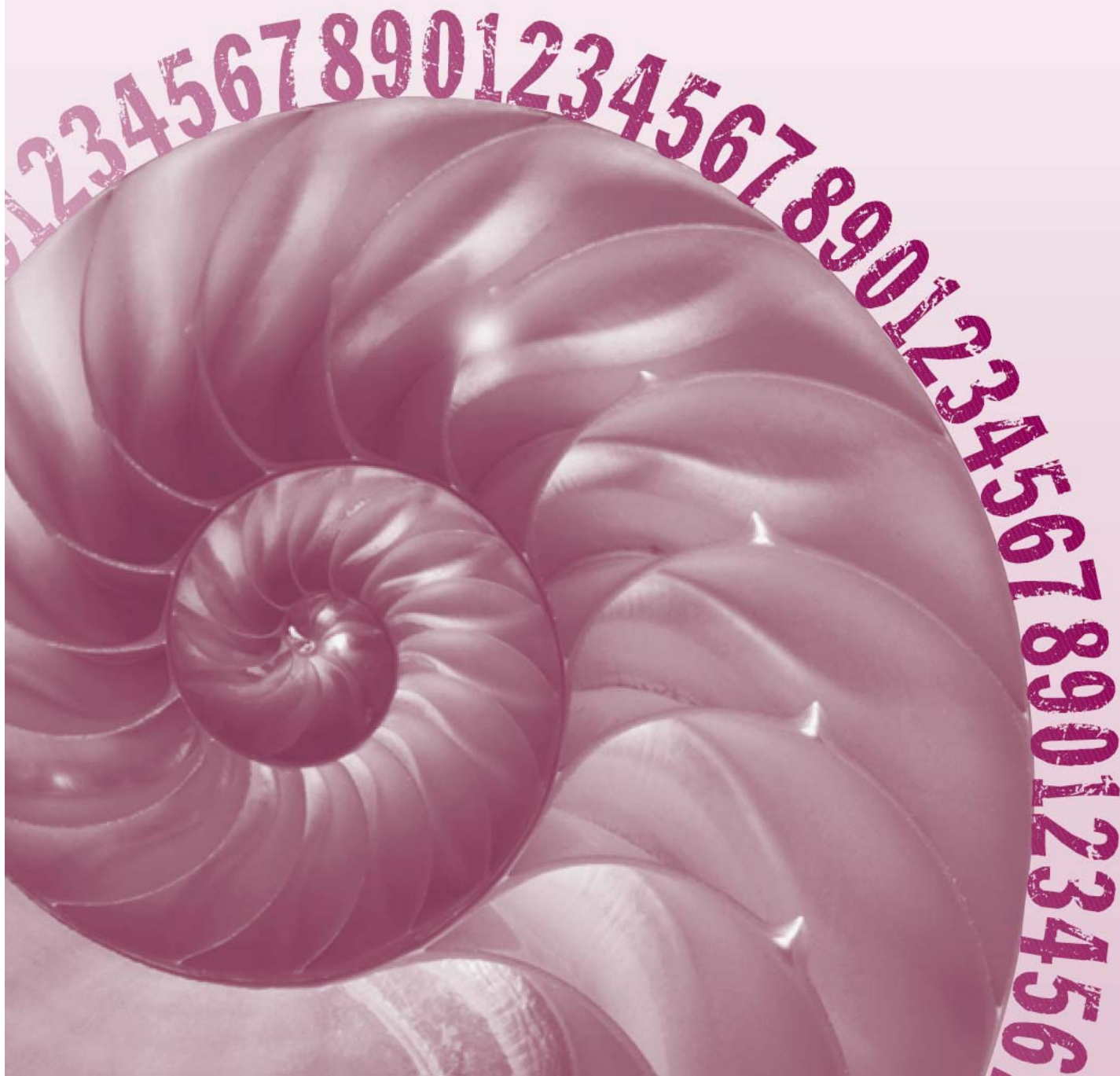




MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

Home-School Partnership: Numeracy DRAFT 2008



The foundations for learning mathematics begin in the home. Parents, caregivers, and whānau are the first teachers. By the time children turn five, they will have been involved in a range of informal mathematical experiences. They will have had time to explore their environment and to develop many mathematical understandings before they enter the more formal setting of a primary school. Being surrounded by number, shape, and measurement gives children a strong base on which effective mathematics teaching can be built and the support of their families assists in strengthening their development in numeracy.

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Note: Teachers and parents may copy these notes for educational purposes.

This book is also available on the nzmaths website at
<http://www.nzmaths.co.nz/Numeracy/hspn/index.aspx>

For more information about the games and activities referred to in this handbook, go to:
<http://www.nzmaths.co.nz/Numeracy/hspn/index.aspx>

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Home–School Partnership: Numeracy

The Home–School Partnership concept is based on the principles of cultural inclusion and partnership between schools and their communities. It covers both literacy and numeracy and aims to support, develop, and use the rich resources of diverse people in the school community.

This *Home–School Partnership: Numeracy* handbook has been written to help schools and communities as they work together to support children’s achievement in numeracy. The suggestions in it are intended as a guide for principals, teachers, and parents when they are planning Home–School Partnership: Numeracy sessions. The handbook is not a “do it this way” list of instructions but a collection of ideas to select from and add to the good ideas already used in home and school communities.

One obstacle for parents visiting their child’s mathematics classroom or attending school functions can be the language that teachers use. Sometimes teachers use the language of education and schools and then further confuse parents by using unexplained mathematical language. Those planning Home–School Partnership: Numeracy sessions need to carefully consider the language used and the intended audience. It is with that point in mind that this book has been written.

