorations or investigations for sustained periods (e.g., make 'work in progress' signs to protect children's work, or organise kai outdoors instead of dismantling ongoing work).

f. Share with whānau the ways that you support children to be curious about and use maths to explore and investigate their ideas.

Resources to model or represent maths thinking

Provide resources that support mokopuna to model or represent their maths interests and thinking through creative play.

Why is this practice important?

As children play and investigate their world, they use resources to create models or representations of their ideas, including their maths ideas. Their maths thinking is illustrated through a process of modelling and the models they create (e.g., when they rearrange furniture to construct a whare, their planning and construction process (modelling) and the final whare (model) shows spatial thinking and problem solving).

How to apply this practice in your setting

a. Take time to learn from whānau the kinds of creative play that mokopuna enjoy. Provide resources that support children to model or represent their maths thinking through such play.
b. When creating models or representations, support children to explore the properties of different materials. Together reflect on their choices and the materials' usefulness (e.g., comment on the properties of wood a child has chosen to hammer a nail into ("It's very hard and thick.") or the features of a feather in a heuristic play basket).
c. Support mokopuna to adapt resources to suit their play purposes (e.g., by cutting out, folding, pulling apart, or joining them). Use scaffolding to support children's thinking (e.g., fold a blanket in half and invite a child to do the next fold).
d. Introduce materials that provoke mokopuna to expand their explorations (e.g., add feathers alongside water play to encourage exploring the properties of weight).
e. Notice when mokopuna prefer one specific material and encourage them to expand the inventive ways in which they can use that single resource (e.g., using cardboard cylinders to build a tower or a track for their cars to go through).

Modes to support maths play and investigations

Provide opportunities for mokopuna to represent their interests, play, and investigations in a variety of modes.

Why is this practice important?

When mokopuna are supported to express and model maths thinking using different modes (e.g., symbols, gesture, language, movement, music, drawing, and role playing), they share maths thinking in ways that suit their interests. Using a range of modes to create models or representations allows children options to practise purposeful maths thinking. Maths thinking includes testing properties and making decisions about how or what resources to use, adapting materials, or switching modes for a purpose.

How to apply this practice in your setting

a. Work with whānau to learn about the different ways (or modes) that mokopuna enjoy using to explore and express themselves at home and in their community (e.g., art (mahi toi), movement (korikori), language (reo), music (puoro), and dramatic play (ngā whakaari ā-whānau).
b. Provide a variety of resources (e.g., musical instruments and art or construction materials) that mokopuna can use to explore, represent, or model their maths thinking in different modes, including those enjoyed in their home contexts.
c. Provide sustained opportunities for mokopuna to create another representation of their construction or model in different modes (e.g., making drawings of their block construction or pattern, and inventing symbols to illustrate their garden design).
d. Draw attention to the ways kaiako use different modes to represent their maths thinking (e.g., in birthday charts, when recording moe (sleep) times, or when ringing a bell to represent daily patterns such as kai time).

Using maths language

Create opportunities for children to use language to express their thinking during maths-related experiences.

Why is this practice important?

When children have many opportunities to describe and clarify their maths thinking with others, they can consolidate and expand understanding of their own thinking. This supports them to become more proficient at using language to communicate their maths thinking. The way children communicate their maths thinking provides a window into their ideas and working theories. This creates an opportunity for kaiako to support and scaffold learning and connect to further learning possibilities.

How to apply this practice in your setting

a. Make use of planned and spontaneous opportunities for mokopuna to communicate their thinking using spoken and non-spoken language (e.g., support pairs or small groups of children to share and discuss their ideas through art or conversation).
b. Pose open-ended questions as prompts for mokopuna to express their thinking in different ways or to elaborate on or expand their ideas.
c. Support mokopuna to think out loud and to ask questions during maths exploration (e.g., provide a running commentary about your own actions – "I want this to go there. I'll push it sideways. I need to turn it. Yes!").
d. Foster language of curiosity, puzzling, problem posing, and prediction in a variety of modes (e.g., speaking, gesture, movement, and art). For instance, wonder aloud how something could be built differently or made stronger using alternative materials.
e. Notice and encourage the language of creativity, agency, dispositions, and working theories (e.g., "I noticed you were trying new and different ways to put those smaller blocks together. You kept trying until you found what you wanted.").