The term “numeracy” used throughout this book refers to the mathematics that children learn at primary and intermediate schools. The terms “numeracy”, “mathematics”, and “maths” mean the same thing in this book.

The Numeracy Development Projects are a New Zealand-wide professional development programme for teachers. The projects aim to improve students’ performance in mathematics through improving the professional capability of teachers. For more information about numeracy or the Numeracy Projects, refer to the Ministry of Education’s nzmaths website: www.nzmaths.co.nz

Kia mahia tatau tahi
ma te paiinga a a tatau tamariki.

May we all work together
for the good of our children.

Key Messages for Parents in Home–School Partnership: Numeracy

Helping Your Child to Learn

You, your culture, and your language are a very important part of your child's learning.

Children learn by listening, watching, talking, and playing.

You can help your child learn by listening, watching, talking, and playing.

By keeping in touch with the school, a partnership between you and the school can develop that will enhance your child's learning.

Understanding Numeracy: Starting to Learn

You are your child's first and most important teacher. By showing a positive attitude towards mathematics, you will help to foster your child's interest in mathematics.

Counting is the beginning of numeracy learning. Numbers are all around us. Show your child how you use them, everywhere, any time.

Your child's teacher will want to know about the things you do at home to support your child's numeracy learning. This will help the teacher to better understand your child's numeracy ideas.

Understanding Numeracy: Understanding the Learning

Children learn by using equipment, drawing pictures and diagrams, and talking about what they are doing.

Encouraging children to use their memory and to work things out in their heads helps their development.

Children go through broad, overlapping stages in their numeracy learning. Ask your child's teacher to talk with you about those stages.

Children will be exploring many ways to work out problems. Talking about how they work out their own problems and listening to others' strategies helps their understandings.

Understanding Numeracy: Maintaining the Learning

As children reach senior primary school, their ideas in numeracy become more complex, so it is still very important that they continue to use equipment, draw pictures and diagrams, and talk about what they are doing.

Children need to be looking for patterns and relationships between numbers and to be generalising their ideas.

Showing an interest, encouraging, and having high expectations that children will succeed in mathematics are powerful motivators for children's achievements in mathematics.

Guiding Beliefs

Everyone has their own beliefs about teacher effectiveness and what are the most important factors for children's achievements in education. However, there is a growing understanding that when parents, children, and school staff work together, there are more opportunities for children's learning to improve. Communities can only come to that consensus through listening and sharing what each has to offer. In many instances, information seems to go between parents and children and teachers and children or from teachers to parents. For a true partnership, there needs to be communication and shared understandings between the three parties. It is important for parents to learn about the mathematics taught in the classroom, but it is equally important for teachers to know about children's mathematical experiences at home.

Children can become frustrated if their parents "don't seem to know how to work out a problem the way they do it at school"; that is quite understandable as the Numeracy Development Projects only began in 2000. Since then, there have been many changes to the ways teachers are teaching mathematics, in particular, number. Teachers are encouraged, for example, to move away from their formal style of teaching and to tap into children's thinking, asking questions such as "How did you get that answer?" or "Can you think of another way of doing it?" Children are encouraged to talk among themselves about the mathematics, to share their ideas, and to generalise their understandings.

Just as children share their understandings with other children and teachers, they also need to share them with their parents. At times, parents may like some help and support to understand the mathematics that children are being taught. Home-School Partnership: Numeracy gives parents access to both knowledge and information through participation in activities similar to those that their children do in school. As parents in turn share their experiences of everyday mathematics, the idea that "school maths" and "home maths" are separate should change. This will have a positive impact on children's views and attitudes towards mathematics.

Researchers and educators believe that building home-community and home-school partnership is fundamental to effective teaching¹ and that families need to be involved as much as possible. Building harmonious relationships between school, families, and communities can have reciprocal benefits for all concerned. Parents develop more understanding of the school's programme and appreciate their children's numeracy knowledge, while home and community environments offer a rich source of numeracy experiences on which to base and enhance that learning in school.

¹G. Anthony, and M. Walshaw (2007). *Effective Pedagogy in Mathematics/Pāngarau: Best Evidence Synthesis Iteration [BES]*. Wellington: Ministry of Education.

Home–School Partnership: Numeracy is a way to bring a community together. It can:

- reinforce and endorse what families and parents are already doing for their children;
- increase parents’ and families’ understanding of numeracy and the practical ways to help children learn;
- provide opportunities to share ways in which families and teachers working together can further enhance children’s numeracy development;
- help to establish a caring working partnership.

The aim of Home–School Partnership: Numeracy is to improve student achievement by having teams of parents and teachers working closely together to deliver numeracy sessions for parents, caregivers, and whānau.

The teachers and parents leading the Home–School Partnership: Numeracy sessions will:

- plan the community sessions;
- encourage parents to participate;
- help parents recognise their importance as “parents as first teachers”;
- encourage ways in which parents can help their children in numeracy;
- signal the importance of high expectations and a positive attitude towards numeracy;
- gain more confidence in working with a group of parents;
- encourage all school staff to participate in the sessions.

Section 1: Getting Started

In each school involved, the Home–School Partnership: Numeracy sessions are led by a team of teachers and parents from the school. Before the sessions start at a school, the roles and responsibilities of the key people need to be assigned. One of the crucial roles is that of the principal as the school leader; the others are that of the lead teacher and lead parents. It is preferable that both lead teachers and lead parents have certain qualities. For example, it helps if the lead teacher has good organisational skills and relationships with the staff and community and if the lead parents are known in the community and have the confidence to work with groups of parents. However, in saying that, there have been many nervous parents whose confidence has developed over the course of community sessions.

Responsibilities

Principal:

1. To promote the agreed aim (see page 4) of Home–School Partnership: Numeracy;
2. To select the lead teacher(s) and parent team and negotiate times and dates;
3. To support the community sessions, for example, by attending them in a welcoming role and providing release time and funding for planning and preparation.