Notice and recognise

Progress examples to help you notice and recognise a child's progress

Use the phases of progress (outlined below) to help you notice and recognise a child's progress.

- Draw on what you already know and what you've observed.
- Have discussions with the child, whānau, and colleagues.
- Use the practices (in step 3) to respond, based on what you notice.

Te korekore

Within an enabling environment, children are curious and begin to explore different sensory models and representations.

- With adult support, children attune to the way maths thinking can be used to make sense of the world (e.g., the organisation of space, shape, pattern, and quantity). They experience and modify models designed by others (e.g., by combining, separating, or moving).
- Children enjoy using their senses to explore different quantities in their world. With adult support, they tune into the way measurement is used around them to describe, estimate, predict, and compare.
- Children are curious and, with support, tune into maths language, symbols, and representations. They begin to associate these with meaningful experiences and routine happenings.

Te pō

Within an enabling environment, children explore and use representations through drawing, constructing, and adapting existing objects and materials.

- Children explore and create new maths representations as they make sense of their world. They explore, shape, construct, and deconstruct objects and materials through processes such as arranging (e.g., by making simple patterns and modelling with clay).
- Children use everyday items to informally explore and enjoy quantities. They notice, recognise, and puzzle about different amounts and shapes (e.g., during sand and water play).
- Children begin to explore connections between people, places, and things in their world, using language, marks, pictures, symbols, and constructions.

Te ao mārama

Within an enabling environment, children intentionally create or adapt representations of their maths thinking.

- Children are intentional in their use of maths representations to create and design. They use and adapt a range of objects and materials to represent and connect with their ideas and designs (e.g., using clay to show small, medium, and large).
- Children independently and collaboratively explore quantity and use measurement purposefully (e.g., to predict, estimate, compare, test their thinking, and solve problems).
- Children create marks or symbols to show connections, relationships, and repeating patterns. They use maths language, symbols, drawing, and constructions to describe, explore, predict, and investigate their environment with increasing complexity.

Te ao hōu

Within an enabling environment, children create, adapt, describe, and explain a range of maths representations for different contexts and purposes.

- Children innovate and collaborate to plan, design, construct, and adapt maths representations over time, for a range of contexts and purposes.
- Children initiate and carry out measuring activities for a purpose and use prediction, estimation, and comparison to inform measuring decisions and solve problems. They may select and use informal measurement methods (e.g., string) to measure length, width, or height.
- Children innovate and collaborate to create and use maths symbols for a purpose to plan, design, and problem solve (e.g., by creating drawings, plans, graphs, and maps). They explore a range of ways to describe and represent patterns, relationships, number, shape, and space, including changes over time (e.g., by creating a sequence of images). They use an increasing range of maths language to explain their processes and thinking.

3 Respond

Practices to help you respond at different phases of progress

After you have assessed the phases of progress (in the previous step), use these practices to work one-on-one with a child based on what you've noticed.

Talk with others about what these practices might look like in your setting, and test your thinking by looking at adjacent phases.

Note that these practices are not exhaustive, and you might think of others.

Te korekore

Within an enabling environment, children are curious and begin to explore different sensory models and representations.

Supporting maths exploration and investigation

Create an environment that supports curiosity, exploration, and investigation related to maths.

a. Provide resources that mokopuna can take apart, combine, or move to explore maths concepts (e.g., balls for exploring movement and shape; blocks, natural materials, puzzles, shells, and nested bowls for exploring shape, pattern, number, and measurement; and cylinders for exploring number and measurement in water and sand play).
b. Support mokopuna to enjoy maths in everyday experiences (e.g., pattern, number, shape, and space in kapa haka and siva dance; pattern in daily routines; and number and measurement when sharing food and organising excursions).
c. Use simple language and gestures related to maths (including comparison) during everyday interactions (e.g., bigger, tiny, wide, more, and pair).

Resources to model or represent maths thinking

Provide resources that support mokopuna to model or represent their maths interests and thinking through creative play.

a. Provide resources that children can use creatively to model or represent their ideas (e.g., paint, sticks, fabrics, clay, blocks and sand).
b. Tune into and comment on children's actions and decisions as they explore materials and create models or representations (e.g., "You've flattened the dough and laid it under the other piece."; and "You've put the curved block on top - it's wobbling.").
c. Encourage children to explore the properties of resources using their senses (e.g., how it feels to twist harakeke; the weight of containers filled with frozen or warm water; and the feel of a feather brushed across their skin).
d. Provide commentary while jointly moving or manipulating resources (e.g., "It's very heavy — shall I hold this end steady?").