Lead teachers:

1. To help with selecting lead parents;
2. To support the team of lead parents with planning, preparing, and facilitating the community sessions;
3. To communicate with and involve the staff, principals, and BOT.

Lead parents:

1. To encourage other parents to attend parent meetings;
2. To be involved in planning, preparing, and facilitating the community sessions;
3. To work with the lead teachers, when appropriate, to inform staff and BOT.

Numeracy facilitators may be available to:

1. provide support and encouragement;
2. help with resources and/or planning sessions;
3. provide mathematical knowledge and background if needed.

To contact a numeracy facilitator, call your local university and ask for the Regional Numeracy Co-ordinator.

The above people become the *lead team*, whose role is to facilitate community sessions in a sensitive, warm, and nurturing way that encourages people to take part. One way to encourage participation is to have small-group discussions during each session, with each member of the lead team having responsibility for a group of parents. Another lead-team role is to keep the school staff informed and to encourage their participation.

The partnership is based on clear lines of communication between home and school, so it is important that all staff understand what is involved. The following questions may provide a framework for conveying the key ideas to school staff:

- Do all staff members know about the school's commitment to Home–School Partnership: Numeracy?
- Do they understand its purpose and intended outcomes?
- Do these sessions fit within their understanding of communicating with parents?
- Does the school have a policy or strategy regarding communication with parents?

Preparation, Action, and Reflection for Lead Teachers

When the decision is made to implement Home–School Partnership: Numeracy sessions in your school, it may be worthwhile to examine the current student assessment data for numeracy. This will encourage all teachers to be involved as part of the partnership and to see both themselves and the parents as learners. Below is a suggestion of one way to involve teachers at each stage of the partnership, with the expectation that, as the partnership develops, aspects of Home–School Partnership: Numeracy will become an integral part of school and staff meetings.

Part 1:

For a teachers' staff meeting and for a board of trustees' meeting, before Home–School Partnership: Numeracy sessions begin

Discuss the following questions and share answers:

- What are your beliefs about the value of Home–School Partnership: Numeracy?
- What might the results or changes be for your school?
- What are some of the challenges and issues your school might face?
- How will the school benefit from Home–School Partnership: Numeracy?
- What are the benefits for the community?

Part 2:

For a teachers' staff meeting when Home–School Partnership: Numeracy is underway

Each teacher chooses one or two students who have some difficulties with mathematics. The teachers discuss the following questions in regard to language needs, culture, home situation, language at home, parents' aspirations, and so on.

- What does the teacher know about this student? What don't they know?
- How could they find out what they don't yet know?
- Are the child's parents/caregivers attending Home–School Partnership: Numeracy sessions?
- If not, how can they be encouraged to attend?
- If Home–School Partnership: Numeracy is not for them, what strategies will you put in place so that they know how numeracy is taught in schools and how to help their child(ren)?

Part 3:

For a teachers' staff meeting, at the end of the Home–School Partnership: Numeracy sessions, with the aim of reflection and sustaining the numeracy partnership

- Reflect on what went well and what changes could be made for another time.
- Discuss school-wide data in numeracy.
- Does a particular group need further support from school and from their family? (For example, junior or senior syndicate or class level)
- Does a group need to be more closely monitored? (For example, a class level or a group within a class)
- Is more specific teaching needed as well as home support?
- Are there any teacher professional development needs related to numeracy or effective teaching and learning?
- Once the decisions are made, write simple action plans to help achieve your goals.

Section 2: Planning and Preparation

Once the lead team has been selected and roles have been delegated, decisions have to be made about training lead parents, possible ways of delivering the community sessions, and how many sessions to have. It is entirely up to your school and the community, although at least three sessions are recommended, with four–six sessions most common.

There are a number of questions that need to be asked. Some possible questions and answers are provided below, but the real answers lie with your school and your community.

Time for planning sessions

How long is a planning session and what does it involve?

The planning sessions (for the lead teacher and lead parents) can be for a morning or a full school day. That means there needs to be release time for the lead teacher. Usually, two community sessions can be planned in a day. If an outside facilitator is available, the planning time may be shorter. Generally, the planning session is held one week and the community sessions in the following two weeks. Remember that some parents may have to take time off work. A sacrifice like that should be valued in some way. Food, koha, or petrol vouchers are always useful.

Time of day for community sessions

What part of the day?

Whichever time you choose, there will always be some groups of parents that miss out. Holding sessions during school time is ideal for catching parents who are either dropping off children or picking them up, although it does mean that working parents cannot attend. If you have the sessions in the evening, childcare issues and providing a meal may need to be considered. Some schools provide childcare or involve children in the sessions at night to cater for this. Some schools hold two or three community sessions in a day, which can be both satisfying and tiring. Whatever time you choose, start and finish on time.

Duration

How long?

One to one-and-a-half hours is the recommended duration. If the session lasts for too long, parents may not be keen to come back. If children are attending, 1 hour is usually long enough.

Number of sessions

How many?

Four to six is recommended, but the number is entirely at the discretion of the school. If your meetings are to be close together, more than six meetings would be a considerable commitment for all involved.

Suitable dates

What time of the year best suits your school?

Consider the regularity of sessions: fortnightly in one term or once or twice a term. A longer duration may make it difficult to maintain a consistent team of parents. Check for community events outside the school and special occasions, for example, Halloween seems to be becoming more popular, with both children and parents involved in the evening's activities. Preparing for White Sunday, Chinese New Year, or Matariki celebrations are some of the others.

Clusters

Will you work within your school or cluster with another one?

A cluster may suit some smaller schools. If you are in a cluster, then meeting times for planning workshops and community sessions need to be set early and adhered to.

Knowing your audience

How will you support parents who speak languages other than English during the shared part of the sessions?

Use the languages from your group where appropriate, for example, during counting games. You may consider involving their children as translators or utilising the language skills of your lead parents. Encourage parents to play the games and activities at home in their first languages.

Child care

What will happen with the children when you are working with parents?

Who will be responsible? Consider the possibility of providing childcare at school for both planning and community sessions or just for the planning sessions. You might like to have children involved in activities or provide alternative areas such as a crèche or an activity-based area.

Catering

What will you offer parents? Who will provide this?

Food has been identified as one of the most important aspects of any Home–School Partnership: Numeracy session. Not only are you showing that you value the people coming, you acknowledge them culturally as well as showing common courtesy. It is thoughtful to provide food for the family at the evening sessions, as it saves cooking meals when they return home. Sausage sizzles, fish and chips, pizzas, or finger food are popular, but keep in mind there may be other particular dietary requirements such as diabetic, halal, or vegetarian.

Invitations

How will you get parents along? By invitation or by advertising?

Some suggestions:

- child-created invitations personalised to their parents
- invitations in different languages
- word of mouth: lead parents contact their community
- tickets: children take them home, and parents who come to the meetings put their tickets into a prize draw
- displays in the school hall
- banners outside the school gate
- newsletters with photographs and parents' feedback on the value of Home–School Partnership: Numeracy from an earlier session
- paper bracelets around children's wrists to take home as a reminder to parents
- foyer display
- local newspaper
- pamphlets given out at the front gate
- telephone tree
- local radio
- parish priest
- raffle prizes displayed before the session day
- shoulder tapping at the gate
- showing raffle prizes to children at assembly
- food as an incentive, for example, offer breakfast

- written invitations on a key: “You are the key to your child’s future” or “Unlock the key to your child’s future”
- home visits or individual contact with some parents by teacher, principal, or lead parents.

Equipment

What will you need to bring to each community session?

Pretend you are going on camp. It is no different except that it is easier. You need to be prepared and treat each session as if you are “going bush” and cannot just “pop back” if you forget things.

Take-home packs

What will be in them? Who will organise this?

Some suggestions for contents:

- games the parents have played that night
- cards
- dice
- counters
- written resources/ideas.

Making games

Are you going to have parents making a game in a particular session?

If so, you will need to supply equipment such as the masters on card, scissors, felts, laminating pockets, and laminators.

Sponsorship

Will the school seek this? If so, who will be responsible?

If your school is lucky enough to be sponsored, think about how the sponsors will be acknowledged in your community sessions.

Seating and tables

Will you need tables? What seats do you need?

Try to avoid using junior seats. There is nothing more embarrassing for parents than trying to fit large frames onto very small chairs. If you can't find enough chairs of a reasonable size, it may be a good idea to borrow some plastic picnic chairs.

Planning for extra community participants

Who is invited? Extended whānau? Parents of pre-schoolers in the area?

Don't be disheartened if you have only a few parents at a session. Even one parent is more than you had before. However, consider the dilemma you may be in if you plan for 20, and 200 turn up. It has happened. So there needs to be more than one plan. You may need to change your venue in a hurry, know where to find spare chairs, have someone ring the local fish and chip shop or pizza place, know which classrooms have the equipment you need quickly, and have some spare games up your sleeve that will involve a lot of people. It calls for flexibility and creativity.

Culture

What cultural information will you need to have?

- For each cultural group within your school community, you will need to take time to get to know them and their needs. The questions below may help.
- What is an appropriate way of communicating during these sessions? (For example, greetings, blessing of food, thanking, or farewelling)
- Are there any particular food requirements?
- Are there any protocols relating to how and/or where they sit?
- Are there any specific protocols relating to their personal needs?

Teachers

How will they be involved?

You need to discuss how staff members are to be involved in the Home–School Partnership: Numeracy sessions – as learners or teachers. To begin with, it needs to be decided what sort of partnership it is. Usually, there is a period of time when parents are doing the learning, but as people get to know each other and closer relationships develop, there is a see-saw effect the other way and the teachers become the learners. When they start to benefit from each other, then the true Home–School Partnership: Numeracy evolves.

Transport

How will people get to the community sessions?

Not everyone has ready transport. Organising transport involves knowing your community. As well, some people may be very shy, so make sure they do not arrive on their own. Buddy up people and arrange it so that everyone who wants to come is able to.

Venue

Where will you hold your community sessions? How will the venue look?

Decide which area you will use. An ideal one would be a multi-purpose room that can be closed off for smaller numbers and opened up for larger numbers. Ensure that the room is set up in the way you want the group to work. You might have seminar-type seating in the centre for key mathematical messages and themes, with tables and chairs set up elsewhere for group work. Seating must be appropriate for adults of all sizes: teachers may be used to sitting in junior chairs, but many adults are not.

Setting up an environment must reflect respect for the community. For example, if you have a mainly Pasifika community, then you may consider playing Pasifika music and incorporate the use of lei, tapa, flowers, and music. If people can recognise aspects they are familiar with, they will immediately feel more comfortable.

Ideas for displays:

- children's numeracy-related art



- school mathematics equipment
- materials for sale for under three dollars and how they could be used
- library books with a maths context
- mathematics games
- key points and photos displayed from previous sessions

- posters in different languages
- displays of Number Framework stages
- displays of strategies on a “washing line”
- if possible, display in parents’ first language key messages such as:
 helping your child to learn; understanding numeracy: starting to learn;
 understanding numeracy: understanding the learning;
 understanding numeracy: maintaining the learning.

Multimedia

What technological equipment do you need?