Modes to support maths play and investigations

Provide opportunities for mokopuna to represent their interests, play, and investigations in a variety of modes.

a. Provide resources that mokopuna can explore with all their senses and use to express their maths thinking through play (e.g., musical instruments to create a fast or slow beat; clay to shape and reshape; and water and sand with different-sized containers).
b. Use spoken and non-spoken language for routine happenings (e.g., a regular song or piece of music to signal kai, or photos mokopuna can attach to a chart to indicate they are present).
c. Present resources (across a range of modes) in ways that highlight their potential for maths exploration (e.g., display patterned artwork alongside shapes that mokopuna can use to make similar patterns; or display drums alongside playing music).

Using maths language

Create opportunities for children to use language to express their thinking during maths-related experiences.

a. Use language and gesture to comment on, wonder out loud, and pose questions. Give children time to engage, and tune into their cues.
b. Foreground maths thinking during stories, play, and routines (e.g., wonder out loud about the ways in which Maui and his brothers plaited paraharaha (flat), tapawhā (square), and tuamaka (round) flax ropes to catch the sun.
c. Use language and gesture to describe tactile models (e.g., weaving). Encourage mokopuna to touch and explore these, using language to prompt thinking about aspects of the construction (e.g., flat, over, and under).

Te pō

Within an enabling environment, children explore and use representations through drawing, constructing, and adapting existing objects and materials.

Supporting maths exploration and investigation

Create an environment that supports curiosity, exploration, and investigation related to maths.

a. Learn more about children's interests related to maths investigations from a range of perspectives, including those of colleagues, whānau, and other children. Investigations could include measuring for baking, designing indoor huts, and constructing with Duplo or blocks.
b. Provide opportunities for children to puzzle about shape and quantity – for example, by reshaping clay or exploring water quantity using a range of different shaped containers (e.g., narrow, wide, tall, and short cylinders).
c. Respond to children's curiosity and notice potential for extending maths thinking in their experiences by observing, asking questions, offering materials, and creating space and time for exploration.
d. Initiate opportunities for children to be part of larger groups when exploring maths experiences (e.g., together create a long, wide river in the sandpit).

Resources to model or represent maths thinking

Provide resources that support mokopuna to model or represent their maths interests and thinking through creative play.

a. Expand the range of resources that children can join, separate, and reshape (e.g., large beads, tiles, and collections of natural materials, ribbon, or string). Encourage children to notice their features (e.g., large, light, patterned, similar, different, curved, or pointy).
b. Notice potential maths experiences in children's play. Provide resources to help them explore, problem solve, and test out their working theories about the properties of the materials or objects they are using (e.g., alternatively shaped blocks or lighter fabric).
c. Create opportunities for children to be curious and creative in larger groups when using resources in play (e.g., when using dominos as play money).
d. Document children's investigations in different ways (e.g., display models or constructions such as from weaving or working with clay; photograph or film children testing and choosing resources; note conversations as children wonder and problem solve).

Modes to support maths play and investigations

Provide opportunities for mokopuna to represent their interests, play, and investigations in a variety of modes.

a. Prompt children to explore potential maths experiences through different modes (e.g., provide different-sized boxes to create a range of constructions, or different objects or musical instruments to create a pattern of beats or sounds).
b. Expand the range of opportunities children have to experience joining, separating, and reshaping using different modes (e.g., a child interested in connecting and grouping trains may be interested in hanging dolls' clothes on a line (connecting) or grouping the clothes after they have dried).
c. Make visible the way children's learning expands by documenting their multi-modal interests (e.g., sharing quantities with a playdough pizza could be extended into using blocks in dramatic play).

Using maths language

Create opportunities for children to use language to express their thinking during maths-related experiences.

a. Use language and gesture to show children how they can share ideas, wonder, and think. Use prompts to help sustain conversations.
b. During play, comment on mathematical aspects of movement, features of objects, and quantity (e.g., "You're spinning faster and lower in a circle." (movement); "Those leaves are bigger and more spiky and curvy." (objects); and "There are more blocks in this pile." (quantity).
c. Use language and gesture to draw children's attention to features of visual models and representations (e.g., to look for patterns, notice size and shape, and compare different objects).

Te ao mārama

Within an enabling environment, children intentionally create or adapt representations of their maths thinking.

Supporting maths exploration and investigation

Create an environment that supports curiosity, exploration, and investigation related to maths.

a. Initiate and support investigations that have the potential for maths planning (e.g., for using space, number, and measurement to help design, model, or create a vegetable garden.)
b. Create opportunities for shared conversations about ways of exploring or responding to challenges (e.g., "What have you already tried?"; "What else might work?"; and "Who else in our centre knows about this?").

c. Create opportunities for mokopuna to model or represent their maths ideas (e.g., by using clay to compare the concepts of small/iti, medium/wawaenga, and large/nui).
d. Make visible the ways in which mokopuna generate and refine their working theories over time. Keep aside constructions, notes of conversations, and drawings (models) to illustrate and revisit the theories.

Resources to model or represent maths thinking

Provide resources that support mokopuna to model or represent their maths interests and thinking through creative play.

a. Expand the range of resources that can be used intentionally to construct 3D models (e.g., interlocking jigsaw pieces, interlocking blocks, and fabrics that can be easily joined together).
b. Provide a range of resources for mokopuna to select, arrange, and organise into collections for display or use (e.g., natural materials or different sized balls for outdoor use).
c. Encourage mokopuna to use a variety of resources to predict and test out ideas (e.g., "How many rocks will sink the boat?").
d. Encourage mokopuna to document their models and modelling process in different ways (e.g., by using digital tools, mark-making, and drawings; and by contributing to narrative assessments).

Modes to support maths play and investigations

Provide opportunities for mokopuna to represent their interests, play, and investigations in a variety of modes.

a. Prompt children to use multi-modal approaches when investigating and problem solving (e.g., to use cardboard, photos, wood, sand, rulers, and/or paint when creating plans (or models) for a vegetable garden).
b. In conversations with children, explore different modes of exploring, finding out, or responding to challenges (e.g., "Let's draw what it might look like together."; or "Could we measure the length with our steps instead?").
c. Display documentation that illustrates children's investigations as they expand across modes (e.g., display taniwha drawings, taniwha constructed with clay, and photos or videos of children 'being' taniwha).
d. Support mokopuna to invent symbols or other markings to represent their ideas. Encourage them to describe and explain their markings and symbols when appropriate.

Using maths language

Create opportunities for children to use language to express their thinking during maths-related experiences.

a. Encourage mokopuna to use maths language when communicating – for example, when discussing where a missing piece of equipment might be (outside, under, on top of, or in the middle).
b. Give mokopuna time and space to communicate their thinking. Use maths terms when responding, to sustain further dialogue and exploration.
c. Support mokopuna to choose how they want to express their maths thinking (e.g., by using spoken or non-spoken language, drawing, constructions, or through movement).

Te ao hōu

Within an enabling environment, children create, adapt, describe, and explain a range of maths representations for different contexts and purposes.

Supporting maths exploration and investigation

Create an environment that supports curiosity, exploration, and investigation related to maths.

a. Intentionally expand the range and challenge of children's maths investigations. This could involve initiating similar explorations with different materials, in different contexts, or for a different purpose.
b. Demonstrate strategies that children can use to involve others in maths experiences and investigations (e.g., by seeking a point of view, or asking someone to help fold, twist, or weave harakeke under and over).
c. Initiate, sustain, and extend conversations that encourage children to share their explorations using maths language.
d. Notice, comment on, or document when children display dispositions of curiosity and persistence in an increasing range of more complex maths contexts.

Resources to model or represent maths thinking

Provide resources that support mokopuna to model or represent their maths interests and thinking through creative play.

a. Involve mokopuna in creating interesting play opportunities by grouping and displaying resources, equipment, and materials.
b. Help mokopuna to plan their investigations using prompts such as "What do you think you will do first?" and "What could you use?"
c. Support mokopuna to work together to predict how resources will perform for a specific purpose and to test their predictions (e.g., to predict and then test whether a feather is lighter than pumice and whether both float).
d. Encourage mokopuna to design, modify, or make new materials and equipment when needed for their investigations (e.g., scrunching paper into a ball to add to their collection of round objects.)