It is important that all equipment is working and is appropriate to the audience. If overhead transparencies are being used, can the colour and size be seen from the back of the room? Remember to avoid yellow in any headings of posters or banners. Check that there are adequate speakers if sound is required. If the school has sophisticated technology, ensure the lead team know how to use it correctly, for example, data projectors or interactive whiteboards.

Data

Do you need to gather data for reporting to your board of trustees?

Teachers gather and analyse data on students’ attainment so that they can be responsive to the students’ needs and plan for more effective learning. Gathering evidence from community sessions also helps show where the schools and community could strengthen their relationship and contribute to students’ achievements. Suggestions and formats can be found on the nzmaths website (www.nzmaths.co.nz).

Check-up before community sessions

Does every person in the lead team know what they need to do?

About two or three days before each community session starts, check that all people clearly understand their role in delivering the community sessions. Someone has to assume this responsibility; everyone needs to know who is doing the check.

Questions may include:

- Who is to do the welcome?
- Are you ready for the session?
- Do you have any problems that need to be solved?
- Are you prepared for a larger number than expected?
- Do you require support from other members of the community?
- Are the take-home packs completed?
- Is the food organised?
- Are the materials ready for displays that help set the scene?
- Has the relevant equipment been checked?
- Who is organising raffles or spot prizes if you intend to have them?
- What will be available for the children if they are being cared for in school?
- Is someone available to help with a boisterous or unhappy baby or toddler?
- Who will be around to help pack up at the end of the session?
- Are there containers or suitable wrapping if there is leftover food?
- Who is going to turn off the lights and lock up?

Greeting the community

How will you greet the community as they arrive?

For example, by:

- the principal or board of trustees chairperson meeting parents at the door;
- lead teachers and lead parents personally welcoming parents as they arrive;
- someone writing names on tickets for a prize draw;
- offering food or a hot or cold drink.

Section 3: Community Sessions

Generic Outline

It is envisaged that all sessions will have the components listed below. There are some suggestions under each component heading, although it would take more than an hour and a half if you tried to do everything that is there. Part of the learning in each session needs to include the language of mathematics. Parents can reinforce mathematics language by talking about mathematics in their first language. Remember to allow time in the one to one-and-a-half-hour community session for food.

Welcome

Suggestions: music, songs, dance, karakia (or an appropriate saying in accord with the community), prayer, or blessing. These are not the “must do” list; you may well come up with ideas of your own.

Short introduction

Introduce people by acknowledging the parents who are there and the people who have planned and will facilitate the sessions. Give an overview of the session and the key purposes for the session. There may well be a sharing of parents’ stories and, especially at the first meeting, the lead team’s own personal stories.

Setting the scene

Create a friendly, inclusive, supportive environment: energisers, ice-breakers, appropriate video clips, inspirational stories, and games are available on the nzmaths website. These help set the tone, relax everyone, and foster closer relationships.

Key mathematics focus (doing the mathematics)

For each session decide on a specific mathematics focus, for example:

- counting
- place value
- addition and subtraction
- part–whole thinking
- multiplication and division
- fractions, decimals, and percentages.

Other areas to consider (using mathematics):

- sharing our cultures: mathematical language and mathematics activities from around the world;
- games;
- targeting specific transition groups, for example, pre-school, pre-intermediate, or pre-secondary school;
- celebration, for example, a family night with barbeque, umu, or hāngi, and children and parents playing maths games.

Note: It is recommended that you plan for four to six community sessions in one year, using topics such as those above. If you wish to do all the suggested topics, it would be advisable to have a two-year plan.

Games and activities

Some ideas:

- games and activities relevant to the key mathematics focus for this session;
- introduction of new maths games;
- rotations (stations) centered around the key mathematical focus;
- a take-home pack of the games that have been played and the equipment used;
- learning mathematical language in a language other than their own (if English is not their first language).

Wind-up

Some ideas:

- questions and discussion (how to use tonight's ideas at home);
- feedback and feed-forward (to direct future sessions);
- take-home packs;
- spot prizes/raffles;
- appreciation shown for the families' input and commitment.

Specific Outlines

The following three outlines consist of examples of community sessions that you can “pick and mix” from. Whatever you choose, make sure that it links to the needs and interests of your community. The outlines are not a prescription, but they have all been used in various parts of New Zealand.

Outline One (four sessions)

Session 1

The Number Framework to stage 5: an overview of the Framework and an outline of what the Numeracy Development Projects consist of. Counting games and activities

Session 2

Addition and subtraction: strategies to solve problems. Games and activities to support knowledge development

Session 3

Multiplication and division: learning tables; from skip-counting to fluency

Session 4

Fractions, decimals, and percentages. It is up to lead teachers and lead parents to decide if there is time to fit this topic in. Often, the first three sessions are extended because parents become very involved in the content. Some choose to have a games night to finish off for the year and save this session for the following year.

Outline Two (six sessions)

Session 1

Getting to know one another; parents as teachers; learning through games

Session 2

The Number Framework: what it is and what it means for their children

Session 3

Mathematical games: children teach the parents

Session 4

Part-whole thinking: what it means and why it is important

Session 5

Sharing cultures: mathematics activities from around the world

Session 6

Celebration: visiting classrooms and outdoor sports.

Outline Three (six sessions)

Session 1

Introductions, sharing of mathematics experiences, questions, why numeracy, basic addition and/or subtraction facts, counting, and games that help counting

Session 2

The Number Framework, strategy stages, exploring problems using teachers', children's, and parents' own strategies, part-whole thinking, children's portfolio samples and what they mean, games that help reinforce basic facts and part-whole thinking

Session 3

Revision of strategy stages, subtraction (again, link to counting), place value. Resources and games at home that help develop the understanding of place value

Session 4

From additive to multiplicative: What does that mean? How does it relate to the Number Framework?