Modes to support maths play and investigations

Provide opportunities for mokopuna to represent their interests, play, and investigations in a variety of modes.

a. Encourage mokopuna to expand their maths thinking across different modes and contexts (e.g., provide opportunities for mokopuna who confidently use their hands, footsteps, or arms to measure, and to represent these measurements using invented symbols).
b. Demonstrate strategies that mokopuna can use to include others to help solve maths problems that require a multi-modal approach (e.g., asking a more skilled mokopuna/teina to help figure out different ways of creating a model of a wearable art piece).
c. Initiate and extend conversations with mokopuna using maths language and symbols in different modes – for example, "It's twice as long." during carpentry; "Can we make wider and taller movements?" during dance; and "It's three days until our Matariki celebration." when crossing days off a calendar.
d. Help mokopuna to plan their investigations using prompts such as "How else could you test that idea?" and "You want the pattern of the beat to alternate. What would that sound like?"

Using maths language

Create opportunities for children to use language to express their thinking during maths-related experiences.

a. Increase the complexity of maths language as part of meaningful everyday events (e.g., "I see that our shoes are all lined up. You have made a line of twos. Each pair of shoes match.").
b. Plan opportunities for children to use maths language and symbols to help others as they puzzle about maths problems. Recognise the expertise that children can share with others, including kaiako and whānau (tuakana-teina).
c. When planning larger projects, such as constructions and maths-oriented games, create extended opportunities for children to share, make, justify, and test predictions.
d. Invite children to communicate about their thinking and to contribute to their assessment and documentation approaches.

4

Document

An example of how you could use Kōwhiti Whakapae to enhance your assessments and communication

In this section, an assessment example illustrates how you can use the information gathered in the previous three steps to enhance your documented assessments and communication. The example describes and tracks a child's learning progress over time in ways that inform ongoing planning. It also highlights the kinds of evidence, such as observations or conversations with whānau, that were used to support judgements and planning decisions. Finally, it shows how documentation can support conversations with children and whānau about a child's learning and progress.

After reading the example, think about how you currently document your planning and assessments and describe learning progress over time. Talk with team members and children's whānau to identify how your assessment documentation might better describe:

› a child's current capabilities, strengths, and interests, with evidence (Notice)
› a child's progress and possible directions for their learning (Recognise)
› how you will support the child to progress over time (Respond).

Assessment example: Aria makes connections

These three stories are about Aria, who is three years old and attends an early learning centre.

The kaiako all know Aria and her whānau, including her older brother who recently left the centre for school. Her baby brother is still home while mum is on maternity leave. Aria's mother and father are of Māori descent, and te reo Māori is one of the languages being introduced at home, with mum and dad learning alongside their tamariki.

The three stories were written by Aria's kaiako, Donna, who noticed Aria's connected interests in whānau, art, maps, and maths. The stories show Aria's journey as she explores in the art area and beyond, and they capture how her knowledge of maths grows as she represents and shares her ideas with friends.

As you read the stories, you will find more information about how the kaiako engaged with the 'Create and communicate' area of Kōwhiti Whakapae to support their practice and to strengthen Aria's learning in relation to the Mana reo | Communication, Mana whenua | Belonging, and Mana aotūroa | Exploration strands of *Te Whāriki*.

See the website for Kōwhiti Whakapae for the full sequence of learning stories.

This assessment illustrates Tūhuratia te pāngarau | Create & communicate maths. To browse the complete suite of examples, see this page on Kōwhiti Whakapae online.

Recommended resources

Kaiako guide

Maths Kaiako Guide

This kaiako guide provides a deeper dive into maths learning in the early years and complements Kōwhiti Whakapae. Topics include: What is maths in the early years?; Weaving the maths in *Te Whāriki*; Attitudes and dispositions; Rich resources for maths thinking; Community maths; Maths with infants and toddlers; and Joy with numbers.

See *Te Whāriki Online* for the full resource.

Whānau guide

Explore Maths Together – Mā Kōrua e Tūhura te Pāngarau

This guide includes a video and pamphlet in te reo Māori and English to help parents and whānau support maths learning in the home.

See *Te Whāriki Online* for the full set of resources.