Looking at learning of multiplication facts and relationships between division and subtraction. Games that help and/or consolidate

Session 5

Fractions: activities that can be done at home to help develop an understanding of fractions; fractions as a double operation; how fractions relate to the Number Framework

Session 6

A celebration of numeracy. A family night with barbeque tea, modelling by children, and games set out in rotation.

Note: Some schools that prefer four sessions amalgamate sessions 1–4 into three sessions and finish with a family night, where participants bring something to share and celebrate. For example, parents sharing photos, songs, videos, or stories about themselves or their children and teachers sharing something from their classrooms.

Section 4: Content Knowledge

No one is suggesting that parents should be given every mathematical idea a child will need in their primary years, but there are simple messages that help. For example, it is helpful to know that *counting forwards and backwards* is an important development in children's counting. Parents may find the following messages useful when supporting their children's developing mathematical understandings.

Mathematical Ideas

Counting

There are two initial skills:

- Say the counting words in order – 1, 2, 3, 4, 5, ...
- Match the counting sequence to the objects one by one.

The next significant idea, when those skills have been mastered is:

- The last number name used gives the number of objects.

Challenges for children:

Counting in order is challenging because there is no pattern or repetition in the first twelve numbers. Other challenges:

- Counting backwards, for example, 14, 13, 12, 11, 10, 9, 8, ... and naming the number before and the number after a particular number;
- Learning “teen” numbers: 11, 12, 13, 14, 15, 16, 17, 18, 19;
- Learning to count over the decade, for example, 18, 19, 20, 21, 22 and 38, 39, 40, 41, 42;
- Progressing past counting only what they can see (they may wrongly think a thousands block is 600 because that is all they see).

Ways to develop their understanding:

- Practising counting forwards and backwards by 1s, 2s, 5s, and 10s using everyday items around them, for example, vegetables, fruit, steps, sheep, cows, table cutlery, hands, and pegs;
- Counting in 10s from 10 and also from single-digit numbers, for example, 4, 14, 24 ... and backwards ... 24, 14, 4.

Place value

- Place value involves grouping in 10s.
- There are only 10 digits (0–9).
- The same digits are used in different positions for different values.
- Zero is an important “place holder”.
- There are patterns in the way numbers are formed, for example, 20–29, 30–39.
- When counting from 0 to 20, there are some cultural differences.
- Counting has an important role in developing ideas of place value.
- Challenges for children:
- Mastering place value. This may take several years.
- Coming to terms with confusing irregularities in number words, for example, thirteen could be seen as three and ten, whereas twenty-three reads as two tens and a three;
- Understanding the part zero has to play in numbers such as 702 or 3 000;
- In dictation, learning not to write as they hear, for example, not writing 125 as 100205;
- Recognising the written words for numbers, for example, twelve, fifty;
- Knowing what “ones” are and that “a ten” means one group of things.

Ways to develop their understanding:

- Bundling pegs and threading beads into groups of 10;
- Building blocks in towers of 10;
- Matching bundles with numbers;
- Using spare pages of a graph book for circling amounts, for example, to find 58, circle groups of 10; what is left?
- Talking about the reasonableness of their answers.

Part–Whole thinking

- Numbers can be split up into parts and those parts combined into new whole numbers, for example, $8 + 5 = 8 + 2 + 3 = 10 + 3 = 13$.
- There are many ways to make a number, for example, 9 can be made from 7 and 2 or from 6 and 3.
- Part–whole thinking involves solving problems without the need to count.

Challenges for children:

- Taking the risk of moving on from the counting strategy;
- Learning to see the connections between smaller numbers and larger ones. Children may add 5 and 4 easily but lose their way with 5000 plus 4002 or add $7 + 4$ but not see the connection with $17 + 4$.

Ways to develop their understanding:

- Playing games, such as a Make 10 Snap that forces children to make 10, for example, 6 and then a 4;
- Helping them make the connection between small numbers and larger ones, for example, $4 + 2 = 6$, so $40 + 20 = 60$; and $17 + 5 = 22$, so $57 + 5 = 62$;
- Helping them to develop a sense and a feel for number through language. Discussion with children about their mathematical activities is essential for their number sense to develop.

Addition and subtraction

- Adding 1 more will give you the next counting number.
- Order does not matter when adding, for example, $(2 + 3) + 4 = 2 + (3 + 4)$.
- For every addition fact, there is a related subtraction fact, for example, $6 + 4 = 10$, so $10 - 6 = 4$.
- Counting backwards is important for subtraction.
- Tidy numbers are numbers that end with a zero (10, 100, 50).
- Compatible numbers add together to give tidy numbers (for example, $41 + 59 = 100$).
- Tidy numbers can also be compatible (for example, for $20 + 20 = 40$, knowing smaller numbers such as $2 + 2 = 4$ helps make connections to the larger numbers easier).
- Subtraction is “take away”, but it is also “difference between”.

Challenges for children:

- Adding when using zero;
- Learning that numbers like 51 can be renamed as 4 tens and 11 ones;
- Understanding place value, for example, that 237 can be expanded to $200 + 30 + 7$;
- When subtracting a larger number from a smaller one, learning not to reverse the numbers, for example, not turning $4 - 6$ into $6 - 4$.

Ways to develop their understanding:

- Singing songs or reading simple stories that involve addition or subtraction, for example, “Five little ducks went out one day ... only four came home”;
- Making up number stories using fingers;
- Threading two colours of beads on a string and adding to find the total, then writing the number story;
- Playing games that involve addition and subtraction;
- Encouraging older children to learn the simple things well (for example, addition and subtraction facts to 20) because it helps make the hard maths easy!
- Writing expressions in a horizontal form (for example, $199 + 99$); this forces the children to notice the numbers. (The teaching of vertical form algorithms is left until stage 6.)
- Helping children with the knowledge they need (for example, 10s and 100s in numbers to 10 000) helps their strategy development.

Basic facts (*addition and subtraction facts to $9 + 9$, multiplication facts to $10 \times$*)

There are certain number facts that children need to remember as they meet new ideas in mathematics. For example, $4 \times 25 = 100$, or 100 centimetres = 1 metre. Many sessions could be held just around the knowledge facts required at different stages in the Number Framework.

- Basic facts involves knowing about number relationships, for example, knowing that 7 is made up of 5 and 2, or 6 and 1, or 4 and 3.
- Known facts can be used to find others, for example, using doubling: $2 \times 3 = 6$, so $4 \times 3 = 12$.

Challenges for children:

- Understanding basic facts learned by rote;
- Understanding that a fact like 5×8 has the same answer as 8×5 ;
- Not being put off memorising because they think there are too many to learn!
- Accepting that they still need to be able to instantly recall tables even though they can work them out by using a few known facts, for example, knowing $8 \times 5 = 40$ or using 8×5 is $5 \times 5 + 3 \times 5$ ($25 + 15$).

Ways to develop their understanding:

- Rhythm counting (in time: 1, 2, 3, 4, 5, ...); stress counting (1, 2, 3, 4, 5, 6); and double counting (3 x 5 so 5, 10, 15 and knowing that 5 is 1 group, 10 is 2 groups, and 15 is 3 groups);
- Counting in 2s (people's eyes, ears, feet, shoes);
- Counting in 5s and 10s by relating to hands and feet;
- As they become more able, making connections between 5x and 10x; 2x, 4x, and 8x; then 3x, 6x, and 9x;
- Playing games using doubles and squares;
- Using their hands to help young children know their basic facts to 10 (addition and subtraction);
- Playing addition and subtraction games, and multiplication and division games.

Multiplication and division

- Multiplication is about groups of equal size and the number of groups. For example, 3 x 4 could mean 3 groups of 4.
- Order does not matter when multiplying; the answer is the same, for example,
 $3 \times 8 = 24$ and $8 \times 3 = 24$.
- When using multiplication, a related division fact can be stated, for example,
 $5 \times 3 = 15$ and $15 \div 5 = 3$.
- A good knowledge of subtraction and multiplication are needed to work out division problems.

Challenges for children:

- Instant recall of multiplication facts;
- Understanding the remainder in division problems;
- Language can be confusing. For example, 4 sets of 3 is different to 4 multiplied by 3.
- Understanding what happens to numbers when they are multiplied by 1 or 0;
- Attempting division with a poor understanding of subtraction.
- Ways to develop their understanding:
- Rhythm counting, stress counting, and double counting (see basic facts);
- Making a set, then having the child copy and then make several equal sets;

- Giving number stories that they can solve that involve multiplication and division. For example, “Count four buttons into a cup. If each cup is only allowed to have 4 buttons, how many cups would you need if you had 12 buttons?”
- Setting out equal rows of buttons, covering them, and having the children copy what they have seen;
- Talking about rows and columns: “Is there a quick way to find out how many buttons there are?”
- Investigating draws of games, for example, “If there were 6 teams and they all played each other, how many games would be played?”

Fractions

- A whole can be divided into equal parts, with the parts called fractions.
- Each of those parts can be put back together to make a whole.
- Parts can be joined to make a fraction less than 1.
- Parts can be joined to make a number more than 1.
- Fractions can be written in bar notation ($\frac{1}{2}$) or place value notation (0.5)

Challenges for children:

- They may (mistakenly) view a fraction (for example, $\frac{7}{8}$) in the same way as they view a whole number. A fraction has two parts to it: the denominator (for example, the 8 in $\frac{7}{8}$) is the equal parts that the fraction is divided into; and the numerator (for example, the 7 in $\frac{7}{8}$), is the number of like parts. (So $\frac{7}{8}$ has 8 equal parts, and we are talking about 7 of them.)
- Whole number strategies don’t work when adding fractions: adding the tops and then the bottoms doesn’t give the correct answer. Saying 7 out of 8 reinforces that misunderstanding.
- What they know about whole numbers doesn’t always apply to ordering fractions.
- There are fractional numbers between whole numbers.
- There are tenths on the right of the decimal point, not “oneths”.

Ways to develop their understanding:

- Finding fractions by cutting paper, fruit, cakes, pizzas; shopping, sharing, cooking;
- Finding fractions of sets, for example, “What is half of this group of buttons?”
- Finding halfway along pieces of string;
- Finding different ways to cut a piece of paper in half or in quarters;
- Dividing paper into fifths and tenths or quarters and eighths and looking for relationships.

Problem solving

Children become better problem solvers if they have been involved in discussion about the problem. Asking the students what they think the problem is about and encouraging them to act out the problem or draw diagrams helps them to build up problem-solving strategies. As the students become more able, help them develop a problem-solving plan, such as the four-step one below:

1. Read and understand the problem. What is the question asking?
2. Make a plan. Where will you start? What are your ideas?
3. Carry out the plan. Are you able to work the problem out? If not, start again.
4. Look back. Have you answered the question? Make changes if necessary.

Possible challenges for children in all areas:

- Being able to quickly access and use the mathematical vocabulary needed
- Being able to read, with understanding, what the problem is asking
- Being able to communicate clearly the processes and/or strategies they are using.

Section 5: Games and Activities that Reinforce and Consolidate Numeracy

Playing games provides good opportunities for children to learn about logic and strategies. For example playing cards and board games are good ways to encourage and develop children's numeracy ability. Playing, listening, watching and talking about games and activities helps develop, reinforce, and consolidate children's mathematical understandings.

The following list consists of games and activities that can be used for the community sessions or for children and parents to play at home. A description of each game and how to play it is on the nzmaths website at <http://www.nzmaths.co.nz/Numeracy/hspn/index.aspx>

As you read through an activity or game, think about how it could be made easier or harder to suit the needs of the children. A simple activity can be made harder by changing a few numbers. The bubble jigsaw puzzles are good examples because children and parents can make simple addition puzzles or puzzles using fractions, decimals, and percentages.

Teachers will probably be familiar with most of the games suggested below. You could help families set up a family mathematics kit at home by providing mathematics activities and games that they could take home and keep.

More games to support numeracy at home can be found in the "Families" section on the nzmaths website.

For counting, place value, addition, and subtraction

- Rachel's Millions
- Grab Bag
- On and Back
- Doubles and Halves Froggo
- Car Plate Numbers
- Dice Number Track
- Card Number Track
- Make 10 Circus
- Clock Maths
- Gold Mine
- Monster I-Scream
- Spider and the Fly

- Dough Numbers
- Bean on the Track
- Towers to 10
- Rocket to 7
- Difference Between
- Dice Add Up
- Action cards
- Your Choice
- Salute
- Memory (basic facts to 20)
- Horizontal Rocket
- Cover Up Kiwi
- Pile Up with 10 Frames
- What's Missing?
- Bubble Jigsaws
- Bingo Teen and Tys
- Cover Up Cars
- I Like Maths
- Doubling Using Finger Patterns

Other suitable games and activities on the nzmaths website:

- Rocket
- Missing Number Bingo
- Squeeze
- Traffic Lights
- Target 15, 287

For multiplication and division

- Multiplication Bubble puzzles (see bubble jigsaws in addition/subtraction)
- Start Unknown
- Kiwi Multiplication
- Motocross Multiplication
- Rocket Multiplication

Other suitable games on the nzmaths website:

- Four in a Row Multiplication
- Multiplication Madness
- Loopy
- Tennis Ball Multiplication

For fractions and ratios

- Fractions, decimals, and percentages bubble jigsaws (see bubble jigsaws in addition/subtraction)
- 0 to 1 on the Number Line
- Fraction with Dough
- Colour in Fraction Wall
- Decimal Rocket Blast Off
- Ordering Numbers

Other suitable games on the nzmaths website:

- Mix and Match
- Missing Decimal Bingo
- Easy fraction game
- Decimal Bingo
- Target 15.287

Section 6: Other Ideas to Involve Parents in Numeracy

- Share ideas that encourage mathematics in everyday experiences, for example, in the car, supermarket, garage, sports field, kitchen, and garden.
- Invite parents into classrooms to share their stories about how they learnt mathematics at school. Discuss similarities and differences; consider different cultures and cross-curricular approaches.
- Include a cultural presentation at the beginning or end of a Home–School Partnership: Numeracy community session and involve the children and/or parents.
- Invite different cultural groups to share mathematics activities and games from their cultures.
- Ask parents to translate the Number Framework or key messages into their home language. These could be displayed in the school.
- Provide content workshops for parents to consolidate their own knowledge.
- Have a mathematics open day or morning, with children playing games, demonstrating equipment, or using computers with their family.
- Start a mathematics library of books and/or games.
- Read picture books with a mathematics context to your students just before home time to model shared reading and mathematics to parents.
- Have computers available for parents to use after school to support those who don't have a computer at home. Encourage exploration of the nzmaths website.
- Use the school newsletter to provide tips on mathematics or a weekly problem or game.
- Create a numeracy wall in your school foyer displaying items such as current numeracy activities, ways to help with numeracy at home, and numeracy problems.
- Have a celebration at the end of the Home–School Partnership: Numeracy series of sessions – perhaps a sports afternoon or a shared meal. Invite cultural groups to prepare food; this could be combined with health, technology, or social studies emphases. Recipes could be provided. Children could collect data, for example, on numbers coming or quantities needed.
- Survey parents at the end of the Home–School Partnership: Numeracy sessions to find out how things have gone, how they have applied the

mathematics ideas, which activities they enjoyed, what they would like in future, and so on.

- Consider repeats, for example, for new parents, or a two-year cycle.
- Remind parents of the Families section on the nzmaths website, Team-Up booklets, and reading books that have a mathematical content.
- Have a noticeboard in the school with photos of parents enjoying themselves at the first Home–School Partnership: Numeracy session, with space for comments if wanted. Parents coming into the school will see the photos and perhaps realise that Home–School Partnership: Numeracy may be less threatening and more fun than they thought.



Section 7: Building On the Relationships That Have Been Established

Encourage your school to have a long-term plan for Home–School Partnership.

Incorporate the successful ideas acquired from the Home–School Partnership:

Numeracy sessions in future Home–School Partnership plans.

- Have a series of meetings rather than “one-offs”.
- Consider focusing on different year groups, syndicates or transitions from Early Childhood Centres.
- Encourage teachers to focus on building relationships, not just with their students but with the parents and family as well.
- Consider a similar approach with other curriculum areas.
- Contact school advisers for ideas and support.
- Use expertise within the school.
- Share ideas and training sessions with nearby schools.
- Establish a planning team. The numeracy team can provide information on organisation for sessions.
- Approach the BOT for a Home–School Partnership budget.
- Ask parents to support class programmes by making equipment and games.
- Invite parents into class to help with class programmes.
- Parents can share or teach aspects of their own cultures, as relevant.

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Home–School Partnership: Numeracy



To be numerate is to have the ability and inclination to use mathematics effectively — at home, at work and in the community.

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